WAIMANU NATIONAL ESTUARINE SANCTUARY MANAGEMENT PLAN

STATE OF HAWAII
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WAIMANU NATIONAL ESTUARINE SANCTUARY MANAGEMENT PLAN
STATE OF HAWAII

U.S. DEPARTMENT OF COMMERCE NOAA
COASTAL SERVICES CENTER
2234 SOUTH HOBSON AVENUE
CHARLESTON, SC 29405-2413

Prepared for:
State of Hawaii
Department of Planning and Economic Development

Prepared by:
Decision Analysts Hawaii, Inc.

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PREFACE

CONTENT AND PURPOSE

In 1976, the State of Hawaii received a grant from the Office of Coastal Zone Management (now the Office of Ocean and Coastal Resource Management) of the National Oceanic and Atmospheric Administration, United States Department of Commerce. The purpose of this grant, which was matched by an equal amount from the state, was to establish the Waimanu National Estuarine Sanctuary within Waimanu Valley on the Island of Hawaii.

The Waimanu Valley Sanctuary will serve as a natural field laboratory in which to study and gather data on the natural processes occurring within this estuary of the coastal zone. It will provide a relatively undisturbed area which will always remain available for ecological research, and will be available for use as a control against which the impacts of human activities in similar areas can be assessed. The sanctuary is to be used primarily for long-term scientific and educational purposes, especially to provide some of the information essential to coastal zone management decisions.

This document presents a management plan for the Waimanu National Estuarine Sanctuary—a plan which is needed if Waimanu Valley is to fulfill its purpose as a natural field laboratory. Background information on the establishment of Waimanu Valley as a National Estuarine Sanctuary is presented in Chapter 1, including the Federal authorization, the site selection process, and the federal grant award. Chapter 2 presents the location and a description of Waimanu Valley, including the historical background, physical features, and habitat and biological features. Components of the management plan are given in Chapters 3 through 9. Goals and objectives are presented in Chapter 3. Chapter 4 addresses the problem of obtaining use of those lands in Waimanu Valley which are not owned by the state, including lands of the Department of Hawaiian Home Lands, Bishop Estate, and small private

landowners. Permitted and restricted uses within the valley are covered in Chapter 5 including agency responsibilities, access and use, and state regulations. The research program is given in Chapter 6, and includes plans for a research center and the initial research agenda. Needed research covers archaeological, historical, and cultural resources; fresh water resources; coastal waters; flora and fauna; and integrated studies of ecosystem dynamics. Control of problem flora and fauna is addressed in Chapter 7. The interpretive program is covered in Chapter 8, including a public awareness program and student education. In the final chapter, the schedule and finances are addressed.

ACKNOWLEDGMENTS

This report was prepared jointly by Dr. Bruce S. Plasch, who is responsible for the final content, and Ms. Jacqueline A. Parnell. The maps (Figures 1 and 2) were prepared by Ms. Nancy Brown. All photographs are by Ms. Parnell except for Figure 3, which was taken by Mr. Bruce Taylor.

Providing information and valuable ideas in the preparation of this report were individuals with: Office of Ocean and Coastal Resource Management of the National Oceanic and Atmospheric Administration, United States Department of Commerce; the Hawaii Department of Land and Natural Resources; the Hawaii Department of Planning and Economic Development; the Department of Hawaiian Home Lands; the County of Hawaii; the University of Hawaii, Manoa and Hilo campuses; the Bishop Estate; and The Nature Conservancy of Hawaii.

Certain individuals were particularly helpful. Ms. Lani Stemermann of Volcano provided contacts and information needed for developing the research agenda, and served as a guide in visiting Waimanu Valley and identifying important and unusual features. Ms. Jacquelin Miller of the Environmental Center at the University of Hawaii at Manoa made arrangements for a special meeting with scientists at the Manoa campus. Dr. Joseph Halbig provided assistance in identifying and meeting with scientists at the Hilo campus. Their assistance is deeply appreciated.

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CHAPTER 1

SANCTUARY ESTABLISHMENT

AUTHORIZATION OF NATIONAL ESTUARINE SANCTUARIES

In response to intense pressures and conflicts within the coastal zone of the United States, Congress enacted the Coastal Zone Management Act of 1972 (amended in 1976), 16 U.S.C. 1461. The Act authorized a new Federal program to be administered by the National Oceanic and Atmospheric Administration (NOAA), in the Department of Commerce, to assist and encourage states to develop and administer comprehensive management programs for the resources of the coastal zone. Within NOAA, the Act is administered by the Office of Ocean and Coastal Resources Management (OCRM), formerly the Office of Coastal Zone Management (OCZM).

The Act affirms a national interest in the effective management, beneficial use, protection, and development of the coastal zone, and provides three grant programs to achieve these objectives. Two of these grant programs assist the coastal states in developing (Section 305) and administering (Section 306) comprehensive coastal zone land and water use management programs.

A third section of the Coastal Zone Management Act established an estuarine sanctuary program (Section 312) to provide grants to states on a matching basis in order to acquire, develop and operate estuarine areas "to serve as natural field laboratories in which to study and gather data on the natural and human processes occurring within the estuaries of the coastal zone." The National Estuarine Sanctuary Program has been operating under estuarine sanctuary guidelines published June 4, 1974 (39 FR 19922), and proposed regulations published September 9, 1977 (41 FR 45522). Proposed revisions to these regulations were published in the Federal Register on August 3, 1983 (Vol. 48 No. 150).

Sanctuaries established under this program have the dual purpose of (1) preserving selected undisturbed areas in order that examples of a variety of natural coastal ecological types will always remain available for ecological research, and (2) ensuring that natural areas will be available for use as a control against which the impacts of man's activities in other areas can be assessed. These sanctuaries are to be used primarily for long-term scientific and educational purposes, especially to provide some of the information essential to coastal zone management decision-making. Some of the research purposes are:

- to gain a thorough understanding of the natural ecological relationships within the estuarine environments of the United States;
- to make baseline ecological measurements;
- to serve as a natural control against which changes in other estuaries can be measured, and to facilitate evaluation of the impacts of human activities on estuarine ecosystems; and
- to provide a vehicle for increasing public knowledge and an awareness of the complex nature of estuarine systems, their values and benefits to man and nature, and the problems which confront them.

A biogeographic classification scheme has been developed based on regional variations in the nation's coastal zone. This scheme is used to ensure that the national program includes at least one site from each region. An estuarine typology system is utilized to ensure that sites selected reflect the wide range of estuarine types in the United States. Twenty-seven regions have been identified in eleven geographic areas. Waimanu National Estuarine Sanctuary represents the Hawaiian Islands Region in the Insular group.

SITE SELECTION PROCESS

The Hawaii Coastal Zone Management Program is under the jurisdiction of the Department of Planning and Economic Development (DPED). In 1974, DPED initiated action to enable Hawaii to participate in the National Estuarine Sanctuary Program. After an extensive selection process by the Department, Waimanu Valley was proposed by the state for inclusion in the federal estuarine sanctuary program. This process included input from local, state, and federal agencies, and from private individuals.

The Department first appointed an Estuaries Technical Committee which developed a preliminary list of candidate estuaries in May, 1974. This committee included representatives from DPED, the Department of Land and Natural Resources (DLNR), the University of Hawaii, and several federal and state agencies. In June, 1974, a Hawaii Estuary Policy Committee was formed, consisting of the State Marine Affairs Coordinator, the Chairman of DLNR and the Director of DPED. They appointed a Working Committee composed of representatives from DLNR, DPED, and the University of Hawaii. The Working Committee expanded the initial 16 candidate sites recommended by the Estuaries Technical Committee to 24 candidate sites. Information on the 24 sites, the estuarine sanctuary program, and the suggested criteria for evaluating the sites were sent to state and county agencies and individuals for review. The evaluation criteria were based on the Federal Estuarine Sanctuary Guidelines and included such considerations as the extent to which a site fit the biogeographic definition of an estuary, research potential, and existing land use conflicts.

As a result of this analysis, 14 of the sites were eliminated because they could not be protected, were already developed, or for one reason or another did not satisfy the Estuarine Sanctuary Guidelines. The remaining ten sites were then evaluated. The first five were ranked as follows: Kahana (Oahu), Kiholo (Hawaii), Waimanu (Hawaii), Hanalei (Kauai) and Waipio (Hawaii). Site profiles for each of these top five candidates were sent to the County Planning Departments for comment. Their input, plus the Working Committee recommendations, were given to the Hawaii Estuary Policy Committee. This Committee considered both the ability of the sites to meet Federal Guidelines and the state's financial ability to provide matching funds. In January 1975, the state decided to apply for an Estuarine Sanctuary Grant for the valley/bay of Waimanu on the Island of Hawaii. Several of the other sites had state lands available for matching Federal funds; Waimanu, however, was felt to be the least altered by recent human activity and to have the best potential for research pertinent to the Hawaii CZM program on valley/tidal stream systems. In addition, designation of Waimanu would result in the least disruption of current land use practices of all of the sites considered.

GRANT AWARD TO THE STATE

In July of 1975, the State of Hawaii requested a grant in the amount of $191,250 from the Office of Coastal Zone Management (now the Office of Ocean and Coastal

Resource Management) to be matched by an equal or greater amount from the state. The purpose of the grant was to establish an estuarine sanctuary in the Waimanu Valley on the Island of Hawaii. In April of 1976 the Office of Coastal Zone Management (OCZM), distributed a Draft Environmental Impact Statement on the proposed estuarine sanctuary grant award for review and comment by all interested public, private, state and federal individuals and agencies. The Final Environmental Impact Statement was presented to the Council on Environmental Quality in May, 1976 and the grant was awarded to the State of Hawaii by OCZM on June 30, 1976.

CHAPTER 2

LOCATION AND DESCRIPTION OF SANCTUARY

GENERAL DESCRIPTION *

The State of Hawaii consists of eight major islands and 124 minor islands in a chain stretching across the northern Pacific Ocean from northwest to southeast. It has a total area of 6,450 square miles, of which 6,425 are land and 25 are inland waters. The state has a coastline of 750 miles. The total population of the state is close to one million people.

The Island of Hawaii (Figure 1) is both the most southern and largest of all of the islands, with an area of 4,038 square miles. It is almost twice the combined size of all the other islands in the state and is popularly referred to as the "Big Island." Over 100,000 people live on the island, representing ten percent of the state population.

All of the islands are of volcanic origin. Geologically, the chain is very young, with the age decreasing from the northern islands to the southeast. Hawaii is the most recent of the Islands, with two active volcanoes that periodically contribute additional acreage to its mass. It has the highest mountains in the state, Mauna Kea (4,205 meters; 13,796 feet) and Mauna Loa (4,169 meters; 13,677 feet).

Waimanu Valley is the second largest of a series of similar valleys located on the northeastern windward coast of the Island of Hawaii (Figures 1 - 8). The Waimanu Estuarine Sanctuary includes approximately 5,900 acres (about 9.2 square miles),

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* A major portion of this chapter is taken from the Final Environmental Impact Statement for the Proposed Estuarine Sanctuary Grant Award for Waimanu Valley, Hawaii County, Hawaii. Office of Coastal Zone Management, National Oceanic and Atmospheric Administration, United States Department of Commerce, 1976.

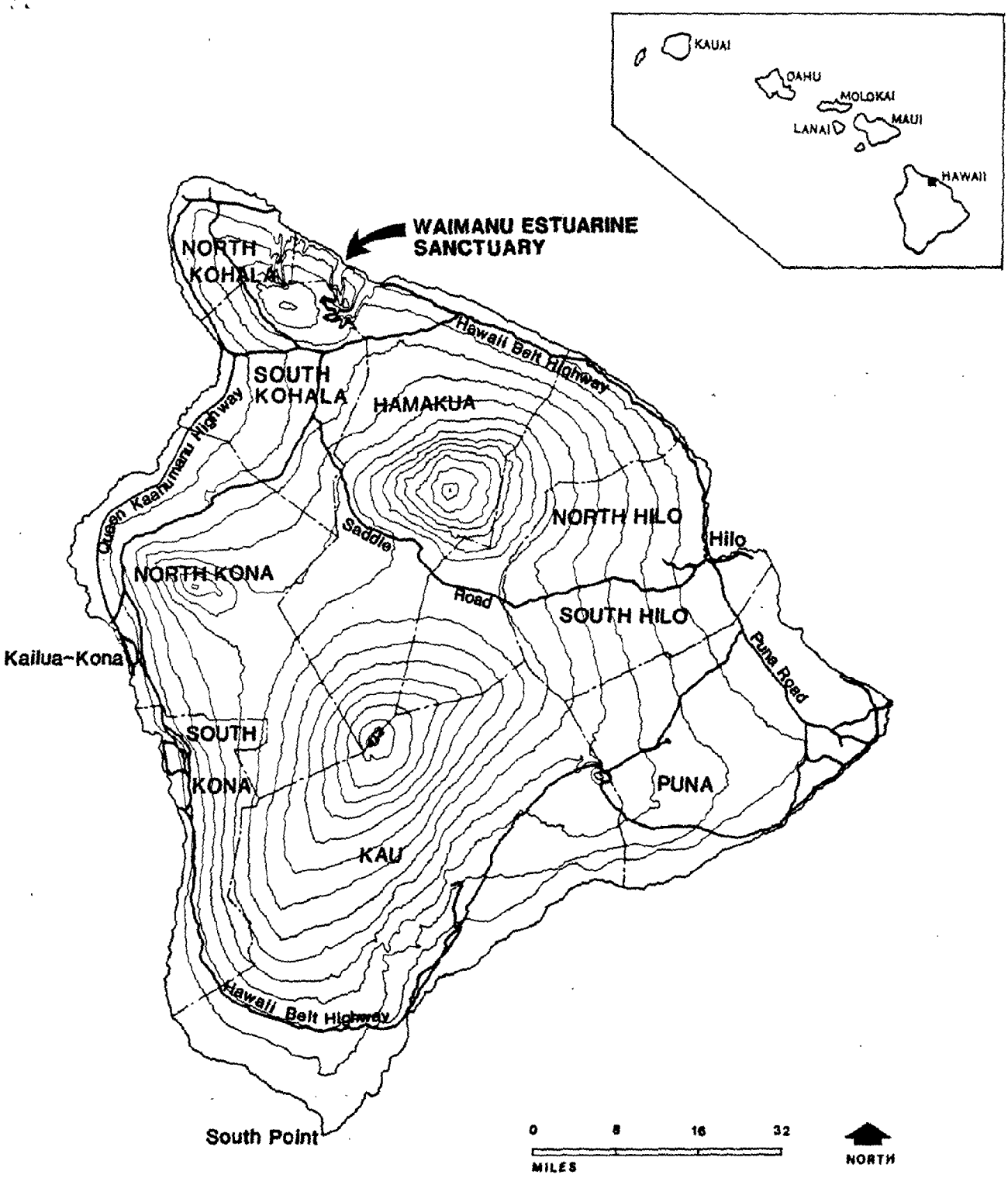


Figure 1. Hawaii Island

Figure 2. Waimanu Estuarine Sanctuary-Project Vicinity

0 1 Miles

North

Waimanu Estuarine Sanctuary Boundary

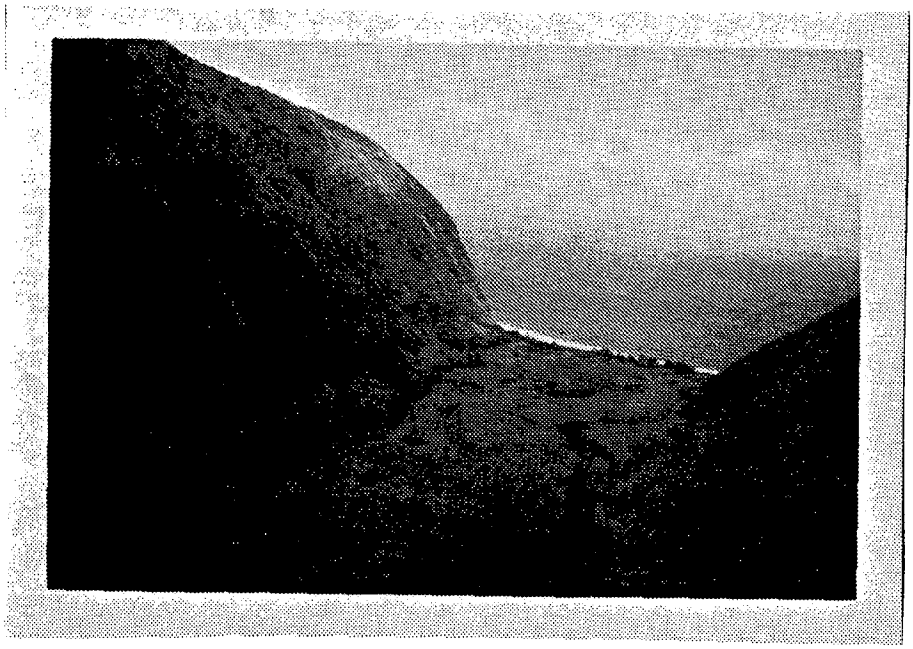


Figure 3. Aerial view of Waimanu Valley, looking northeast to the ocean.

