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Preservation of Historical Resources on Kaho'olawe: Responsibilities, Natural and Cultural Impacts, and Priorities

By:
Michael Graves
C. Kehaunani Abad

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A Report Submitted to the
Kaho'olawe Island Conveyance Commission

Michael W. Graves and C. Kēhaunani Abad
University of Hawai'i

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To all of these individuals we are grateful for the assistance, advice, and information. They have helped to make this an enjoyable and rewarding as well as productive project for both us. Finally, we have tried to separate our facts from our opinions throughout this report, and have attributed the facts to reliable sources. That makes us solely responsible for the opinions represented here. We have made them in the hope that this will lead to productive discussion and resolution of the important historic preservation issues pertaining to Kaho'olawe.

Executive Summary

The Kaho'olawe National Historic District is an irreplaceable historic resource deserving adequate protection and preservation for the future. It comprises over 640 archaeological sites varying in size, function, age, and degree of preservation (Hommon 1980a:8). This report describes: 1. past and current U.S. Navy legal obligations to manage and preserve these sites; 2. the natural and human-induced impacts that threaten these sites; and 3. a series of recommendations regarding priorities and policies for establishing and implementing a historic preservation plan for the island.

Navy responsibilities for preserving Kaho'olawe natural and historical resources have increased through time. This report details the history of historic preservation statutes, regulations, and judicial decisions applicable to the island, the Navy's obligation to comply with these requirements, and measures applied to the island in response to such requirements. Navy efforts toward preserving historic properties have been largely absent prior to the early 1970s, and only piecemeal thereafter. This continues to be the case as of 1992 despite the Navy's jurisdictional responsibilities under various federal historic preservation statutes. We recommend that the Navy should quickly assume its full role as the guardian of the Kaho'olawe National Register District.

The historic properties of Kaho'olawe need to be preserved from a variety of natural and human-induced impacts whose

cumulative effects may deteriorate or destroy them. Of particular concern are vandalism, military exercises and infrastructure, and widespread erosion along the coasts and uplands. Other impacts, although more localized and of lesser effect, include archaeological research, site preservation efforts, revegetation projects, and site visits by the Protect Kaho'olawe 'Ohana and others. The effects of these impacts on historic properties have been to disturb, alter, or remove portions of the archaeological record and to threaten site integrity. Future human activities of considerable concern are ordnance clean-up on the island, revegetation and erosion control programs, increased site visits, and the potential for site vandalism.

We recommend that a series of archaeological sites be given high priority for immediate protection and preservation, including all burial sites, religious sites, the large quarry and shrine complex at Pu'u Mōiwi, and the Hakioawa archaeological district. The numerous sites along the island's southwestern coast that are rapidly being eroded should be investigated. We further recommend a long term program of monitoring archaeological sites in order to identify the range and effects of impacts and to monitor their occurrence. We recommend this program be combined with a plan to actively protect and preserve sites, with the close cooperation of native Hawaiian groups, in particular the PKO (hereafter, the 'Ohana). Such a plan should incorporate a program of revegetation and site preservation since

these two efforts can be complementary. Other solutions we advise include site avoidance (both by humans and/or machinery), active site preservation and stabilization, controlling the spread of alluvial and colluvial erosion, and limited data recovery.

Managing and preserving Kaho'olawe's historic resources should be a joint effort involving native Hawaiians, the Navy, and the State of Hawaii. The management approach should emphasize preservation and protection of the resources, accompanied by appropriate educational opportunities, and provide native Hawaiians an opportunity to employ suitable adaptive uses for culturally important historic properties. The land management plan for Kaho'olawe must take into account all of the historic resources on the island, be comprehensive, long-term, and have provisions for assessing its implementation.

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Chapter 1

The Kaho'olawe Preservation and Stabilization Project.

In this first chapter we briefly set out some of the historical context for the current study. However, we want to caution that a full history of the historic preservation process on Kaho'olawe has yet to be written. Here, we introduce first the legislative and legal background to the first systematic archaeological reconnaissance of the entire island. Next, we identify some of the ways in which the island's history has been deemed significant by archaeologists. The archaeological reconnaissance also revealed what many already suspected: that sites on Kaho'olawe had been (and continued to be) impacted by both natural and cultural agents. Thus, the historical heritage of Kaho'olawe was at some risk, and management of the historical resources should have high priority. We complete this chapter by describing some of problems and issues which continue to trouble the historic preservation process on Kaho'olawe. This will also serve to indicate why this report was commissioned. We offer information about both responsibilities for managing the historic properties of Kaho'olawe, and the processes and events which make successful historic preservation a continuing challenge to all of us.

The historic resources of Kaho'olawe have been the source of sporadic archaeological interest throughout this century

(McAllister 1933; Stokes n.d,). Within the past 15 years, however, the scope and intensity of their documentation through archaeological field work have substantially increased (Barrera 1984; Hommon 1979, 1980a, 1981; Hommon and Streck 1981 Rosendahl et al. 1992). During this same period of time, and as the result of various actions (including litigation) taken by individuals, legislators, groups, and federal agencies, the United States Department of the Navy has sought to comply with federal laws and regulations that pertain to its historic preservation and environmental protection. The Navy has assumed the role of land manager, given its exclusive use of the island since the early 1940s.

As a federal agency, the Navy in 1971 was first required to prepare an Environmental Impact Statement; in 1972 this report was completed (United States Department of the Navy 1972) and accepted. Although no archaeological survey was done as part of this first study, by 1976 the Navy had contracted with the State of Hawaii, Department of Land and Natural Resources to conduct an archaeological survey on Kaho'olawe. In 1977, a Draft Supplement to the Final Environmental Impact Statement (United States Department of the Navy 1977) was completed. At this time the archaeological survey had located more than 55 archaeological sites and prepared nominations for these sites to the National Register of Historic Places. In 1976 a suit was filed against the Navy by the Protect Kaho'olawe 'Ohana and in 1980 this suit was resolved through a consent decree (Aluli v. Brown 1980). The

judgment required the Navy to submit the entire island (and all of its historic properties) as a multiple resources (or district) for nomination to the National Register of Historic Places. This nomination was completed (Hommon 1980b) and was subsequently accepted by the Keeper of the National Register. Among other stipulations, the consent decree established the Navy's responsibility to manage the historic resources of the island, especially those archaeological and burial sites which were subject to erosion and those sites that might be impacted by military activities, from both ground troops and bombing or gunfire. Additionally, the federal government, through the Navy, has funded a series of mitigative studies (Hommon 1981a; Hommon and Streck 1981; Rosendahl et al. 1987) to recover archaeological information from sites whose historical integrity was threatened by various natural processes. In 1979 the Navy issued a second supplement to the Final EIS (United States Department of the Navy 1979).

Both the survey and the limited excavations conducted on Kaho'olawe have raised questions about the island's history. These studies clearly established the scientific significance of the historic resources of Kaho'olawe, especially as they pertained to: 1. the timing of Hawaiian prehistoric colonization of the island; 2. the duration of human occupation; 3. the nature of prehistoric occupation of the island; 4. the kind of subsistence economy which was practiced on the island; 5. the degree and extent of landscape and vegetation change in both pre-

contact and historic times; and 6. the relative (and absolute) human population size on the island. This work has been generally successful (although not always substantively correct) in confirming the scientific (i.e., archaeological) importance of the island. A good part of Kaho'olawe's history is preserved in archaeological sites, and many of these sites can still be found and studied. With the exception of Ni'ihau, no other Hawaiian island preserves such a complete array of archaeological sites as does Kaho'olawe.

At the same time, the archaeological survey and excavations documented considerable erosion of the uplands on the island, and this erosion has left many archaeological sites as surface scatters of lithic debris, shell fish remains, and assorted artifacts. These sites are referred to as "lag sites" in several archaeological reports (Ahlo 1981; Hommon 1980; Yent 1983). Elsewhere, archaeologists noted portions of sites that were in the process of eroding out of upland soil hillocks (Ahlo 1981; Hommon 1980a, 1981a; Neller 1982a; Rosendahl et al. 1987). Concurrently, many of the valleys along the northeast and northwest coasts of Kaho'olawe had been deluged with sediments emanating from upland erosion, and these sediments figured into archaeological reconstructions of the island's prehistory and history (Barrera 1984; Hommon 1979, 1980b, Kirch 1985; Spriggs 1987, 1991). Archaeologists first (Hommon 1980b) hypothesized that native Hawaiians had caused the upland erosion before European contact and this erosion contributed to the degradation

of the environment for farming and subsequent population decline on the island. Although the dating, intensity, and duration of the upland erosion is now a matter of some debate, there is no doubt but that its scale is large and in several cases, the intermittent streams which flow through the gullies and gulches along the coastal valley bottoms have cut new channels, added substantial coastal alluvial deposits, and have also exposed archaeological deposits and created additional contexts for erosion to occur. Awareness of these contexts (as well as storm induced coastal erosion) led to several limited excavation projects designed to recover material remains from threatened sites or features within sites on Kaho'olawe (Hommon 1981a; Rosendahl et al. 1987).

Despite the provision of the 1980 consent decree which stated that a Cultural Resources Management Plan (CRMP) should be implemented without delay, attempts over the past decade to manage the island's historic resources and to preserve or stabilize sites threatened by erosion or sedimentation have been piecemeal, at best. Hopefully, the recent commitment of the Navy to complete the long overdue CRMP (Ogden 1991) will resolve most of the historic preservation management issues. This current project (and the report presented here), sponsored by the Kaho'olawe Island Conveyance Commission, was designed to emphasize the processes affecting archaeological site preservation on Kaho'olawe, and in this manner it is distinguished from the CRMP. Additionally, we take as our point

of departure the perspective that preservation of historic resources on Kaho'olawe should have high priority and that in order for these resources to be effectively preserved, it is necessary to understand the scope of federal responsibility and its perspective in historic preservation. We also believe that only by integrating scientific knowledge on the manner in which natural and cultural processes (e.g., erosion, land clearance) impact historic properties on the island can we begin to develop policies and establish priorities to preserve the archaeological record.

Previously, one approach to managing the historic resources of Kaho'olawe was to emphasize the recovery of information (i.e., mitigation) from the intact portions of threatened deposits as a solution to erosional problems. Technical emphasis was placed on the excavation of cooking features (e.g., earth ovens or hearths) or archaeological deposits such as middens within or adjacent to structural features (e.g., terraces or platforms). After excavation, these areas were back-filled and often attempts were made to stabilize portions of the areas excavated, typically using netting. These measures were thought to contribute to site preservation. The Navy policy of limiting access to the island by all but their own personnel (and designated guests) and the Protect Kaho'olawe 'Ohana (whose members are restricted for the most part to Hakioawa, Kealaikahiki, Pu'u Moa'ulaiki, Pu'u o Moaulanui, and Kamohio) has helped to preserve archaeological sites, unintended as it might have been.

Surprisingly, there has been little to indicate that the Navy, its archaeologists, or the contract archaeologists hired to conduct research on these sites have adopted a comprehensive perspective relative to site preservation. Only the Draft CRMP (Ahlo 1981) that was later rejected, evinces an interest in documenting impacts to historic properties and identifying preservation strategies for threatened sites. Given the scale and rate of erosion that has been documented on Kaho'olawe within recent time and given the kinds of changes which may result as a consequence of the Kaho'olawe Island Conveyance Commission projects and their reported recommendations to the U.S. Congress, a historic preservation perspective which does not address the problems of human and natural impacts to archaeological sites may inadvertently lead to the cumulative deterioration of the historic resources on the island. Moreover, preservation of historic properties by excluding human activity from Kaho'olawe, although laudable from the standpoint of the historic properties, may not be acceptable. Among other objectives, we will consider how site preservation might be integrated into large scale efforts to control erosion of the island, and to ultimately slow and then reverse the processes by which historic properties are being threatened.

Currently, the rationale used to select features within historic properties for preservation is poorly developed. The terms used--in archaeological or planning reports--to describe qualitatively different forms of preservation are rarely

consistent with those used by federal land managers. No policies or priorities for site preservation have been established to guide the Navy or future land managers. This report attempts to suggest several ways to approach the preservation of historic properties on Kaho'olawe that are both sensitive to the cultural concerns of native Hawaiians and scientifically warranted.

For more than a decade now the Protect Kaho'olawe 'Ohana ('Ohana) has demonstrated its commitment to the land, the natural environment, and historic resources of Kaho'olawe. The 'Ohana has long emphasized the need to monitor and protect the historic resources on Kaho'olawe from the ongoing effects of both human and natural impacts. Members of the 'Ohana have noted the relationship between devegetation and large scale upland erosion and their combined impact on historic property integrity, both in the uplands and down slope, along the coast and in valleys. The 'Ohana has also noted the impacts of Navy bombing and military exercises on sites in the impact zone and along the coast from Hanakanaia to Lae o Kealaikahiki. During its monthly accesses to Kaho'olawe, the 'Ohana has attempted to identify historic resources in the vicinity of Hakioawa--the main area set aside for 'Ohana use--for preservation. At Hakioawa, the 'Ohana has recognized the significance and condition of several important historic properties. They have done this by bringing to the attention of the Navy and archaeologists the threat by erosion to features within this archaeological district. They have also avoided sites at Hakioawa that might be further impacted by human

activities. At the same time, the 'Ohana has sought to incorporate historic resources into its activities, including religious ceremonies, guided walks, rehabilitation of the vegetation landscape, and day trips to other island localities. Members believe these activities are integral to the maintenance of their beliefs and values, as well as serve to strengthen the identification of Hawaiian as a distinctive culture. It is therefore important to the 'Ohana that the question of historic property preservation be placed within the context of appropriate long term management or use. Historic preservationists in the United States for some time now have found ways to respect historic properties and at the same time be able to use them for suitable purposes. This is what is known as adaptive use. In this report we will suggest adaptive use can be combined with appropriate measures to preserve historic properties from damage or loss of the qualities which render them scientifically and culturally significant.

There is general agreement among all who have familiarized themselves with the historic resources on Kaho'olawe that these are special in many ways. They represent a part of the history of the Hawaiian people that has been irretrievably lost in other areas of the state. They are of national and state significance, as witnessed by the National Register listing of the entire island and all its historic properties. Ironically, a case could be made for their significance on an international scale, especially when viewed within the context of the island's

environmental and landscape change, its position in recent U.S. military policy, and its place in the emergent arena of native Hawaiian sovereignty. Because of the recent history of federal use of Kaho'olawe by the U.S. Navy for military purposes and the struggle by native Hawaiians and others to gain back control over more of the state's land, these issues propel the island into international importance. The entire island has become, in some respects, an international historic property by virtue of the groups--some in contention with others--which have interests in its past and future.

There is tacit recognition by the Navy, the Advisory Council, the State Historic Preservation Officer, as well as by the 'Ohana that historic properties on Kaho'olawe have been impacted in the past, and the impacts continue today and will likely persist into the future. The establishment of the Kaho'olawe Island Conveyance Commission provides a timely forum for a discussion of the relationships between land management policies, historic resource preservation, natural and cultural impacts, and the use of historic resources, especially within the framework of the current land use and possible scenarios for the future of the island. This is the overall goal of our study. In the remainder of this report, then, we will sequentially address: 1. the legal obligations for historic preservation and cultural considerations; 2. the identification of impacts to historic resources on Kaho'olawe; and 3. priorities and policies that may be implemented to enhance the preservation of the historic

resources of Kaho'olawe. With this accomplished, we hope to have helped the Commission during its deliberations and as it prepares its report to Congress. Finally, we would be remiss if we did not once more stress the need to find ways to wisely preserve this island's important historical heritage.

Chapter 2

Legal Authority for Historic Preservation on Kaho'olawe

The island of Kaho'olawe has been controlled by the United States Department of the Navy (hereafter, the Navy) since 1941. Previously, the island had been part of the Hawaiian Kingdom and later, after the Kingdom was overthrown, Kaho'olawe was incorporated as public land by the Territory of Hawaii. With the onset of American participation in World War II, Kaho'olawe was used by the military for ground exercises and as a bombing target. The Navy continued to maintain their administration of the island after World War II. Prior to statehood, Executive Order 10436 was issued by President Eisenhower (United States President 1953) and this placed the island under the jurisdiction of the Department of the Navy. Both the Executive Order and the enabling legislation for Hawaiian statehood stipulate that the island of Kaho'olawe should be conveyed to the State when it is determined to be no longer necessary for Navy use. A Memorandum of Agreement between the Navy and the State of Hawaii (United States Department of Navy 1978) reiterates the State's interest in the eventual return of the island to its dominion.

Because the Navy administers the island and since the Navy is a part of the United States federal government, federal historic preservation and environmental protection statutes are applicable to the significant historic resources on the island. The two federal statutes whose provisions are most often applied

to the historic resources of Kaho'olawe are the National Historic Preservation Act (NHPA) of 1966, as amended (United States Congress, National Historic Preservation Act 1966) and the National Environmental Policy Act (NEPA) of 1969, as amended (United States Congress, National Environmental Policy Act 1969). It was the application of NEPA in the early 1970s to the federal government's military activities on Kaho'olawe that provided the legal basis for the Navy's first Environmental Impact Statement (United States Department of the Navy 1972). From its inception, compliance with the provisions of NEPA has been interpreted by the Council on Environmental Quality to include a description and evaluation of archaeological and historical sites within a project's boundary (Council on Environmental Quality 1971, 1973, 1976; Scovill et al. 1977).

As early as 1972 during the interagency review of the Navy's first EIS for Kaho'olawe, the Advisory Council on Historic Preservation (ACHP) in a letter to the Navy suggested that the EIS "...should include a discussion of the steps taken to comply with ...Executive Order 11593," and raised the issue of compliance with Section 106 of NHPA (Garvey 1971). Executive Order 11593 directed federal agencies to begin the timely review and survey of their lands for properties eligible for the National Register. At the same time the United States Department of the Interior directed the Navy to consult with the National Register (of Historic Places) and with the State archaeologist regarding the historic properties that might be located within

the project (i.e., bombing and military exercises area) boundaries (Lyons 1971). Clearly, the Navy had an obligation to assess the historic resources of Kaho'olawe that might be affected by its undertakings.