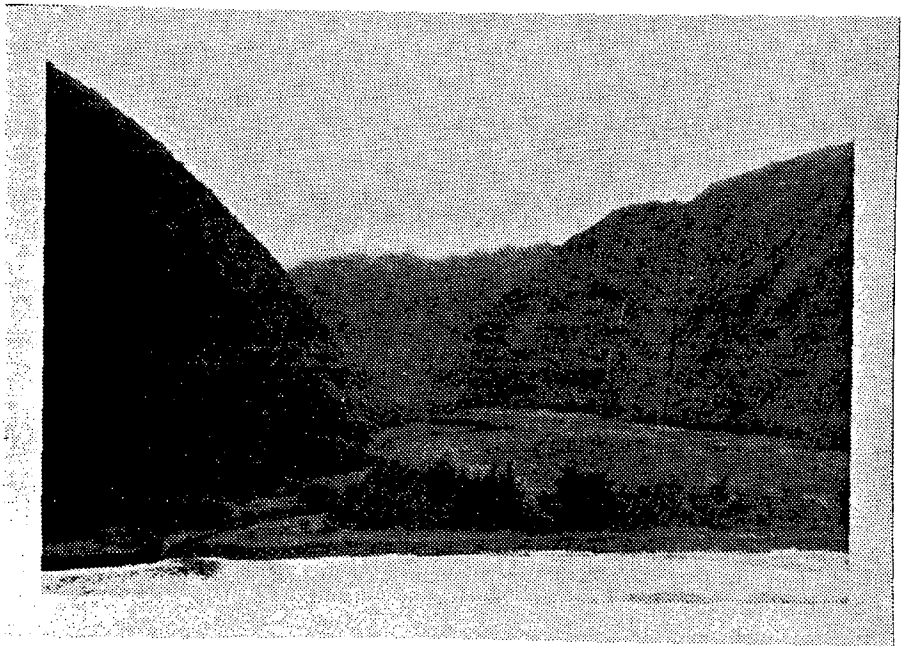
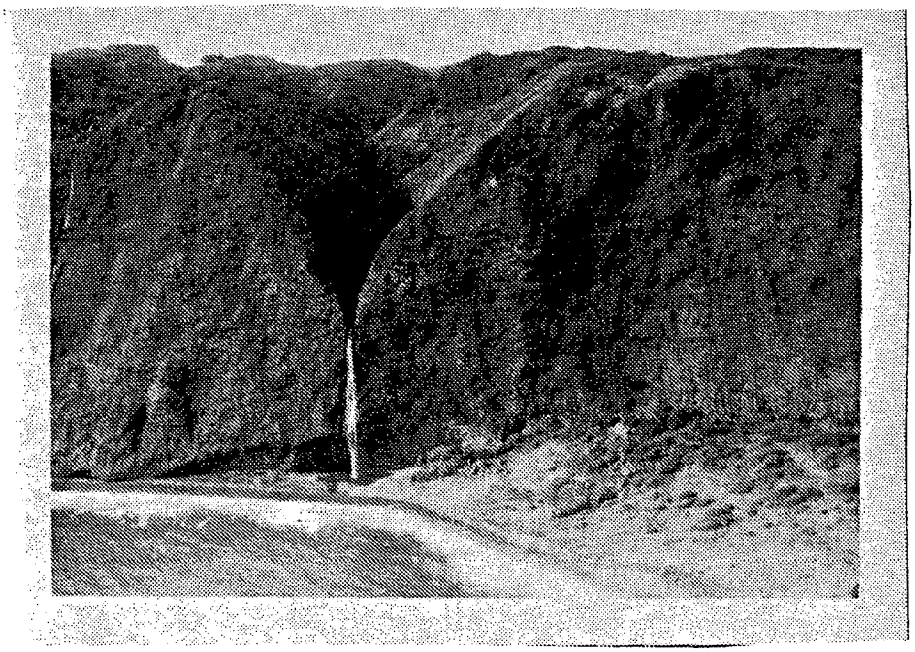
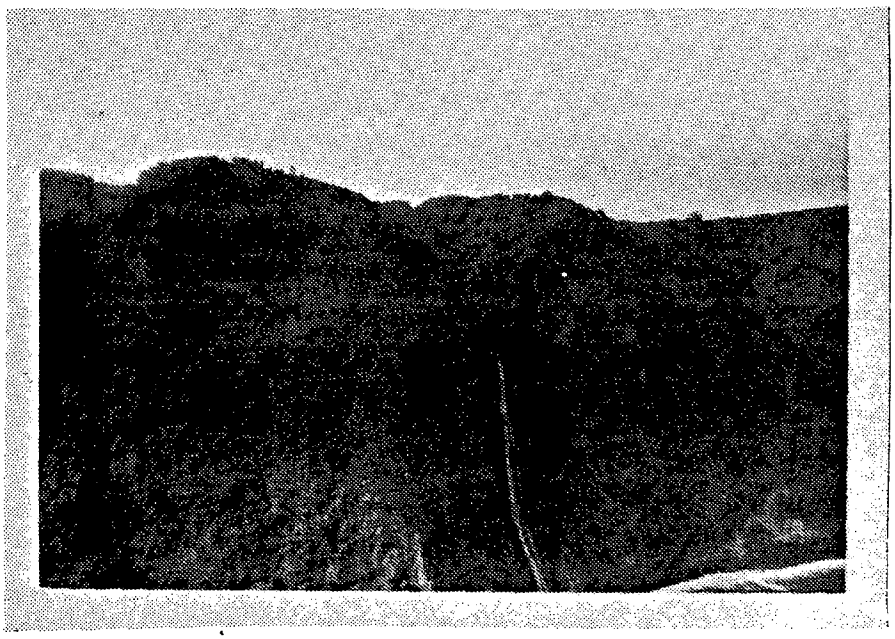


Figure 4. Aerial view of Waimanu Valley, looking southwest toward the Kohala mountain range.



Figures 5 & 6. Aerial view of cliffs separating Waipio and Waimanu Valleys. The trail zigzags along the tops of these cliffs, following the natural contours of the land, and crossing three streams. Figure 5 is closest to Waipio Valley, Figure 6 is closest to Waimanu Valley.



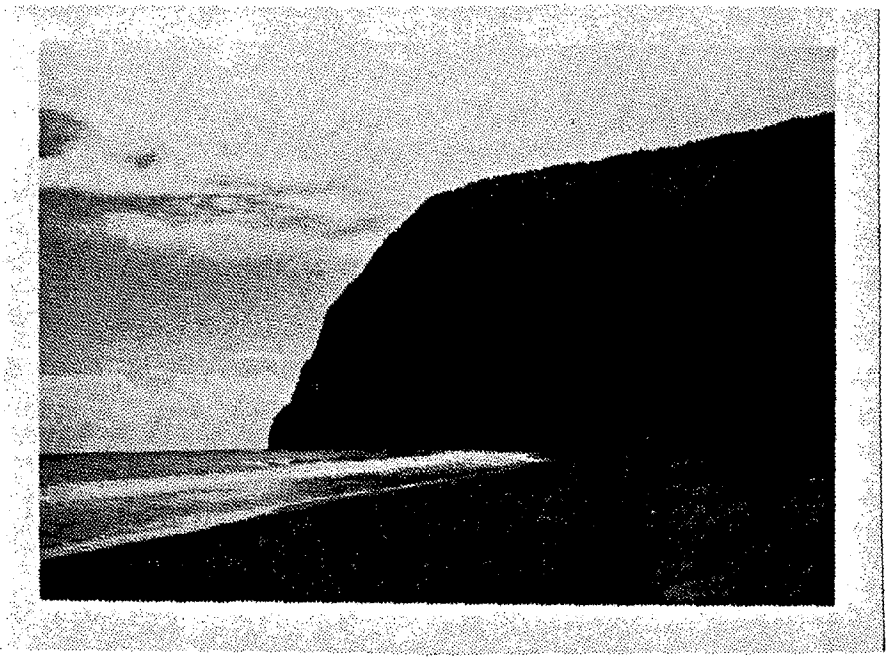


Figure 7. East side of Waimanu Valley. The trail from Waipio Valley descends this cliff; the stream mouth is near its base.

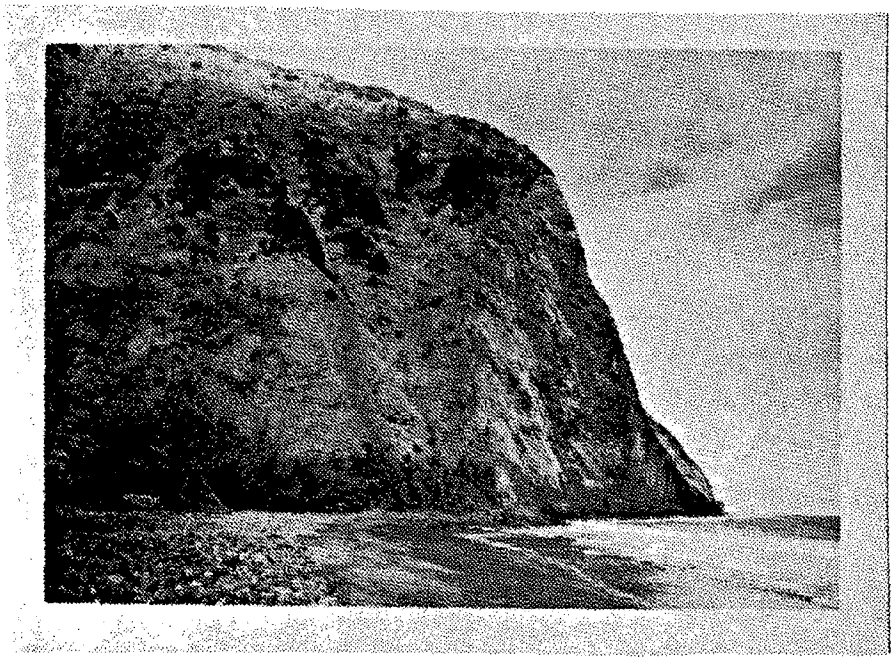


Figure 8. West side of Waimanu Valley. The narrow dark grey sand beach is bordered by large cobblestones.

consisting of the trail corridor from neighboring Waipio Valley, the embayment, submerged lands, wetlands and the upland watershed of Waimanu Stream and its tributaries. Approximately 720 acres are valley bottom lands and are primarily fresh water wetlands. The remaining acres are heavily vegetated talus slopes, uplands, and valley wall. The estuarine portion consists of less than five acres.

The Sanctuary is divided into three general areas. The major area is the ahupua'a, an ancient term for a type of land division running from the mountains to the sea. Its boundaries are the ridge of the eastern valley wall to the head of Waimanu Valley (elevation 3000 feet), then turning north toward the sea, approximately following the ridge of the western valley wall, and finally descending to the 1200 foot cliff at the sea's edge. The second area is the trail corridor connecting Waimanu Valley with Waipio Valley which provides the only land access route into Waimanu. The final area is the southwest portion of the watershed, including the upper watersheds of the major tributaries to Waimanu Stream. The three areas together form a natural ecological unit.

HISTORICAL BACKGROUND

The Hawaiian Islands were settled by people from the Marquesas and Society Islands in southeastern Polynesia, in successive waves of emigration that may have begun as early as the seventh century. The islanders used the land for agriculture, establishing extensive field systems. There is virtually no valley floor where the flora has not been altered to some extent.

Under the ancient Hawaiian system, there was no private ownership of land. Land was divided into administrative units that usually followed natural features and related to the use of the land as a resource. The largest unit was a moku, an island or a district of an island. The next division was the ahupua'a, a portion of a moku, whose boundaries usually ran from the mountains to the sea. An ili was a smaller unit of land within an ahupua'a. The boundaries of the land were not surveyed but were defined by natural features of the land and were kept by oral record passed down from generation to generation. It is the boundaries of one of these ahupua'as that comprise the major Sanctuary boundaries.

Waimanu has been occupied for many centuries although it may have been that this occupation was intermittent. The Hawaiian lifestyle did not significantly change

the natural landscape in this valley. Water ditches were used to regulate water supply to the taro (Colocasia esculenta) fields, the principal crop produced in the valley. By the turn of the century, both taro and rice were grown in the valley with some of the residences constructed on the remains of Hawaiian heiaus, or temples. Agriculture and residences alike were destroyed by a tsunami in 1946. Since that time, the valley has been uninhabited, left to the forces of nature and a few hunters and campers.

The archaeological value of Waimanu Valley is relatively unknown. No historic properties of state or local significance are listed within Waimanu Valley in the current listings of the National and Hawaiian Registers of Historic Places. The inventory of possible candidates, however, is not yet complete. Loo and Bonk in 1970 conducted a preliminary site survey along the southeast side of the valley. Of the ten sites recorded in this narrow area, eight were judged significant enough to warrant further study. In October, 1971, a site survey team from the Bishop Museum under contract with the Department of Land and Natural Resources revisited the valley as part of the Statewide Inventory of Historical Places. Two archaeological complexes were identified and assigned site numbers. These complexes are:

1. Waimanu Complex (site #2104)

   A complex of cultural features related to extensive wetland taro cultivation. Such features include rock walls and terraces, and habitation sites.

2. North Waimanu Complex (site #2105)

   A complex of cultural features similar to site #2104, but including a stone platform and a burial platform.

An additional archaeological reconnaissance was conducted in 1976 by Chiniago Enterprises to provide data for the establishment of the Sanctuary. Although many sites are in poor condition, all of the survey teams recognized the value of Waimanu Valley as an historical resource, and recommended further study.

PHYSICAL FEATURES

Climate

The temperatures of the Hawaiian Islands are warm and equable. The lowest temperature on record in Honolulu is 10 degrees Centigrade (52 Fahrenheit), and the

highest 34 degrees Centigrade (93 Fahrenheit). The warmest month is August and the coldest is February. As expected, temperatures decrease uniformly with increasing elevation to an inversion level usually between 1500 meters and 2100 meters (5000 feet and 7000 feet).

The climate of the Island of Hawaii is semi-tropical, varying locally with elevation and orientation to the trade winds. The trade winds are northeasterly and remain relatively uniform and persistent throughout the year. Their average velocity is 19.2 kilometers per hour (12 miles per hour). This wind pattern is an important factor in determining the climate of the island, particularly precipitation patterns. The incoming trade winds cool as they rise over the mountains, dropping most of their moisture on the windward side of the island. The resultant rainfall patterns can vary from 760 centimeters (300 inches) annually on the northeast, or windward, side of Mauna Kea to 15 centimeters (six inches) annually on the southeast and southwest, or lee, sides of the island. The rainfall in the Kohala Mountains in the Waimanu area averages about 500 centimeters (200 inches) annually. Data available from the Division of Water and Land Development of DLNR and the National Weather Service for Waimanu and Waipio Valleys give some indication of the distribution of rainfall within the valleys. The data indicate highly variable total rainfall from year to year. However, in a given year, less rain falls at the mouth of the valleys than at their higher elevations.

In addition to the effects of the trade winds, two other major types of weather influence this island, although they have relatively little effect on the Waimanu area. Convective storms occur off the Kona Coast on the lee side of the island. In addition, infrequent major winter storms, known as Kona storms, originate in a low pressure zone southwest of the island.

Geology and Soils

The entire northeastern coast of this island forms part of the flanks of the Kohala shield volcanoes. The Kohala shield is capped by an erosion-resistant siliceous lava called the Hawi Series. It is underlain by basalt flows of the Pololu Series, which are thin and interleaved with ash and tuff beds. There are seven valleys on the northeast coast within the Kohala Forest Reserve that are geologically similar. These are, from east to west: Waipio, Waimanu, Kainu, Honopue, Honokea, Honokana Nui, and Pololu. Waimanu is the second largest of these valleys; Waipio, the largest. These

valleys owe their development to the fact that fault scarps protected the valleys from being filled by lavas of the Hawi Series and that the valleys drain the windward (wettest) side of the island. Subsequent to the formation of the valleys, they were submerged to a depth of at least 250 meters (830 feet), and are now filled with alluvial sediments. Since this island is the youngest of the Hawaiian Islands, its valleys and estuaries are also the least developed of those in the state. In fact, the valleys of the Waimanu area might well be the youngest and least developed in the State of Hawaii.

The shorelines near Waimanu Valley are composed of steep cliffs, some as high as 465 meters (1528 feet). Sand and cobblestone beaches are found at the valley mouths, and in some areas sand has been blown inland to create dunes of up to 16 meters (51 feet). The sand is generally well sorted, medium grained and composed entirely of detrital grains of fresh lava fragments. The beach at Waimanu is composed of basaltic boulder/cobblestones on the Waipio side and dark grey sand on the west side of the mouth.

The Soil Survey for the Island of Hawaii, published by the Soil Conservation Service, U. S. Department of Agriculture (USDA), lists two types of soils for the area. These two types represent general types of soils occurring on the island, as no extensive studies of Waimanu Valley have been undertaken. The valley bottom lands are listed as Tropaquept soils consisting of moderately deep, poorly drained soils formed in recent alluvium. They have a surface layer of dark-grey mucky silt loam and subsoil of silty clay loam. The second type of soil occurring here is classed only as Rough Broken Land consisting of very steep, precipitous lands broken by intermittent drainage channels. The soil material may range from very shallow to deep on slopes of from 35 to 70 percent.

Streams

The water resources of the island come primarily from high-level impoundments and water on perched ash and tuff beds. The primary source of water for Waimanu and neighboring valleys is from perched water beds in the Kohala Mountain ash and tuff beds. The water resources above Waimanu are the only ones in the Kohala area which have not been diverted and ditched to other areas. This has been due to the technical difficulty and high cost of diverting Waimanu's water resources.

The tea-colored waters of Waimanu Stream are typical of streams in the boggy plateau of the entire Kohala Mountains watershed. The stream is characterized as a low gradient stream possessing sluggish flows along the middle and lower reaches, becoming more rapid, even torrential at the headwaters. Waimanu possesses a stream mouth estuary with less freshwater input than the adjacent valley of Waipio, thus indicating an estuarine situation in terms of mixohaline range and concomitant species diversity. Waimanu Stream has not been gauged. Stearns and Macdonald in 1946 published some information on Waimanu Stream but their figures are based on a limited set of data. They hypothesized that the Kawainui tributary of Waipio once was a tributary of Waimanu Stream since the present flow of Waimanu Stream would have been unable to create the existing 1000 meter valley. In 1946, and even now, the head of Waimanu Valley Stream originated behind a twelve foot dike, at an elevation of 129 meters (425 feet) one mile from the head of the canyon, and discharged about five million gallons per day (mgpd) during dry weather. Above the springs, the discharge was only half a million gallons per day. Waihilau, at an elevation of 129 meters (425 feet) was thought to be the largest high level stream on Hawaii; they estimated its flow to be 12 mgpd. Then, as now, Waihilau Stream joined Waimanu in the valley floor; numerous other streams and springs also contribute to the flow of Waimanu Stream. Stearns and Macdonald estimated the flow at the mouth of the valley to be 30 mgpd.

After Waihilau Stream, Waiilikahi Stream is the second major tributary of Waimanu Stream. Between 1950 and 1960, the USGS kept records at a gauging station on Waiilikahi Stream at an elevation of 835 meters (2740 feet). Their records indicate yearly mean low discharges of about 5 mgpd and yearly mean high discharges of about 8 mgpd. Although the variations in annual discharge are small, individual months do show a large range from year to year. For instance, July discharge records range from a low of 4.2 mgpd in 1960 to a high of 13.9 mgpd in 1959. December discharges range between 4.9 mgpd and 19.6 mgpd. Similar variations for other streams could be expected, thus the flow measured at the mouth of Waimanu Stream may be quite variable.

A disturbing characteristic of the streams in Waimanu is the presence of the bacteria causing leptospirosis. Leptospirosis is a zoonotic disease caused by a bacteria

belonging to the order Spirochaetales, genus Leptospira. [G. F. Beck, A Survey of mammalian fauna of the Waimanu Valley, Island of Hawaii, for the Prevalence of Leptospirosis, MPH Thesis, University of Hawaii, School of Public Health, 1977, p. 1]. The survey by Mr. Beck was prompted by events that took place in September and early October, 1976, when seven biologists and helpers spent three and a half days in Waimanu Valley surveying the aquatic resources of the valley. Two of the members of the party became ill with the disease. Mr. Beck notes that:

> . . . Leptospirosis in the human is an acute febrile disease of varying duration (days to weeks) and of varying severity. It can range from an inapparent or very mild illness to one with severe liver and kidney involvement that may result in death.
>
> Rodents, dogs, cattle, swine and wildlife have been thought to constitute the principal reservoirs of the infection in nature. . . Infection of a suitable host results in a septicemic phase followed by a chronic kidney infection, during which the leptospira may be shed in large numbers in the urine. . . The organisms enter the host via the abraded or broken skin or through the mucous membranes of the nose, mouth or conjunctiva. Humans acquire the disease as a result of contact with infected urine, tissue, water or soil. . . (p. 1)

Mr. Beck further notes that the disease in man has long been recognized as an occupational hazard in a number of professions, including veterinarians, slaughterhouse workers, etc. In Hawaii, in addition to field biologists, the most susceptible occupation appears to be taro patch workers.

The discovery of the presence of leptospirosis in Waimanu's waterways has serious implications for future uses and activities in the valley. This is discussed in more detail in following chapters.

Ocean Currents

The predominant current in the Hawaiian Islands is the North Equatorial Current. The currents around each island are a function of bottom topography, shoreline topography, winds and tides. Generally, along the northeast coast of the Big Island, the currents set northwest in the summer and southeast in the winter. This is a high-energy coastline, with limited coral reef development off Waimanu. The waves are generally moderate to large all year and the tidal range is less than one meter.

Estuary Characteristics

The estuary in Waimanu Valley is small, backed by extensive fresh water wetlands. Marine influence at the mouth is restricted by a cobblestone berm perhaps three meters (10 feet) wide. The stream's flow is sluggish on the valley floor, creating freshwater marshes on practically the entire northern half of the valley floor (Figures 9 and 10).

During a field trip conducted by the DPED with participants from DLNR, the National Marine Fisheries Service (NMFS), and OCZM in May 1975, the stream paralleled the berm before entering the sea approximately 40 meters (130 feet) west of the main stream channel. During high tide, the surf regularly overrode the berm. Subsurface percolation of sea water through the berm also occurred. At high tide a tongue of warm saline water, approximately half a meter deep, progressed up the stream bed for a distance of approximately 30 meters (100 feet) from the berm. Samples taken at this time indicated a salinity of 10 parts per thousand in the tongue (surface salinities were about 5 parts per thousand). At low tide, no tongue of saline water was detected; samples taken at the same locations in the stream as those taken at high tide indicated salinities of less than one part per thousand from surface to bottom (normal sea water has a salinity of about 35 parts per thousand). Other members of the party reported that the stream has in the past entered the sea directly from its channel on the east side of the valley and has also paralleled the berm for as much as a hundred meters to the west of the channel before entering the sea. The outlet probably varies as a function of stream flow and wave intensity. There are some indications that portions of the marsh may be brackish; the extent of these areas is unknown. The estuarine portion of the stream is limited; this type of valley/stream system, however, is representative of the estuarine streams found on this island and on others having a similar geological age and history.

HABITATS AND BIOLOGICAL FEATURES

The lack of human influence has allowed the vegetation to follow its own course of succession for nearly forty years, since the tsunami of 1946. In October, 1976, the Division of Forestry (now Forestry and Wildlife) of DLNR made a reconnaissance trip into the valley to determine the management needs of the proposed Sanctuary. [Report of Waimanu Estuarine Sanctuary, Honolulu, Hawaii, 1976.] In December of that same year, a survey of fresh water aquatic fauna and habitat in the Sanctuary

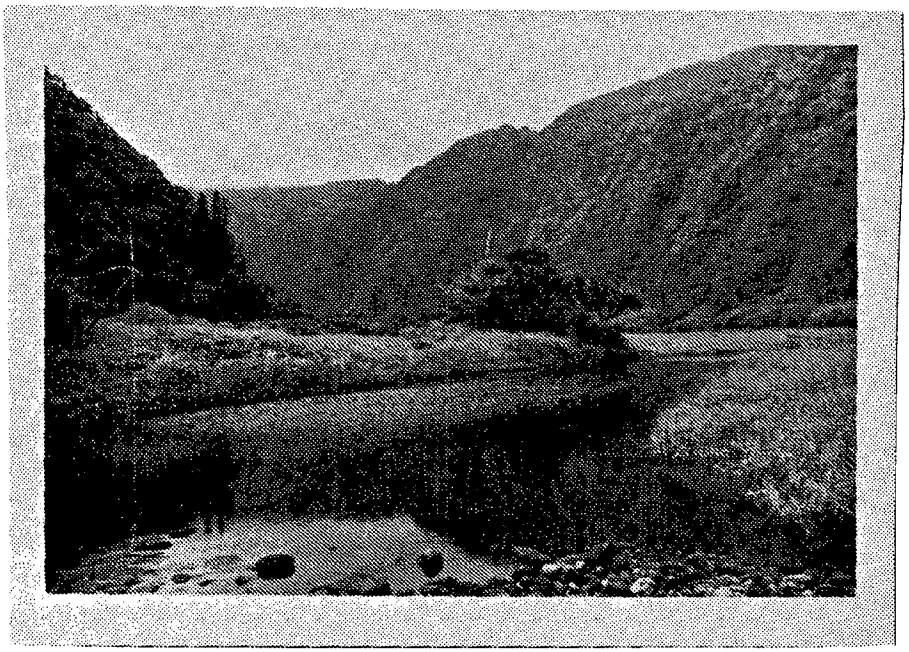


Figure 9. Estuary area, looking into the valley.

Figure 10. Stream mouth at base of cliff on east side of the valley.

was made by the Division of Fish and Game (now the Division of Aquatic Resources) of DLNR [Richard N. Yoshida, Survey of the Fresh Water Aquatic Fauna and Habitat in the Proposed Waimanu Estuarine Sanctuary, Island of Hawaii, Honolulu, Hawaii, 1976]. In 1977, in addition to the survey of leptospirosis in the mammalian fauna in Waimanu Valley previously cited, a survey of birds in the valley was taken as part of a larger study [Robert J. Shallenberger, An Ornithological Survey of Hawaiian Wetlands, U.S. Army Corps of Engineers, Honolulu District, 1977]. A very brief site visit and observations were also made by the planning consultants in February, 1984.

However, no in-depth baseline studies of the flora and fauna of Waimanu have taken place, and comprehensive inventories of flora and fauna have high priority on the research agenda. The following description of flora and fauna is based on the surveys cited and material in the Environmental Impact Statement for the Sanctuary proposal.

Flora

The isolation and volcanic origin of the Hawaiian Islands has resulted in many unique species of plants and animals. The present flora consist of native species, Polynesian introductions (many of which have developed local varieties) and "exotic" species brought by later settlers. The vegetative patterns result principally from the elevation, exposure to ocean spray, orientation to trade winds and exposure to human influences. Common and Hawaiian names will be used in the discussion; Table I taken from the Final Environmental Impact Statement document provides the corresponding scientific names, origins, habitats, and uses of species referred to in the text. Table II lists the native and exotic species found along the Waipio-Waimanu trail corridor and in the valley in 1976 by the State Forestry survey team.

The trail to Waimanu Valley climbs a 366 meter (1200 feet) cliff and traverses thirteen water-cut gulches (seven of which have small perennial streams) before descending into Waimanu Valley. Within the valley, there are extensive areas of marsh; remnants of a trail exist along the lower valley wall.

The zigzag trail from Waipio to the top of the first ridge has lantana (an exotic species), 'ulei, and kauna'oa uka (both native) along the trail. The top of the

TABLE I

Waimanu Estuarine Sanctuary Flora:
Species Referred to in Text

Scientific Name	Common Name (Hawaiian Name)	Habitat or Elevation (feet)	Uses
Endemic or Indigenous Species			
Acacia koa Gray	(Koa)	1,500 to 4,000	Canoes, crafts, furniture
Asplenium nidus L.	Birds-nest fern ('Ekaha)	Lower forest	Ornamental, crafts
Metrosideros collina (Forst.) Gray subsp. polymorpha	('Ohi'a-lehua)	1,000 to 6,000	Leis, spears, flooring
Cassytha filiformis L.	(Kauna'oa uka)	1,000 to 3,000	
Coprosma ernodeoides Gray	(Kukae-nene)	3,000 to 6,000	
Dicranopteris linearis (Burm.) synonyms: Gleichenia linearis (Burm.), Clarke dichotoma Hook	False staghorn fern (Uluhe)	500 to 3,000	Ground cover
Ipomoea pes-caprae L.	Beach morning glory (Pohmehue)	Beach	
Microsorium scolopendria (Burm.) Copel	Maile-scented fern (Laua'e)	Sea level to 2,000	Leis, landscaping
Osteomeles anthyllidifolia Lindl.	('Ulei)	Sea level to 4,000	Fish spears, 'ukeke (musical instrument), hoop for fish nets
Pandanus odoratissimus -L.F.	Screw pine (Halà or Puhala)	Sea level to 2,000	Leaves for many craft uses
Rauwolfia	Hao tree (Hao)	Sea level to 1,000	Medicine, arbors

TABLE I (cont'd)

Scientific Name	Common Name (Hawaiian Name)	Habitat or Elevation (feet)	Uses
Polynesian Introduced Species			
Aleurites moluccana (L.) Willd.	Candlenut tree (Kukui)	Sea level to 2,000	State tree, oil leis, medicine
Artocarpus communis Forst.	Breadfruit ('ulu)	Lowlands	Food, gum, part of canoes
Cocos nucifera L.	Coconut (Niu)	Coastal	Food, crafts, oil, shade, cordage
Eugenia malaccensis L.	Mountain apple (Ohi'a'ai)	Sea level to 1,800	Edible fruit attractive forest cover
Morinda citrifolia L.	Indian mulberry (Noni)	Open lowlands, edge of forest	Important as a medicinal plant
Other Exotic Species			
Albizia moluccana Miq.	Albizia (Siris)	Sea level to 5,000	Reforestation
Araucaria columnaris (Forst.) synonym: A. cookii R.	Cook Island Pine	Sea level to 5,000	Reforestation, fog drip, ornamental lumber, masts
Araucaria heterophylla (Salisb.) Franco; synonym: A.excelsa Lamb R. Br.	Norfolk Island Pine	Sea level to 5,000	Reforestation, fog drip, ornamental, lumber, masts
Caricaceae, Carica papaya L.	Papaya (He'i)	Sea level to 1,200	Edible fruit (Commercial)
Casuarina equisetifolia	Ironwood	Sea level to 3,000	Windbreak, reforestation
Coffea arabica L.	Coffee	1,000 to 2,500	Commercial coffee
Eucalyptus robusta Sm.	Eucalyptus	2,000 to 5,000	Reforestation, commercial timber

TABLE I (cont'd)

Scientific Name	Common Name (Hawaiian Name)	Habitat or Elevation (feet)	Uses
Other Exotic Species (cont.)			
Eucalyptus saligna Sm.	Eucalyptus	1,000 to 6,000	Reforestation, commercial timber
Eugenia cumimi (l.) Druce	Java plum	Sea level to 4,000	Reforestation
Ficus nota (Blco.) Merr.	Fig	Sea level	Reforestation
Lantana camara L.	Lantana	Sea level to 2,000	Ornamental, has become a pest
Mangifera indica L.	Mango	Lower altitudes	Edible fruit
Psidium guajava L.	Guava	Sea level to 2,000	Fruit, jam medicinal tea
Schinus terebinthifolius, Raddi	Christmas-berry	Sea level	Ornamental, pest

Source: Final Environmental Impact Statement, Proposed Estuarine Sanctuary Grant Award for Waimanu Valley, Hawaii County, Hawaii, pp. 22-24. May 28, 1976. Office of Coastal Zone Management, National Oceanic and Atmospheric Administration, Department of Commerce, Washington, D.C. Revised Oct. 1984 following Harold St. John's List and Summary of the Flowering Plants of the Hawaiian Islands, Lawai, Kauai, Hawaii, 1973.

TABLE II

NATIVE AND EXOTIC SPECIES IN WAIMANU ESTUARINE SANCTUARY

Native Species

Waipio-Waimanu Trail Corridor

Scientific Name	Common Name	Abundance
Alyxia olivaeforma	maile	*
Antidesma platyphyllum	hame	*
Asplenium nidus	'ekaha	*
Canthium odoratum	alahe'e	**
Clermontia kohalae	oha kepua	*
Cibotium chamissoi	hapu'u	***
Cibotium glaucum	hapu'u	*
Cibotium menziesii	hapu'u-'i'i	***
Diospyros sandwicensis	lama	**
Dicranopteris lineais	uluhe	***
Euphorbia lorifolia	'akoko	*
Freycinetia arborea	'ie'ie	**
Gouldia axillaris	manono	*
Metrosideros collina	ohi'a-lehua	**
Myrsine sp.	kolea	*
Osteomeles anthyllidifolia	'ulei	**
Pandanus odoratissmus	hala	***
Pelea sp.	alani	*
Perrottetia sanwicensis	olomea	*
Pipturus alibidus	mamaki	*
Pisonia inermis	papala-kepau	*
Psychotria sp.	kopiko	**
Sadleria cyatheoides	amau	**
Scaevola chamissoniana	naupaka kuahiwi	*
Selaginella arbuscula	selaginella	*
Sida fallax	ilima	***
Smilax sandwicensis	hoi-kuahiwi	*
Wikstroemia sp.	'akia	*
Xylosma hillebrandii	maua	*

* Few
** Moderate
*** Plentiful

TABLE II (cont'd)

Native Species - Waimanu Valley

Scientific Name	Common Name	Abundance
Bidens menziesii	kokoolau	*
Canthium odoratum	alahe'e	**
Clermontia kohalae	oha kepau	*
Diospyros sandwicensis	lama	***
Fern sp.	fern	*
Hibiscus tiliaceus	hau	**
Ipomea congesta	koali-awahia	*
Ipomea pes-caprae	pohuehue	*
Metrosideros collina	ohi'a-lehua	**
Myrsine sp.	kolea	**
Pandanus odoratissimus	hala	***
Perrottetia sandwicensis	olomea	*
Pipturus alibidus	mamaki	*
Pisonia inermis	papala-kepau	*
Pritchardia lanigera	loulu palm	see note
Psychotria sp.	kopiko	**
Scaevola frutescens	naupaka	*
Sida fallax	ilima	***
Thespesia populnea	milo	*
Tetraplasandra meiandra	ohe	**
Touchardia latifolia	olona	*

* Few
** Moderate
*** Plentiful

Note: endangered species. On top of valley - in poor condition with many dead trees. Need to collect seeds and propagate species.

TABLE II (cont'd)

Exotic Species

Waipio-Waimanu Trail Corridor

Scientific Name	Common Name	Abundance
Acacia confusa	Formosa koa	*
Albizzia moluccana	molucca alibizzia	*
Aleurites moluccana	kukui	***
Araucaria excelsa	Norfolk Island pine	*
Bambusa sp.	bamboo	*
Brassaia actinophylla	octopus tree	*
Casuarina glauca	longleaf ironwood	**
Cecropia peltata	trumpet tree	*
Cordyline terminalis	ti	***
Eucalyptus robusta	swamp mahogany eucalyptus	**
Eupatorium riparium	Hamakua-pamakani	***
Ficus elastica	India-rubber fig	**
Ficus nota	rough-leaf fig	*
Ficus pseudopalma	Philippine fig	*
Fraxinus uhdei	tropical ash	**
Grevillea robusta	silk oak	**
Hedychium flavum	yellow ginger	*
Khaya nyasica	African mahogany	*
Macaranga grandifolia	macaranga	*
Melaleuca leucandendron	paper bark	**
Parkia sp.	cupang	*
Polypodium phymatodes	laua'e	**
Psidium cattleianum	strawberry guava	*
Psidium guajava	common guava	**
Setaria palmifolia	palm grass	***
Terminalia myriocarpa	jhalna	**
Tristania conferta	brushbox	*
Toona ciliata var. australis	Australian red cedar	*
Zingiber zerumbet	'awapuhi	**

* Few
** Moderate
*** Plentiful

TABLE II (cont'd)

Exotic Species - Waimanu Valley

Scientific Name	Common Name	Abundance
Aleurites moluccana	kukui	***
Alocasia sp.	Chinese ape	*
Artocarpus incisus	'ulu	*
Arundo donax	giant reed	***
Bambusa sp.	bamboo	*
Casuarina equisetifolia	shortleaf ironwood	*
Cocos nucifera	niu	*
Coffea arabica	coffee	**
Coix lacryma-jobi	Job's tears	**
Colocasia esculenta	kalo	*
Commelina diffusa	honohono	**
Cordyline terminalis	ti	***
Cyperus papyrus	papyrus	**
Eugenia malaccensis	mountain apple	**
Eupatorium riparium	Hamakua-pamakai	***
Livistona chinensis	Chinese jan palm	*
Mangifera indica	mango	**
Melia azedarach	Pride-of-India	*
Morinda citrifloia	noni	***
Mucuna urens	sea bean	*
Musa sp.	banana	*
Nephrolepis sp.	swordfern	**
Panicum maximum	guinea grass	*
Panicum purpurescens	California grass	***
Passiflora edulis	lilikoi	*
Passiflora edulis flavicarpa	yellow lilikoi	*
Pennisetum ruppelii	fountain grass	**
Piper methysticum	'awa	*
Pluchea indica	Indian pluchea	
Polypodium phymatodes	laua'e	**
Psidium cattleianum	strawberry guava	*
Psidium guajava	guava	**
Ricinus communis	castor-bean	*
Schinus terebinthifolius	Christmas-berry	*
Setaria palmifolia	palm grass	***
Stachytarpheta jamaicensis	oi	**
Terminalia catappa	false kamani	*
Tournefortia argentea	tree heliotrope	*

* Few
** Moderate
*** Plentiful

Source: State of Hawaii, Department of Land and Natural Resources. 1976. Report of Waimanu Estuarine Sanctuary, Division of Forestry.

Figure 11. (right) Waterfalls on the west side of Waimanu Valley.

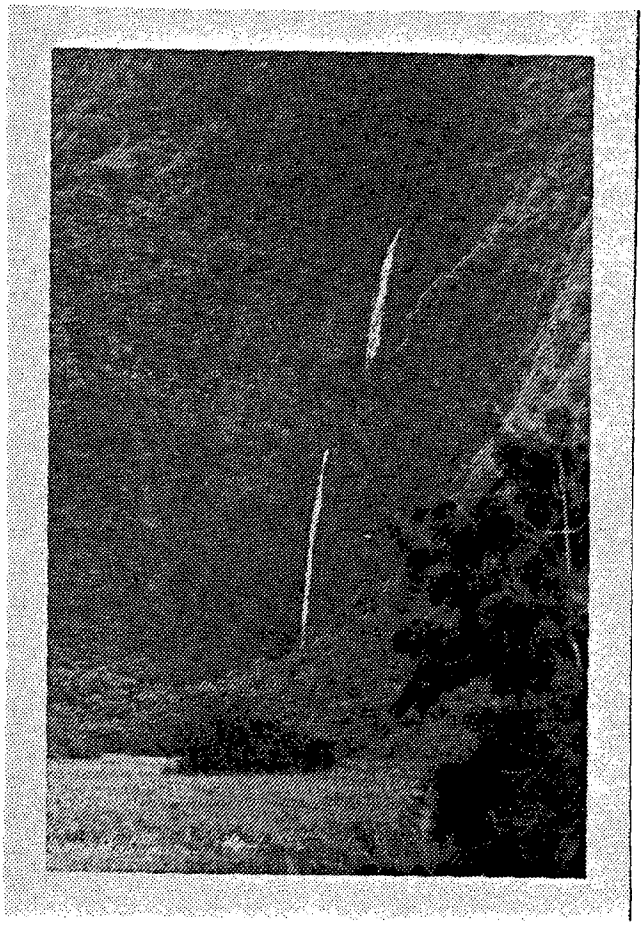


Figure 12. (below) A view of the valley, marsh in the foreground, pandanus tree in right foreground.

ridge has a covering of a hardy exotic species, ironwood. This species occurs on all the ridge tops and provides protection to other forms of vegetation from the trade winds. The trail corridor then traverses lower coastal areas, protected stream valleys and higher elevations. Each area has its own complement of vegetation. The coastal areas tend to have more exotics — eucalyptus, Java plum, albizia, Norfolk Island pine, and Cook Island pine — all of which have been used extensively in reforestation projects. The coastal area also supports native populations of Acacia koa. The exposed slopes have native pandanus groves while the higher elevations are covered primarily with native species like ohia, 'ulei and various ferns. As the trails descend into Waimanu, native species of ohia, koa, and pandanus become mixed with such exotics as Christmas berry and guava. Along the vegetated talus slopes at the valley wall/floor break, native species include birds-nest fern, hapu'u and other ferns. There are also breadfruits (a Polynesian introduction), guava, and mango (both exotic). In the upper reaches of the watershed the rare 'ape'ape is found.

Directly behind the berm there is a small area of higher dry ground. This area supports native pandanus and pohuehue species, the Polynesian breadfruit, papaya, coconut, and ironwood. The northern half to two thirds of the valley consists of freshwater marshes and ponds. California grass and an endemic sedge, cladium leptostechyum, are the principal species of the marsh. There may be areas of brackish water, however, the extent of these areas and the species associated with them are unknown. Upstream of the marshes, the ground becomes dry enough to support ohia and guava.

Fauna

Endangered Species

The State of Hawaii has only one species of native land mammal, the Hawaiian Bat or 'opea (Lasiurus cinerius semotus), which is on the endangered species list. It has been observed in Waimanu Valley, feeding over the shoreline and inner bay during the evening. Hawaii's only native hawk, the 'io (Buteo solitarius), is also an endangered species and has been seen in Waimanu Valley. Both of these species are dependent on native vegetation. Other endangered species may occur in Waimanu, but again, until further studies can be carried out in the region, no complete listing of endangered species of the area can be given.