Subsequently, the Navy entered into a contract, first in 1976 with the State of Hawaii Department of Land and Natural Resources and then, later with Hawaii Marine Research, Inc. to conduct an intensive reconnaissance survey of Kaho'olawe, concentrating first on sites located in the impact zone or target area of the island. In a Supplement to the Final EIS (United States Department of Navy 1979), the Navy identified both Executive Order 11593 (United States President 1971) and NHPA as the primary statutes which required the survey, although the survey data were also used in an earlier 1977 Supplement to the EIS. The original survey was later enlarged to include all of the island.

NHPA was amended in 1980 and in so doing it incorporated much of Executive Order 11593 and various interpretations of the law by the Advisory Council on Historic Preservation. NHPA is undeniably the most important piece of federal historic preservation legislation because it includes provisions that: 1. establish federal agency responsibilities for identifying historic properties; 2. guide determinations of eligibility of those sites to the National Register of Historic Places; and 3. provide for the mitigation of the effects of various sorts of impacts from federal undertakings on those properties or sites

eligible for the National Register (Advisory Council on Historic Preservation 1986). In the case of the Navy, the use of the island for military exercises and as a bombing target make it necessary to comply with Section 106 of NHPA. With the completion of the archaeological survey and the nomination of entire island to the National Register, the Navy complied with one of the provisions of Section 106. A Memorandum of Understanding between the Navy, the ACHP, and the State (of Hawaii) Historic Preservation Officer was signed (United States Department of the Navy 1981) which established procedures for mitigating the adverse effects of federal undertakings on Kaho'olawe. Mitigation measures included excavation of affected sites and features. The Navy had previously entered into a Memorandum of Agreement with the State of Hawaii (United States Department of the Navy 1978) related to both environmental and historic preservation matters on Kaho'olawe. This agreement included measures for reducing the environmental deterioration of the island by reducing the population of goats and by revegetating upland areas.

Neither NEPA or NHPA preclude undertakings on federal lands that will affect historic properties eligible for the National Register. However, the goal of both statutes is to encourage (and reward) planning where the relative costs and benefits of particular projects or activities can be estimated or described prior to their implementation. The costs are generally conceived of as impacts to the quality of the environment and historic

properties. Benefits are the positive outcomes of an undertaking, for example, the enhanced ability of the Navy to fulfill its military function. In this way the proposed undertaking can then be evaluated in terms of its effects on historic properties (and additionally for NEPA, on natural or non-renewable resources) relative to the benefits which accrue to American society and the state of Hawaii. The ACHP has developed guidelines for implementing Section 106 Reviews, and these contain a number of principles for the treatment of historic properties that consist of archaeological sites (Advisory Council for Historic Preservation 1980). Alternatives to the undertaking should be considered especially if it should adversely affect significant historic properties, and these can include options such as abandoning a project, redesigning various components of a project, or implementing the project as designed or redesigned (but with mitigative measures). For National Register historic properties on federal lands the effects of undertakings must either be avoided or minimized (such that they do not significantly affect the property). Alternatively, if the benefits of an undertaking outweigh the costs, then adverse affects to historic properties must be mitigated (such that sufficient information is obtained so as to reproduce the qualities that made a property historically significant). Mitigation is equivalent to data recovery, and this generally means scientifically controlled excavation and information recording about a property or archaeological site. By mitigating

the adverse effects of an undertaking through excavation and systematic data recording, the federal government can then treat the project as having no adverse effects. In other words, mitigation transforms an undertaking with adverse effect into one with no adverse effect. The consent decree (Aluli v. Brown 1980:9-10) between the Navy and the 'Ohana also required the military to mark sites, maintain markers, and to instruct troops to avoid both sites and markers.

Equally important from the standpoint of preservation, NHPA and its regulations establish that it is the responsibility of federal land holding agencies to preserve, where possible, National Register sites and districts. In other words, the goal of federal agencies is to plan effectively to maintain historic resources. NHPA also obligates federal agencies to assure that National Register properties are not being excessively or rapidly deteriorated, especially before preventative or mitigative efforts can be applied to the properties affected. As mentioned previously, the entire island of Kaho'olawe has been placed on the National Register as a district, thus NHPA potentially applies to all the archaeological sites on Kaho'olawe. Additionally, Aluli v. Brown (1980:12) requires that the military "shall take steps to protect from erosion those archaeological sites which are considered to be eligible for listing in the National Register." Threatened sites, especially those containing human burials, are to be stabilized under the consent decree. Again, given the status of the entire island as a

historic district, all sites on the island affected by erosion are included within this ruling.

Section 110 of NHPA (United States Congress, National Historic Preservation Act 1966) describes the responsibilities that federal agencies must fulfill in the areas of "...identification, evaluation, registration, and protection of [historic] properties." The Department of the Interior issued guidelines and standards for this Section of NHPA (United States Department of the Interior, National Park Service 1983), and a booklet has been jointly published by the Advisory Council and the Department of the Interior which describes how Section 110 should be implemented (Advisory Council on Historic Preservation and United States Department of the Interior, National Park Service 1989). Section 110 requires that federal agencies assume responsibility for preserving historic properties under their jurisdiction. Accordingly, federal agencies such as the Department of Navy should integrate preservation of historic properties with other programs (military exercises or reforestation) for which they are responsible. Among the actions that the Navy is required to undertake are: 1. the systematic identification of historic properties under its jurisdiction; 2. the development of a management inventory of historic properties; 3. the integration of the management inventory with planning procedures such that potential impacts to historic properties are considered early in the process; and 4. the consideration of the contemporary use and re-use of historic properties when this is

appropriate.

Under Section 110, federal agencies must also develop and implement preservation plans for the historic properties under their jurisdiction. Among the considerations that agencies should incorporate into their plans are the kinds of values that properties may have for: 1. interpretation, 2. contribution to a sense of time and place, 3. research, 4. education due to their rarity or exemplary features, and 5. cultural significance. The potential use or re-use of a historic property may also factor into management decisions.

Importantly, Section 110 obligates federal agencies to assure that National Register historic properties are not allowed to be substantially altered or to deteriorate significantly even in the absence of an undertaking. This provision applies whether or not the agency's actions or previous undertakings are directly responsible for the alteration or deterioration of a historic property. Additionally, Section 110 requires federal agencies to carefully consider known and potential threats to historic properties from natural forces or vandalism. The reasoning behind this is simple: the cumulative effects of such impacts can eventually cause a property (or an entire district) to lose the integrity or qualities that it formerly possessed and which made it suitable for inclusion on the National Register. Thus, federal agencies have a responsibility to consider historic properties during the planning stages of their undertakings which might directly affect them. Additionally, in their role as

steward of this nation's historical record these agencies must help to protect and maintain those National Register properties, especially from the threat of vandalism and natural forces.

Section 110 further stipulates that historic preservation activities by federal agencies should be carried out in consultation with appropriate state and federal agencies, and with appropriate native American groups, including native Hawaiians. Under both the regulations (United States Department of the Interior 1987a, 1987b) issued to implement the Archaeological Resources Protection Act (United States Congress 1979) and the American Indian Religious Freedom Act (United States Congress 1978), native American groups must also be notified if damage or harm will occur to their religious or cultural sites on public lands or if there are sites on federal lands that may be of ongoing cultural interest, such as burial grounds, religious sites, or those sites which are associated with traditional history. Similarly, the recently passed Native American Graves Protection Act (United States Congress 1990) vested ownership and control of newly discovered cultural items (both human burials and associated funerary objects) on federal lands to lineal descendants or to organizations associated with descendant native American or native Hawaiian populations. Previously recovered or excavated Hawaiian cultural items may now be repatriated to native Hawaiians for reburial.

These statutes and regulations reflect a trend towards increasingly closer cooperation and consultation between the

federal government and native American and Hawaiian groups on matters pertaining to their cultural and historical patrimony. The rationale for this policy is fairly obvious: these historic sites and properties are often some of the most tangible remains of a group's history and culture. Highly evocative and possessing strong religious, spiritual, or symbolic meanings, and crucial for cultural identity, historic properties associated with native American and Hawaiian groups have values other than those emphasized by scientists and professional anthropologists. Thus, decisions regarding the current or future integrity of such properties need to take such cultural considerations into account. This is especially the case when an undertaking will adversely affect the physical integrity of a historic site or property, by destroying or substantially altering it. Moreover, archaeological investigation in the form of excavation falls into this category of effect because (although information is recovered) it involves the physical destruction of a site. The role of cultural groups is not limited solely to their consultation on matters pertaining to the physical nature of a property, but also should include their concerns about secondary impacts, especially those involving changes or alterations of the environmental or geographic context of a historic property. The Advisory Council on Historic Preservation recommends that cultural groups be brought into the planning process early, not just to review the findings, but also to add their traditional and collective values and significance assessments to an area and

its properties (Parker and King 1990). The Advisory Council has defined cultural groups broadly to include those recognized by state and federal agencies (e.g., the Hopi Tribe) and those whose organization pertains in some direct manner to the historic resources of an area. This is crucial for Hawaiians at this juncture, since there is no single group which can be said to stand for all native Hawaiians. The Advisory Council's definition provides for recognition of groups such as the Office of Hawaiian Affairs (a unit of the state of Hawaii government) as well as the Protect Kaho'olawe 'Ohana.

Importantly, cultural values can apply to landscapes, whether they contain material (i.e., archaeological) representations or not. Named places of the Hawaiian landscape which lack archaeological materials must still be reviewed within the planning process, since by the process of naming them, these areas achieve a level of cultural significance (regardless of their archaeological significance). Echoing this, Matthew Spriggs (1990) has recently identified several points at which a dialogue between Hawaiians and archaeologists should take place, including consultation on archaeological research and the protection of sacred and traditional sites. Thus, the values Hawaiians attribute to the place known as Kaho'olawe are important considerations in the evaluation of the historic properties on the island; both land managers and archaeologists should be mindful of this as they plan for the future of these properties.

Federal legislation also has made provisions for what are generally termed 'preservation' and 'stabilization' of historic properties and for the continued adaptive use of historic properties (Advisory Council on Historic Preservation 1982:35). Traditionally, these provisions have been used to enhance the economic value (see Advisory Council on Historic Preservation 1983) of historic properties (i.e., the restoration or rehabilitation of historic buildings for commercial purposes, tax relief, or real estate gain,) or to maintain historic properties in their current state for educational and recreational purposes. However, there is no reason why these same provisions could not also be used to enhance the cultural and traditional historic values of historic properties or archaeological sites for native Americans or Hawaiians who are descendants of the people who built these properties in the past. Clearly, this is inherent in the establishment of historic building districts in urban areas (e.g., Chinatown in Honolulu). While there is often an economic incentive for such designations, historic districts are also important to the cultural or ethnic groups affiliated with them. Importance here is symbolic as well as political or ideological. Thus, in keeping with the provisions of Section 110 of NHPA, value, as it is applied to adaptive use or long term preservation, can be interpreted in ways other than simple economic or use criteria. Finally, we note that Aluli v. Brown (1980:8) states that the cleared areas (defined as those from which military ordnance has been removed), "...to the maximum

extent possible...shall be used for religious, cultural, scientific, and educational purposes."

The implications of this are relatively clear. National Register properties which are archaeological sites are suitable candidates for preservation and adaptive use as places where ongoing cultural and traditional activities and events may take place. Currently in Hawaii, the pu'uhonua (refuge) and heiau (religious structure) complex at Hōnaunau in the Kona District of the island of Hawai'i are part of the National Park system operated by the federal government. At the same time, this archaeological and historical complex is occasionally a place where the production and use of traditional Hawaiian crafts are demonstrated and where religious and performance events are held. Portions of the historic property have been repaired, and in one case, the wooden structures and objects associated with a heiau have been restored. The example of Hōnaunau illustrates one approach to the preservation of historic properties on federal land. We would not necessarily recommend the public display of native Hawaiian religious properties to casual observers, since such displays are considered sacrilegious or inappropriate to some Hawaiians. However, this case does indicate that Hawaiian sites can be preserved on federal land and appropriate native Hawaiian adaptive uses may be found for such properties. The question of what constitutes appropriate adaptive use of native Hawaiian historic properties, especially those under current federal jurisdiction, can best be answered by consulting with

native Hawaiian groups as stipulated by NHPA, and the recent statutes that Congress has passed and the regulations that the Department of the Interior has promulgated.

How have these provisions for preserving historic properties been interpreted and implemented by Department of the Interior and the National Parks Service? First, guidelines and standards have been issued that define several different kinds of historic preservation activities (United States Department of the Interior 1983:44739-44740). Of interest here are: 1. protection, 2. preservation, 3. stabilization, and 4. rehabilitation. Protection refers to "the act or process of applying measures designed to affect the physical condition of a property by defending or guarding it from deterioration, loss..., or to cover or shield the property from danger or injury." Preservation is defined as "the act or process of applying measures to sustain the existing form, integrity, and material of a...structure, and the existing form and vegetative cover of site." Stabilization refers to "the act or process of applying measures designed to reestablish...the structural stability of a[n]...deteriorated property while maintaining the essential form." Rehabilitation is defined as "the act or process of returning a property to a state of utility through repair or alteration which makes possible an efficient contemporary use while preserving those portions or features of the property which are significant to its historical, architectural, and cultural values." These definitions illustrate how federal agencies recognize different

levels of preservation that can be undertaken at a historic property. From protection to rehabilitation, there is a range of effort and additional materials made to approximate an earlier construction, use, or abandonment context for a historic property and to perpetuate that appearance of the property through time.

Second, The Department of the Interior has formalized the process by which adaptive use and preservation of historic properties are integrated and evaluated. These include guidelines that specify the kinds of preservation activities that are in keeping with a property's historic context, especially if it is listed on the National Register. Additionally, for income producing properties, there are rules that guide the rehabilitation of historic buildings in order to qualify for favorable tax treatment (Advisory Council on Historic Preservation 1983). Although most of the emphasis has been placed on regulating adaptive use and preservation within the context of commercial development, there is no reason why long term preservation and adaptive use cannot be applied to historic properties where non-economic considerations may predominate.

Summary

In this section we have briefly described how the application of federal historic preservation statutes to Kaho'olawe was initially based on compliance with NEPA and Section 106 of NHPA. Amendments to NHPA, the promulgation of federal regulations and guidelines, and the passage of new

federal legislation in the past decade provide the basis for arguing that the Navy's responsibility to manage and preserve the island's historic resources has been broadened. Perhaps most importantly, under Section 110 of NHPA the Navy has a responsibility to protect and preserve the historic properties on Kaho'olawe, regardless of the status of its undertakings. This suggests that the Navy should insure that the historic properties of Kaho'olawe are not deteriorating or being degraded as a result of neglect or lack of action. A case can be made that the historic resources of Kaho'olawe continue to be impacted by processes both natural and cultural whose origins or persistence can be traced to the Navy. Similarly, the Navy has a responsibility to identify natural processes (outside of human control) that may be affecting the integrity of historic resources and to develop plans to recover information before it is lost. The loss of historic resources (or their information potential) represents a loss of historic integrity and this affects the qualities which first led to the island's historic properties nomination to the National Register. Thus, we can link the Navy's obligations to these sites back to NHPA and the provisions which implement its regulations.

Because the vast majority of historic properties on Kaho'olawe are attributable to ancestral native Hawaiians, the Navy also has a responsibility under federal law to consult with Hawaiians on the preservation of these historic properties, especially those whose condition may be deteriorating. In order

to accomplish this, it is necessary to have: 1. an inventory of historic properties with current information on their condition; and 2. information on the natural and cultural processes that affect or threaten the integrity or qualities that make the historic properties of Kaho'olawe eligible for the National Register. Similarly, for the Navy to effectively manage the historic resources of Kaho'olawe (and by implication, to complete its CRMP), it must again consult with native Hawaiians and include provisions for the effective preservation of historic properties on the island as part of its management plan. Finally, management and preservation of the historic properties on Kaho'olawe offer the Navy a unique opportunity to join with native Hawaiians to devise culturally appropriate adaptive use of archaeological sites. Adaptive use is encouraged by the federal government as one means to enter into partnerships with private groups and local governments for the long term preservation of historic properties. At this juncture, it seems appropriate to recommend that the Navy, native Hawaiians, and the State of Hawaii enter into a partnership to act as stewards of the land and historic resources on Kaho'olawe.

Chapter 3.

An Overview of Impacts to Historic Properties on Kaho'olawe

As described in the last chapter, under Section 110 of NHPA, the Navy has a legal obligation to both manage and preserve the historic properties of Kaho'olawe. Some of the impacts that have affected the integrity of the historic properties of Kaho'olawe were undoubtedly at work prior to the Navy's control of the island in 1941. McAllister (1933:45-55), for instance, described several sites impacted by erosion or flooding on Kaho'olawe. Nonetheless, with its assumption of jurisdictional control of the island, the Navy has now also assumed the responsibility for controlling excessive deterioration or alteration of historic properties that might affect their integrity or significance values. This is the case, whether or not the Navy was directly responsible for the impacts.

In order to plan for the preservation of historic properties on Kaho'olawe, it is first necessary to estimate the effects of impacts on the properties. There are two components that must precede this: 1. knowledge about the historic properties (this establishes their values and the kinds of information they may possess), and 2. knowledge about the natural and cultural processes which alter or destroy the integrity of historic properties; this should establish the nature of effects. Knowledge about historic properties is derived from information collected during previous inventory surveys, and any additional

archaeological or historical research that may have been performed. In addition, this knowledge would include information obtained from consultations with native Hawaiians as well as information that would be available from previous research in Hawaii (or other appropriate locations) about different kinds of historic properties. Knowledge about human induced and environmental processes (often termed, natural and cultural formation processes, cf. Schiffer 1987) serves to establish the nature and effects of different impacts on historic properties. Such information is derived from previous research in archaeology or other natural sciences. Again, consultations can be especially helpful in identifying where impacts occur and the kinds of processes which produce particular types of impacts. In this chapter we will concentrate on describing potential impacts to historic properties drawing on the perspective provided by recent studies of formation processes (Schiffer 1987) and by our own and previous observations about the condition of historic properties on Kaho'olawe.