Birds

Non-waterbird avifauna observed by Dr. Robert Shallenberger in his 1977 survey in the valley included house finch, spotted doves, Japanese white-eyes, spotted munia, common mynahs and northern cardinals. Shallenberger notes that an earlier survey reported red-billed leiothrix, 'elepaio, 'amakihi and 'apapane in native forest above 3600 feet, northwest of the valley. He reports seeing Hawaiian hawks ('io) "but only in small numbers above the ridge trail and along the rim of the valley." He also states that "Unusual calls heard in the early morning and evening on this survey are believed those of Newell's Shearwaters (Puffinus auricularis newelli). Although the largest concentrations of this "threatened" species are found on Kauai, there have been recent sightings (and sound records) of this species on the Hamakua coast and higher elevation forest."

Shallenberger observed few waterbirds during his survey and notes that:

> . . . recent evidence suggests that the site is of limited value to waterbirds in its present condition . . . The only open water in Waimanu, other than the stream itself, is too deep, and its shores too densely vegetated, to provide an accessible source of food for herons. Although the open pond may be attractive to migratory ducks, it is too small to support a significant number of birds on a long-term basis.

The Hawaiian Waterbirds Recovery Plan prepared by the Hawaiian Waterbirds Recovery Team and published by the U.S. Fish and Wildlife Service in August, 1977, lists Waimanu Valley as a "Secondary Area" for waterbirds. The plan notes that:

> Waipio Valley has a few small taro paddies and two small overgrown marshy ponds. These former taro and rice marsh areas are attractive to coots. The areas should be investigated thoroughly to determine their current and potential value for endangered waterbirds. Investigation should be made of small marsh areas at the foot of the two narrow, short and steep-sided valleys, Waimanu and Pololu. Waimanu Valley, particularly, appears to have potential for waterbird use and consideration should be given to development and enhancement programs. Pololu Valley has an estuarine marsh worthy of investigation as possible waterbird habitat. (pp.45-46)

A 1980 feasibility study on the establishment of a wildlife sanctuary at nearby Pololu Valley establishes the presence of a number of important waterbirds, supporting the recommendations of the Hawaiian Waterbirds Recovery Team. It is reasonable to expect that similar findings will be made in Waimanu.

The Waipio wetlands are a habitat for the black crowned night heron (aukuu) and a stopover for such migrants as the golden plover. Unidentified ducks are often seen. They could be the native koloa, resident of the Kohala watershed. It is quite possible that some or all of these species also frequent Waimanu Valley. A National Marine Fisheries Service biologist also reports having sighted aukuu in Waimanu.

Fishes

Although no intensive, long-range studies have been made, various species of aquatic organisms have been seen in Waimanu Stream. Among these are five native fish species and four native invertebrates in addition to the introduced Tahitian prawns. Table III lists the macrofauna which were collected and/or observed in Waimanu Stream in 1976 by the team from Fish and Game Division of DLNR.

Mammals

As noted earlier, the Hawaiian bat, 'opea, has been sighted in the valley.

Wild pigs are extensive and cause considerable damage to vegetation and to trails because of their extensive rooting. (However, there are few wild goats, probably because the valley climate is too moist). The areas disturbed by the pigs provide an open, "cultivated" area, making it easier for seeds of exotic species to gain a foothold and spread, increasing the threats to remaining intact native ecosystems. Because of the great numbers and large size of the feral pigs in Waimanu, there is a potential danger to visitors and scientists working in the valley. Control of pigs and other feral animals is an important part of Sanctuary management.

The Polynesian rat (iole) and the house mouse have been seen in Waimanu. There are also numerous mongoose. The mongoose was intentionally introduced to Hawaii for the purpose of controlling the rats; they unfortunately also destroy the eggs and young of ground nesting birds. A large number of mongoose have been sighted in Waimanu Valley.

TABLE III

WAIMANU STREAM MACROFAUNA - 1976

Native Fishes

- O'opu Nakea (*Stenogobius stamineus*)
- O'opu Anihaniha (*Stenogobius genivittatus*)
- Akupa (*Eleotris sandwicensis*)
- Aholehole (*Kuhlia sandwicensis*)
- Mullet (*Mugil cephalus*)

Introduced Fishes

- Puntat (*Clarius sp.*)
- Mosquito fish (*Gambusia* ?)

Native Invertebates

- Wi (*Neritina granosa*)
- Brown Wi (*Theodoxus vespertina*)
- Atyid Shrimp (*Atyoides bisulcata*)
- River Shrimp (*Macrobrachium grandimanus*)

Introduced Invertebrate

- Prawn (*M. lar*)

Introduced Amphibian

- Bullfrog (*Rana catesbeiana*)

Source: Richard N. Yoshida, *Survey of the Fresh Water Aquatic Fauna and Habitat in the Proposed Waimanu Estuarine Sanctuary, Island of Hawaii*. Hawaii Department of Land and Natural Resources, Division of Fish and Game, 1976.

CHAPTER 3

SANCTUARY GOALS AND OBJECTIVES

A major purpose of the National Estuarine Sanctuary Program is the protection of estuarine resources for the use and benefit of present and future generations. Grants from the Office of Ocean and Coastal Resource Management have enabled the State of Hawaii to protect the valley of Waimanu, its watershed, streams, springs, beach and bay, and to ensure the use of the area and its resources for scientific, educational and other compatible uses.

The goals of the National Estuarine Sanctuary Program address Resource Protection, Research, Resource Utilization, and Public Awareness. The goals are:

(1) **RESOURCE PROTECTION**
Enhance resource protection by implementing a long-term management plan tailored to the site's specific resources;

(2) **RESEARCH**
Provide opportunities for long-term scientific and educational programs in estuarine areas to develop information for improved coastal decision making;

(3) **RESOURCE UTILIZATION**
Promote Federal-State cooperative efforts in managing estuarine areas, and

(4) **PUBLIC AWARENESS**
Enhance public awareness and understanding of the estuarine environment through resource interpretive programs.

Seven objectives have been identified to attain these goals and guide implementation of the Sanctuary management policies, two for Resource Protection, three for Research, and one each for Resource Utilization and Public Awareness.

RESOURCE PROTECTION

The Waimanu Estuarine Sanctuary was established to ensure the long-term protection of a stream and its terminal estuary and the surrounding area. Rules have been adopted by the Department of Land and Natural Resources to protect the Sanctuary. The principal issues are obtaining use of lands not owned by the state, further defining permitted and restricted uses, and achieving an appropriate level of enforcement of the regulations. In order to accomplish this, it will be necessary to complete an inventory of the resources in the valley. See research objectives below.

There are two resource protection objectives:

- **Obtain use of land not owned by the State of Hawaii.**
- **Develop management control systems that will protect the valley's resources from destruction and exploitation.**

RESEARCH

A second purpose of the Sanctuary is to provide opportunities for scientific research to gain a better understanding of estuarine systems, provide a baseline for comparison with developed areas, and to improve decision making in other coastal areas.

Waimanu Valley is characteristic of the valley/tidal stream environments occurring on the windward slopes of volcanic islands. As a relatively undisturbed natural ecological unit which includes native forests, streams, springs, ponds, marshes, and bay, it is expected that studies of natural populations within the valley will provide needed baseline data to compare with disturbed populations elsewhere. Studies of shrimp and mullet in the streams, and studies of the relationships between forest and marsh ecosystems, should provide information useful to scientists and agencies working in other areas.

The information derived from research carried out in the valley can provide useful baseline data for comparison with altered watersheds, and be of considerable interest to the coastal zone management program which must consider the management of fresh water supplies and of stream valleys as part of its program.

There are three research objectives:

- **Analyze ecological relationships of freshwater and estuarine environments.**
- **Identify the natural and historical resources of the valley to document existing environmental conditions within the Sanctuary and monitor changes as they occur.**
- **Compare a relatively unmanipulated system to similar areas that have been extensively affected by human activities.**

RESOURCE UTILIZATION

A third goal is to provide for maximum use of the Sanctuary compatible with resource protection and research. Hunting and fishing of exotic species in the Sanctuary will continue to be encouraged. The Waimanu Valley will also continue to provide a wilderness experience for visitors. There is one resource utilization objective:

- **Provide for maximum use of the Sanctuary compatible with resource protection and research.**

PUBLIC AWARENESS

The final goal for the Sanctuary is enhancing public awareness and understanding through resources interpretive programs. These will be designed to reach both serious students and the general public. There is one public awareness objective:

- **Provide an educational focus to increase public understanding of Hawaii's coastal resources.**

CHAPTER 4

OBTAINING USE OF LANDS NOT OWNED BY THE STATE

A large portion of Waimanu Valley is owned by the Department of Hawaiian Home Lands (DHHL) and private parties. In order to successfully develop Waimanu Valley as a Sanctuary as planned, it will be necessary for the state to obtain use of some of these lands, and desirable to obtain use of the remainder; alternatives are discussed below.

GENERAL APPROACHES

There are two basic approaches for obtaining use of non state-owned lands in Waimanu Valley: to obtain fee simple title to the land, or to obtain a conservation easement.

Fee-Simple Title

Purchase

Fee simple title to desired lands can be obtained by purchase through negotiation or using state eminent domain powers to appropriate private property for public use in return for just compensation. Considerable acreage already has been obtained by eminent domain, but some owners declined to sell their land for the price offered by the state (see Figure 13 for remaining ownership pattern). However, no further purchase of lands by the state are anticipated; funds are limited and/or the remaining private lands are not essential to the development of the Sanctuary.

Land Exchange

Fee-simple title to remaining lands can also be obtained by exchanging land already owned by the state for the desired land in Waimanu Valley. This approach is far more complicated and time consuming than outright purchase because of the difficulty in identifying available state lands which, in the view of both parties to the exchange, has the same value as the land in Waimanu Valley for which it is being exchanged. Nevertheless, some land owners clearly prefer this approach.

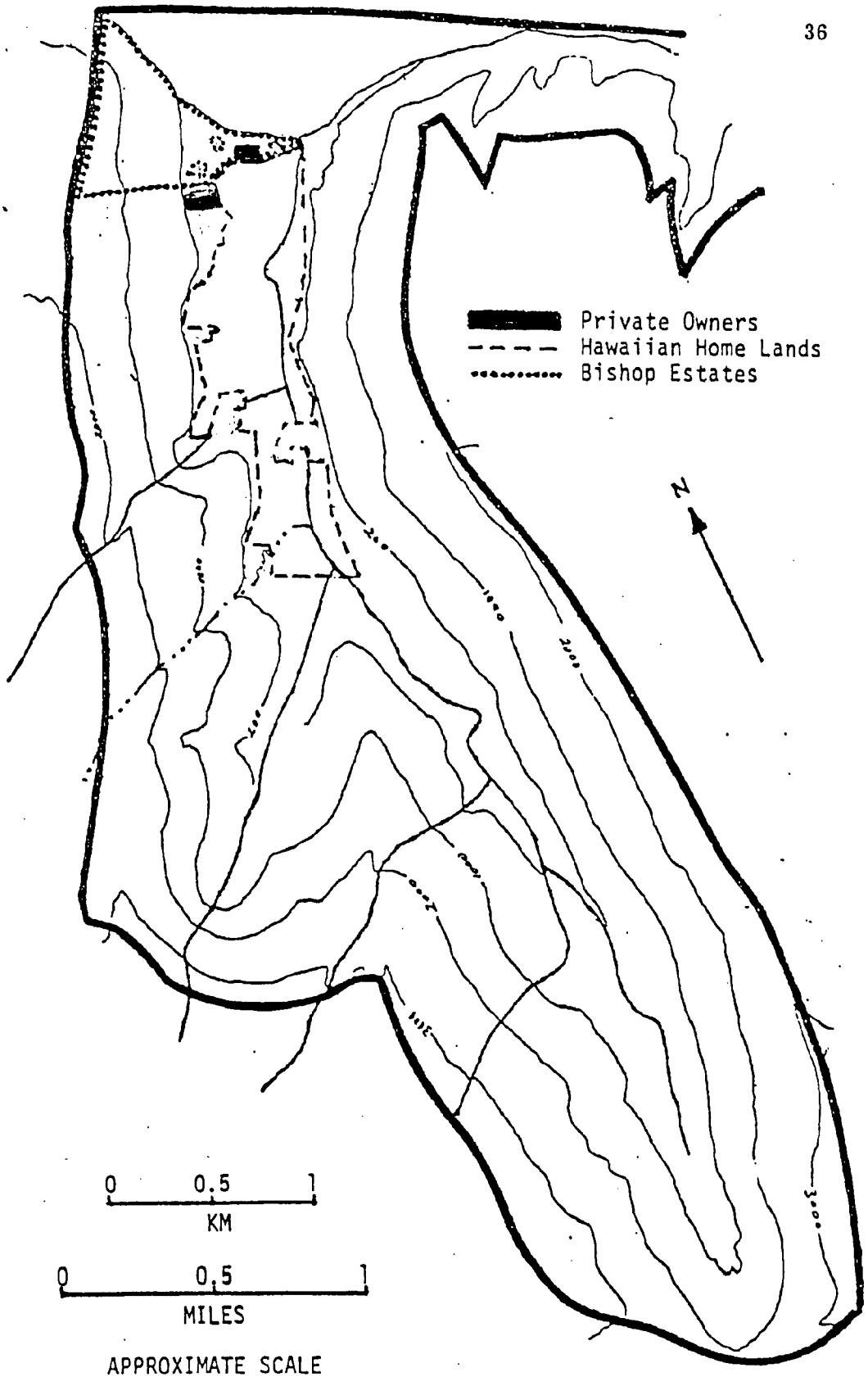


Figure 13. Land Ownership in Waimanu Valley

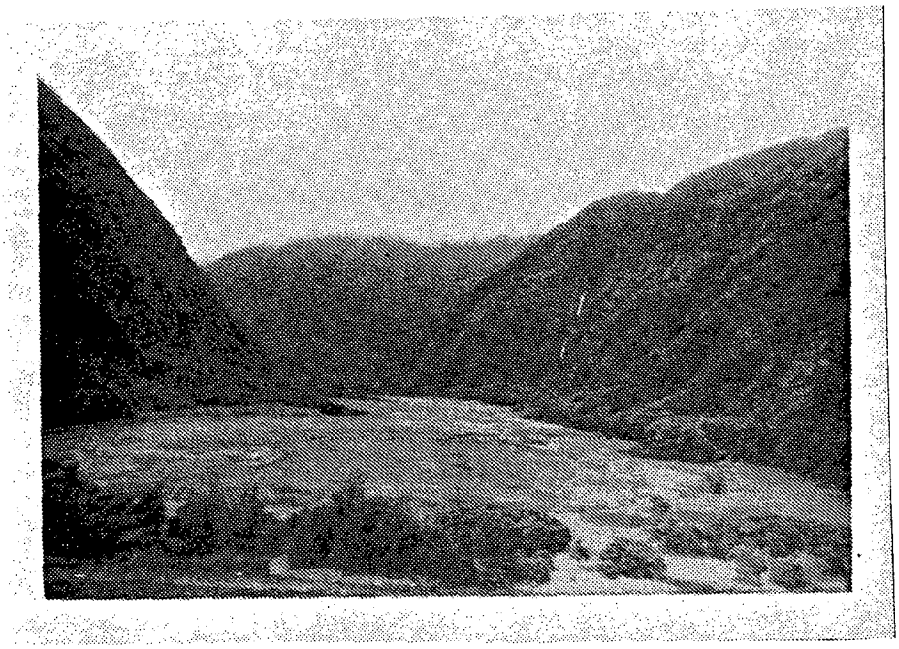


Figure 14. Bishop Estate lands are in right foreground, Hawaiian Homelands in center. Camping area is in forested area in foreground.

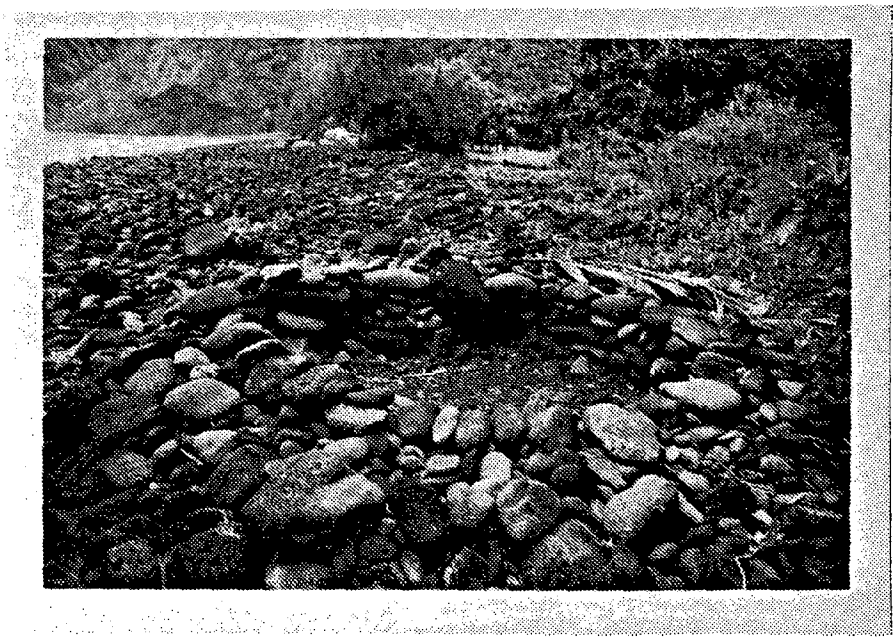


Figure 15. Close up of firepit on beach near camping area on west side of valley.

Conservation Easement

Rather than acquire fee-simple title to the desired land, a less expensive alternative is to obtain a conservation easement whereby the state acquires only selected rights to the land as needed to develop and manage the Sanctuary, while the land owner retains ownership and all remaining rights.

Although the state has not entered into such an agreement, they have been used by others in Hawaii. For example, The Nature Conservancy of Hawaii entered into a perpetual conservation easement with Moloka'i Ranch in order to develop the 2,774-acre Kamakou Preserve as part of its Endangered Hawaiian Forest Bird Project. The Conservancy obtained the right to preserve and restore the forest, and works with the landowner and the State of Hawaii to protect Kamakou Preserve. The management plan for the Preserve focuses on: (1) reducing damage to the forest by feral pigs, goats, and other animals, in part through increased hunting; (2) controlling problem weeds; (3) increasing knowledge of the forest; and (4) making Kamakou Preserve an important part of the Molokai community through education programs and field trips directed towards students and the general public. The landowner retains title to the land and the right to develop and divert the water resource, and benefits through improvements made to the land. The general public benefits through increased access, increased hunting opportunities, and increased knowledge about the forest.

In order to determine the value of a conservation easement, the following must be determined:

— The landowner's rights to current and potential uses of the land, and associated obligations and liabilities.

For the private landowners, the potential development of the lands within Waimanu Valley are severely restricted since the land is within the state Conservation District. On the other hand, their exposure to liability appears significant in view of the presence of campers and hunters, helicopter traffic and landings in the valley, and the problems posed by leptospirosis.

For the DHHL, the potential for development is greater since they are exempt from state and county development controls. Although they have never taken advantage of this exemption, it does affect the value of their land. Even so, the development potential of land within Waimanu Valley is severely limited by problems and costs of providing access, water, drainage, waste disposal, etc. Also, agriculture or aquaculture activities probably would be ruled out by the high concentration of leptospirosis.

— Potential activities associated with developing and managing the valley as a sanctuary, and the associated obligations and liabilities.

  Such activities would include research, on-going monitoring, control of animals and plants which damage the valley, etc.

— The landowner's rights to current and potential uses of the land which would be removed (or added) because of the development of the sanctuary, along with the obligations and liabilities which would be removed.

  Development and management of the sanctuary would result in little loss to landowners since their rights and potential for development are already severely limited. However, their exposure to liability would be reduced because of the state's assumption of liability.