Schiffer first coined the term formation processes in order to emphasize the fact that what we see today in the archaeological record is the outcome of a number of natural and cultural processes which led both to the initial deposition of material culture and its subsequent alteration over time. Thus most archaeological sites today look very different from how they would have appeared when they were first deposited. These post-depositional processes include both agents of natural (i.e.,

environmental) and cultural (i.e., human) origin. Scientists from a number of disciplines (e.g., geology, biology, chemistry) as well as archaeologists have contributed to a growing body of knowledge about the rate, impact, and outcome of various post-depositional formation processes. Moreover, Schiffer (1987) has recently synthesized much of this literature and distinguished among a variety of cultural and natural formation processes. We have drawn upon his work to organize our description and discussion of post-depositional processes.

Impacts can result, first, from projects that take place on the same land as historic properties. The kinds of projects which most often have impacts are those involving land modification or alteration. In the process of completing a project or implementing its procedures, the landscape--including the historic properties sitting on and in the landscape--may be altered. These kinds of modifications are sometimes called direct impacts (King et al. 1977:57, 59; Wildesen 1982:54). There may also be indirect impacts resulting from the direct effects of projects to other areas with historic properties (King et al. 1988:61-62; Wildesen 1982:54). For instance, one indirect effect of building and maintaining unimproved roads is to increase erosion along the margins of the road and to channel and concentrate the flow of water into gullies or gulches. The increased runoff of water can lead to the erosion (i.e., an indirect effect) of historic properties located down slope from the road (i.e., the direct effect). At times, the cumulative

effects of indirect impacts can have as great an effect as those directly resulting from a project. As discussed in Chapter 2, the federal government also considers that National Register sites can be impacted by neglect, especially when this introduces or increases the occurrence of natural processes of decay and deterioration. Impacts may occur, therefore, not through any direct intervention of the Navy, but through inattention to the condition of historic properties. As the current designated land manager of Kaho'olawe, the Navy has assumed a responsibility to the island's historic properties, and to consider the impacts and the natural and cultural formation processes that are placing those properties at risk.

The impacts we shall be most concerned with in this report are those which individually or in some combination affect the integrity of historic resources. Historic preservation integrity is defined as the property a historic resource will possess when its historical context(s) can be identified and interpreted. Disturbance of sites, for instance, make it more difficult to identify them, and thus reduce their integrity. Disturbance can have similar effects on site interpretation. Integrity, then, is a function of identification and interpretation potential for historic properties, and all effects which reduce this potential reduce integrity to a corresponding degree. The effects of impacts, then, are to bury, transfer, remove, or alter (Wildesen 1982:54) components of historic properties (here viewed as archaeological sites), thereby reducing site integrity through

modification of historic contexts. Impacts can do this in a variety of ways: by separating one portion or part of site from the rest, by accelerating the rate at which deterioration and decay operate on material remains, or by any other kind of activity or event which makes it increasingly difficult to identify or interpret historic properties.

Schiffer's (1987) recent exhaustive review of formation processes provides a useful framework with which to conceptualize the effects of impacts on historic properties. Cultural formation processes involve human behavior as the direct causal agency in the alteration of historic properties. In this case, we are concerned about cultural formation processes which are post-depositional, that is, those human behaviors affecting the integrity and quality of a historic property after its deposition and abandonment by its original inhabitants. These behaviors modify the archaeological (i.e., preserved) record of historic properties. Two kinds of cultural formation processes are described by Schiffer (1987:99-140): reclamation processes and disturbance processes. Reclamation processes are human behaviors that reestablish a direct systemic context for historic properties. In other words, archaeological materials within historic properties or the properties themselves are once again placed "in use" (although the human behaviors and their context may vary from the original forms). Collecting and pothunting are examples of reclamation processes; other kinds of reclamation include archaeological excavation (i.e., the systematic removal

of artifacts and their study or display under professional conditions), preservation actions, as well as the reuse of archaeological sites by native Hawaiians. Disturbance processes are distinguished from reclamation by the fact that neither artifacts or sites actually reenter a systemic context of use when they are disturbed. As Schiffer (1987:121) notes, disturbance occurs as the result of an activity that has some purpose or focus, other than the use or examination of a historic property. Disturbance activities on Kaho'olawe can be subdivided into two kinds: earthmoving and surface disturbances. Earthmoving disturbances include bombing (and other forms of explosion), and all forms of construction that involve digging into and through the earth's surface (road building, house construction). Surface disturbances would include trampling, crushing by humans, the lateral displacement of materials by machinery moving across the ground surface, the removal of chips or flakes of rock when small gunfire inadvertently hits a historic property.

Natural formation processes are "any and all events and processes of the natural environment that impinge upon artifacts and archaeological deposits" (Schiffer 1987:7). Again, we are concerned with those post-depositional natural processes that disturb the integrity of historic properties. Although natural formation processes are a relatively constant force affecting the archaeological materials of all historic properties, we shall focus on natural formation processes whose rate is substantial or

whose geographic scale is large. Additionally, we will also be interested in documenting changes in these processes which might suggest evidence of significant increase in their rate or scale. For the purposes of this report, we shall confine our consideration of natural formation processes to those which operate at the scale of the archaeological site (e.g., Site 102) or a larger geographic area (e.g., the eastern uplands of Kaho'olawe).

All natural formation processes lead to the disturbance of historic properties. On Kaho'olawe the three main types of natural formation processes are: 1: eolian, 2. hydrological, and 3. coastal. Eolian processes involve the wind blown erosion of sediment, soil, and the lighter fraction of cultural remains from a historic property. Hydrological processes refer to water runoff, either channelled through gullies or gulches where it is labeled as alluvial or across the surface of the landscape where it is termed colluvial. Hydrological processes may involve both erosion (removal and transport) and sedimentation (i.e., deposition at lower elevations) of historic materials and of the sediments which originally surrounded them. Additionally, colluvial and alluvial processes may combine in a given geographic area. Coastal processes involve the effects of the ocean and climatic events that can produce both erosion (e.g., through storm events) and sedimentation (e.g., the deposition of sand dune deposits). Climatic events may, in turn, be the result of long term patterns of precipitation and temperature. These

natural formation processes often interact and on Kaho'olawe they are often directly affected by other factors, particularly, vegetation and animals. The rate of erosion on most non-coastal terrains is a function of vegetation coverage. On Kaho'olawe vegetation coverage is thought to be determined by climatic patterns which determine the kinds and density of plants, and by the number of cloven hoofed animals (goats, sheep, cattle) which feed on these plants. Thus, it is also important to keep in mind that there can be causal relations between cultural events (and formation processes) and natural processes such as erosion. For instance, the introduction and establishment of cloven hoofed animals on Kaho'olawe represented a series of cultural events with considerable natural impact.

In most circumstances, the material evidence of human settlements and occupation simultaneously undergo both positive (preservation) and negative (decay and deterioration) phases of formation soon after human abandonment. Typically, some portion of the abandoned assemblage of cultural remains will undergo a process of decay and deterioration prior to and after its burial. This is usually a function of the kind of material--organic or inorganic--that comprises the cultural assemblage as well as the climatic conditions which affect a site. Yet, as materials are incorporated into a sedimentary environment--that is, as they are buried--they tend to be preserved (or the rate of decay is substantially slowed). The more rapid and complete is the deposition or burial of cultural remains, the more likely these

remains will be preserved. Exposure or re-exposure to the earth's surface subjects cultural remains to greater rates of decay or increases the chance for disturbance to occur. Thus, in evaluating the impact of formation processes on Kaho'olawe, we are not so much interested in those whose occurrence is within typical parameters for this region of the world. Rather, we will describe those processes under the control of humans or processes that cause excessive harm to historic properties and their contents. This can occur through re-exposure to the surface, alteration of contextual relationships, transfer or removal to new locations, or redeposition and reburial in secondary deposits.

Obviously, in order to fully understand and estimate the effects of formation processes on the historic properties of Kaho'olawe this would require a level of investigation beyond the scope of this project. For that reason, we will recommend that a more comprehensive study be done on natural and cultural impacts. However, for this project we can draw on the observations of others, as well as our own admittedly limited observations about the condition of historic properties on the island and the factors that are probably impacting these properties at the present time, and likely into the future. We organize this discussion of formation processes into those processes which are solely cultural (or human) in their origins, and those which are natural or which involve an interaction between cultural and natural formation processes.

Cultural Formation Processes--Reclamation

1. Vandalism or Pot-hunting at Historic Properties.

The lack of a permanent population for much of the historic era has helped to protect many coastal sites on Kaho'olawe from human activity, especially from the unauthorized or illegal taking of artifacts and excavation of archaeological sites. With the exception of the Navy and other branches of the U.S. military (and their designated agents) and the 'Ohana, the island has had relatively few official visitors over the past 50 years. Since the cessation of the bombing and military exercises on Kaho'olawe in 1990, it appears that visitors are coming closer to shore, and in at least one case, came to shore and excavated a religious and habitation site, known as the Kamōhio shrine (Site 306).

Kamōhio shrine is located in a protected cove on the northwest side of Kamōhio Bay. A portion of the site was excavated in the early part of this century by J.F.G. Stokes (n.d.) an archaeologist with the Bishop Museum. Later a published archaeological monograph (McAllister 1933) on Kaho'olawe drew heavily on Stokes' field notes of the excavations at Kamōhio. What made the excavations at Kamōhio of considerable note was the excellent preservation of organic cultural remains in the rock shelter and the base of the cliff where the site is situated. Additionally, the site appears to have had considerable de facto refuse--that is materials that seem to have been left in place and never retrieved by the original Hawaiian inhabitants. Thus,

there were ritual objects and offerings recovered from the shrine portion of the site. The living area of the site, under the rock shelter was well-protected from decay, and a large array of fishing related materials were recovered, including a few objects that are unique to Kamōhio and Kaho'olawe. Stokes' excavations at Kamōhio were also the first in Hawai'i to disclose the presence of stratified archaeological deposits (Kirch 1985:12), although their significance would not be realized until many years later. We now suspect that Kamōhio's subsurface deposits may preserve several centuries of prehistoric Hawaiian occupation.

The pot-hunting incident was discovered by the 'Ohana during their annual canoe journey around the island during the Makahiki celebration in January of 1991. They reported to the incident to the Navy, and in January of 1992 the site was visited, the pot-hunting activity documented, and the damage to the site was repaired over a period of two days. The illegal excavations at the site were situated in the rock shelter floor and within the adjacent walls of the lower terraces associated with the shrine. Pot hunters brought screens to the site to sieve the archaeological deposits. They dug in some areas nearly 50 cm deep. At least six holes were dug into the floor of the rock shelter. The pot-hunters destroyed intact cultural deposits on this floor in an area estimated to be more than 15 square meters. In addition, the pot-hunters tore apart portions of the terrace walls that abut the rock shelter floor.

What the pot-hunters were looking for and may have found, we can only surmise. Fishhooks and other angling tools, fishhook manufacturing tools, carved sea urchin spines, shell ornaments and tools, and possible ritual offerings were recovered from the shrine during the excavations by Stokes. Few such objects were found during the repair of the site in January 1992. The damage to the site extended beyond the removal of artifacts and included the disturbance to sections of the floor or the rock shelter that were apparently not previously excavated by Stokes. Thus, the pot-hunting activity may have destroyed some of the earliest prehistoric deposits at this site. Additionally, the damage to the terrace walls done by the pot-hunters disturbed parts of the religious features at this site.

It is of concern to us that remote coastal sites on Kaho'olawe may now be threatened by vandalism of this sort. Pot-hunting is illegal, of course, and as long as the Navy continues to have jurisdiction over the island, the Archaeological Resources Protection Act is applicable. The provisions of this federal law make it a crime to vandalize or take cultural remains from historic properties on federal land (see Carnett 1991). There are both civil and criminal penalties which can be levied against those convicted of this kind of offense. Additionally, this law applies to stolen or looted materials which are offered for sale. This, too, is illegal. The National Park Service has established a Listing of Outlaw Treachery (LOOT) Clearinghouse through which cases of archaeological looting and vandalism can

be reported and publicized. The Navy is required to report such cases of pot-hunting to the Clearinghouse (Carnett 1991:16) although it is unclear if they have yet done so.

2. The Excavation and Preservation of Historic Properties.

Some of the historic properties on Kaho'olawe are either structurally or depositionally unstable, and concern for the unchecked erosion of cultural remains from these sites has resulted in a series of excavation and preservation projects conducted over the past 10 years. Both archaeological contractors and the 'Ohana have attempted to actively preserve historic properties; only archaeologists have first excavated portions of sites and then attempted to preserved the remaining threatened deposits. Because of the conditions established in the consent decree, the 'Ohana has devoted most of its attention to preserving historic properties within Hakioawa complex (Site 356); the activities of archaeologists have been more widely dispersed across the island.

Coastal historic properties on Kaho'olawe are more likely to contain relatively intact walls or pavings or remnants of these features. Many of the walls are integrated together as the foundations or borders of structures, such as terraces, platforms, and enclosures. In a few cases, sets of structures themselves are integrated into a single complex, as for example when multiple terraces are placed adjacent to one another on a slope. At Hakioawa, the 'Ohana has repaired breaks in the walls

of several structures in order to stabilize the entire wall and the buried archaeological deposits that often accumulate around walls. The 'Ohana has accomplished this by incorporating wall fall from the original wall to rebuild the damaged portion of the wall. The act of repair does, however, alter the archaeological record on the surface of the historic property by removing portions of the displaced wall from nearby locations. Such repair efforts can be identified for the combination terrace and platform heiau (Site 358) at Hakioawa. Wall stones have been restacked on several terraces, and the surface of the structure is now kept relatively clear of trees and large shrubs whose root systems can weaken foundation and wall stones. Additionally, comparison of the site survey form for this complex with its current configuration suggests that new terraces have been added during stabilization or previously undocumented terraces on the structure were discovered during stabilization. These terraces are located between Features J and K and also to the south of feature J and H on the original survey drawing of the site. A small platform or ahu is situated at the top of the slope and slightly to the north of the this complex. The 'Ohana built this platform and has restacked rock as it has fallen from the ahu.

Other sites where the 'Ohana has repaired damaged walls includes the terrace (Feature A) of Site 347 located at the mouth of the eastern gulch at Hakioawa and portions of a habitation terrace (Feature E) at Site 569 on the east side of the bay just north of Hakioawa. In both cases, the 'Ohana has repaired damage

to these features that has resulted from the partial collapse of walls due to the effects of storm or intermittent stream erosion at the edge of the beach. The 'Ohana has also reconstructed a portion of site 348 to include a modern terrace platform at its southwestern corner and they have rebuilt and modified walls at site 560, Features C and D (R. Reeve, personal communication 1992). In most of these cases there is no documented record of the repair or reconstruction work undertaken by the 'Ohana.

The erosion of cultural materials and archaeological features out of hillocks, sand dunes, or other portions of historic properties has resulted in several Navy sponsored excavation and preservation projects (Hommon 1981; Rosendahl et al. 1987). These projects were intended to repair the impacted portions of each site, as well as to recover archaeological information through excavation and subsequent analysis. In some cases, the combination of excavation followed by refilling the excavated pit and repair of the impact area seems to have worked, as for example with the removal of human burials discovered to be eroding from Site 560 (which the 'Ohana has labelled a hale o Papa) in Hakioawa. During the initial archaeological survey of the locality bones were noted in two separate areas of the complex (Features G and H, and Features D and E), eroding out of a remnant sand dune. Such geological formations often contain extensive Hawaiian burial assemblages. The erosion was caused by colluvial or surface water runoff from the ridge above; it gathered on the slope above Site 560 and was channeled through

the features exposing human bone and other cultural remains. The burials were first fully exhumed, and then they were re-interred in wooden boxes, and covered with sand. Finally, filament netting was stretched across the excavations and weighted down on either the sides with small stones. This appears to have ended erosion in these areas, although much of the dune deposit continues to lack extensive vegetation that might serve as an effective barrier to future erosion. Additionally, the walls of two terraces (Features D and G) have partly collapsed and the erosional channels have shifted and may soon threaten additional burials at this site.

Yet, we also witnessed instances in which the excavation of eroding archaeological features and the subsequent efforts to protect or preserve the remnant portions of the site did not halt the deterioration of the historic property. At Sites 473 and 512 in the eastern uplands of Kaho'olawe, fire or cooking pits had been excavated (Rosendahl et al. 1987) as a means to recover information from these features which were being eroded. The features were vertically sectioned and then the fill of the pit was excavated. Upon completion of the excavation, the features were back filled, and netting was stretched across the pit. Yet at these sites, erosion continues to affect the exposed archaeological features and deposits. Neller (1982a:5) noted a similar sequence at Site 473 where a human burial was found eroding from a section of the shrine exposed in a hillock. The remains were reburied at the site. Later, however, the reburial

pit itself was discovered eroding out of Site 473. In all of these cases, continued erosion is probably attributable to the steep slope of the edges of the hillocks in which the features are exposed relative to the surrounding eroded hardpan surface. Relatively little vegetation had grown over the excavated areas, and so sediment continued to erode from the face of the exposed hillock. Additionally, the removal of the fill of the archaeological features seems to have precipitated partial collapse of the pit walls (even after refilling), and enhanced erosion of the adjacent portion of the hillock.

Some of the efforts to excavate and stabilize eroding features along the coast were equally unsuccessful. At Site 142, along the coast northwest of Hanakanaia, several eroding firepit features were first noted (Hommon 1981a) during the original survey of the island. These features were subsequently excavated, back-filled, and then covered and staked with netting (Rosendahl et al. 1987). Despite the location of these features on a moderate slope adjacent to the coast, these firepits are today completely obliterated. Although this may be partly due to coastal storm erosion along the entire southwest coast of Kaho'olawe, the loose sand deposit in which the features were originally placed was also destabilized by excavating several of the firepits. Despite back-filling and netting, no vegetation had recolonized the area in 1992, and the features were completed eroded.