  The key right which the landowners would lose if the state were to obtain a conservation easement would be the right to bar access to researchers and those involved with managing the sanctuary. However, the right to bar access currently is not enforced by any of the landowners in Waimanu valley; apparently, they either lack interest in preventing trespassing and enforcing their rights, or are unable to do so because of the difficulties involved (i.e., determining and marking boundaries, possibly building walls or installing fencing, placing "No Trespassing" signs, and dealing with violators.)

— The net value of the above landowner's rights to current and potential uses of the land which would be removed (or added) because of the development of the sanctuary, along with the obligations and liabilities which would be removed.

  Based on the experiences of the The Nature Conservancy of Hawaii, it is anticipated that this value will be substantially less than the amount which would be required to purchase the land in fee.

DEPARTMENT OF HAWAIIAN HOME LANDS

The DHHL owns over 200 acres within Waimanu Valley, most of which is the valley floor wet land regarded as essential to development of the Sanctuary. As mentioned in Chapter 2, evidence exists of a former agricultural community based on taro cultivation of these lands; remains include terraces, platforms, and fragments of walls. Cultivation of taro, rice and other crops continued in the valley until it was inundated by the tsunami of 1946. The lands of DHHL were included in the Mahele Book of 1848 as part of the Crown Lands of the ahupua'a in Hamakua. [Arthur Y. Akinaka, Ltd. and James M. Dunn, A Land Inventory and Land Use Study for the Department of Hawaiian Home Lands, Honolulu, Hawaii, December 18, 1972, p. 24.]

As mentioned previously, the lands of DHHL are exempt from state and county development controls. Although they have never taken advantage of this exemption, it does affect the value of their land. Even so, the development potential of land within Waimanu Valley is severely limited by problems and costs of providing access, water, drainage, waste disposal, etc. Also, agriculture or aquaculture activities probably would be ruled out by the high concentration of leptospirosis.

In 1972, the DHHL's Land Use Plan for these lands was:

Leave presently in conservation; inaccessible.
[Akinaka, Plate 22A.]

DHHL's 1976 assessment and policy for these lands was as follows:

> Because of the inaccessibility of this parcel, there is little likelihood for decades that it can contribute directly to DHHL goals of housing, agriculture, or income. On the other hand, there has been some recent specific interest expressed by others in preservation of the the area. There may be reluctance to permanently transfer outright control of the area, because of cultural sentiments related to use of this land by earlier generations of Hawaiians. Accordingly, DHHL may wish to consider some lease or license arrangement that accomplishes the aim of preservation of the area.
>
> Policy: DESIGNATE AS LAND BANK RESERVE."
> [Hawaii Department of Hawaiian Home Lands, Hawaiian Home Lands General Plan, Honolulu, Hawaii, April 1976, p. 54.]

Current policy of DHHL favors development of Waimanu Valley as a Sanctuary. However, use of the land by the state must be based on the principle of full payment for value received. To help determine this value, the state will be expected to conduct a thorough inventory of the valley, the cost of which will not be credited to the payment for use of the valley. The DHHL prefers a land exchange with the state, but appears willing to grant a short-term conservation easement of possibly 3 to 5 years in order to allow development of the Sanctuary to proceed. The time limit would be designed to insure that the land exchange is completed within a reasonable time. Payment for the temporary conservation easement may be in terms of services desired by the DHHL, such as selected resource inventories (soils, solar, wind, rocks, keawe, etc.) which would be designed to determine the development potential of other lands owned by DHHL.

BISHOP ESTATE

The Bishop Estate land onstitute some 90 acres, most of which is rocky beachfro wall. These lands are desired for the Sanctuary, but not e

Even without development of the Sanctuary, it is very unlikely that these lands would be developed over the foreseeable future given their location within the state Conservation District, the vulnerability of the beachfront land to tsunamis, the steep grades of the land which forms a portion of the valley wall, and problems and costs of providing access, water, drainage, waste disposal, etc. The Estate's exposure to liability with these lands appears relatively high since most helicopter landings and most camping activities occur on their lands.

In order to further the development of the planned Sanctuary, the Bishop Estate appears willing to negotiate a conservation easement with the state.

OTHER PRIVATE LANDS

At the time the Sanctuary was initiated, there were 17 separate small parcels of land in private ownership, totalling about 59 acres. These were all kuleana properties, with title originating from land grants made under the Hawaiian monarchy. Fourteen of these properties have been acquired by the state.

Three of the landowners rejected the state's offer for their land, each believing that the offer for their particular parcel was too low. One of these parcels is located roughly halfway between the valley walls near the beach (see Figure 5). The other two parcels are adjacent in wooded areas on the west side of the valley and near the ocean. Both are at relatively low elevations, but above the wet lands and probably sufficiently high to be safe from tsunamis. Also, these two parcels have ocean views, and benefit from more sun than most other areas in the valley. One also has a sizeable fresh water spring, and two waterfalls, with the spring and one of the waterfalls being the source of water used by campers. Some, and possibly all, of these owners have emotional ties to the lands.

As with the other lands in the valley, the development potential for these lands is limited. All are located within the state Conservation District, and the beachfront property is subject to tsunamis. In addition, all would have problems and costs associated with providing access, water, drainage, waste disposal, etc. Furthermore, all of the owners are exposed to liabilities because their lands are used by campers and others.

Although the state would prefer to have these remaining three parcels included in the Sanctuary, they are not regarded as essential, and no further offers for these parcels are anticipated. However, two of the landowners appear to be willing to negotiate a conservation easement. On the other hand, the landowner who owns the spring is unwilling to grant an easement, and has expressed interest in enforcing his right to bar trespassers. But this landowner, and possibly one of the others, desires to exchange his land with the state.

SERVICES TO OBTAIN USE OF LANDS

In order to obtain use of the lands of DHHL essential to the development of the Sanctuary, and possibly obtain use of other lands which are desired, considerable analysis will be required. To accomplish this in a timely manner, it is recommended that the services of a land planner, an appraiser, and an economist be retained to:

- identify state lands which would be of appropriate value and available for exchange with the lands of DHHL and possibly others;
- determine the value and/or lease rent of conservation easements; and
- identify services and their value which the state can offer to DHHL to pay for any short-term conservation easement which may be negotiated.

CHAPTER 5

PERMITTED AND RESTRICTED USES

Major issues are the questions of access and use, changes that may need to be made to the administrative rule delineating permitted activities within the Sanctuary, and the location of responsibility for various management functions.

AGENCY RESPONSIBILITIES

Agencies Involved

The establishment and maintenance of national estuarine sanctuaries is a joint cooperative effort of the federal and state governments. Primary responsibility at the federal level rests with the Office of Ocean and Coastal Resources Management (OCRM) of the National Oceanic and Atmospheric Administration (NOAA) of the Department of Commerce. OCRM administers the National Estuarine Sanctuary Management Program which provides 50 percent matching grants to coastal states for the purposes of acquiring, developing or operating selected estuarine areas.

In Hawaii, the State Department of Planning and Economic Development (DPED) has been designated by the Governor as the lead agency for administering the state's Coastal Zone Management Program. DPED is funded by state appropriations and grants from OCRM for planning and implementation of measures to protect coastal resources generally, and for the Waimanu Sanctuary specifically. Responsibility for administration of the Sanctuary, however, is placed with the State Department of Land and Natural Resources (DLNR). The responsibilities of the two agencies were identified and formalized in a Memorandum of Agreement signed by the directors of the two agencies on March 30, 1978. (see Appendix A).

A number of agencies have a direct interest and involvement in the Sanctuary. A major participant is the County of Hawaii. State agencies include the Department of Hawaiian Home Lands which owns land in the valley, and the Department of Health,

responsible for regulations affecting environmental quality. Federal agencies include the Fish and Wildlife Service, the Army Corps of Engineers, and the Geological Survey.

Department of Land and Natural Resources

The Department of Land and Natural Resources is headed by an executive board known as the Board of Land and Natural Resources. The Chairman of the Board is the chief executive of the Department. There is general agreement that this department is the appropriate agency to manage the Waimanu National Estuarine Sanctuary. The only issue is how responsibility for various aspects of management should be allocated within the DLNR.

In contrast to state parks and recreational areas which experience heavy public use, the Sanctuary requires a fairly low level of management. Management functions include enforcement of regulations; maintenance of facilities, including trail access and litter removal; coordination of research; and promotion of educational uses. It is not necessary that all of these activities be located within the same organizational unit.

Forestry and Wildlife

There are six divisions within DLNR, three of which are actively involved in Waimanu. Overall responsibility rests generally with the Division of Forestry and Wildlife, largely because of the history of the area. This Division has statewide responsibilities for the management of forest and forest resources, and the management of wildlife outside of the forest proper. The Waimanu Valley watershed is part of the Kohala Forest Reserve, and the Division assumed the lead role in developing the regulations for the Sanctuary. Since the designation of Sanctuary status effectively removed the valley from consideration of development and use of its forest resources, their area of interest is now oriented to protection, research, and enhancement of the flora and fauna in the valley.

Conservation and Resource Enforcement

The Division of Conservation and Resources Enforcement (DOCARE) has a major role since they are responsible for enforcement of all Departmental rules. The Division, with full police powers, enforces all state laws and rules involving state lands, state parks and historical sites, Conservation Districts, forest reserves, aquatic life and wildlife areas, state shorewaters and shores, as well as county ordinances involving

county parks. DOCARE also provides a variety of information and educational services to the public, some of which have been funded in part by the Office of Ocean and Coastal Resources Management, coordinated by the State Department of Planning and Economic Development.

Land Management

The Division of Land Management has responsibility for the management of state-owned lands, including negotiations for acquisition and disposition of public lands through sales, lease, rent or exchange. It has been responsible for the acquisition of private lands within the Sanctuary.

State Parks, Outdoor Recreation, and Historic Sites

Two of the other three divisions which presently have no direct management role have an interest and are involved in the Sanctuary, but to a lesser extent. The Division of State Parks, Outdoor Recreation and Historic Sites administers the state park system, the statewide recreation planning program, and the historic preservation program. The primary interest of this Division in Waimanu is in its historic and archaeologic significance.

Water and Land Development

The Division of Water and Land Development's interest is primarily in research in relation to its program for developing in-stream use standards.

Aquatic Resources

The Division of Aquatic Resources would be the most appropriate to manage the Sanctuary if it were to be moved from Forestry and Wildlife. This Division administers the state's programs in commercial fisheries and aquaculture, aquatic resources and environmental protection, and aquatic recreation. They have already conducted one baseline survey and will continue to be involved in the valley under their aquatic resource and environment protection program. The objectives of this program are

> . . . to conserve and to enhance the fish and other aquatic animals and plants which collectively belong to the people of Hawaii, including the species which have been classified as threatened or endangered, and to protect the habitats these organisms need. [Department of Land and Natural Resources, Annual report 1982-83, p.12]

Natural Area Reserves System

DLNR has administrative responsibility for other programs which are outside of the divisional structure. One of these is the Natural Area Reserve System which was

established by the Legislature in 1970 to protect and preserve unique natural areas in Hawaii. A Natural Area Reserve System Commission (NARSC) was also created at the same time to assist the Department in establishing and maintaining the system (Chapter 195, Hawaii Revised Statutes. See Appendix B). In addition to its specific powers and duties relating to Natural Area Reserves, the Commission is mandated to "advise the governor and the department of land and natural resources on any matter relating to the preservation of Hawaii's unique natural resources". Under its adopted rules, it also reviews and makes recommendations to the Board of Land and Natural Resources for permits for research, education, management or other purposes consistent with natural area objectives. (See Appendix C).

In view of the above, it is recommended that:

- **The Natural Area Reserve System Commission act as an advisory body for proposed research, education, and management activities within the Sanctuary.**

- **The Commission should review requests for permits to conduct research, education, and management activities, and make recommendations for approval or denial to the Board of Land and Natural Resources.**

Having the NARSC involved in management of the Waimanu Sanctuary offers two advantages. One is the great similarity between Natural Area Reserves and National Estuarine Sanctuaries. Although the criteria for State Natural Area Reserves is more stringent, strongly emphasizing native or endemic species and undisturbed habitats, their purposes are nearly identical. Another is the composition of the Commission. Both the original proposal for establishment of the Sanctuary and the Environmental Impact Statement noted the need for an advisory body for the Sanctuary. The statute provides that the Natural Area Reserve System Commission shall consist of

> . . . eleven members . . .Six of the members of the commission shall be persons possessing scientific qualifications as evidenced by an academic degree in wildlife or marine biology, botany, forestry, zoology or geology. The chairman of the board of land and natural resources, the superintendent of education, the director of planning and economic development, the chairman of the board of agriculture and the president

> of the university of Hawaii or their designated representatives, shall serve as ex-officio voting members. . .

Although NARSC has not been involved with Waimanu in the past, it seem to be the appropriate group to act as an advisory body to the department, and specifically to guide research and educational activities in Waimanu.

Role of Forestry and Wildlife

Consideration was given to designating the Sanctuary as a Natural Area Reserve which would would have removed it from the Kohala Forest Reserve and thus out of Forestry and Wildlife Division. However, designation of a Natural Area Reserve is a long process which would be even more complicated because the criteria for national estuarine sanctuaries are different from those for state natural areas. Since the NARSC has authority to perform the proposed advisory functions whether or not the Sanctuary is designated as a Natural Area Reserve, there seems to be little to be gained by designating the Sanctuary as a NAR. It is therefore recommended that:

- **The Sanctuary remain in the Kohala Forest Reserve under the Division of Forestry and Wildlife.**

- **Day-to-day management functions of the Sanctuary identified in the 1978 Memorandum of Agreement between DLNR and DPED remain with the Division of Forestry and Wildlife.**

Roles of Other Divisions

Each division and program within the Department of Land and Natural Resources has a well-defined mission. As noted above, all are involved in the Sanctuary in some way, to a greater or lesser extent. There is no need to make any changes except to take into account the new role of the Natural Area Reserve System Commission in coordinating research, management, and educational activities. It is therefore recommended that:

- **The responsibilities of divisions and offices within the Department of Land and Natural Resources for the Sanctuary should continue as they are at present.**

- **The Natural Area Reserves System Commission should be kept informed of research or other projects planned for the valley by the**

Department of Land and Natural Resources to ensure coordination with the University and other agencies.

ACCESS AND USE

The key issue in the management of Waimanu Valley is achieving a balance between preservation and human use. Waimanu has a unique and fragile environment that must be protected. On the other hand, one of the major reasons for its preservation is to provide a laboratory for scientific research and a public awareness program.

Controversial questions of use and access, and conflicts between preservation and recreational opportunities have recently arisen. Similar issues have been addressed for the Na Pali Coast on the Island of Kauai. [Na Pali Coast Management Plan Revised Environmental Impact Statement. State of Hawaii Department of Land and Natural Resources, Division of State Parks, Outdoor Recreation and Historic Sites, Honolulu, Hawaii, September, 1981.] This area is under the jurisdiction of State Parks, Outdoor Recreation and Historic Sites. Conflicts in demands for use of this scenic spot have led to the development of a management plan for the park units along this coastal area, addressing a situation quite similar to Waimanu. The major difference is that the primary objective addressed in the Na Pali plan is satisfying recreational needs while preventing overusage and protecting natural resources and archeological sites. In contrast, the primary purpose of the Waimanu Sanctuary is preservation and study. However, in both areas the underlying conflicts are virtually the same.

Like Na Pali, there are three ways to get in to Waimanu Valley: by a fairly difficult trail, taking four to six hours; by helicopter; or by boat during the summer and late fall. Since the valley is uninhabited and relatively inaccessible, uses have been generally limited to occasional visits by government scientists or technicians, hunting, fishing, and recreation by surfers and hardy hikers seeking a wilderness experience. Some of these remain overnight or longer (camping is allowed by permit at designated campsites only). However, within the last year, there has been a great increase in the number of helicopters bringing tourists and other visitors into the valley. Some of these trips are solely for the view; it has been reported that others involve landing, hiking, and picnicking. These overflights upset hikers and campers who have struggled along the long trail in search of a wilderness experience.

There is also purported to be some illegal growing of marijuana within the valley, but this has not been confirmed.

With the development of a research program and encouragement of more scientific studies, greater use will be made of the Sanctuary. A public awareness and interpretive program will also increase the number of visitors. The demand for access by helicopter, and possibly by boat, will probably increase. Helicopter entry by permit is now allowed under the Division of Forestry and Wildlife rules. However, the regulations of the Department of Land and Natural Resources that govern Waimanu, (Title 13, Chapter 4, Administrative Rules — see Appendix D) prohibit the landing or operation of any aircraft or other motorized vehicle, including boats.

It is recommended that:

- **The present rules be amended to allow permits to be issued for limited access by helicopter or boat.**

Increased activity in the valley will inevitably lead to additional conflicts, particularly between the sportsmen and the others. One concern is visitor safety, not only from possible accidents and illness but from being inadvertently shot. It may become necessary to restrict access by limiting permits in order to minimize conflicts. Another alternative is to establish different special seasons for scientists and campers, similar to hunting or fishing seasons, when no hunting permits would be issued, or to limit hunting to areas where scientists are not working. It is recommended that:

- **A census of visitors be made to determine existing use.**

- **Restrictions on the issuance of access permits for certain designated seasons and/or areas be considered to minimize conflicts.**

Services and Facilities

Provision of services to visitors is a sensitive issue, one that has arisen frequently in controversies over management of the Na Pali Coast on Kauai. On the one hand, a major purpose of the Sanctuary is to provide increased awareness and appreciation of an estuarine environment, and it is reasonable that basic services should be provided

to visitors, such as safe drinking water. An argument for the provision of sanitary facilities and trash removal, along with allowing camping at designated sites only, is the inadvertent destruction of valuable archaeological artifacts by the digging of disposal pits. On the other hand, too many services will attract too many visitors and result in the destruction of the resource being preserved. Services therefore become a part of the delicate balance that must be maintained.

It is generally agreed that the service level should be minimal since this is not primarily a recreational area. The main concern is to define and provide the basic services that are required for the health and safety of visitors and for the protection of the valley's resources. Among these are (1) a safe supply of drinking water, (2) nonpolluting sewage disposal, and (3) basic trail maintenance.

Encouragement of additional uses will probably require improvements in facilities. The original proposal for Sanctuary establishment recommended the construction of two shelters, to be built on the east side of the valley, 460 meters (1500 feet) from the beach on an elevated shelf above the old trail. These shelters were proposed to house a resident manager and provide space for scientists or visitors. This site would provide protection from flooding and tidal waters. Water supplies would be provided by catchments or a well. Sewage disposal facilities would be constructed to have minimal impact on the environment.

In the original proposal for the establishment of the Sanctuary, a resident manager was considered desirable. It does not seem necessary to have the manager live in the valley. The main problem is the cost of establishing and maintaining the position and the necessary facilities.

There appears to be general agreement that permanent facilities in the valley should not be planned for construction at this time. However, there is still a need for some shelter to protect supplies and scientific equipment. This can be provided at the existing Forestry shelter outside of the valley adjacent to the trail, about an hour's hike from the valley floor. This shelter was built for trail and maintenance workers and consists of a slab and roof, approximately 20 feet on each side. Portable shelters can also be utilized.

In the future, after archaeological assessments have been completed and the level of research and educational activities determined, it may prove to be desirable to have permanent facilities, including possibly those for a resident manager.