These examples suggest that the short term advantages of

excavating and preserving archaeological sites should always be considered within the context of long term site integrity. While useful information for archaeological purposes may be derived through excavation and back filling, it is also clear that this activity can initiate additional erosion or site deterioration, especially in the areas adjacent to those which were excavated. Thus the advantages or benefits of excavating historic properties threatened by erosion should be weighed against efforts to protect or preserve such sites without first excavating them. Site or feature preservation as a reclamation process has the least impact when there is regular monitoring and maintenance of the preserved portion of the site. Where the 'Ohana has been able to visit the threatened features on a recurrent basis and restore walls to their previous condition, there is little evidence of ongoing deterioration. As repairs are needed the 'Ohana notes and then makes them. Unfortunately, there has been little follow up to the Navy sponsored archaeological excavation and preservation efforts, and in several cases the sites have deteriorated.

3. The Addition, Alteration, or Transfer of New Artifacts, Features, or Structures at Historic Properties.

As part of the consent decree and in keeping with recent interpretations of the American Indian Religious Freedom Act, the 'Ohana has had access to all of the Hakioawa Archaeological Complex (comprised of at least 41 individual sites). The

archaeological survey of Hakioawa identified at least three possible heiau (Sites 350, 358, and 560), and five to seven possible shrines (Sites 345, 352, 348A, 472A, 482B, and possibly 485 and 557) at Hakioawa. One more possible heiau and two possible shrines were discovered at the small bay just north of Hakioawa (Site 569). A number of other possible shrines have been discovered in the uplands, including Sites 102, 108 (at Pu'u Mōiwi), and 473. While most of these sites are not visited regularly by the 'Ohana, at least three of them are visited and to some extent have been reclaimed by the 'Ohana and are now integrated into their yearly Makahiki observances through periodic visits. These are two of the possible heiau in Hakioawa (Sites 358 and 560) and the shrine at Pu'u Mōiwi (Site 108).

All three sites now exhibit additions and alterations, the result of recent 'Ohana incorporation of the religious architecture into their ritual cycle. At the Pu'u Mōiwi shrine members of the 'Ohana have added a small circular rock alignment (c 50 cm in diameter) with offerings of water worn rock, shaped or worked rock (including one with a rainbow painted petroglyph), shell, and coral. This small shrine sits at the far western edge of the site, away from the original terrace and platform features that comprise the dominant architecture of the shrine. The recently constructed feature also lies adjacent to the main scatter of flaked basalt and adze rejects that are distributed throughout the eroded portion of the site. This small shrine was constructed within the past 10 years as a means to include Pu'u

Mōiwi in the religious activities of ʻOhana members. Both the small scale and peripheral location of the new shrine combine to make it relatively non-obtrusive to the larger shrine and lithic workshop. Its contents also make it possible for archaeologists to clearly identify it as a recent addition to the site.

Also at the Puʻu Mōiwi shrine, there is a modern human figure petroglyph cut into a flat stone that is part of the paving of the front terrace of the shrine. The petroglyph is of modern derivation although the form taken is a traditional one. Although it does not substantially affect the integrity of the shrine, the location of this petroglyph on a portion of rock paving of terrace could be confusing to archaeologists and Hawaiians who do not know its history. Thus, it may have some impact on the information potential of the shrine, especially if it not noted as such on the inventory site form. The question of these additions to the shrine's religious integrity can be raised, although we do not fully understand the implications of such alterations given various interpretations of the American Indian Religious Freedom Act. If the new petroglyph and shrine are part of the exercise of native Hawaiian religious activities, then they may be allowed under this act.

At Hakioawa the ʻOhana, in addition to preserving collapsed walls at Site 358 (the terraced possible heiau on the north side of the gulch) has apparently added at least one platform on a restored terrace. This platform does not appear on an earlier survey map of this feature, yet should have been visible to the

survey team even without extensive clearing. It apparently was added to the structure within the past 10 years based on Neller's description of the site (Neller 1982a). Although the platform conforms to the Hawaiian tradition of stacked rock construction and thus is in keeping with the heiau architecture, its style is sufficiently distinctive to separate it from the earlier construction at the complex.

The addition of this platform to an existing heiau, does have an affect on the integrity of the complex and its historical values. As such it does concern us, although once again such modifications of religious structures as defined by native Hawaiians for the practice of their traditional religious activities may be allowed by the Native American Indian Religious Freedom Act. Nonetheless, new construction at existing historic properties should be documented, so that the information potential of each construction episode is not mixed or combined. The potential impact, if such information is not recorded, might be the loss of historic information should we be unable to reassort construction episodes at some later date. At both possible heiau in Hakioawa (Sites 358 and 560) which the 'Ohana has reclaimed, lele or sacrificial stands built out of wooden poles have been placed on the uppermost terrace. Recently, out of concern for the potential erosion at Site 560 the 'Ohana has placed the lele on the ridge above the site. Both lele are historically compatible with the architecture of these religious structures, and help to define their previous and current roles

within Hawaiian culture.

Within the boundaries of the Hakioawa complex, the ʻOhana has also built a dance and chanting platform, a large meeting house structure (hale hālāwai), and more recently, a ceremonial platform (mua haʻi kupuna), and the modern platform or ahu above Site 358 (mentioned previously). In each of these cases, the contemporary building has been situated so as to avoid the documented archaeological sites. At the same time, there was little or no subsurface alteration of the terrain; thus, no buried deposits were encountered or impacted. In all three cases, construction was undertaken in a manner similar to (but not identical to) the existing archaeological features of Hakioawa. Thus, the historical integrity of the archaeological complex at Hakioawa is not compromised by incompatible architectural elements. Yet, the construction style and materials of these new features is sufficiently distinctive to mark them as contemporary additions.

Federal law does not require that historic properties be left untouched by contemporary human populations. Stabilization and rehabilitation are appropriate preservation measures for historic properties that have been deteriorated. The Department of the Interior, however, does encourage that modifications or additions to historic properties be compatible with the qualities that help to define their initial historical and cultural significance. The ʻOhana has been sensitive to this concern, and the changes they have made to historic properties on Kahoʻolawe

are entirely in keeping with the architectural and cultural contexts of the island. Thus far, it has been possible to distinguish recent modifications from those which occurred during previous periods of occupation on the island. However, to ensure that reclamation through modification and the addition to existing historic properties does not obscure portions of the archaeological record, we recommend that such changes be documented by amending existing survey forms and records to show the location and nature of contemporary use and reconstruction relative to existing features.

4. Casual Collecting of Artifacts from the Surface of Sites on Kaho'olawe.

An examination of the several archaeological reports (Barrera 1984; Hommon 1979, 1980, 1981a, 1981b; Hommon and Streck 1981, Neller 1980a, 1980b, 1981, 1982a, 1982b; Rosendahl et al. 1987, Yent 1983) which pertain to Kaho'olawe suggests that all researchers agree that the historic properties--even those affected by erosion--preserve good samples of cultural remains and artifacts for study and interpretation. The variety of research topics that Hommon (1979, 1980a) and Rosendahl et al. (1987) identify for Kaho'olawe also implies that adequate surface and subsurface deposits of cultural materials remain at many of the sites on the island. In contrast, there are many areas of densely populated O'ahu where such assumptions about the preserved surface artifacts and cultural remains would not be

warranted. Clearly, one of the reasons that the historic properties of Kaho'olawe are of special interest to archaeologists can be found in statements (e.g., Hommon 1980a) about their potential interpretation. The interpretive potential of these sites, in turn, is based on the high visibility of surface artifact assemblages, the result of erosion. The presence, abundance, and distributional characteristics of portable cultural remains on the surface of archaeological sites are qualities that help define the significance of Kaho'olawe's historic properties to archaeologists and non-archaeologists alike. Additionally, the visibility of surface cultural remains on the island serves as a potent reminder to all visitors of the widespread occupation of the island by Hawaiians and the effects of erosion on Kaho'olawe.

Again, because of its isolation and limited permanent population, the historic resources on Kaho'olawe have not been extensively impacted by the removal of artifacts from sites by casual collecting. There are, however, unsubstantiated reports that during previous archaeological work on Kaho'olawe, artifacts were collected and removed from some of the sites without permission or further documentation. Such reports also exist for non-archaeological accesses by the 'Ohana and the Navy. This type of activity should be discouraged.

With the increase of pothunting and casual artifact collecting at archaeological sites in the United States, land managers and archaeologists have begun to document the factors

which influence the occurrence of these activities (Francis 1978; Lightfoot 1978). Not surprisingly, access and public information about the location and content of archaeological sites are the primary variables affecting modern collecting activities. The unimproved roads maintained by the Navy on Kaho'olawe pass through or are adjacent to 20 archaeological sites and are within 100 meters of nearly twice that number of sites, making all of them susceptible to casual collecting. The same is true for the walking trails on the island. Moreover, if Kaho'olawe receives increased numbers of visitors, casual collecting of artifacts from sites can also be expected to increase as access improves. Many of the historic resources would certainly be vulnerable to this type of activity; upland sites often occur as scatters of cultural material on hardpan. This makes it easy to locate and retrieve any artifacts which might occur at a site. This may place the sites associated with the adze quarry at Pu'u Mōiwi especially at risk, since they contain abundant quantities of adze rejects, identifiable tool types that often show up in individual collections.

Casual collecting by individuals although seemingly of low impact to historic properties can have a much greater cumulative impact when collecting occurs over a period of time and by many people. Educational efforts, especially those described by the Listing of Education in Archaeological Program (LEAP) Clearinghouse (Knoll 1990), may be among the most effective tools for reshaping public attitudes towards casual collecting at

archaeological sites. LEAP is sponsored by the National Park Service and is available to other federal agencies, such as the Navy, for the development of outreach programs. There are currently no official educational efforts by either the Navy or the 'Ohana to control casual collection of artifacts by their representatives. We believe such efforts should have high priority in the near future.

Cultural Formation Processes-Disturbance

5. The Movement and Alteration of Historic Materials Resulting from the Use of Machinery on Sites.

There are two main effects of machinery on the archaeological record of historic properties. First, in the process of building roads and preparing areas for construction and storage, both the surface and subsurface cultural remains can be displaced by grading and other earth-moving activities associated with the operation of large machinery. The construction of unimproved (i.e., unpaved) roads on Kaho'olawe necessitates the use of earth moving equipment in order to produce acceptable pathways for vehicles. In several instances these roads cut through historic properties, e.g., Sites 618, 150, 111, in the central portion of the uplands. Additionally, roads must often be subsequently diverted or widened in the uplands to avoid or repair portions of roadways that have been washed out or eroded. These forms of maintenance also involve the use of machinery and they lead to the further encroachment on

adjacent archaeological sites. Several instances of this are visible along the main military road in the uplands of the island.

Road building or maintenance and the construction of equipment storage areas and new facilities has also affected sites in the vicinity of the Navy Camp at Hanakanaia. Neller (1980a:3 and 1980b) noted that the road out of the Navy Camp to the uplands crossed over a midden deposit, part of Site 131, Feature A. More recently, the Navy has constructed an equipment and vehicle storage area that further encroaches upon Site 131. In both of these cases, earth moving equipment was used to level both the road and storage area, and in the process has displaced the cultural materials which once existed in these localities. Inspection of the borders of the roadway and the storage facility revealed concentrations of cultural material that had been pushed out of their previous depositional context and into small piles of dirt or into the small drainage channels that appear next to the road.

Secondly, the passage of machinery over a site leads to additional breakage and crushing of cultural materials on the surface of archaeological sites. Although most archaeological studies of the effects of trampling have focused on human walking (e.g., Gifford-Gonzalez et al. 1985; Wilk and Schiffer 1979), we can expect the impact of machinery-related trampling on surface deposits to show even greater or more profound effects. The regular passage of machinery over a site leads to breakage and

crushing of lithic materials. Organic remains, such as charcoal and shell, can easily be reduced to small unidentifiable fragments. Additionally, recurrent movement of machinery along a pathway can laterally displace cultural material from that path. We have also noted an area in the vicinity of Lua Moaula which vehicles regularly used as a turn around (either Site 410 or 411). No cultural remains are now located within this turn around but they do occur immediately outside of this area, suggesting that they have been crushed and pushed off to one side from the force of the vehicles' tires. The survey forms for both Sites 410 and 411 indicate a single locus of cultural material which formed a rough semi-circle. No such locus exists any longer.

Finally, in some cases, the roads used by the Navy are being extended beyond the limits shown on the official map. This occurs on the hardpan areas which slope down towards valleys such as Hakioawa. These road extensions are not marked on maps, they can sometimes be difficult to follow or relocate (especially by new drivers), and they can easily cross over scatters of artifacts which have eroded onto the hardpan. Where this occurs, cultural remains can be crushed and displaced further from their previous location. This is visible on the jeep track which extends down the hardpan towards Hakioawa.

6. Disturbance of Historic Properties from Bombing and Small Gunfire.

Much of the Navy's bombing of Kaho'olawe has been concentrated on the western upland portion of the island and on the northeast uplands, above Ahupū Bay which forms the impact zone or target area of the island since the 1960s. The immediate impact of large bombs with explosive devices is, of course, to create craters on the landscape. When bombs land on historic properties, their explosion can destroy the archaeological context of those properties, both within the immediate impact zone of the bomb and outside this area, where dirt and other materials (including cultural remains) are redistributed. Thus, bombing can remove, redeposit, and possibly, rebury cultural materials. Furthermore, the percussive effects associated with bombing can potentially fragment cultural materials into pieces that are no long recognizable.

During the island wide archaeological survey 1976-80, relatively few sites were found within the impact zone, with the exception of the shrine and lithic working complexes at Pu'u Mōiwi (Sites 211, 210, 208, 209, 107, 383, 108, 205, 206, 250, and 204) along the southern margins of the uplands. Only about 10 more sites were located in the upland impact zone, all were less than 500 meters from bomb targets.

For Hommon (1980:28) the sparse distribution of archaeological sites within much of the upland impact zone is interpreted as the outcome of relatively little or recurrent traditional use of this area by Hawaiians during the prehistoric and early historic periods. Although we were not able to inspect

these areas, we would encourage some caution before this interpretation is widely accepted. First, we note that the complementary distribution of bomb targets and archaeological sites in the impact zone and the marked reduction in site density (compared to the eastern uplands outside of the impact zone) may be partly due to the impact of bombing effects on these sites, perhaps making subsequent identification of sites more difficult. Second, vegetation in the impact zone has probably obscured archaeological sites or limited inspection of the ground, especially given concerns about unexploded ordnance in this zone. Additionally, the impact zone was the area first surveyed by the archaeological team during the island wide reconnaissance. We suspect that sites in this area were missed or failed to be identified during this portion of the survey, as the survey team became accustomed to the occurrence and condition of archaeological sites on Kaho'olawe. In particular, we believe there may be additional sites located along and above the intermittent stream drainages which link the archaeological complex at Pu'u Mōiwi to Ahupū Bay. The current research being conducted by Pat McCoy has disclosed a series of adze workshop sites extending from the highest elevations downward towards the gulches which drain this area. The boundary of these sites roughly corresponds to the boundary of the first area surveyed.

More recently, an unexploded bomb landed near Pu'u Mōiwi during one of the military exercises on the island and this was reported by the 'Ohana. In addition, impacts caused by small gun

fire or shrapnel have been reported at Pu'u Mōiwi. Neller (1982a) reports evidence that the shrine at Pu'u Mōiwi(Site 108) was hit by small gun fire; there are several linear distributions of chunks taken out of the basalt boulders on the site. Some of these cross part of the shrine itself. Neller (1982a) suggests it may have been the result of the goat eradication program which involved hunting the animals from helicopters. Given the religious and technological significance of this site, such an impact is unacceptable.

Throughout the impact zone, and extending to the north and east towards the dense array of upland archaeological sites, there are pieces of metal, bullets, and occasionally bombs and bomb fragments distributed across the landscape. In addition to the risk this ordnance poses to humans, these objects and fragments affect the integrity of historic properties by adding new materials to sites. This has sometimes made it difficult for archaeologists to distinguish recent additions of metal associated with military activities from metal introduced to the island during the historical era. Further, metal can sometimes be found embedded relatively deeply in archaeological deposits.

7. Reforestation and Revegetation Projects.

Both the Navy and the 'Ohana have initiated projects that are designed to improve and enhance the vegetation of the uplands of Kaho'olawe. This area now contains extensive tracts of barren hardpan and degraded vegetation communities. The goals of these

projects are to reclaim these tracts and make them suitable for the sustained growth of newly planted or transplanted vegetation (Aluli v. Brown 1980; United States Department of Agriculture 1979; United States Department of Navy 1977). There are potential impacts to historic properties associated with revegetation projects. These can include the displacement of cultural materials during the planting phase, the alteration of cultural materials through trampling during planting activities, and the reburial of cultural materials as organic and inorganic debris accumulates around newly established vegetation.

In the late 1970s, the largest revegetation project on Kaho'olawe was sponsored by the Navy, and involved the development of a series of tree windbreaks in the east central uplands (Hawaii State Legislature n.d.:197; United States Department of Agriculture 1979; United States Department of Navy 1977:9-G). In order to plant these trees it was necessary to create a large number of planting holes in the hardpan. These holes were created by small explosive devises, and were set into a pattern of parallel rows. The rows were oriented perpendicular to the prevailing winds and are several hundred meters in length. Although many rows were initially established, only about 20 of these rows were ultimately planted. They were planted with tamarisk trees, a non-native plant, because goats do not eat them and they are hardy (i.e., resistant to dry conditions). This reforestation project is situated in a portion of the eastern uplands, between the boundary of the impact zone and Lua Moaula.

This is an area where numerous archaeological sites exist and some of these sites are quite extensive in area. Inspection of some of the tamarisk rows shows that they pass through sites, i.e., there is artifactual debris on either side of the row indicating the row now separates what was formerly a single site or archaeological feature. Examples of this include Sites 416 and 150. Furthermore, the orientation of the planting rows relative to the prevailing winds also resulted in some rows running perpendicular to the slope. As a result, surface water runoff is sometimes concentrated between rows of tamarisks and in some cases there is evidence of gullying upslope between the planting rows. This may soon threaten historic properties, such as Site 102.

The planting of such windbreaks is an example of a well-motivated attempt to reverse the vegetation loss on the eastern uplands of Kaho'olawe whose implementation seems not to have fully considered the impacts to archaeological sites. There is no evidence that sites were studied or cultural materials collected prior to the explosives being used to create planting holes through historic properties. Although the organic detritus from the tamarisk trees is beginning to collect on the surface around the wind breaks, there is no indication that the gullying between wind breaks is being monitored or systematically alleviated.

More successful have been the recent attempts to introduce on a smaller scale native plants and shrubs to the eastern

uplands. In this case, the revegetation has taken place in the southeastern uplands where relatively few historic properties were identified. Our inspection of a couple of these revegetation sites disclosed no archaeological deposits or cultural remains within their boundaries. Secondly, the small scale and location of these revegetation projects has generally been accomplished without extensive gullying as a by-product. However, we were shown machinery which was used on one project to breakup the hardpan prior to planting. The extensive use of this kind of machinery in the future may affect archaeological sites located on the hardpan where planting is planned.

The Protect Kaho'olawe 'Ohana has also undertaken a relatively small scale project to collect water and to redistribute it down slope in order to create or stabilize vegetation. Additionally, the 'Ohana is planning to expand their water catchment and revegetation projects. Two new projects are in the design stage. The Navy has asked the 'Ohana to complete an Environmental Assessment (Holmes and Reeve 1991) for these projects and to prepare copies of the project design so that the placement of the catchment system and piping can be designed to minimize impacts on historic resources. The impacts that would occur for this project include the preparation of the water catchment tank and water collection area, plus the extension of piping from the tank to down slope areas. The 'Ohana has generally attempted to place water catchment and collection devices in areas devoid of historic properties (e.g., on hardpan

or in bomb craters). Only the location of the piping is of some concern. We would recommend that above ground piping be placed so as to avoid historic properties. Underground piping for assisting revegetation may by necessity impact cultural materials. In most cases this will affect cultural materials associated with the eroded or lag sites. Because these sites have already lost their original context, and since the depth and width of the trench necessary to enclose the piping will be relatively small, we would recommend that cultural material encountered be moved immediately upslope. Both the small size of the catchment and components and limited amount of landscape modification associated with these projects suggest that the impacts will be relatively limited, even if the catchment is placed within the boundaries of an archaeological site.

More generally, the 'Ohana has suggested that the Navy has sometimes been over zealous in its application of federal Environmental Impact rules to the 'Ohana's revegetation projects. Moreover, the procedures for preparing Environmental Assessments are not always well understood by the Navy, and this has led to some delay in the implementation of pilot projects whose overall impact on archaeological sites is relatively minor.

There is also a beneficial impact to historic properties of successfully implemented reforestation and revegetation projects. They will act as wind breaks or catch sediments and organic debris, and provide an environment for vegetation to colonize and maintain its growth. This should lead to the stabilization of

the landscape and the accumulation of sediments. Thus, numerous sites in the eastern uplands that are now exposed to or threatened by erosion may be protected and their context preserved by these efforts. Possibly, some of these sites may eventually be reburied--that is by incorporation of cultural remains into subsurface deposits--by sediment accumulations. This would also help to preserve these materials, and to protect them from future deterioration and human impacts.

8. Direct Human Effects on Historic Properties.

Direct human effects refers to the activities of humans without the intervening impact of machinery or tools. For Kaho'olawe, this refers to the effects of humans walking over sites, usually as a means to get to another location. There are two primary forms of impact associated with this: established trails and the unrestricted movement of military ground forces during exercises.

Trails, although smaller in size than roads, can also impact historic properties on Kaho'olawe, especially if they pass through or near to archaeological sites. With time and regular foot traffic, trails will reduce (and often eliminate) vegetation on the pathway. Although trails are generally narrow (less than 50 cm), the loss of vegetation can then expose cultural materials on the surface and beneath it to the effects of trampling and to subsequent erosion. Such impacts are most noticeable when sites

are located on slopes, and the trail passes through a portion of the site in which the deposit is relatively unconsolidated (i.e., midden). There is an example of this on the foot trail up the central ridge from Hakioawa. The path crosses a portion of the site and has exposed some of the midden contained within the soil. One solution to this would be to avoid such midden deposits when establishing trails. However, when avoidance is not an option, an alternative would be to place clean fill on top of the midden and build a stepping-stone trail across the area. The stones would protect the deposit from further exposure and erosion.

Other areas where trails may impact historic resources are on slopes and at the top of cliff lines which lack extensive vegetation. In these cases, the impacts are indirect and secondary. The loss of vegetation may channel water runoff down slope or over the edge of the cliff, impacting historic resources farther away. In this case it may be necessary to redirect or realign pathways away from these kinds of locations or to make certain that they do not accumulate water runoff in a manner that can accelerate erosion on historic properties.

Trails typically lead to and from known points on Kaho'olawe and these points often contain archaeological sites. Trails, then, may direct the flow of people on foot to historic properties and in so doing trails may increase the effects of visitation, casual collecting, and secondary natural erosion. It would also appear that the number of trails through the island is

increasing, and thus the impact of trails on historic properties is likely to increase as well.

The Navy has used extensive portions of Kaho'olawe in the past for ground exercises, in which troops move across the land on foot. Upon the completion of the island-wide archaeological survey of 1976-80, the Navy issued maps showing site locations on the island and issued instructions for military personnel to avoid sites during maneuvers. Unfortunately, it is not entirely clear that this is happening. First, site locations are sometimes misplaced on the maps, thus making it difficult for personnel to intentionally avoid sites. Second, some of the site locations represented on the map by a dot are difficult to locate on the ground, and thus would be relatively easy for personnel to inadvertently pass through. Third, along the southwest coast, especially in the direction of Lae o Kealaikahiki, Sites 142, 139, 140, and 137 all show evidence of visits by military personnel. There are food containers, bullets, and other forms of military gear present at all of these sites, and probably at other sites along the coast which occupy relatively large areas. When ground exercises occur, the locations of sites on maps should be confirmed and their markings should be re-established so that personnel can reliably avoid these sites. Furthermore, Commanding officers should be notified of the locations of any archaeological remains which lie within their area of operations.

Natural Formation Processes-Disturbance

To facilitate the description of natural formation processes that affect historic properties on Kaho'olawe, we shall divide them into two basic categories: 1. coastal and climatic erosional and depositional processes, and 2. eolian and hydrological erosional and depositional processes. For both kinds of natural processes we will examine how these operate both independently and through an interaction with other factors to: 1. preferentially remove classes of cultural remains, 2. alter the horizontal or vertical distribution of cultural materials, or 3. redeposit materials into new sedimentary contexts.

9. Ocean and Climate Driven Erosion and Deposition along the Coast.

Heavy storms, near encounters with hurricanes, tsunamis, and seasonal high tide surges represent relatively high energy forces that may occasionally push ocean wave activity past the shoreline of Kaho'olawe. If global atmospheric warming occurs and oceanic sea levels rise, the magnitude and frequency of ocean storm events on the coastal historic properties of Kaho'olawe can be expected to increase as the elevation of the beach and ocean (the shoreline) rises relative to the elevation of coastal sites. Historic properties which are situated away from the immediate shoreline and above the high tide level can still be threatened by both long term climatic processes and short term climatic events if ocean waves cross sufficiently far onto beach zones.

One effect of ocean waves on coasts during heavy storms is to expose beaches to erosional forces contained within waves when the water moves onto formerly dry portions of the beach. Often, this results in the attrition and scouring of the edges and lower sections of the beach. Where the beach is formed predominately of sand (or other fine-grained sediments), wave activity can easily remove portions of the beach as the water mixes with sand to form a solution that is then transported back into the ocean where it is eventually redeposited. Archaeological remains--either on the beach surface or buried beneath--can be first exposed and then transported from their location on the beach and redeposited at the shoreline or farther offshore. Additionally, anytime ocean waters extend onto formerly dry beach areas, they can remove or kill off shoreline vegetation (the result of saltwater infiltration), and thus expose archaeological materials to additional erosion, from subsequent storms, precipitation runoff, or wind. Storm generated ocean wave erosion can also affect archaeological sites situated near the shoreline, even in rocky areas. In Hawaii, such areas are often unprotected by reefs and thus are more directly exposed to the full impact of ocean waves. Ultimately, rocky beaches or rock outcrops do not confer much protection to archaeological sites located in close proximity to the ocean. The effects of storm activity is not limited to only small-sized archaeological remains, but over time may gradually remove portions of archaeological features (e.g., retaining walls) and even entire midden deposits.

Several archaeological reports (Morgenstein 1980; Neller 1980a) as well as the draft CRMP (Ahlo 1981) mention the potential effects on historic properties of coastal erosional processes. During our visits to Kaho'olawe we noted that the entire southwest coast of the island from Kealaikahiki Point to the unnamed point where the water-filled bomb crater (Sailors Hat) is located has been affected by ocean generated erosion. There is evidence at several sites of wave washover on the beach, the erosion of extensive archaeological deposits and structural features, and the dieback of beach vegetation.

A series of hearths and firepits (Feature A) at Site 142 was previously identified as threatened by coastal erosion and then excavated (Rosendahl et al. 1987:IV30-41). Prior to the excavation of the site in December 1982, Hurricane Iwa passed through the Hawaiian Islands, and the excavators (Rosendahl et al. 1987:IV-30) noted that some of the firepits had been damaged and others contained sand from wave washover. Today, all of the hearths and firepits are almost completely destroyed, despite indications that the excavations were refilled, covered with netting, and staked down.

At Site 139, adjacent to Site 142, the original survey forms described the archaeological deposit to be nearly 1 meter in depth. As of 1992, these deposits are no longer visible, and have probably been washed away by recent storm activity. Vegetation along the beach from Site 142 through Site 137 has died back at least 10 to 15 meters, and this may potentially

expose additional portions of these sites to subsequent coastal erosion.

On the southern end of this coastline, at Site 134 portions of the archaeological structures depicted on the original survey forms are now missing. Where they should be located is now apparently within the high tide mark. Some of the features associated with Site 134 were missing in 1980 when Neller (1980a:3) visited the island. We discovered that additional features were missing in 1992. A previously unrecorded site located at the headland south of Hanakanaia also shows signs of wave damage. One of the structures at this site appears to be a shrine, and portions of the walls and interior deposits have been partly eroded. A second structure has midden contained within it, and this midden is eroding out onto the shoreline.

On the east coast of Kaho'olawe, in the vicinity of Hakioawa there is also evidence of wave-related erosion. A platform feature at Site 347 on the shoreline on the east side of Hakioawa Gulch has been partly eroded (although the 'Ohana has repaired it in the past). Similarly, the complex of features on the east side of the bay north of Hakioawa (Site 569) has been eroded along the beach zone from wave (as well as, stream flooding) activity. Again, the 'Ohana has placed cobbles in front of these structures as means to shield them from further erosion. We also visited a small rock shelter that is part of Site 469. This feature is located within an exposed rock outcrop between Hakioawa and the bay to the north, and situated only a few meters

above and away from the high tide mark. The front of the cave had a retaining wall; behind it were archaeological deposits at least 50 centimeters deep. The retaining wall is beginning to collapse in places as a result of wave action during storm events, and if it falls, the archaeological deposit will be exposed to erosion.

Our inspection of coastal sites was relatively cursory. However, we can suggest that the effects of erosion from coastal processes may be fairly widespread on Kaho'olawe. It includes an entire section of the southwestern coastline, coastal deposits near the mouths of gullies and gulches, and other isolated features that may be within the range ocean waves from storm events. The effects of these coastal processes have been to remove cultural remains, archaeological deposits, stone foundations from localities closest to the shoreline, and in some cases, to deposit sand on top of remnant historic properties. Additionally, salt water infiltration has killed beach vegetation in some areas, leaving these areas vulnerable to subsequent erosion by coastal or eolian processes. Finally, we are concerned that coastal erosion may also threaten sand dune deposits, often used as burial zones by prehistoric Hawaiians.

10. Erosion and Sedimentation through Eolian and Hydrological Processes.

Erosional processes have had (and currently have) a major

impact on the historic properties of Kaho'olawe. Virtually everyone agrees on this. What have been the sources of some debate are the timing, geographic extent, duration, and causal agent or agents involved in these erosional processes. Some of this debate is largely academic, e.g., whether or not major episodes of erosion occurred prior to the arrival of Europeans to Hawaii, although not without political consequences. It is not our intention to resolve all aspects of this debate, but to attempt to identify the strength with which we might want to accept conclusions regarding erosion on the island.

For a time in the late 1970s and 1980s, archaeologists believed that extensive vegetation reduction and soil and sediment erosion in the upland zone of Kaho'olawe began during the prehistoric period (Hommon 1979, 1980). This view was in keeping with other archaeological studies suggesting that as Hawaiians colonized and established agriculture in sloping or elevated locations, they practiced a modified from of swidden or slash and burn horticulture. Ethnographically documented swidden systems have sometimes been accompanied by the loss of primary forests, the creation of grasslands, and erosion of the topsoil from garden areas to lower elevations. Thus, it was concluded a similar scenario occurred in the prehistoric past for Hawaii.

This conclusion about the timing of massive erosion on Kaho'olawe has now been challenged by Spriggs' (1987, 1991) recent geoarchaeological observations and analyses, and his reading of archival and historical documents. According to

Spriggs (1991:97-98), evidence suggests that coastal gulch-associated "catastrophic" erosional sedimentary deposits are equivalent to stratigraphic unit known as the Ahupū Formation, and that these post-date the prehistoric archaeological deposits on Kaho'olawe. In other words, the Ahupū Formation is a historic phenomenon whose origins can be traced to repeated alluvial and eolian deposition. Moreover, the Ahupū Formation overlies thin layers of <u>in situ</u> burned grasses or ash and charcoal lenses. Spriggs (1991:99) argues that these burn layers "...represent remnant ground surfaces that were <u>not</u> affected by this [historic] erosion, and cannot be used to signal the erosion, except to say that it occurred later" (emphasis in the original). Spriggs (1991) does not believe that repeated burning caused the erosion associated with the Ahupū Formation. Instead, he attributes this erosional phase to the introduction of goats, cattle and sheep. This view had been presented earlier by Stearns (1940).

While we would not take issue with the role of recently introduced herbivores in the erosional history of Kaho'olawe, there are several issues that remained unresolved by Spriggs' study. First, the identification and the distinctiveness of the Ahupū Formation continues to be problematic. For Spriggs, it represents the uppermost stratigraphic unit or unit(s). However, it is not always clear how Spriggs distinguished it from layers of similar color and sediment size composition. Second, it is unclear how Spriggs determined the depositional history of the Ahupū Formation units or, for that matter, of any of the other

stratigraphic units described in his study. And finally, the depiction of the Ahupū Formation as a catastrophic depositional event is never addressed by Spriggs. These are important matters for they help to determine aspects of the timing and magnitude of late prehistoric and historic period erosion on the island.

If we accept Spriggs' reconstruction of Kaho'olawe's erosional history, it is still necessary to include a phase of late prehistoric erosion because all of his coastal study areas show evidence of pre-European sedimentation and this implies erosional transport. And while the charcoal lenses or burn layers may not represent erosion themselves, they are separated in some instances by alluvial sediments which elsewhere Spriggs (1991:93) suggests is the result of the erosion of "soil aggregates". Thus, even under Spriggs' interpretation, erosional episodes on Kaho'olawe pre-date the introduction of cloven-hoofed animals, extending the onset of soil movement into the prehistoric period. What is still unclear is the magnitude of prehistoric erosional episodes, their geographic spread, and the factors which produced them.

That erosion on Kaho'olawe is (and has been) the result of both hydrological and eolian transport is undeniable. Additionally, the magnitude of either form of transport is likely to be increased by any activity or circumstance that leads to the reduction or removal of vegetation. Clearly, then, animals can increase the opportunity for sediment transport if they affect vegetation growth or regrowth. Goats and sheep, because their

feeding patterns are to closely crop grasses (near to the soil surface), are potential candidates for increasing sediment transport on Kaho'olawe. However, other grazing animals and humans can also disrupt the growth or establishment of vegetation on the island. Cattle, for instance, because their weight and cloven hooves may break up grassy ground cover. Humans, through their agricultural tillage practices or because of their use and development of trails and roads, can also produce breaks in vegetation.

Finally, although the Navy may not be historically responsible for the introduction of cloven-hoofed animals to Kaho'olawe, or for the introduction of human activities to the island, as part of their jurisdiction of Kaho'olawe they have assumed the responsibility for managing the effects (e.g. loss of vegetation and erosion of the topsoil) these impacts have had on historic properties from the distant past until today. They should be particularly mindful that under Section 110 of NHPA, the Navy has the responsibility to ameliorate the impacts to historic properties that might threaten their continued significance. The ongoing erosion of sediments from archaeological sites constitutes an impact that can lessen their potential to contribute information to history and prehistory. Additionally, their erosion is a cultural affront to Hawaiians whose historical patrimony they represent.

Lacking detailed studies, the following observations about the nature and extent of erosional processes on Kaho'olawe should

be considered provisional or tentative. A detailed geoarchaeological study of the island is needed to substantiate a number of the hypotheses regarding the operation of erosion in the past and today.