In view of the above, it is recommended that:

- **Services be limited to those necessary to protect human health and prevent extraordinary hazards.**

- **No additional facilities be constructed until after an archaeological assessment has been completed and a need for such facilities has been demonstrated.**

Trail Improvements

Another issue is improvements to the trail corridor from Waipio Valley which is part of the Sanctuary and the usual access route. The original proposal recommended that the trail be improved and maintained to allow safe access for scientists and visitors alike. Suggested improvements included clearing some of the existing slides which make the trail hazardous, clearing some of the overgrown vegetation, and creating drainage paths in areas presently subject to washout. It was further recommended that the trails on either side of the valley be cleared of overgrown vegetation (but nowhere paved). In the lower part of the valley where extensive marshes occur, a wooden walkway was proposed to be constructed to facilitate access to the stream while minimizing the damage to the environment. These trails were considered necessary for the various types of monitoring experiments and for allowing controlled visitor access to the valley. The trails were to be kept to a minimum with their location to be decided during the initial survey and reconnaissance investigations of the valley. This has not been done, and the question of the extent to which trails should be built or improved has still not been resolved. It is recommended that:

- **Trails be maintained sufficient for safe but not easy passage.**

Monitoring and Enforcement

A final issue to be considered is monitoring and enforcement of regulations, including informing potential users of the rules. Many people are not aware that Waimanu has

Sanctuary status and special regulations. It has been proposed that signs be posted at the Waipio trail head stating the regulations concerning the Sanctuary.

A major concern is the ever-present problem of vandalism and the difficulty of enforcing regulations in an area as remote as Waimanu. The only feasible method of access is by helicopter which is expensive. One option is to utilize commercial helicopter services, providing commercial helicopters are allowed to land in the valley. As is the case for Na Pali, Kauai, such service could be provided to the Division of Conservation and Resources Enforcement (DOCARE) as an in-service contribution in addition to customary permit fees.

It is recommended that:

- **Signs be constructed and placed at the beginning of the trail into the valley to inform visitors of the applicable rules.**

- **Helicopter companies provide in-kind services as well as fees to the state.**

SANCTUARY REGULATIONS

Regulations for the Sanctuary were adopted by the Department of Land and Natural Resources on August 29, 1980 as Regulation No. 11, entitled Concerning the Establishment, Protection and Management of the Waimanu Estuarine Sanctuary, Hamakua District, Island of Hawaii. These regulations were repealed and replaced in 1981 to conform to a new statewide codification system, with no substantive changes, as Chapter 4 Waimanu Estuarine Sanctuary, Title 13, Administrative Rules, effective June 22, 1981. (see Appendix D)

The adopted regulations represented little change from the previous practices in the valley. Hunting is not only allowed but encouraged in order to reduce the wild pig population. Similarly, fishing for Tahitian prawns is allowed and encouraged. Both the pigs and the prawns are exotic species whose presence in the valley is not considered desirable. Swimming is allowed in the bay; however, it is discouraged because of the persistent strong currents and reported presence of sharks.

The regulations were patterned after those for the State Natural Area Reserve System, but are somewhat less restrictive. Chapter 4 contains five sections. Section 13-4-1 establishes and describes the Sanctuary as follows:

> Establishment. (a) The board does hereby declare and establish the Waimanu estuarine sanctuary for the protection of indigenous flora and fauna, to preserve a Hawaiian estuarine sanctuary for future scientific and educational purposes.
>
> (b) The Waimanu estuarine sanctuary, hereinafter called "sanctuary" shall include and consist of all the lands within the ahupua'a of Waimanu, and its embayment in the Hamakua district of the county of Hawaii and also the corridor of the Waimanu trail which leads from Waipio Valley across the lands of Muliwai. . .

Section 13-4-2 identifies prohibited activities. The following activities are prohibited in Subsection (a) except as provided in Section 13-4-3:

(1) To fish for, take, possess, or remove any fish, mollusk, crustacean, seaweed, or other marine life;
(2) To kill, destroy, molest, capture, or possess any animal or bird or nest or eggs thereof;
(3) To possess any firearm, bow and arrow, crossbow, pellet gun, air gun, sling shot, trap, poisons, or snares;
(4) To introduce any plant or animal;
(5) To land or operate any aircraft or other motorized vehicle, including boats;
(6) To damage, destroy or remove any flora;
(7) To damage, destroy or remove any official sign, marker, building, or shelter;
(8) To camp, or to erect or construct any structure;
(9) To trespass into any "No Trespassing Area" where the areas have been posted by the department;
(10) To dispose of or discard any litter, garbage, trash, or other waste material;
(11) To deposit in any stream or other water any animal carcass, chemical, or substance which may pollute the stream or water;
(12) To start or maintain any fires.

Subpart (b) of this section states that:

> . . . no person, natural or corporate, shall take, appropriate, excavate, injure, destroy, or alter any historic or archaeologic property located on lands owned or controlled by the state or any of its political subdivisions.

Subpart (c) states that

> . . . no materials taken into the sanctuary shall be left behind; all materials taken into the sanctuary shall be packed out.

Both subparts (b) and (c) allow for exceptions with permission of the Board of Land and Natural Resources. The permit system is identified in Section 13-4-3 as follows:

> Exceptions; permits. (a) The taking of prawn from a stream and the taking of marine fish from shore by hook and line or by throw net shall be permitted.
> (b) When authorized under and pursuant to chapter 123, Title 13, Administrative rules, or by permit issued by the board, hunters may take game animals and, for this purpose, may possess legal hunting arms and use dogs for hunting.
> (c) Camping shall be permitted only at designated camp sites.
> (d) Fires may be started or maintained only at sites designated for that purpose;
> (e) The board may issue permits for management, scientific, or educational work in the sanctuary and shall specify any terms or conditions deemed necessary for the protection and conservation of the plant and animal communities in the sanctuary.

Section 4 contains standard enforcement provisions and Section 5 provides for penalties for violation of any provision of the rule.

Some changes are needed to the rules. As noted earlier, there is an inconsistency between the Waimanu rules and those of the Division of Forestry and Wildlife on helicopter access. There have also been some problems with disposal of garbage, trash, and entrails and carcasses of slaughtered animals by hunters.

It is recommended that:

- **The regulation governing Waimanu, Waimanu Estuarine Sanctuary, Title 13, Chapter 4, Administrative Rules, be amended to (1) allow access by helicopter and boat with restrictions appropriate and consistent with other Department regulations, and (2) specify requirements for removal or disposal of trash, garbage, and the entrails and carcasses of slain animals.**

- **The Division of Forestry and Wildlife and the Natural Area Reserve System Commission conduct a joint review of the regulation to determine whether any other amendments might need to be made as a result of new activities within the Sanctuary.**

CHAPTER 6

RESEARCH PLAN

A number of scientists from the University of Hawaii, Manoa and Hilo campuses, and several state and federal agencies have expressed interest in participating in research within the valley. Any research carried out in Waimanu will be more difficult to accomplish than in other areas because of its comparative inaccessibility. However, the research opportunities in a relatively undisturbed total ecosystem of this type offset some of the difficulties in accessibility. Another advantage of research in Waimanu is the guarantee of long term availability of the valley because of its status as a Sanctuary. No manipulative, destructive, or consumptive research will be permitted.

RESEARCH CENTER

The research carried out in Waimanu Valley will be under the **jurisdiction of DLNR, in cooperation with the University of Hawaii.** A clearinghouse, either formal or informal, should be established to ensure that ongoing and proposed research are coordinated. If the recommendations made in Chapter 5 are implemented, the Natural Area Reserves System Commission would fulfill this function.

As mentioned earlier,

- **Research activities should be coordinated through the Natural Area Reserve System Commission.**

- **A seminar or workshop should be organized for potential researchers who have expressed interest in the valley, in order to develop a detailed research plan, including funding, scheduling, information exchange, etc.**

- **a second workshop should be held to define additional research that is warranted, following the initial assessments.**

RESEARCH AGENDA

The research program for the Sanctuary can be divided into two general areas: developing baseline data and specific directed inquiries. Since there have been relatively few studies made of the valley, baseline survey needs are quite extensive. Certain unique attributes of the valley have also produced proposals for specific directed research.

Discussions with government officials and scientists at the University of Hawaii and elsewhere have resulted in a number of research proposals, for baseline studies, intensive surveys, long range monitoring, and specific directed inquiries. These have been grouped into several general areas for convenience. However, it should be recognized that there is considerable overlap among disciplines and interests and, correspondingly, overlap and duplication among research proposals.

The major research areas are:

- **Archaeological, Cultural and Historic Resources**
- **Fresh Water Resources**
- **Coastal Waters**
- **Flora and Fauna**
- **Integrated Studies of Ecosystem Dynamics**

The following sections identify general baseline needs, followed by specific proposals. At the end of each section, agencies or organizations which have expressed interest are identified.

Archaeological, Cultural and Historical Resources

There have been no major archaeological surveys of Waimanu Valley, although research in other valleys further north along the Hamakua-Kohala coast (Honopue, Honokane, and Pololu) and neighboring Waipio suggest that significant archaeological remains are likely to be found in Waimanu. Initially, a complete archaeological and historic site survey of the valley should be made, to assess their importance and to

evaluate the need for further excavations, if appropriate. Archaeologists stress that these should be done as soon as possible, before other major research activities are undertaken, in order that important sites, if found, can be protected from inadvertent harm from other research activities.

Following initial surveys, specific research proposals include:

- **Preparation of an oral history of the valley.**
  This is urgent since only a few of the adult residents who were living in the valley prior to the 1946 tsunami are still alive.

- **An investigation of the geoarchaeology and coastal morphology of Waimanu, similar to studies being undertaken in Kawainui Marsh on Oahu.**
  The purpose of the research would be to gain an understanding of the relationship between the early Polynesian inhabitants and their environment and to the extent to which they reacted to changes in stream levels or influenced these changes by modifications.

- **An anthropological study of the valley as part of the series of windward valleys on the Kohala coast, looking at the early Polynesian cultural systems, the interaction between adjoining valleys, the anthropogenic landscape, etc.**
  It has been suggested that Waimanu might be used as the base for an extensive investigation, especially if a shelter were constructed.

(Departments of Archaeology and Anthropology at University of Hawaii at Hilo (UH Hilo) and Manoa (UH Manoa); State Department of Hawaiian Home Lands (HHL))

Fresh Water Resources

Little information is known about the estuarine systems of Hawaii, particularly the biological aspects. There has been one thorough study of the estuarine and freshwater portions of Kahana stream on Oahu by the Cooperative Fishery Research Unit. Although numerous published and unpublished accounts of various bays exist,

only Kaneohe Bay, Hanauma Bay, and Pearl Harbor (all on Oahu) have been studied in any detail from a biological standpoint. Circulation patterns have been studied for some of the larger estuarine systems, but the published information is sketchy. Because of the difficulties in reaching the valleys of the northeast coast of Hawaii and their small estuarine areas, these estuarine systems have not been studied to any great extent. In addition, relatively little is known about their upland areas.

Initially the streams and wetland areas of the valley should be identified, mapped and surveyed. This would include a detailed analysis of the physical and chemical characteristics, limnology, and productivity of the streams and wetland areas. Suggested specific research proposals include:

- **A study of valley water system dynamics, including native forest ground water aquifer recharge mechanisms.**
  The mechanisms and efficiency by which native forests recharge ground aquifers is not well understood, and it is hoped that the undisturbed areas of this valley will provide new insights into this subject.

- **An analysis of the flora and fauna in the streams of Waimanu, to provide data on aquatic resources requiring protection.**
  This will be used in the development of instream use regulations statewide.

- **A study of comparative erosion rates in disturbed and undisturbed areas.**
  It has been reported that there is one area in the upper watershed which has not been invaded by wild pigs which could be enclosed to compare with erosion in other disturbed areas.

- **Further investigation of the nature and extent of leptospirosis in the valley stream, including the natural history of the spirochete.**
  Also to be evaluated are the extent of risk to visitors from the presence of leptospirosis in the valley, legal liability of the state,

and measures and further use restrictions, if any, which should be taken to reduce health risk to visitors and liability to the state.

(Office of Water Data Coordination, Water Resources Division, U.S. Geological Survey (USGS); U.S. Fish and Wildlife Service (USFWS); U.S. Army Corps of Engineers; Divisions of Water and Land Development (DOWALD) and Aquatic Resources (DAR) in DLNR; Department of Health (DOH); Departments of Biology, UH Hilo, UH Manoa.)

Coastal Waters

No coastal water studies have been made in Waimanu. Previous attempts have been abandoned because of high wave conditions at the times of the planned surveys. Initially, a nearshore ecological survey should be made to identify the nature and extent of coral, limu, fish, invertebrates, etc. There should also be a survey of the bathymetry, bottom composition, and other physical characteristics of the bay. Two longer-term projects have been proposed:

— **A study of the long-term hydrologic/hydraulic dynamics of the interface of the stream mouth, bar, nearshore wave and current system.**

The evolution and change at the interface, both in terms of salt intrusion and the movement of the bar/barrier at the mouth could provide valuable information applicable to other coastal areas in the islands.

— **A study of the life histories and contribution of the larvae of diadromous species and both dissolved and particulate nutrients to productivity of coastal waters, including the effects on coastal water quality.**

This study would also provide information applicable to other areas.

(DAR; Blue Water Marine Lab, UH Manoa and Marine Option Program at UH Manoa and Hilo; USFWS).

Flora and Fauna

Over one third of the 3000 endangered species in the United States are in the State of Hawaii. Although there have been few sightings in Waimanu, it is reasonable to expect that more of these species would be found here. Until a thorough inventory can be completed the extent and distribution of native and indigenous species cannot be determined. Some baseline studies have already been made as noted earlier in the description of the valley. Additional proposed work includes:

— **A comprehensive survey of the area, within confines of the terrain, to document the occurrence, distribution and movements (diurnal, temporal, seasonal) of wildlife in the Sanctuary.**
This survey would focus on endangered species (Hawaiian hawk, Hawaiian bat, Hawaiian duck, endemic forest and waterbirds) but all birds would be inventoried. Proposed routes could also include basic mammal surveys.

— **Evaluation of the suitability of identified wetland habitats for the development of native water bird sanctuaries.**
With the data gathered in the first proposal, areas with the greatest potential would be evaluated and ranked as possible waterbird sanctuaries.

— **Tracking studies of the movements of feral pigs within the Sanctuary and determining their effects on the estuarine ecosystem.**

From baseline data gathered in the first proposal, areas with high pig densities can be identified and pigs collared. Information from this study could indicate the extent, duration and cycles of pig movements in the Sanctuary, and to what extent and in what ways they may affect the estuarine ecology. Recommendations for feral pig control or eradication could then be based on these results.

— **Investigation of natural successional trends in wetland vegetation to determine successional plateaus and climax species and conditions.**

The results of this study would aid the Sanctuary managers in determining plant succession and how it can be controlled to the benefit of the Sanctuary.

— **Inventory and mapping of existing vegetation and a study of the changes made in the valley in the last forty years since the settlements were destroyed.**
The rates of growth and the relationships among native, endemic and exotic vegetation since then can be noted, and future changes monitored.

— **Control studies on native shrimp disease and life history studies on the mullet.**
These studies were proposed in the 1976 Final Environmental Impact Statement document.

(DAR; Division of Forestry and Wildlife, DLNR (DOFAW); USFWS)

Integrated Studies of Ecosystems Dynamics

Research carried out within the Sanctuary could increase the understanding of the physical and biological characteristics in tidally influenced valley/stream ecosystems. Scientific research carried out on a single ecosystem by a variety of state and federal agencies could also enhance communication and coordination among the agencies managing Hawaii's coastal zone. In addition, the Sanctuary offers a unique opportunity to compare the impact of human development on similar valleys, for example, a highly urbanized area like Maunawili on Oahu or more rural settings like Waipio, a nearly identical system which supports agriculture and grazing and which is expected to undergo various types of development pressures in the near future. A number of proposals have been made for further land modifications, water diversions and for increased agricultural and recreational use of Waipio. A comparison study of the two areas that would include various baseline measurements, hydrologic data gathering, limnological studies and other analyses of the estuarine and the freshwater biosystems would enable long-term comparisons to be made between an undisturbed system and a disturbed, stressed counterpart.

Over the long term, the information derived from this research would assist in the coastal zone management decision-making process, and would provide a basis for wise usage of the valley resources of Hawaii. These results, which would apply to areas outside of Waimanu and Waipio, would help avoid the conflicts caused by the diverse activities occurring within the coastal zone.

Although no specific organization or agency has developed a proposal, the following study should provide useful information to coastal zone managers:

— **A study to identify valleys that would have had development similar to that of Waimanu if they had not experienced different kinds of human activities, and how they have been affected or could have been altered with differing types of management plans or controls.**

Some suggestions for interdisciplinary research as part of educational programs are discussed in the following section on education.

CHAPTER 7

EXOTIC SPECIES CONTROL

FERAL ANIMALS

A major concern is the damage being done to Waimanu because of the presence of feral pigs. These are wild populations descended from escaped domestic stock introduced to Hawaii by man. These animals have caused extensive damage in many areas throughout the state. Besides the direct destruction of native plants, mollusks, and insects, the pigs cause soil erosion, facilitate the spread of exotic plants and weeds, create water-holding areas for mosquito breeding, and are major carriers of disease. The administrative rule for Waimanu recognizes the undesirability of the pigs by encouraging their hunting. However, this does not appear to be adequate to keep the feral pig population under control. A more aggressive pig control program may be needed.

The problem of feral animals, particularly of the hooved animals - cattle, sheep, and goats, as well as pigs, is serious in many areas of the state. Various plans have been developed to control the populations. Most of these involve some kind of fencing to restrict movement of the animals combined with hunting to reduce populations.

The management plan prepared by The Nature Conservancy of Hawaii for Kamakou Preserve on Molokai contains a discussion of the problem and a proposed control plan. [Robert Alan Holt, Kamakou Preserve Moloka'i 1983-1987 Management Plan, Endangered Hawaiian Forest Bird Project, The Nature Conservancy of Hawaii, Honolulu, Hawaii, November, 1982]. That area has problems with cattle, pigs, goats, and Axis deer, a species introduced to Hawaii from India in 1868. Of these, the pigs are the most troublesome.

The Nature Conservancy plan presents a number of strategies to address the problems. These include (1) encouraging more private hunting by extending the

hunting season and increasing bag limits; (2) investigating the use of snares and traps in remote areas inaccessible to hunters (traps and snares are now prohibited in any part of a Forest Reserve without special permission from DLNR); and (3) limiting the movement of the animals into and within the Preserve by constructing fences.

The National Park Service has also developed strategies to control ungulates in both the parks on Maui and Hawaii. A critical part of any control plan is an accurate census of the number and distribution of the animals, including their movements. The research proposals in Chapter 7 include such a study.

It is therefore recommended that:

- **The research proposal on feral pig control be given a high priority. Once the problem is defined, a pig management plan should be prepared and implemented to reduce the damage caused by these animals to the lowest level possible.**

EXOTIC PLANT SPECIES

The Sanctuary regulations forbid the introduction of any new species. Chapter 2 describes the many exotic plant species already in Waimanu Valley; given the many exotic plants already there, it is probably neither desirable nor practical to try to eliminate existing introduced species in the Sanctuary. Also, many of these plants are useful and present no problems. Others, however, fall into the classification of "noxious weeds," and may require controls. Proposed control actions should be considered after more complete baseline surveys have been done. It is recommended that:

- **Programs for control of exotic plant species be developed as warranted, depending on the results of scientific studies in the Sanctuary.**

OTHER PESTS

Other pests that cause problems in natural areas, preserves and sanctuaries in Hawaii include small mammals, particularly rats and mongooses, and mosquitoes. The Management Plan for Kamakou Preserve notes:

> . . . It is widely held that introduced rats, mongooses and cats prey upon native birds; hard evidence of this, however, is not plentiful except for certain ground nesting bird species. Rats and mice also impact native vegetation in some areas, by consuming fruits, seedlings and young shoots and by girdling trunks of trees and shrubs. . . (p. 36)

The plan goes on to say that control measures for these mammals have not been fully developed for use in forest areas, and that field work planned by the National Park Service is expected to result in new information applicable to many Hawaiian forest areas.