Eolian erosion of historic properties is most intense on Kaho'olawe where relatively high wind speeds occur, where there are relatively loose topsoil or sedimentary conditions, and where plant ground cover is sparse or absent. Today, these conditions seem to best apply to the eastern upland slope of Kaho'olawe. With few trees and only limited reforestation, winds can blow across the ground surface strong all day long from the northwest. The velocity of the winds is sufficient to suspend particles of sand and silt in the air and transport them to another part of the island or even the out into the ocean. Although we would not wish to minimize the effects of colluvial or alluvial erosion on Kaho'olawe, it is very likely the sustained effect of eolian erosion that has produced the "lag" or deflated surface scatters of cultural remains that are especially densely concentrated in the northeastern uplands of the island. The winds have removed much of the sedimentary context of these sites.

There are at least two forms in which these deflated sites can be found. The first occurs (and is primarily visible) where an edge of grassland is being eroded. Typically, these grassy areas are isolated as hillocks, surrounded by a brownish hardpan surface that is somewhat more resistant to erosion. The edges of the hillock often contain <u>in situ</u> cultural remains and features,

but associated with them are portions of the site which have already been eroded. These are located adjacent and usually down slope from each hillock and occur as a scatter of archaeological materials, including lithic debitage, lithic tools and manufacturing rejects, shell, fire-cracked rock, foundation stones from walls or pavings, and bone fragments. The scatter rests upon this hard brownish substrate, called a hardpan. Thus, in this instance the historic property is represented by a deflated assemblage and a portion that is only visible in somewhat vertical sections from the eroding edges of hillocks. The surface hardpan scatter lacks any three-dimensional context. The lighter fragment of the archaeological record--charcoal, small bone and plant materials, and the surrounding sediments are gone--eroded away, either by eolian processes or slope wash from rain storms. Most of these sites are located on the northeastern uplands of Kaho'olawe, and extend south and to the west as far as Pu'u Mōiwi in the central uplands.

Sites that combine eroding hillocks and surface scatters include several terraced and paved features that might be shrines, such as at Site 102, at Pu'u Mōiwi (Site 108), and at Site 208 (down slope from Pu'u Mōiwi). At other sites there are large blocks of rock suggestive of wall or terrace alignments, but often these are now resting on the hardpan and their interpretation as structures is less definitive. Many of the inland hillock sites also contain evidence of hearths, earth ovens, or firepits. These are sometimes visible within the

eroding section of a hillock, and these have been the focus of data recovery operations (Hommon 1981; Rosendahl et al. 1987). In other instances, only a concentration of fire-cracked rock on the hardpan indicates the former presence of cooking or warming features. Less numerous but still visible in the eroding hillocks are the portable cultural remains, such as lithic debitage.

The second form in which these upland sites occur is simply as a surface scatter of materials with no eroding hillock remaining (Hommon and Streck 1981). In this case, all of the three dimensional context is gone, leaving only the horizontal context of the cultural remains left to observe. This is an important loss, since the depth of artifacts and features beneath the surface of the original land can offer archaeologists information about the relative and absolute age of the materials. Hommon and Streck (1981) investigated Site 109 on Kaho'olawe, one of the inland sites affected by eolian erosion. Despite the erosion of the surrounding sediments, they were able to define four concentrations of cultural materials at this site (Hommon and Streck 1981:15), each defined by somewhat different combinations of materials and dispersed over a relatively discrete area of the site. Hommon and Streck (1981:9) recognize that the cultural remains from this site represent those which have survived the effects of erosion and decomposition when exposed to surface processes. Additionally, the materials located farthest down slope at the site seem to have been

transported the greatest distance. Possibly, they have experienced greater colluvial erosion for a longer period of time than materials farther upslope. If so, it might still be possible to reconstruct the sequence of erosion at these sites, and ultimately by comparing a variety of upland sites it may be possible to reconstruct or estimate the original boundaries of the site. Hommon and Streck (1981:28-43) do suggest that there is still considerable information, including the spatial context of the remaining materials, that may be retrieved from such sites if suitable recovery methods are employed.

The conclusions we draw from our own observations and this study are two-fold. First, upland sites affected by eolian erosion are in various stages of dispersion and have suffered loss of some spatial context and stratigraphic relations. Exposure of formerly buried cultural materials in upland locations subjects the lighter organic fraction to relatively rapid deterioration and transport. The heavier materials suffer loss of their stratigraphic position relative to one another, and over time may undergo additional colluvial transport down slope. Those parts of the site which were exposed first are generally those which have been transported farthest from their original depositional locations. Second, there remains information about site structure and context that can be extracted from such sites, but lacking comparative studies of the impacts of erosion on a series of these sites it is currently difficult to estimate the parameters of the information we can expect to derive with

archaeological methods.

Eolian erosion and sediment transport is also an important formation process along the coast of Kaho'olawe, as evidenced by sand dune deposits in several localities, including Hakioawa and the northern portion of Hanakanaia. Sand dunes were often used by Hawaiians to bury their dead (Kirch 1985:240), and the sand dune at Hakioawa is overlaid with a set of structures (Site 560) that have been interpreted by the 'Ohana as a hale o Papa. Sand dunes are subject to continual eolian erosion, and as a result, we recommend that all dune deposits on Kaho'olawe be located and monitored on a regular basis.

Hydrological erosion on Kaho'olawe can be either colluvial or alluvial in nature. Colluvial erosion refers to the movement of sediments or other materials along a sloping plane under the force of gravity, often incorporating water. Alluvial erosion refers to the movement of sediments and materials by water flowing through a channel. Much of the hydrological erosion in Hawaii is colluvial in form. On Kaho'olawe it occurs in the uplands where the surface is relatively even, sloping, and with little infiltration of water due to soil and vegetation loss. As a result, rainfall does not penetrate the surface, but rather washes across the slope as a sheet. This sheet wash can move loose sediments and lighter cultural materials. When large areas of slope are denuded, such as is the case with some of the hardpan surfaces above Hakioawa, sheet wash can accumulate substantial water flow at relatively great velocity and can move

heavier cultural materials. As suggested previously, colluvial erosion is likely to affect archaeological materials that have been deflated onto the hardpan by eolian erosion by transporting these materials farther down slope.

Colluvial transport also operates within the confines of gullies and gulches. Talus slopes and the interior margins of valley bottoms are susceptible to colluvial erosion, especially when rainstorms soak unstable and sloping sediments. The additional weight of the sediments can exceed the mechanical and physical strength of bonds holding sediments together and can lead to movement to a lower elevation and a new location. Colluvial erosion also operates within stone foundations of archaeological sites on Kaho'olawe, and is responsible for the collapse of walls over time.

Alluvial erosion can affect historic properties on Kaho'olawe in at least two ways. First, where surface runoff water accumulates and begins to flow into channels, the erosive force of the water runoff can scour deeper and wider channels. Spriggs' report (1991) illustrates several stratigraphic profiles along both Hakioawa and Ahupū stream channels in which buried archaeological deposits are visible. This occurred as a result of channel widening or lateral movement of the stream channel. Although it exposes buried materials, such movements of stream channels also erode portions of the buried deposit, and by exposing buried deposits they also contribute to their subsequent deterioration and decay.

Surface water runoff can also initiate additional erosion at the head of the channels, because as the water flows into the channel it often undercuts the existing soil, and then erodes the channel upslope. The upslope erosion of channel heads is a serious threat to archaeological sites located on the hardpan. As channels cut deeper and farther upslope they can intersect archaeological sites and transport cultural remains from the hardpan through water flow. Where channel cuts have almost completely obliterated the hardpan surface, especially noticeable along the lower portion of the uplands, there are no archaeological sites. We suggest that this is not coincidental; any such sites have long been eroded from these locations and redeposited at lower elevations.

The second effect of both alluvial and colluvial erosion is to redeposit sediments and possibly cultural materials into new locations, particularly where the slope of the channel changes. Again, Spriggs' work is suggestive, since in both Hakioawa and Ahupū Gulches there are substantial alluvial deposits along certain sections of the valley bottoms. The presence of large cobbles in these alluvial deposits indicates that there was sufficient velocity to the water flow at times in the past to transport heavy materials. This would include all forms of cultural remains that might have been incorporated into the stream flow. Some of this stream flow, including the heavy portion suspended in the water, makes its way to the ocean. Thus, the erosion of upland sites through alluvial and colluvial

processes can lead to the redeposition of materials into the offshore environment surrounding Kaho'olawe. The redeposition of archaeological materials is not solely confined to upland-coastal contexts. Spriggs (1991:92) identifies a white sand deposit in the uppermost section of a stratigraphic profile taken from the west bank of Hakioawa Gulch, adjacent to Site 560, the hale o Papa. This white sand underlies much of Site 560 and is part of the dune deposit on which the structure was built. Erosion of the site has been previously noted; apparently, the sands have been transported to the bottom of the valley where they now are redeposited.

The effects of natural erosion processes are substantial on Kaho'olawe. They include: 1. the deflation of archaeological sites from the force of winds, 2. the exposure of formerly buried cultural materials, 3. the increased deterioration of organic remains on the surface of sites, 4. the increased spatial disarray of inorganic cultural materials by sheet and slope wash, 5. the transport and reburial of materials in new locations by alluvial and colluvial erosion, and 6. the additional deposition of sediments on top of archaeological materials which were formerly visible on the surface. These effects combine to reduce the information (or our ability to interpret that information) available about the history and prehistory of the island. The archaeological heritage of native Hawaiians is thereby compromised.

11. Human Interaction with Natural Processes of Erosion.

As discussed at the beginning of this section, natural formation processes that impact historic resources are also affected through the intermediary effects of contemporary human activities. In other words, processes such as erosion and sedimentation may be introduced, maintained, or expanded by human inducement. The introduction of goats to Kaho'olawe is an example of a historically induced human impact on natural processes via vegetation reduction. We limit the following discussion to those activities of relatively recent vintage that diminish vegetation coverage or provide contexts for enhanced erosion.

The recurrent bombing and other military exercises on Kaho'olawe by the U.S. military, especially within the central training area, limits opportunities for vegetation growth or regrowth. Bombs pulverize portions of the landscape and create craters and the sedimentary debris which accompanies bombings. The effect of this may be to increase localized eolian and hydrological erosion on historic properties located nearby.

The system of unimproved roads and in some cases unmarked tracks results in the removal of vegetation from road surfaces and adjacent margins. In several cases we observed localities where roads and their margins were associated with progressive deepening and widening of the road corridor. These corridors then serve to channel surface water runoff and to further erode both roads and their margins. Grading new roadways only shifts

the location of this process, and initiates another cycle of vegetation reduction, downcutting, and channelling of surface runoff. Roadways in the uplands may also contribute to the encroachment of gully heads upslope, due to the additional load of concentrated surface runoff generated by roadways. This runoff from roads can accumulate and intersect with gully drainages, creating spillways which downcut and undercut the tops of each gully. Given the close spatial proximity of the dirt roads on Kaho'olawe with a number of upland sites, and the coastal sites surrounding Hanakanaia, the opportunity for additional colluvial and alluvial erosion to occur at these sites is great.

Trails can also be associated with increased erosion that affects historic resources on Kaho'olawe. Although the relative scale and impact of trail induced erosion is small compared to roads, coastal sites in most gulch localities of Kaho'olawe may be impacted, since trails generally originate or end there. Additionally, the colluvial and alluvial sediments that comprise much of the terrain upon and within which many of the archaeological sites were built and deposits are more likely to be eroded by the removal of vegetation along and adjacent to trails.

Arid environments are generally more vulnerable to human induced erosion, simply because the density of vegetation is substantially less than in better watered places and the vegetation can be reduced relatively quickly. Research

activities, especially those which remove vegetation and loosen earth, can enhance erosional processes. This seems to be the case for many of the sites where test excavations were conducted or where data recovery was undertaken in order to salvage information from eroding firepits or midden. Often, after excavation was completed and the units refilled, eolian and colluvial erosion continued to impact these sites, and may in fact have been most prevalent in areas surrounding former excavations. Clearing areas for mapping or for site reclamation can have similar effects. The removal of the vegetation in order to better observe or utilize the surface of a site can then lead to erosion of that surface after the archaeological work or visit is completed.

Although there may be little we can do to change the nature of the natural environment of Kaho'olawe--it will always be a relatively dry and windy place and storms will continue to scour it shores--we can acknowledge and begin to anticipate how our actions (alone or in combination with natural processes) can affect the integrity of the historic resources on the island. It would help to have these impacts better understood and integrated into management and planning for the island, such that for any future actions that might take place on Kaho'olawe we are in a better position to predict their effects on archaeological sites. Then we can weigh alternatives and consider the trade-offs between our plans and our impacts.

Additionally, the effects of anticipated human activities

and natural events should be estimated for the historic properties of Kaho'olawe, and these should be ranked in terms of their impacts, benefits (if any), interactions with other effects, and appropriateness with respect to the natural and cultural environment. Although not intended to be exhaustive, we anticipate impacts from the following: 1. island ordnance clean up and environmental restoration, 2. further implementation of native Hawaiian educational, religious, and cultural programs, 3. additional archaeological and other scientific investigations, 4. increased authorized and unauthorized visits to the island, and 5. continued military activities.

High Priority Historic Properties or Areas

There are several historic properties on Kaho'olawe whose condition deserves immediate attention. Virtually all of these are thought to be Hawaiian sites associated with religious practices, although they may have represented other traditional Hawaiian cultural domains as well. The loss of historical integrity at these sites is especially of concern, given their important role today among native Hawaiians as both symbols of their heritage and as places where religious activities can take place.

At Hakioawa, both of the possible heiau (Sites 560 and 358) that are currently in use by the Protect Kaho'olawe 'Ohana should be inspected to determine how best to preserve the architectural features and associated archaeological deposits. Of particular concern is the effect of erosion at Site 560, the hale o Papa. Can repair of standing walls, filling in of erosion channels, and re-routing of the ridge trail reduce the erosion of the sands on which this structure was built? Could the slope on which this site occurs be stabilized by the planting of ground cover and the selective removal of kiawe. Can the site withstand the effects of repeated visits by 'Ohana members involved in ritual activities? If erosion cannot be suitably checked at Site 560 and the 'Ohana wishes to continue its religious activities there, would they then consent to the removal of human burials that would be eventually disturbed by erosion? Currently, the 'Ohana conducts its religious activities at Site 560 on the ridge above

the site, and members rarely visit the structure except to leave occasional offerings.

In marked contrast, the effects of erosion at Site 358 are not currently a threat to its integrity. The efforts by the ʻOhana to preserve and stabilize portions of the possible heaiu structure have reduced any potential erosional disturbance at the site. However, there is no up-to-date map of the site showing where the structure has been preserved and stabilized, or where new features have been added (or discovered during clearing and repair). A new map, showing stablized walls and newly constructed features should be prepared immediately.

At the bay north of Hakioawa, the possible heaiu and associated features (Site 569) on the east side of the gulch is also in danger. Here the sources are ongoing coastal erosion and the channel cut by the intermittent stream that flows out of the gulch. Repair of walls which have fallen, and documentation of this repair should stabilize the site and prevent further short term damage to the archaeological deposits or the complex of structures. Studies should be prepared for the long term stabilization of features adjacent to the coast.

There are several possible shrine sites located in the uplands above Hakioawa which have been and are currently affected by eolian erosion and will soon be impacted by colluvial and alluvial erosion. These religious sites should be fully documented and recorded, and then attention should be directed to prevent the gullies from cutting farther upstream into the sites.

Additionally, the revegetation of the deflated portions of the sites should be encouraged by planting around the periphery of the site, and perhaps by establishing small plantings within areas of low cultural density of the sites. Sites we identified in the uplands that should receive high priority are Pu'u Mōiwi (Site 108), Site 102, Site 103A, Site 208, and Site 473. Site records from the uplands should be inspected to determine if other shrines might be affected by erosion, and remedial actions should be planned for these as well. We were unable to visit the possible shrine at Moa'ula during this project. It should also be inspected to determine its condition, and the preservation of its features and deposits should receive high priority.

The basalt quarry sites associated with Pu'u Mōiwi (Sites 108, 205, 206, 204, 250, 383, 107, 210, 208, and 209) represent the second largest quarry complex known for the Hawaiian Islands. This makes these sites extremely valuable for a variety of reasons, and thus we would argue there is a high priority need to identify and correct erosional conditions at these sites. Furthermore, since these sites are well within the target impact zone, ordnance recovery should give high priority to this locality.

Along the southwest coastline, several possible shrines were noted in the survey forms. All of these sites should be revisited and their condition assessed. Some of the shrines may be subject to coastal erosion, others may have been impacted by military activity. The coastal shrines that cannot be saved or

protected from the effects of storm related erosion should have some form of data recovery undertaken, and the culturally significant materials should be reinterred at other appropriate locations. Where possible, however, coastal shrines should be protected and preserved without excavating them.

The Kamōhio shrine (Site 306) has and probably will continue to be subject to vandalism. This well-preserved site deserves immediate attention. Until a plan is devised for its long term management, the site should be regularly monitored for evidence of unauthorized visits or excavations. At the same time, a plan for preserving the site should be developed. This plan would need to take into account the relative isolation of the site, the difficulty in protecting it, the value and significance of its cultural remains, and the concerns for its preservation expressed by native Hawaiians. One possibility would be to excavate the remaining intact archaeological deposits within the rock shelter and remove the cultural remains to a safer, more secure location. Alternatively, it may be possible to place remote devices on the site which would indicate when unauthorized visits were in progress.

The array of sites comprising Hakioawa contain the most dense, most abundant, most varied evidence of prehistoric and historic Hawaiian occupation on the island of Kaho'olawe. This area constitutes an impressive education resource and the Protect Kaho'olawe 'Ohana uses it to introduce its members and visitors to Hawaiian culture and history. The 'Ohana has also constructed

several new structures at Hakioawa; these are used for religious, educational, public, and food preparation and storage activities. We recommend documentation of the 'Ohana's improvements at Hakioawa, and encourage the preparation of an overall site map for this area so that the 'Ohana can plan for its future use.

The documentation and preservation of historic properties presented here remains partial. We did not visit all sites on the island or all parts of Kaho'olawe during this project. We have selected for first priority emphasis those properties of high cultural value to native Hawaiians. This includes religious sites and those of potential educational value. Other sites that will fall into these two categories undoubtedly exist elsewhere on Kaho'olawe and they should also be identified and impacts to them remediated.