At this time, rats and mongooses are definitely known to exist in the Sanctuary. Rats are known to be carriers of leptospirosis; however, the nature and full extent of any problem that they may cause has not been established. It is recommended that:

- **Research studies on fauna in the Sanctuary include determining the nature and extent of any problem with rats, mongooses or other small mammals.**

Control programs for avian diseases, especially avian malaria, are better known. The Kamakou Preserve plan states:

> . . . Avian malaria is transmitted from bird to bird by the introduced nightbiting mosquitos (Culex quinquefasciatus). It is now believed that malaria first struck native bird populations during the first two decades of this century and that its range - i.e., the range of mosquitos - is a major factor limiting native birds to higher and/or drier native forests. . .
>
> Management recommendations made to Hawaii Volcanoes National Park for malaria control call for elimination of mosquito breeding sites wherever possible. This means standing water. This goal ties in with pig control since many standing-water sites are caused by pig rooting, wallowing and trampling in wet forest. . . (p. 41)

The only evidence of a problem with avian diseases in the Sanctuary is the absence of native birds. This could be attributable to other reasons. It is therefore recommended that:

- **Research studies on avifauna in Waimanu include an investigation into the presence of avian diseases, and if found, suitable control programs be adopted.**

CHAPTER 8

INTERPRETIVE PLAN

PUBLIC AWARENESS STRATEGIES

The Sanctuary can provide a vehicle for increasing public knowledge and awareness of the complex nature of valley systems and the problems which confront them. The information gained from studies in Waimanu should be applicable to other more accessible areas and provide information to aid other educational programs on the island and elsewhere in the state.

The rules as adopted allow for unlimited access to all parts of the valley and recreational uses within the valley at a low intensity. The interest in visiting Waimanu could be expected to increase if trail improvements are made and there is publicity about the program. If this use is not detrimental to the valley's environment, the understanding of nature and the program gained by the public through the educational program in the valley should be beneficial to the estuarine sanctuary program.

Eventually, depending on funding, public education within the Sanctuary could include the establishment of interpretive trails and the development of an identification guide of the flora and fauna species specific to Waimanu. However, such a program should not be undertaken unless a decision is made to have a resident manager because of the problems of maintenance.

Possible Alternative Sites for an Interpretive Center

Another method of increasing public awareness and appreciation of the Sanctuary is to establish one or more interpretive centers with suitable displays. If the Sanctuary were readily accessible, the logical place for such an interpretive center would be near the estuary. However, given the difficulties of access, an interpretive site in

the valley itself would not reach very many people. Further, it would be very vulnerable to vandalism.

For this reason, one or more interpretive sites should be established outside of the Sanctuary itself. One area that seems ideal is at the lookout over Waipio Valley. A pavilion there is owned and maintained by the Hawaii County Department of Parks and Recreation. A display could be created that would compare the two valleys and provide other appropriate information.

Other possible sites are the Lyman House Museum and/or the University of Hawaii campus, both in Hilo, and possibly in Honokaa, the community nearest Waimanu. These would be in addition to the site at the lookout, and could possibly include both permanent and changing displays.

Various programs and resources are available in the community to assume responsibility for the creation and maintenance of interpretive displays. One of these is The Big Island Ocean Recreation and Tourism Project, a special effort in the County of Hawaii funded jointly on an equal basis by the Sea Grant and the Department of Planning and Economic Development. Part of the project is the identification and promotion of coastal trails for the enjoyment of residents as well as visitors. Volunteers from local communities are used as much as possible. They have been contacted and have indicated an interest in such a project. Therefore, it is recommended that:

- **The Big Island Ocean Recreation and Tourism Project should be requested to develop a proposal for an educational program on Waimanu Valley, including an interpretive center, as part of their Coastal Trails project.**

STUDENT EDUCATION PROGRAMS

There are also opportunities for the use of Waimanu Valley as an educational resource on an organized basis. Two specific proposals have been suggested. One is to provide children of Hawaii an opportunity for a hands-on experience of their land and

heritage through field trips into the valley. The other is to use the valley as a site for interdisciplinary studies for students at the University of Hawaii at Hilo.

It is recommended that:

- **The State Board of Education be made aware of the availability and potential of Waimanu as a site for high school science field trips or ecology camps, after problems with safety and access have been resolved.**

- **The University of Hawaii at Hilo be encouraged to develop interdisciplinary student research projects.**
  A long-term research plan could utilize many students over several years, with each contributing something to an overall study.

CHAPTER 9

SCHEDULE AND FINANCES

DEVELOPMENT SCHEDULE

The schedule for implementing the management plan is shown in Figure 16. As clarified below, this schedule largely reflects anticipated funding levels. Scheduled during the early years will be efforts to obtain use of those lands not currently owned by the state, developing a helicopter charge system, and initial research assessments. Later in the development phase will be follow up research, control efforts for problem flora and fauna, if any, and development of the interpretive program.

ESTIMATED COSTS

The budget for the Waimanu Valley Sanctuary is shown in Table IV. As indicated, the budget is divided into two phases: a development period which will be funded predominately by the federal government at a level of $50,000 per year for five years, and ongoing management and operations which will be funded predominately by the state at a level of about $30,000 per year. Expenses are largely concentrated in the development period with tasks phased to reflect the availability of funds each year. The intent is to accomplish as much as possible during the development period so as to minimize the subsequent ongoing management and operating expenses. However, both phases represent a "bare bones" budget with a minimal level level of effort. If additional revenues should be made available by the state or other sources, then additional items can be funded, such as a full-time rather than a part-time manager. Futhermore, the budget will be subject to reallocation. For example, the decision may be made to purchase rather than lease a vehicle.

Obtaining Use of Lands

In order to obtain use of lands owned by the DHHL and private parties, either through land exchanges or conservation easements, the use of consulting services early in the

development period is assumed (see Chapter 4). The estimated expense for this item is $20,000. However, this amount is not shown in Table 4 since anticipated funding is from a seperate budget for obtaining use of lands, and this budget is not covered in this report.

Permitted and Restricted Uses

The major expense under permitted and restricted uses will be for a new staff person to be located on the Big Island. In addition to management and enforcement, responsibilities will include research administration and possibly research. Although such responsibilities are broad, candidates are available. The position will be part time, beginning a few months into the first year, then declining in responsibility starting in the fourth year.

A moderate amount of funds will also be made available for trail improvement and maintenance, supplies, and office expenses. However, it is assumed that an office will be provided in the state office complex in Hilo.

Provisions also will be made for part-time use of a 4-wheel drive vehicle having communications, with the purchase costs allocated over a 5-year period. Funds will also be available for developing and operating a helicopter charge system (see below), and interisland travel averaging about one round-trip between Hawaii and Oahu each month.

Finally, funds will be available for updating the management plan at the end of the 5-year development period. During ongoing management and operations, funds will also be made available for subsequent updates which are expected to cost about $5,000 each and occur about every 5 years, resulting in an average cost of about $1,000 per year.

Research Plan

Research activities will occur early in the development phase, and will begin with initial inventory assessments covering archaeological, cultural, and historical resources; oral history; fresh water resources; coastal waters; flora and fauna; geography and geology; integrated studies of ecosystem dynamics, and identification of valleys which would have been similar if they had not developed (see Chapter 6). Based on the results from these initial studies, a revised research plan will be

developed and used to guide subsequent research, then revised again during the last year of the development period. During ongoing management and operations, funds will also be made available for subsequent revisions which are expected to cost about $5,000 each and occur about every five years, resulting in an average cost of about $1,000 per year.

When conducting field work, researchers will be expected to stay at the state shelter above Waimanu Valley and/or provide their own camping equipment.

Not included in Table 4 are specialized research activities beyond those of the basic inventories and funded by sources other than those discussed below.

Exotic Species Control

If research reveals that various animals in addition to pigs, plants, insects, etc. are a problem in Waimanu and that control efforts would be effective, then control programs will be developed. This may include the development of specialized hunting rules to reduce pig populations in Waimanu Valley, the dissemination of information to hunters, and limited fencing. Also, a volunteer program for the control of noxious weeds and other pests may be warranted.

Interpretive Plan

Following the completion of the initial research assessments, an interpretive program is expected to be developed. As discussed in Chapter 8, this will include programs for students at all levels, ranging from grammar schools through university. In addition, a program for the general public and an interpretive center with displays will be developed.

Contingencies

As indicated, a moderate amount of funds will be available for contingencies.

FUNDING

Development Period

Funding during the development period will come predominately from the National Oceanic and Atmospheric Administration (NOAA), Department of Commerce in five annual payments of $50,000 each, for a total of $250,000. In addition, matching services in kind will be provided by the state. Included will be administrative and

management support based in Honolulu, a state office in Hilo for the manager/researcher administrator/enforcer, related overhead expenses, use of the state forestry shelter above Waimanu Valley, and more.

Regarding the specialized research activities which are excluded from the budget shown in Table 4, additional NOAA funding may be provided for individual projects subject to the merits of the proposed research and the availability of funds. Similarly, funding may be available from other federal programs discussed below under ongoing management and operations.

Ongoing Management and Operations

Funding of ongoing management and operations has been a major concern, particularly with prospects of federal and state budget problems, and competing priorities. For this reason, the management plan for the Waimanu Valley Sanctuary has been designed to minimize ongoing management and operation expenses. Funding for specialized research, which is excluded from the Table 4 Budget, will be based on the merits of the proposal and the availability of funds from the appropriate federal, state, or private programs.

State Funding

Of necessity, the state must assume the bulk of the financial support for ongoing management and operations. Failure to do so could result in a requirement to return all federal funds provided for the development of the Sanctuary, including the funds used to purchase land as well as the $250,000 to be provided for the development period. In order to have a secure source of state funding, it has been proposed (Senate bill 459 of 1983) to allow taxpayers to make a donation for protecting native wildlife by simply checking a box on their yearly tax form. Such an approach was initiated by Colorado in 1977, and is now used by 20 states.

Federal Programs

Even though the state must assume the obligation of funding the management and operations of the Waimanu Valley Sanctuary, a variety of federal programs combined with state matching funds are available to aid in carrying out the objectives for the Waimanu Valley Sanctuary. These include but are not limited to the following:

— Coastal Zone Management Estuarine Sanctuaries Program

In addition to the funds already provided for purchasing land in Waimanu Valley and funds to be provided for the development period of the Sanctuary, a limited amount of funds from the Coastal Zone Management Estuarine Sanctuaries Program will be available for a limited period for conducting specialized research. Such funding will depend upon the merits of the proposed research and the availability of funds. Most research grants are expected to be about $10,000 each.

— Wildlife Restoration (Pittman—Robertson) Program

The Wildlife Restoration Program is administered by the U.S. Fish and Wildlife Service, Department of the Interior. Its objectives are to support projects to (1) restore or manage wildlife populations and the provision of public use of these resources, and (2) provide facilities and services for conducting a hunter safety program. Assistance is in the form of formula and project grants to the state, with up to 75 percent federal funding of total project cost. Funds may be used for land acquisition, development, research and coordination, but not law enforcement or public relations. Projects have included wildlife habitat improvement, research on wildlife problems, surveys and inventories of wildlife populations and habitats, and provision for public use of wildlife resources. Hawaii receives approximately $130,000 each year from this program.

— Wildlife Research Information Program

The Wildlife Research Information Program also is administered by the U.S. Fish and Wildlife Service, Department of the Interior. Its objective is to develop information needed for the protection and enhancement of wildlife resources. Assistance is in the form of technical information dissemination, including work related to animal damage control.

— Wildlife Technical Assistance Program

The Wildlife Technical Assistance Program also is administered by the U.S. Fish and Wildlife Service, Department of the Interior. Its objectives are to provide information and planned technical assistance to native Americans, state agencies, private organizations, and others to improve conditions for the management of wildlife resources. Assistance is in the form advisory services, counseling, dissemination of technical information, and training.

— Endangered Species Conservation Program

The Endangered Species Conservation Program also is administered by the U.S. Fish and Wildlife Service, Department of the Interior. Its objective is to provide federal financial assistance to states in the development of programs for the conservation of endangered and threatened species. Assistance is in the form of project grants to the state, with up to 75 percent federal funding of total project cost. Funds may be used for animal and habitat surveys, research, planning, management, land acquisition, protection and public education. Projects have included: determining the distribution, abundance, and limiting factors of endangered species, and

preparing a recovery plan; monitoring and protection of the breeding of endangered species, augmenting the natural reproduction in controlled environments, and placing the young with wild foster parents; determining optimum densities of species, and determining the most effective census techniques; locating colonies of endangered species, determining land ownership, and protecting habitats by agreement with landowners, lease or purchase; and transplanting endangered species into former habitats from which they have been extirpated.

— Fish Restoration (Dingell—Johnson) Program

The Fish Restoration Program also is administered by the U.S. Fish and Wildlife Service, Department of the Interior. Its objectives are to support projects designed to restore and manage sport fish populations for the preservation and improvement of sport fishing and related uses of these fisheries resources. Assistance is in the form of formula and project grants to the state, with up to 75 percent federal funding of total project cost. Funds may be used for land acquisition, development, research and coordination, but not law enforcement or public relations. Projects have included fish habitat improvement, research on fishery problems, surveys and inventories of fish populations and habitats, and provision for public use of fishery resources. Hawaii receives approximately $200,000 each year from this program.

— Fishery Research—Information Program

The Fishery Research—Information program also is administered by the U.S. Fish and Wildlife Service, Department of the Interior. Its objective is to develop and disseminate information needed for the protection and enhancement of freshwater fishery resources. Assistance is in the form of dissemination of technical information.

— Animal Damage Control Program

The Animal Damage Control Program also is administered by the U.S. Fish and Wildlife Service, Department of the Interior. Among its objectives are to reduce damage caused by wildlife to wildlife resources, and to reduce threats to human health and safety. Assistances includes provision of specialized services, advisory services and counseling, dissemination of technical information, and training.

— Water Resources Investigations Program

The Water Resources Investigations Program is administered by the Geological Survey, Department of the Interior. Its objectives are to provide water information for economic development and best use of water resources, and to carry on research in hydrology. Assistance is in the form of specialized services provided to states and their political subdivisions, and dissemination of technical information. State and local governments are required to contribute at least half the cost of any cooperative mapping. The information developed forms the basis for effective planning of programs for development and management of natural resources and efficient operation of projects. Typical projects are either hydrologic data

collection (streamflow, stream-water quality, etc.), or areal studies such as of the quantity and quality of water resources of an area.

— National Mapping, Geography and Surveys Program

The National Mapping, Geography and Surveys Program is administered by the Geological Survey, Department of the Interior. Its objectives are to map the nation at appropriate scales in accordance with established standards and maintain the maps in up-to-date condition; provide scale-accurate, photoimage products; produce cartographic data in standard digital form; gather, review, index, catalog and disseminate information on the nation's cartographic data; produce land use and land cover map data; and to manage the systematic procurement of high altitude photography of the country to meet the need of numerous states and federal agencies. Assistance is in the form of specialized services provided to states and their political subdivisions, and dissemination of technical information. State and local governments are required to contribute at least half the cost of any cooperative mapping.

Commercial Permit Charges

As mentioned in Chapter 5, considerable helicopter traffic occurs in Waimanu Valley; this traffic occurs without the benefit of required state permits and, in addition, has led to complaints by campers over the noise and disruption of their remote-area camping experience. Nevertheless, Waimanu Valley is not to be developed as a recreational area; rather, a substantial increase in camping activity in the valley could be counter to the objectives of having Waimanu serve as a estuarine Sanctuary with limited human activity. On the other hand, a limited number of brief and properly controlled visits by tourist and others on helicopter tours is unlikely to interfere with the objectives for Waimanu Valley.

But if Waimanu Valley is to be used for commercial use by helicopter companies, then it is appropriate for the state to charge helicopter companies for permission to land in the valley in order to reimburse the state for added cost of enforcing state regulations and monitoring activity. The preferred approach would be a fee, possibly $10 per landing as charged for Na Pali on Kauai. In order to have the fees available to the state for its enforcement and related activities, a special mechanism must be used to prevent the fees from automatically being channeled to the state general fund. An approach for accomplishing this may be to use the Research Corporation of the University of Hawaii (RCUH). With this approach, DLNR would enter into an agreement with RCUH which would empower RCUH to: contract for specified research, hire enforcement personnel, enforce state regulations under the direction of DLNR, grant permission to land helicopters in Waimanu Valley, and charge for this privilege.

An alternative choice to RCUH would be The Nature Conservancy of Hawaii. However, this would be a major expansion of their current role which they may be unwilling to assume.

To avoid the complication of using RCUH, the charge to helicopter companies can be in terms of services rather than money. That is, DLNR staff or their designees would be provided a number of free trips into Waimanu Valley, with the trips having a total value equal to the amount of fees which would be collected under a monetary charge scheme.

Volunteer Services

To further reduce the amount of state funds required for ongoing management and operations, maximum use of organized volunteer services is recommended, particularly for labor-intensive activities. Volunteers may be drawn from Hawaiian groups, environmental groups, and students from all levels to conduct field and laboratory research, oral and written history research, and possibly trail improvement and maintenance, weed control, etc. For example, the Moku Loa group of the Hawaii Chapter of the Sierra Club has organized a clearing and clean up effort for the Waimanu trail in the past. However, use of volunteers must reflect the limitations imposed by logistics, safety, and the time required to obtain, train and supervise volunteers. Because of these considerations, the DLNR Division of Forestry and Wildlife has found that heavy reliance on volunteers is unrealistic for some operations.

Figure 16.— **SCHEDULE**

Item	Year 0	1	2	3	4	5
OBTAINING USE OF LANDS	———					
USE MANAGEMENT:						
Development of special regulations	———					
Trail improvement and maintenance		———	———	———	———	———
Development of helicopter charges system	——					
Management plan update						——
RESEARCH PROGRAM:						
Initial assessments	———					
Revised research plan		——			——	
Ongoing research		———	———	———		
CONTROL OF PROBLEM FLORA AND FAUNA:						
Development of pig reduction program		——				
Other activities		——				
INTERPRETIVE PROGRAM:						
Development of school programs		———	———	———	———	———
Development of general public program		———	———	———	———	———
Development of interpretive center			———	———	———	———

Table IV.— **BUDGET**
(thousand dollars)

Item	Development Period Year 1	2	3	4	5	TOTAL	ON-GOING
OBTAINING USE OF LANDS	--	--	--	--	--	--	--
USE MANAGEMENT:							
Manager/research administrator/enforcer (part-time)	13.0	16.0	16.0	13.0	9.0	67.0	8.0
Trail improvement and maintenance	0.5	1.0	1.0	1.0	1.0	4.5	1.0
Supplies	1.0	2.0	2.0	2.0	2.0	9.0	1.5
Office expenses	1.0	1.0	1.0	1.0	1.0	5.0	1.0
Vehicle with communications (partial use)	4.0	4.0	4.0	4.0	4.0	20.0	4.0
Helicopter charge system	1.0	1.0	1.0	1.0	1.0	5.0	1.0
Inter-island travel	1.0	1.0	1.0	1.0	1.0	5.0	0.5
Management plan update					5.0	5.0	1.0
RESEARCH PROGRAM:							
Initial assessments	25.0					25.0	
Revised research plan		3.0			2.0	5.0	1.0
Ongoing research		11.0	9.0	5.0		25.0	
CONTROL OF PROBLEM FLORA AND FAUNA:							
Pig reduction program		2.0	1.0	1.0	1.0	5.0	1.0
Other activities		1.0	1.0	1.0	1.0	4.0	1.0
INTERPRETIVE PROGRAM:							
School programs		2.0	2.5	3.5	4.0	12.0	2.0
General public program		1.0	1.5	2.5	3.0	8.0	1.0
Interpretive center			5.0	10.0	10.0	25.0	1.0
CONTINGENCIES	3.5	4.0	4.0	4.0	5.0	20.5	5.0
TOTAL	**$50.0**	**$50.0**	**$50.0**	**$50.0**	**$50.0**	**$250.0**	**$ 30.0**

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APPENDIX A

MEMORANDUM OF AGREEMENT BETWEEN THE DEPARTMENTS OF LAND AND NATURAL RESOURCES AND PLANNING AND ECONOMIC DEVELOPMENT

MEMORANDUM OF AGREEMENT

THIS AGREEMENT, made this 30th day of March, 1978, by and between the Department of Land and Natural Resources, State of Hawaii (hereinafter called the DLNR), and the Department of Planning and Economic Development, State of Hawaii (hereinafter called the DPED),

WITNESSETH THAT:

Pursuant to the agreement of the parties herein, the DPED is hereby designated as the lead agency in securing Federal grants and funds under the National Coastal Zone Management Act of 1972 (P.L. 92-583), from the National Oceanic and Atmospheric Administration of the United States Department of Commerce for the establishment of an estuarine sanctuary and the implementation of the Waimanu Sanctuary Program for all the lands within the Ahupua'a of Waimanu, in the Hamakua District of the County of Hawaii, and also the trail corridor from Waipio Valley (known as Waimanu Trail) across the lands of Muliwai as shown on the attached map.