Identification and Monitoring of Historic Properties

Systematic documentation of the historic properties on Kaho'olawe should produce reliable information on the effects of natural and cultural formation processes. Lacking such information, we believe, can easily lead to poorly conceived and partial solutions or the failure to adopt any solution at all. Thus, we recommend that a program be developed for studying the effects of reclamation and disturbance--including both cultural and natural forms--on the historic properties of the island. In Chapter 3 we attempted to establish a conceptual framework for such a study by drawing on the notions of cultural and natural

formation processes. We have identified a number of processes and illustrated their occurrence at different archaeological sites on Kaho'olawe. However, this represents only a beginning, since we did not systematically visit all of the sites on the island nor could we fully document the effects of different impacts on sites. Here, then, we develop the outline for a program of study which can accomplish these goals.

As noted by Neller (1980a) over a decade ago, in order to proceed with a study of impacts to archaeological sites, it will be necessary to resurvey and relocate sites on the island. There are several reasons for this. First, we have discovered that although the island survey found most of the sites that still exist, it did not locate all archaeological sites on the island. Second, some of the sites discovered during the survey are incorrectly marked on the map of Kaho'olawe (Pat McCoy, personal communication 1992). And finally, some of the sites located during the initial survey are bounded in very different ways. Thus, the manner in which sites were identified, located on a map, and boundaries given to the site area are in need of reexamination. The most effective way to accomplish this is to resurvey selected areas of the island, using high quality topographic maps and aerial photographs. Special attention should be placed on surveying in areas with dense ground cover, since site visibility is reduced in these locations relative to the eroded areas. A consistently used definition of site, and a regularized procedure for locating site boundaries should be

employed.

One of the goals of the original survey was to provide information to the Navy and other parties on the location of archaeological sites. This was to help minimize human impacts to sites and to assist in the relocation and identification of sites (Aluli v. Brown 1980; Hommon 1981b; Morgenstein 1980). Unfortunately, we discovered that site locations could be misplaced on maps, there were often no surviving tags with the site numbers at the archaeological sites, and boundary markings for many sites were no longer in place or visible. All sites newly located and also all of the sites previously located by the initial survey should be revisited and marked with a permanent site tag which includes the site number. Sites located near areas of human use or visitation should also have their boundaries marked and the markings should be visible. Both tags and boundary markings should be inspected on a rotating basis to ensure that they are still attached and visible.

The original survey forms were designed to provide general information about archaeological sites. Unfortunately, they do not provide sufficiently detailed information so as to make it possible to compare the same site over time with respect to the effects of natural and cultural impacts, except when those impacts have been catastrophic. As sites are discovered or revisited, there should be a detailed description and map of the site prepared. The description should include all features, structures, and concentrations of artifacts and midden or lithic

debitage. All site descriptions should include identification of impact areas and each area should be located on a map. Maps should show the location of all described portions of the site, as well as the site marker tag, boundaries and boundary markers, and control surface units. Control surface units should be established at a sample of sites. Different locations on a given site should be sampled, so that both low density and high density concentrations of cultural material are represented. Either detailed maps or high quality photographs should be prepared for each control unit, showing the location of cultural materials. The materials should be labelled and numbered on the map. The area of each control unit should be permanently staked for future reference and monitoring. Vertical datums should be established at sites that are experiencing erosion. The vertical controls should be located on the site map and their height above ground indicated. Where the effects of erosion may be variably expressed at a site, several vertical datums should be established.

A standardized site form and reporting system are necessary if we expect to be able to compare the condition of archaeological sites through time and to determine the nature and extent of impacts at sites. We do not recommend mapping each site down to the smallest object. Rather, a series of control surface units that effectively sample the space of a site can achieve the goal of longitudinal comparison of each site.

Although monitoring sites has been mentioned in several

reports (Ahlo 1980, 1981; Carson 1980; Neller 1980b, 1981) there has been very little systematic follow-up on the condition of archaeological sites on Kaho'olawe, other than through data recovery operations. We recommend that on a rotating basis archaeological sites be revisited and the condition of each site be described and then compared with previous survey records. This can best be accomplished by employing the same set of control units and vertical datums over time at the same site, and closely monitoring the kinds of objects and features and their locations. Attention should be paid to the movement, alteration, and loss of cultural remains, and to signs of the natural or cultural processes which may have produced these changes. Such assessments of site conditions should be made on a site by site basis, and collectively for similar sets of sites (i.e., those in similar topographic or geographic settings or sites of comparable structure).

What we are proposing here is the expansion of the site inventory of Kaho'olawe. The inventory would not be a static description of the historic properties on the island, but would be updated regularly to reflect changes in our thinking about the Hawaiian prehistory and history and in the natural and cultural formation processes that are impacting site structure and integrity. This information would also be used to plan for preserving historic properties on Kaho'olawe

Devising Preservation-Use Plans for Historic Properties

With the investigation of impacts to historic properties on Kaho'olawe, there should be a commitment to plan for the reduction of impacts and to engage in preservation and conservation efforts designed to improve the sustainability of archaeological sites. These preservation plans should match the priorities established previously, that is, the most important sites should receive immediate attention so as to not only lessen impacts but also to improve the condition of the site. As sufficient information becomes available on the relative effects of natural and cultural processes to the remaining archaeological sites on the island, efforts should be made to devise preservation projects that are best suited to needs of a site or set of sites. We especially encourage the preservation of historic properties which can accomplish multiple purposes. For example, the revegetation of areas of the uplands surrounding sites can help to check erosion, improve water filtration into the soil, and to gradually rebury sites beneath a protective mantle of plant growth and ultimately soil. Finally, like the inventory, the preservation plan should be seen as a dynamic product whose strategies and tactics may change over time as goals are achieved.

Perhaps the easiest, least expensive, and most effective way to enhance the preservation of historic properties is to avoid generating additional impacts to them. A number of observers

have suggested this (Aluli v. Brown 1980; Hommon 1981b; Neller 1981) for Kaho'olawe, and we reiterate it here. Avoidance has the additional benefit of leaving the property in place and intact. Where possible, roads and construction should avoid historic properties, as also should military exercises. Similarly, any proposed research or island clean up should be designed to affect as few sites as possible and to the least extent possible. Visits to sites should be designed to minimize impacts. Trails should be placed so as to avoid features or concentrations of artifacts; if this is unavoidable, then, the trail should be covered with rocks or other materials to lessen the chance of erosion or wall collapse. All plans for the use of archaeological sites should include maintenance of the integrity of the site, either by recording its original condition and changes to it or by avoidance.

Unfortunately, site avoidance will not completely resolve the issue of preserving historic properties on Kaho'olawe. There are too many on-going natural and cultural processes which will continue to diminish the integrity of historic properties, in the absence of active efforts to preserve them. Moreover, native Hawaiians desire to integrate historic properties into their on-going cultural activities, and avoidance under these conditions is not possible. Some efforts to rehabilitate or protect archaeological sites have already been attempted on the island, and we draw from the experience of these as well as other suggested solutions to describe several ways that site or

property preservation might be approached in the future.

Revegetation has possibly the greatest potential for preserving sites on Kaho'olawe, a fact recognized by many different individuals and organizations (Aluli v. Brown 1980; Holmes and Reeve 1991; Neller 1981; U. S. Department of Agriculture, Soil Conservation Service 1979; Watershed Management Systems 1989; Yent 1983). Several pilot revegetation projects have been initiated, although not all can be considered successful as measured by their impact on historic properties. However, by revegetating portions of the island, especially those areas subjected to considerable erosion (e.g., the eastern uplands), the impacts associated with erosion can be reduced as wind speeds diminish, more rainfall infiltrates into the soil, and as new organic and inorganic materials begin to accumulate around plantings. Thus, suitably placed plantings lessen erosion and can grow to cover or bury exposed or deteriorating archaeological materials. Revegetation may also be employed in other locales, such as on sand dune deposits, exposed archaeological features, on highly eroded surfaces where archaeological remains no longer exist. We recommend the use of plants suited to the terrain, rainfall pattern of the island, and which will have as small as impact as possible on historic properties.

We recommend that implementation of revegetation be approached with some sensitivity to the initial impact that plantings can have on archaeological sites. This is not to

suggest that revegetation must occur outside the boundaries of all archaeological sites, but that plantings be established in suitable locales which have the least or minimal effects on cultural materials. This could be done by identifying areas devoid of archaeological sites, such as the heavily eroded intermediate zone between the eastern uplands and Hakioawa. Plantings might also be placed along the perimeters of sites and between sites and features in a manner that would take advantage of the local pattern of water flow and infiltration over a site. Areas with low density of cultural remains within sites might also be selected for planting. If a grid of plants or subsurface excavations for planting holes are placed over a site, care should be taken so as to affect the archaeological deposits as little as possible. This can be accomplished by limiting the depth of planting, by limiting the lateral movement of archaeological materials, and by avoiding archaeological features. Because water lines may be employed in conjunction with revegetation efforts (Holmes and Reeve 1991), such lines should generally be laid on the surface of the land or should involve only slight excavations into the subsurface portion of archaeological deposits.

Revegetation and site preservation can be integrated together with relatively little loss of site integrity or little alteration of the revegetation program. The advantages of combining the two are clear; erosion is reduced, exposed or threatened sites can be buried and better protected, and

vegetation can cover formerly barren or eroded areas of the island.

In recent years the National Park Service has helped sponsor historic preservation pilot projects involving the use of intentional burial, netting, or filter fabrics (Thorne 1988, 1989, 1991a, 1991b). Netting has been recommended or used as a means to stabilize and protect features eroding out of hillocks after excavation (Hommon 1981b; Morgenstein 1980; Rosendahl et al. 1987; Watershed Management Systems 1989). It was also used along the southwest coast after data recovery operations (Rosendahl et al. 1987), and in conjunction with the reinternment of human burials from Site 560. Unfortunately, the use of netting as a protective device for excavated archaeological features has not always met with success, and in part this can be explained by the failure to conduct follow-up monitoring of netting, as well as the selection of inappropriate areas for the deployment of netting. For instance, it is clear that netting is not suitable for localities undergoing wave erosion along the coast of Kaho'olawe. Nor would it work to prevent erosion of archaeological sites along gullies. Netting works best where erosion is occurring as a result of sheet wash along relatively moderate slopes, such as at Site 560. The use of netting has been only moderately successful at most of the hillock archaeological sites, due to the steep slope of the eroding face of the archaeological deposits at these sites.

When the objective is to effect the temporary retention of

soil and sediments, netting is a solution to protect archaeological sites. As a long term solution, however, netting must be monitored and ground cover should be encouraged to grow over the netting to hold it and the associated archaeological materials in place. Thus, netting could usefully be employed in conjunction with revegetation efforts as a means of protecting and stabilizing historic properties on Kaho'olawe. It is most effective where erosion is not yet operating at destructive levels. Filter fabrics, on the other hand, may represent relatively longer term solutions to erosion at archaeological sites (Thorne 1988). They are designed to limit the effects of recurrent erosion (e.g., storm events) along rather steep slopes. As such, they may be suitable for protecting archaeological sites along the coast of Kaho'olawe or on those sites eroding from hillocks in the uplands. Again, monitoring is recommended to assess the effectiveness and durability of filter fabrics over time.

One final technique to protect exposed archaeological sites is to bury them. Typically, this involves the use of soil or crushed rock that is placed on top of a site. This technique has been previously employed in Hawai'i, in conjunction with the H-3 Highway Kāne'ohe Interchange where a portion of an endangered site was buried as a means to protect it from the effects of the construction. Although the burial of sites may protect them from subsequent erosion or impacts from projects, this solution makes it more difficult to reclaim them or for Hawaiians to incorporate

these sites into their cultural practices. Whenever burial of sites is selected as a preservation option, it should be preceded by recording and mapping of the sites.

Because the threats to historic properties on Kaho'olawe derive from increasing alluvial and colluvial erosion, some effort has been made to identify ways to decrease and then reverse the rate of channel erosion and new head cuts by gullies. Two reports (U.S. Department of Agriculture, Soil Conservation Service 1979; Watershed Management Systems 1989) suggest that check dams be placed along the smaller gullies to slow the velocity of running water and to catch sediments eroding from higher elevations before they reach the coast. A pilot project by Watershed Management Systems demonstrated the efficacy of such a system of check dams. However, the cost of building check dams and their limited suitability to only the smaller gullies and gulches suggest that they will not provide a comprehensive solution to the problem of upland erosion. Employed in conjunction with revegetation projects both in the gullies and the surrounding watershed districts, check dams might help to stem the rate of channel downcutting and the erosion of new channel heads.

The Navy has also attempted to address the problem of gully erosion by using rubber tires as check dams or at gully heads. For the most part these efforts have been unsuccessful since the tires have a poor three dimensional configuration and possess few surfaces which can slow sediment transport. Additionally, there

was no systematic effort to revegetate the areas around the tires as a means to hold any additional trapped sediment. Finally, the use of tires as a means to check erosion can present a visual eyesore, especially when placed near historic properties. We recommend that the Navy remove tire check dams that are not functioning and monitor the remaining check dams to encourage sedimentation and revegetation.

Recently, the Navy has substituted the use of small sand bags for tires as a means to check erosion in gullies. This seems to have been more successful, since the bags are smaller than tires, have larger volume, and possess pliable surfaces. Consequently, sediment is more effectively trapped behind the bags. Nonetheless, the Navy should follow-up by appropriate planting ground cover in the sediment trapped by the sand bags.

The use of rocks and other materials to slow channel erosion has been documented for Kaho'olawe. The application of this technology is somewhat restricted to smaller channels, and should be complemented by monitoring and maintenance of the features, and the establishment of vegetation to hold the sediment in place. The Water Management Systems (1989) document presents guidelines and procedures for the implementation of check dams on Kaho'olawe, and we recommend them.

Archaeological sites can also be preserved through the implementation of more active measures to stabilize and restore architectural features. This has been partly demonstrated at Hakioawa where the terraced heiau at Site 358 has been stabilized

by the ʻOhana. Thus, despite its location on a rather steep slope, this heiau has been well-preserved through a program of wall stabilization and on-going site maintenance. There is little evidence of down slope erosion of sediments or cultural remains, nor is there evidence for erosion across the set of terraces. We recommend that sites intended for educational or cultural use by native Hawaiians undergo a program of stabilization and restoration. In order to implement such a program we further recommend that the present condition of the site be recorded, that all preservation work be designed to balance use needs and the maintenance of site integrity, and that all changes to a site be recorded and mapped. Finally, data recovery may be recommended as a means to preserve information from sites that are in immediate danger from impacts whose operation cannot be effectively controlled. Such measures have been recommended previously (Ahlo 1980; Hommon 1981b; Morgenstein 1980; Neller 1980b, 1981; Yent 1983), although we would encourage that data recovery be a "last resort" alternative. For while data recovery preserves information, it does not, of course, preserve the tangible structure of historic properties. For native Hawaiians, in-place preservation of archaeological sites is generally preferred, given the uses and kinds of roles that historic properties may play in maintaining and strengthening Hawaiian culture and tradition.

Where data recovery is recommended, it should be accompanied by a research plan or design that articulates archaeological

method and theory with contemporary problems of Hawaiian history and prehistory. Similarly, the implementation of recovery should include modern excavation and analytical techniques suited to resolve the problems posed by the research design. At the same time, data recovery should employ documentation that is minimally compatible with site records and any previous recovery operations. This would include the use of mapping, photography, sampling and collection procedures, the recovery of bulk sediment samples, and provenience units of relatively small size.

In addition to these recommendations for site preservation on Kaho'olawe, we also identify several proposals that were made previously but which we believe are unacceptable. The U.S. Department of Agriculture Soil Conservation Service (1979) suggested that sediment retention craters be blasted above small upland gullies and then planted with tamarisk or ground cover. Given the density of archaeological sites and the potential impact of this action on those sites, this proposed undertaking would affect the integrity of historic properties on the island. In general, we recommend that remediative efforts be sensitive to both natural and historic resources and that one not be sacrificed for the preservation of the other. Rechannelling streams (Morgenstein 1980; Neller 1980b) and wave barriers (Morgenstein 1980) are also unrealistic techniques for alleviating natural impacts. They would be expensive, may not be successful, and may have other long or short term deleterious effects. Building new stone walls to "shore up" sites (Neller

1980b) is also not recommended, since it adds to historic properties and may diminish their integrity. Moreover, such efforts can cause more damage to a site, especially if rock from partly collapsed walls is used to build new walls. Fencing historic properties has also been suggested (Hommon 1981b; Morgenstein 1980; Neller 1981), and the Navy has roped off some of the archaeological sites along the southwest coast. This does little to less the natural impacts associated with eolian and alluvial erosion, and in the case of ropes, has done little to keep out either goats or humans. Fences may also prevent native Hawaiians from having access to site for religious purposes and would thus be in conflict with the American Indian Religious Freedom Act. If fencing is undertaken as a means to protect archaeological sites, it should be done with the consultation of native Hawaiians and the fencing and archaeological features should be regularly monitored.

As we have attempted to show, several approaches to preserving historic properties on Kaho'olawe are feasible. We encourage the selection of approaches which are appropriate to the impacts affecting a site, the nature of the site, and the educational, historical and cultural values associated with the site by native Hawaiians and other interested parties. In other words, there is no one way to preserve or stabilize archaeological sites on Kaho'olawe. Rather preservation should be matched to particular site needs that have been adequately documented.

Conclusion

Our study has argued for the full implementation of all federal historic preservation statutes and regulations, including recognition that the Navy has an obligation to manage and conserve the National Register eligible historic resources of Kaho'olawe. We recommend that the application of federal historic preservation statutes be continued for the island for the near term, and that the Navy address its responsibilities by integrating planning and conservation of the island's historic resources at the highest levels. We make no long term recommendation for historic preservation jurisdiction on Kaho'olawe, except to note that at present the federal statutes are more comprehensive than those of the state and provide the opportunity to include native Hawaiian concerns during the review process and as part of long term planning. Any change in the jurisdiction of Kaho'olawe should make provisions for designating an appropriate land manager with adequate resources to fulfill its historic preservation responsibilities. Further we would recommend a program of historic preservation at least as broad as that developed by the federal government.