DPED agrees that it shall:

1. Continue to administer and apply for CZM estuary funding for the acquisition and on-going management of the Waimanu Estuarine Sanctuary.

2. Prepare the annual report with assistance from the DLNR.

3. Contract independent consultants, prior to March 31, 1978, to make an assessment of the annual income lost by the State as a result of designating the Waimanu Valley a sanctuary.

DLNR agrees that it shall:

1. Submit to the DPED for review an annual budget which provides a basis for requesting necessary supplemental Federal funds for program operations. Each annual budget shall be submitted by July 31st.

2. Submit to the DPED, thirty days prior to each quarter year, quarterly work plans describing proposed maintenance and enforcement efforts to be conducted in the Sanctuary.

3. Submit to the DPED, by the 15th calendar day after each quarter year, quarterly performance reports describing the services and activities undertaken and expenditures incurred during the period.

4. Revise the adopted Regulation No. 8, Concerning the Establishment, Protection and Regulation of the Waimanu Estuarine Sanctuary, as may be necessary, in order to assure its consistency with revised program objectives, and shall seek its final approval prior to October 31, 1978.

5. Designate a manager for the Waimanu Sanctuary who shall be responsible for enforcing Regulation No. 8 for monitoring and controlling access as needed.

6. Begin necessary acquisition of private lands in the Waimanu Valley prior to June 30, 1978.

7. Conduct, upon completion of all land acquisition, necessary procedures for withdrawing Sanctuary lands from the Forest Reserve.

8. Obtain a certified survey description of the Sanctuary from the Department of Accounting and General Services prior to November 30, 1978.

9. Maintain existing access trails to the Sanctuary at least once a year. No additional access trails shall be constructed.

10. Conduct, upon completion of all land acquisition, a minimum of one field check per month thereafter in order to ensure compliance with the objectives of the Sanctuary program.

11. Install signs, at appropriate locations within the Sanctuary, which define violations and penalties pursuant to the approved Regulation No. 8.

DLNR and DPED shall each designate a staff liaison to coordinate the efforts of the two departments in this project.

THIS AGREEMENT may be amended upon mutual agreement of the parties.

DEPARTMENT OF LAND AND NATURAL RESOURCES

By _____
Chairman and Member
Board of Land and
Natural Resources

By _____
Member
Board of Land and
Natural Resources

DEPARTMENT OF PLANNING AND ECONOMIC DEVELOPMENT

By _____
Director

APPROVED AS TO FORM:

_____
Deputy Attorney General
Date: DEC 2 1977

APPENDIX B

NATURAL AREA RESERVES SYSTEM, CHAPTER 195
HAWAII REVISED STATUTES

SUBTITLE 6.

[GENERAL AND MISCELLANEOUS PROGRAMS]

[CHAPTER 195]
NATURAL AREA RESERVES SYSTEM

SECTION
[195-1] FINDINGS AND DECLARATION OF NECESSITY
[195-2] DEFINITIONS
[195-3] HAWAII NATURAL AREA RESERVES SYSTEM
[195-4] POWERS OF THE DEPARTMENT
[195-5] RULES AND REGULATIONS
[195-6] NATURAL AREA RESERVES SYSTEM COMMISSION
[195-7] POWERS AND DUTIES
[195-8] PENALTY

[§195-1] Findings and declaration of necessity. The legislature finds and declares that (1) the State of Hawaii possesses unique natural resources, such as geological and volcanological features and distinctive marine and terrestrial plants and animals, many of which occur nowhere else in the world, that are highly vulnerable to loss by the growth of population and technology; (2) these unique natural assets should be protected and preserved, both for the enjoyment of future generations, and to provide base lines against which changes which are being made in the environments of Hawaii can be measured; (3) in order to accomplish these purposes the present system of preserves, sanctuaries and refuges must be strengthened, and additional areas of land and shoreline suitable for preservation should be set aside and administered solely and specifically for the aforesaid purposes; and (4) that a statewide natural area reserves system should be established to preserve in perpetuity specific land and water areas which support communities, as relatively unmodified as possible, of the natural flora and fauna, as well as geological sites, of Hawaii. [L 1970, c 139, pt of §1]

[§195-2] Definitions. As used in this chapter, unless otherwise indicated by the context:

"Department" means the department of land and natural resources.

"Commission" means the natural area reserves system commission.

"Natural reserve area" means an area designated as a part of the Hawaii natural area reserves system, pursuant to criteria established by the commission. [L 1970, c 139, pt of §1]

[§195-3] Hawaii natural area reserves system. There shall be a Hawaii natural area reserves system, hereinafter called the "reserves system", which shall consist of areas in the State of Hawaii which are designated in the manner hereinafter provided as natural area reserves. The reserve system shall be managed by the department of

land and natural resources. [L 1970, c 139, pt of §1]

[§195-4] **Powers of the department.** The department of land and natural resources may designate and bring under its control and management, as part of the reserves system any and various areas as follows:

(1) State of Hawaii owned land under the jurisdiction of the department may be set aside as a natural area reserve by resolution of the department, subject to the approval of the governor by executive order setting the land aside for such purposes.

(2) New natural area reserves may be established:

(A) By gift, devise or purchase;

(B) By eminent domain pursuant to chapter 101; or

(C) By the setting aside of State of Hawaii owned land for such purposes by the governor, as provided by section 171-11. [L 1970, c 139, pt of §1]

[§195-5] **Rules and regulations.** (a) The department of land and natural resources may, subject to chapter 91, make, amend and repeal rules and regulations having the force and effect of law, governing the use, control and protection of the areas included within the reserves system, provided, that no rule or regulation which relates to the permitted use of any area assigned to the reserves system shall be valid and no use of any such area shall be permitted unless such rule or regulation or permitted use shall have been specifically approved by the natural area reserves system commission.

(b) The department may confer upon such of its employees as it deems reasonable and necessary the powers to serve and execute warrants and arrest offenders or issue citations in all matters relating to the enforcement within the reserves system of the law and rules and regulations applicable thereto. [L 1970, c 139, pt of §1]

[§195-6] **Natural area reserves system commission.** There shall be a natural area reserves system commission, hereinafter called the "commission". The commission shall consist of eleven members who shall be appointed in the manner and serve for the term set in section 26-34. Six of the members of the commission shall be persons possessing scientific qualifications as evidenced by an academic degree in wildlife or marine biology, botany, forestry, zoology or geology. The chairman of the board of land and natural resources, the superintendent of education, the director of planning and economic development, the chairman of the board of agriculture and the president of the university of Hawaii, or their designated representatives, shall serve as ex-officio voting members. The governor shall appoint the chairman from one of the appointed members of the commission. The members shall receive no compensation for their services on the commission but shall be entitled to reimbursement for necessary expenses while attending meetings and while in the discharge of their duties.

The commission shall be a part of the department of land and natural resources for administration purposes as provided in section 26-35.

Any action taken by the commission shall be by a simple majority of its members. Six members of the commission shall constitute a quorum to do business.

The commission may engage employees necessary to perform its duties, including administrative personnel, as provided by section 26-35.

The commission shall adopt rules guiding its conduct and shall maintain a record of its activities and actions. [L 1970, c 139, pt of §1]

[§195-7] **Powers and duties.** The commission shall:

(1) Recommend criteria to be used in determining whether an area is suitable for inclusion with the reserves system;
(2) Conduct studies of areas for possible inclusion within the reserves system;
(3) Recommend to the governor and the department of land and natural resources areas suitable for inclusion within the reserves system;
(4) Recommend policies regarding required controls and permitted uses of areas which are part of the reserves system;
(5) Advise the governor and the department of land and natural resources on any matter relating to the preservation of Hawaii's unique natural resources; and
(6) Develop ways and means of extending and strengthening presently established preserves, sanctuaries and refuges within the State. [L 1970, c 139, pt of §1]

[§195-8] **Penalty.** Any person who violates any of the laws and rules and regulations applicable to the reserves system shall be fined not more than $100 or imprisoned not more than 30 days, or both, for each offense. [L 1970, c 139, pt of §1]

APPENDIX C

NATURAL AREA RESERVES SYSTEM, TITLE 13, CHAPTER 209, ADMINISTRATIVE RULES, HAWAII DEPARTMENT OF LAND AND NATURAL RESOURCES

TITLE 13

DEPARTMENT OF LAND AND NATURAL RESOURCES

SUBTITLE 9 NATURAL AREA RESERVES SYSTEM

CHAPTER 209

RULES REGULATING ACTIVITIES WITHIN NATURAL AREA RESERVES

Sec. 13-209-1 Purpose and applicability
Sec. 13-209-2 Definitions
Sec. 13-209-3 Permitted activities
Sec. 13-209-4 Prohibited activities
Sec. 13-209-5 Special-use permits
Sec. 13-209-6 Penalty

Historical Note: Chapter 209 of Title 13, Administrative Rules, is based substantially upon Regulation 10 of the Administration of the Department of Land and Natural Resources entitled "Regulating and Prohibiting Activities within Natural Area Reserves Including Provisions for Excepted-Use Activities by Permit and Penalties for Violation of the Regulation". [Eff. 5/20/79; R JUN 29 1981]

Sec. 13-209-1 Purpose and applicability. (a) The purpose of these rules is to regulate activity within natural area reserves established pursuant to section 195-4, Hawaii Revised Statutes.

(b) These rules shall apply to all persons entering the boundaries of a natural area reserve. [Eff. JUN 29 1981] (Auth: HRS Sec. 195-5) (Imp: HRS Sec. 195-5)

Sec. 13-209-2 Definitions. As used in these rules, unless context requires otherwise:

"Board" means the board of land and natural resources.

"Commission" means the natural area reserves system commission.

"Department" means the department of land and natural resources.

"Game mammals and birds" means those animals that have been designated as such by sections 191-8 and 191-19, Hawaii Revised Statutes, and by administrative rules of the department.

"Natural area reserve" means those State lands that have been designated as part of the Hawaii natural area reserves system by the department pursuant to section 195-4, Hawaii Revised Statutes. [Eff. JUN 29 1981] (Auth: HRS Sec. 195-5) (Imp: HRS Sec. 195-5)

Sec. 13-209-3 Permitted activities. Hiking, nature study, and bedroll camping without a tent or other temporary structure are permitted. Hunting is a permitted activity pursuant to hunting

rules of the department. [Eff. JUN 29 1991] (Auth: HRS Sec. 195-5) (Imp: HRS Sec. 195-5)

Sec. 13-209-4 Prohibited activities. The following activities are prohibited within a natural area reserve:

(1) To remove, injure, or kill any form of plant or animal life, except game mammals and birds hunted according to department rules;
(2) To introduce any form of plant or animal life, except dogs when permitted by hunting rules of the department;
(3) To remove, damage, or disturb any geological or paleontological feature or substance;
(4) To remove, damage, or disturb any historic or prehistoric remains;
(5) To remove, damage, or disturb any notice, marker, or structure;
(6) To engage in any construction or improvement;
(7) To engage in any camping activity that involves the erecting of a tent or other temporary structure;
(8) To start or maintain a fire;
(9) To litter, or to deposit refuse or any other substance;
(10) To operate any motorized or unmotorized land vehicle or air conveyance of any shape or form in any area, including roads or trails, not designated for its use;
(11) To operate any motorized water vehicle of any shape or form in freshwater environments, including bogs, ponds, and streams, or marine waters, except as otherwise provided in the boating rules of the department of transportation, State of Hawaii;
(12) To enter into, place any vessel or material in or on, or otherwise disturb a lake or pond. [Eff. JUN 29 1991] (Auth: HRS Sec. 195-5) (Imp: HRS Sec. 195-5)

Sec. 13-209-5 Special-use permits. (a) The board or its authorized representative, with the approval of the commission, may issue permits to conduct activities otherwise prohibited by section 13-209-4 for research, education, management, or for any other purpose consistent with chapter 195, Hawaii Revised Statutes.

(b) The board or the commission may require a permit application to include an assessment of the potential environmental effect the special-use may have on the area concerned.

(c) The provisions of this section shall not exempt the applicant from complying with any other applicable rule or statute. [Eff. JUN 29 1991] (Auth: HRS Sec. 195-5) (Imp: HRS Sec. 195-5)

Sec. 13-209-6 Penalty. Any person violating any of the provisions of these rules shall be penalized as provided in section 195-8, Hawaii Revised Statutes. [Eff. JUN 29 1991] (Auth: HRS Sec. 195-5) (Imp: HRS Sec. 195-8)

APPENDIX D

WAIMANU ESTUARINE SANCTUARY, TITLE 13, CHAPTER 4, ADMINISTRATIVE RULES, HAWAII DEPARTMENT OF LAND AND NATURAL RESOURCES

TITLE 13

DEPARTMENT OF LAND AND NATURAL RESOURCES

SUB-TITLE 1 ADMINISTRATION

CHAPTER 4

WAIMANU ESTUARINE SANCTUARY

§13-4-1 Establishment
§13-4-2 Prohibited acts
§13-4-3 Exceptions
§13-4-4 Enforcement
§13-4-5 Penalties

Historical Note: Chapter 4 of Title 13, Administrative Rules, is based substantially on Regulation No. 11, Concerning the Establishment, Protection and Management of the Waimanu Estuarine Sanctuary, Hamakua District, Island of Hawaii. [Eff. 8/29/80; R JUN 22 1981]

§13-4-1 Establishment. (a) The board does hereby declare and establish the Waimanu estuarine sanctuary for the protection of indigenous flora and fauna, to preserve a Hawaiian estuarine sanctuary for future scientific and educational purposes.

(b) The Waimanu estuarine sanctuary, hereinafter called "sanctuary" shall include and consist of all the lands within the ahupua'a of Waimanu, and its embayment in the Hamakua district of the county of Hawaii and also the corridor of the Waimanu trail which leads from Waipio Valley across the lands of Muliwai. A map of the sanctuary shall be on file with the department. [Eff. JUN 22 1981] (Auth: HRS §195D-6) (Imp. HRS §195D-5)

§13-4-2 Prohibited activities. (a) Except as provided by §13-4-3, the following activities are prohibited within the sanctuary:

(1) To fish for, take, possess, or remove any fish, mollusk, crustacean, seaweed, or other marine life;

(2) To kill, destroy, molest, capture, or possess any animal or bird or nest or eggs thereof;

(3) To possess any firearm, bow and arrow, cross-bow, pellet gun, air gun, sling shot, trap, poisons, or snares;
(4) To introduce any plant or animal;
(5) To land or operate any aircraft or other motorized vehicle, including boats;
(6) To damage, destroy or remove any flora;
(7) To damage, destroy or remove any official sign, marker, building, or shelter;
(8) To camp, or to erect or construct any structure;
(9) To trespass into any "No Trespassing Area" where the areas have been posted by the department;
(10) To dispose of or discard any litter, garbage, trash, or other waste material;
(11) To deposit in any stream or other water any animal carcass, chemical, or substance which may pollute the stream of water;
(12) To start or maintain any fires.

(b) Except as provided under §13-4-3(e), no person, natural or corporate, shall take, appropriate, excavate, injure, destroy, or alter any historic or archaeologic property located on lands owned or controlled by the State or any of its political subdivisions.

(c) Except as provided under §13-4-3, no materials taken into the sanctuary shall be left behind; all materials taken into the sanctuary shall be packed out. [Eff. JUN 22 1991]
(Auth: HRS §§6E-3, 195D-6) (Imp: HRS §§6E-7, 195D-5)

§13-4-3 Exceptions; permits. (a) The taking of prawn from a stream and the taking of marine fish from shore by hook and line or by throw net shall be permitted.

(b) When authorized under and pursuant to chapter 123, Title 13, Administrative Rules, or by permit issued by the board, hunters may take game animals and, for this purpose, may possess legal hunting arms and use dogs for hunting.

(c) Camping shall be permitted only at designated camp sites.

(d) Fires may be started or maintained only at sites designated for that purpose.

(e) The board may issue permits for management, scientific, or educational work in the sanctuary and shall specify any terms or conditions deemed necessary for the protection and conservation of the plant and animal communities in the sanctuary.
[Eff. JUN 22 1991] (Auth: HRS §§187-2, 195D-6)
(Imp: HRS §§187-4, 195D-5)

§13-4-4 Enforcement. (a) The board or any of its commissioned enforcement officers may expel any person from the sanctuary who commits any act prohibited by these rules.

(b) The board, directly or by delegation to any employee of the department, may revoke any permit issued pursuant to this chapter. [Eff.] (Auth: HRS §195D-6) (Imp: HRS §§171-6, 171-7, 195D-7, 199-2)

§13-4-5 Penalties. (a) Any person who violates the provisions of §13-4-2(a) and (c) shall be punished as provided in §195D-9, Hawaii Revised Statutes.

(b) Any person who violates §13-4-2(b) shall be punished as provided in §6E-11 and §199-7, Hawaii Revised Statutes. [Eff.] (Auth: HRS §§6E-3, 195D-6) (Imp: HRS §§195D-9, 199-7, 6E-11)

APPENDIX E

PROJECT TEAM

APPENDIX E

PROJECT TEAM

This report was prepared jointly by Dr. Bruce S. Plasch, who is responsible for the final content, and Ms. Jacqueline A. Parnell.

DR. BRUCE S. PLASCH

Dr. Plasch, President of Decision Analysts Hawaii, Inc., has a strong background in economics, finance, and quantitative analysis, and has graduate and undergraduate degrees from the Department of Engineering-Economic Systems, Stanford University and the University of California, respectively. After graduation, Dr. Plasch had an appointment at the University of Hawaii where he taught graduate-level economics and analysis courses. For the last decade, he has been a planning consultant specializing in economics, land use, and impact assessments. Dr. Plasch has had considerable experience developing resource management strategies and addressing environmental issues. Clients have included the State of Hawaii, the City and County of Honolulu, the US Army Corp of Engineers, the University of Hawaii College of Tropical Agriculture and Human Resources, Amfac, the Oceanic Institute, Bishop Estate, Campbell Estate, the Pacific Basin Development Council, the Honolulu Symphony, various law firms, and others.

MS. JACQUELINE A. PARNELL - 545-7633 + check + set Marilyn Metz (DLNR) expert

Ms. Parnell has a Master's degree from the Department of City and Regional Planning, University of California, Berkeley. Until 1983 she was the Director of the Hawaii Office of Environmental Quality Control. Previously she had been the senior environmental planner for the Hawaii State Department of Health and an urban planner with the U. S. Environmental Protection Agency. Ms. Parnell was project manager for the State's "208" Water Quality Management Planning Program, and has

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