The impacts that currently affect historic properties on Kaho'olawe are widespread, varied, and numerous. Despite little information on the rate of impact, we have documented instances in which sites are being dramatically transformed or lost. The widespread erosional processes in the eastern uplands of Kaho'olawe threaten to destroy the integrity and information

potential of an important set of archaeological sites, including several religious features, one of the largest basalt quarry complexes in the state, and the remnants of an extensive upland agricultural complex on an arid island which may have no surviving counterparts elsewhere in the state. Elsewhere on the island, both natural and cultural processes have combined to threaten coastal sites with beach erosion, rapid and deep sedimentation, vandalism, and exposure of buried deposits and features. Thus far, Kaho'olawe has preserved a full array of its coastal archaeological sites, a situation unlike most other islands in the state. The loss or potential loss of these coastal resources constitutes a major challenge for future planning, management, and preservation on the island. Far less serious are the reclamation processes associated with the Protect Kaho'olawe 'Ohana efforts to establish and maintain their culture on the island. Nonetheless, we have identified our concerns that the historic properties be safeguarded and where human actions will have an identifiable impact on a site, that impact and its resulting consequences should be described and evaluated.

This project and the role given to the KICC offers us one final opportunity to propose how historic resources on Kaho'olawe can be preserved and managed in the future. Among other provisions, this plan should include means for integrating native Hawaiian assessments into site preservation and management on Kaho'olawe. This simply recognizes that the Hawaiian community has established through judicial precedent that they may have

access to Kaho'olawe, and on the island they may practice their culture and traditions. In other words, on Kaho'olawe the historic resources must be protected, and at the same time be made available to Hawaiians. These resources are not simply monuments to the past, but also sustain the community today. We also recommend that Hawaiian cultural perspectives be sought during the planning for any future use or development of the island. This type of consultation is not only appropriate is now required by federal law.

Further, given the damage and deterioration that the historic properties of Kaho'olawe have already suffered, we recommend that preservation be given high priority in the future. Finally, we recommend that a permanent position be created and assigned to the management of the natural and historical resources of Kaho'olawe, and this position be filled so that the proposed CRMP and this preservation plan can be fully implemented. With this in place we can be better assured that the nationally significant historic resources of Kaho'olawe will be given the protection they deserve and the heritage they present can be appreciated by future generations.

Works Cited

Advisory Council on Historic Preservation. 1980. Treatment of Archeological Properties: A Handbook. [Washington, D.C.]: Advisory Council on Historic Preservation.

. 1982. Where to Look: A Guide to Preservation Information. [Washington, D.C.]: U.S. Government Printing Office.

. 1983. Federal Tax Law and Historic Preservation. [Washington, D.C.]: Advisory Council on Historic Preservation.

. 1986. Section 106, Step-by-Step. [Washington, D.C.]: U.S. Government Printing Office.

Advisory Council on Historic Preservation and National Park Service. 1989. The Section 110 Guidelines: Annotated Guidelines for Federal Agency Responsibilities Under Section 110 of the National Historic Preservation Act. [Washington, D.C.]: Advisory Council on Historic Preservation and National Park Service.

Ahlo, Hamilton M., Jr. 1980. Letter to Contracting Officer of the Pacific Division Naval Facilities Engineering Command, 4 November. Attachment in Preliminary Case Report: 35 Sites in Danger of Erosion; Kaho'olawe, Hawaii, 1980, 1980. TD [photocopy]. Hawaiian Collection, Hamilton Library, University of on Hawaii, Honolulu.

. 1981. Kaho'olawe: A Cultural Resource Management Plan Draft. TD [photocopy]. Hawaiian Collection, Hamilton Library, University of Hawaii, Honolulu.

Aluli v. Brown. 1980. Civil No. 76-0380, Consent Decree and Order, United States District Court, District of Hawaii, 1 Dec.

Barrera, William Jr. 1984. Kaho'olawe Archaeology: An Overview. Hawaiian Archaeology 1:31-43.

Carnett, Carol. 1991. Legal Background of Archaeological Resources Protection. Technical Brief, 11. [Washington D.C.]: Archaeological Assistance Program, U.S. Department of the Interior, National Park Service.

Carson, J. T. 1980. Letter to Susumo Ono, State Historic Preservation Officer, Department of Land and Natural Resources, State of Hawaii, 7 November. Attachment in Preliminary Case Report: 35 Sites in Danger of Erosion; Kaho'olawe, Hawaii. TMs [photocopy]. Hawaiian Collection, Hamilton Library, University of Hawaii, Honolulu.

Council on Environmental Quality. 1971. Statements on Proposed Federal Actions Affecting the Environment. Federal Register, 36(79):7724-7729, 23 April.

. 1973. Preparation of Environmental Impact Statements: Guidelines. Federal Register, 38(147):20550-20562, 1 August.

. 1976. Preparation of Environmental Impact Statements: Guidelines. Code of Federal Regulations, Title 40, Part 1500:754-777. [Washington D.C.]: U.S. Government Printing Office.

. 1991. Environmental Impact Statement. Code of Federal Regulations, Title 40, Part 1502:662-697. [Washington D.C.]: U.S. Government Printing Office.

Francis, Julie E. 1978. The Effect of Casual Surface Collection on Variation in Chipped Stone Artifacts. In An Analytical Approach to Cultural Resource Management: The Little Colorado Planning Unit. Edited by F. Plog. Arizona State University, Anthropological Papers 13:114-132.

Garvey, Robert R. Jr. 1971. Letter to Rear Admiral D. F. Welch, Department of the Navy, 11 November. Attachment in Final Environmental Impact Statement Concerning Military Use of the Kahoolawe Island Target Complex in the Hawaiian Archipelago. TD [photocopy]. Environmental Center Library, University of Hawaii, Honolulu.

Gifford-Gonzalez, Diane P., David B. Damrosch, Debra R. Damrosch, John Pryor, and Robert L. Thunen. 1985. The Third Dimension in Site Structure: An Experiment in Trampling and Vertical Dispersal. American Antiquity 50:803-818.

Hawaii State Legislature. n.d. [1976(?)] Kaho'olawe: Aloha No: A Legislative Study of the Island of Kaho'olawe. Honolulu, Hawaii State Legislature.

Holmes, Dan and Rowland Reeve. 1991. Kaho'olawe Restoration Project Environmental Assessment. TD [photocopy]. Michael Graves, Department of Anthropology, University of Hawaii, Honolulu.

Hommon, Robert J. 1979. Research Design, Kaho'olawe Cultural Resources Survey: 1977-78. TMs [photocopy]. Hawaiian Collection, Hamilton Library, University of Hawaii, Honolulu.

. 1980a. Kaho'olawe Final Report of the Archaeological Survey. TD [photocopy]. Hawaiian Collection, Hamilton Library, University of Hawaii, Honolulu.

. 1980b. Kaho'olawe Multiple Resource National Register of Historic Places Nomination Form. TD [photocopy]. Historic Preservation Division, Department of Land and Natural Resources, State of Hawaii, Honolulu.

. 1981a. Kaho'olawe Archaeological Excavations 1981. TD [photocopy]. Hawaiian Collection, Hamilton Library, University of Hawaii, Honolulu.

. 1981b (?). Preliminary Case Reports March 23 through April 1, 1981, Field Trip Report Kaho'olawe Site Inspection. TMs [photocopy]. Hawaiian Collection, Hamilton Library, University of Hawaii, Honolulu.

Hommon, Robert J. and C. F. Streck, Jr. 1981. The Archaeological Investigation of Kaho'olawe Site 109. TMs [photocopy]. Hawaiian Collection, Hamilton Library, University of Hawaii, Honolulu.

King, Thomas F., Patricia Parker Hickman, and Gary Berg. 1977. Anthropology in Historic Preservation; Caring for Culture's Clutter. New York: Academic Press.

Kirch, Patrick V. 1985. Feathered Gods and Fishhooks: An Introduction to Hawaiian Archaeology and Prehistory. Honolulu: University of Hawaii Press.

Knoll, Patricia C. 1990. Listing of Education in Archeological Programs: The LEAP Clearinghouse 1987-1989 Summary Report. [Washington D.C.]: National Park Service, U.S. Department of the Interior.

Lightfoot, Kent. 1978. The Impact of Casual Collection on Archaeological Interpretation Through Regional Surface Surveys. In An Analytical Approach to Cultural Resource Management: The Little Colorado Planning Unit. Edited by F. Plog. Arizona State University, Anthropological Papers 13:91-113.

Lyons, W. W. 1972. Letter to Rear Admiral D. F. Welch, Department of the Navy, 31 January. Attachment in Final Environmental Impact Statement Concerning Military Use of the Kahoolawe Island Target Complex in the Hawaiian Archipelago. TD [photocopy]. Environmental Center Library, University of Hawaii, Honolulu.

McAllister, Gilbert J. 1933. Archaeology of Kahoolawe. No. 115, Bernice Pauahi Bishop Museum Bulletin. Honolulu: Bishop Museum Press.

Morgenstein, Maurice E. 1980. Letter to Contracting Officer, Pacific Division Naval Facilities Engineering Command, 17 January. Attachment in Erosion of Archaeological Sites on Kaho'olawe, Hawaii: A Reconnaissance of Selected Sites, 1981. TMs [photocopy]. Hawaiian Collection, Hamilton Library, University of Hawaii, Honolulu.

Neller, Earl. 1980a. Island of Kahoolawe Site Visit April 25-28, 1980. TMs [photocopy]. Hawaiian Collection, Hamilton Library, University of Hawaii, Honolulu.

. 1980b. Preliminary Case Report: 35 Sites in Danger of Erosion; Kahoolawe, Hawaii. TMs [photocopy]. Hawaiian Collection, Hamilton Library, University of Hawaii, Honolulu.

. 1981. Erosion of Archaeological Sites on Kaho'olawe, Hawaii: A Reconnaissance of Selected Sites. TMs [photocopy]. Hawaiian Collection, Hamilton Library, University of Hawaii, Honolulu.

. 1982a. Kaho'olawe Field Trip Report PKO Access to Kaho'olawe of 14-16 May 1982. TMs [photocopy]. Hawaiian Collection, Hamilton Library, University of Hawaii, Honolulu.

. 1982b. Settlement Patterns on Kaho'olawe Island, Hawaii. TMs [photocopy]. Hawaiian Collection, Hamilton Library, University of Hawaii, Honolulu.

Ogden Enterprises. 1991. Draft Cultural Resource Management Plan for Kaho'olawe Archaeological District. TD [photocopy]. Historic Preservation Division, Department of Land and Natural Resources, State of Hawaii, Honolulu.

Parker, Patricia L., and Thomas F. King. 1990. Guidelines for Evaluating and Documenting Traditional Cultural Properties, National Register Bulletin, 38. [Washington D.C.]: Interagency Resources Division, U.S. Department of the Interior, National Park Service.

Rosendahl, Paul H., Alan E. Haun, Joseph B. Halbig, Mikk Kaschko, Melinda S. Allen. 1987. Kahoolawe Excavations, 1982-3 Data Recovery Project. TD. Hawaiian Collection, Hamilton Library, University of Hawaii, Honolulu.

Schiffer, Michael B. 1987. Formation Processes of the Archaeological Record. Albuquerque: University of New Mexico Press.

Scovill, D. H., G. J. Gordon, and K. M. Anderson. 1972. Guidelines for the Preparation of Statements of Environmental Impact on Archaeological Resources. Tucson: Arizona Archaeological Center, U.S. National Park Service.

Spriggs, Matthew. 1987. "Preceded by Forest"; Changing Interpretations of Landscape Change on Kahoolawe. In Appendices: Kahoolawe Excavations, 1982-3 Data Recovery Project. TD. Hawaiian Collection, Hamilton Library, University of Hawaii, Honolulu.

1991a. Facing the Nation: Archaeologists and Hawaiians in the Era of Sovereignty. Contemporary Pacific 3:379-392.

1991b. "Preceded by Forest"; Changing Interpretations of Landscape Change on Kaho'olawe. Asian Perspectives 30:71-116.

Stearns, Harold T. 1940. Geology and Ground-water Resources of of the Island of Kahoolawe, Hawaii, Bulletin 6. Hawaii Division of Hydrography, Honolulu.

Stokes, John F. G. n.d. [1913]. Field notebooks from 1913 archaeological investigations of Kaho'olawe Island. AMs, Stokes' Manuscripts, group 2, box 3, notebooks 15 and 16. Bernice Pauahi Bishop Museum Archives, Honolulu.

Thorne, Robert M. 1988. Filter Fabric: A Technique for Short-term Site Stabilization. Technical Brief, 2 [Washington D.C.]: Archeological Assistance Program, U.S. Department of the Interior, National Park Service.

. 1989. Intentional Site Burial: A Technique to Protect Against Natural or Mechanical Loss. Technical Brief, 5. [Washington D.C.]: Archeological Assistance Program, U.S. Department of the Interior, National Park Service.

. 1991a. Site Stabilization Information Sources. Technical Brief, 12. [Washington D.C.]: Archeological Assistance Program, U.S. Department of the Interior, National Park Service.

. 1991b. Site Stabilization, Protection Lessen Resource Damage. Federal Archeology Report 4(1):1, 4-5.

United States Congress. 1966. National Historic Preservation Act of 1966, as Amended. PL 89-665; 80 Stat. 915;16 U.S.C. 470 as amended by PL 91-243, 93-54, 94-422, 94-458, 96-199, 96-244, and 96-515.

. 1969. National Environmental Policy Act of 1969, as Amended. PL 91-190; 83 Stat. 852; 42 U.S.C. 4341 as amended by PL 94-52 and PL 94-83.

. 1978. American Indian Religious Freedom Act of 1978. PL 95-341; 92 Stat. 469.

. 1979. Archaeological Resources Protection Act of 1979. PL 96-95; 16 U.S.C. 470aa-47011.

. 1990. Native American Graves Protection and Repatriation Act of 1990. PL 101-601.

United States Department of Agriculture Soil Conservation Service 1979. Erosion Control Program; Kahoolawe Island, Hawaii. TD [photocopy]. Appendix in Aluli v. Brown 1980. TD [photocopy]. Hawaii State Historic Preservation Office, Honolulu.

. 1980. Agreement Between the Pacific Division, Naval Facilities Engineering Command and Soil Conservation Service United States Department of Agriculture. TD [photocopy]. Appendix in Aluli v. Brown 1980. TD [photocopy]. Historic Preservation Division, Department of Land and Natural Resources, State of Hawaii, Honolulu.

United States Department of the Interior, National Park Service. 1983. Archaeology and Historic Preservation; Secretary of the Interior's Standards and Guidelines. Federal Register, 48 (190), 29 September.

. 1984. Protection of Archaeological Resources Uniform Regulations. Federal Register, 49, 6 January.

. 1987a. Archaeological Resources Protection Act; Supplemental Regulations. Federal Register, 52 (55), 23 March.

. 1987b. Native American Relationships Management Policy; Final Management Policy. Federal Register, 48 (183), 22 September.

United States Department of the Navy. 1972. Final Environmental Impact Statement Concerning Military Use of the Kahoolawe Island Target Complex in the Hawaiian Archipelago. TD [photocopy]. Environmental Center Library, University of Hawaii, Honolulu.

. 1977. Draft Supplement 10-31-77 to Final Environmental Statement Concerning Military Use of the Kahoolawe Island Target Complex in the Hawaiian Archipelago, 1972. TD [photocopy]. Environmental Center Library, University of Hawaii, Honolulu.

. 1978. Memorandum of Understanding Pertaining to the Island of Kaho'olawe between the U.S. Navy and the State of Hawaii, 9 August. TD [photocopy]. Attachment in Memorandum of Agreement between the Department of the Navy, the Advisory council on Historic Preservation, and the Hawaii State Historic Preservation Officer. TD [photocopy]. William S. Richardson School of Law Library, University of Hawaii, Honolulu.

. 1979. Environmental Impact Statement Military Use of Kahoolawe Training Area Hawaiian Archipelago. TD. Environmental Center Library, University of Hawaii, Honolulu.

. 1981. Memorandum of Agreement between the Department of the Navy, the Advisory Council on Historic Preservation, and the Hawaii State Historic Preservation Officer. TD [photocopy]. William S. Richardson School of Law Library, University of Hawaii, Honolulu.

. n.d. Clearance of Surface Ordnance from Designated Areas of Kaho'olawe. TMs [photocopy]. Attachment in Aluli v. Brown 1980. Historic Preservation Division, Department of Land and Natural Resources, State of Hawaii, Honolulu.

United States President. 1953. Executive Order 10436, Reserving Kahoolawe Island, Territory of Hawaii, for the Use of the United States for Naval Purposes and Placing It Under the Jurisdiction of the Secretary of the Navy, 20 February.

. 1971. Executive Order 11593, Protection and Enhancement of the Cultural Environment, 36 F.R. 8921, 15 May.

Watershed Management Systems. 1989. Kaho'olawe Water Resources Study Final Report: Strategies for the Management of Land and Water Resources; Kaho'olawe Island. TD [photocopy]. Historic Preservation Division, Department of Land and Natural Resources, State of Hawaii, Honolulu.

Wildesen, Leslie E. 1982. The Study of Impacts on Archaeological Sites. Advances in Archaeological Method and Theory 5:51-96.

Wilk, Richard and Michael B. Schiffer. 1979. The Archaeology of Vacant Lots in Tucson, Arizona. American Antiquity 44:530-536.

Yent, Martha. 1983. Field trip to Kaho'olawe: Review of the Cultural Resources. TMs [photocopy]. Hawaiian Collection, Hamilton Library, University of Hawaii, Honolulu.