

DAVID KAI'ENA BISHAW, II
USGS WATER RESOURCES HILO UNIT
DALE NISHIMOTO HYDRO-TECH
UH-HAWAIIAN INTERNSHIP PROGRAM
SHARON ZEIGLER- CHONG
SUMMER 2004

WATERSHED TRAINING PROGRAM

MA KA HANA KA 'IKE
KNOWLEDGE GAINED BY DOING

Table of Contents

I. Introductory Statement	Pg. 3
II. Proposal	Pg. 7
III. Objectives or Goals	Pg. 9
IV. Summary	Pg. 11

Ka Wai

Introduction

Ka Wai - The Water. Source of Life

Ka Waiwai - The richness, precious source

In the days of old Hawai'i, the people viewed water as their source of life. For without the source we would have No LIFE.



In ancient times as now, fresh water was the key to life and prosperity. The early Hawaiians settled by perennial streams and springs where water was plentiful and reliable. The abundance allowed Hawaiians to develop an extensive agricultural system and a sophisticated

aquaculture; they built a complex system of ditches, terraces and fishponds, and used water in highly efficient ways to grow taro and raise fish. Water was a communal asset: no one was allowed to own it.

The Hawaiians saw gods everywhere in their world: in rocks, clouds, trees, and all parts of the land, sea, and sky that surrounded them. Man and nature were believed to be a part of a larger story of divine creation, and water, the basis of life, was seen as one of god's greatest gifts. It enabled birth, growth, and prosperity; it was essential for both physical and spiritual well-being. In a chant entitled "Ka wai a Kane", the Hawaiians already knew the cycle of water and how they used this knowledge to reach their prosperity.

KA WAI A KĀNE

He ui, he nīnau:	A query, a question
E ui aku ana au iā 'oe,	I put to you
Aia i hea ka wai a Kāne?	Where is the water of Kane?
Aia i ka hikina a ka lā,	at the eastern gate where the
sun	
Puka i Haehae	comes in at Ha'eha'e
Aia i laila ka Wai a Kāne.	There is the water of Kane
E ui aku ana au iā 'oe,	A question I ask of you
Aia i hea ka Wai a Kāne?	Where is the water of Kane?

Aia i Kaulana a ka lā, sun	Out there with the floating
I ka pae 'ōpua i ke kai, breasts	where the clouds-forms rest on ocean's
Ea mai ana ma Nihoa, Mai ka mole mai 'o Lehua; Aia i laila ka Wai a Kāne.	uplifting their forms at Nihoa this side of the base of Lehua There is the water of Kane
E ui aku ana au iā 'oe, Aia i hea ka Wai a Kāne?	A question I ask of you Where is the water of Kane?
Aia i ke kuahiwi, i ke kualono, ridges steep	yonder on mountain peak, on the
I ke awāwa, i ke kahawai; rivers sweep	in the valleys deep, where the
Aia i laila ka wai a Kāne.	There is the water of Kane.
E ui aku ana au iā 'oe, Aia i hea ka Wai a Kane? Kane?	this question I ask of you Where, pray is the water of
Aia i kai, i ka moana, I ke kualau, i ke ānuenuē, heavenly bow	yonder at sea on the ocean in the driving rain, in the
I ka pūnohu, i ka uakoko, blood-red rainfall	in the piled up mist wraith, in the

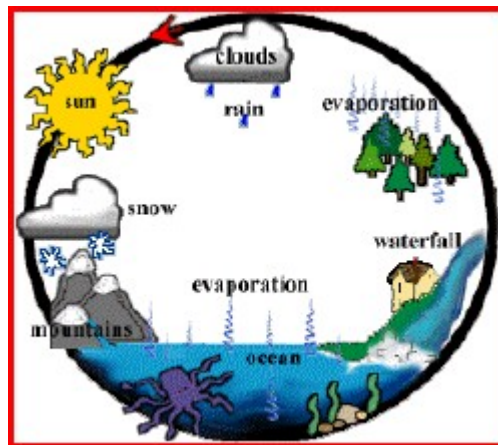
I ka 'ālewalewa; in the ghost-pale cloud from
Aia i laila ke Wai a Kāne. There is the water of Kane.

E ui aku ana au iā 'oe, one question I put to you
Aia i hea ka Wai a Kāne? Where is the water of Kane?

Aia i luna ka Wai a Kāne, In the heavenly blue
I ke 'ōuli, i ke ao 'ele'ele, in the black piled cloud,
I ke ao panopano, in the black-black cloud
I ke ao pōpolohua mea a Kāne lä, e! In the black mottled sacred
cloud of the gods
Aia i laila ka Wai a Kāne. There is the water of Kane.

E ui aku au iā 'oe, one question I ask of you
Aia i hea ka Wai a Kāne? Where flows the water of Kane?

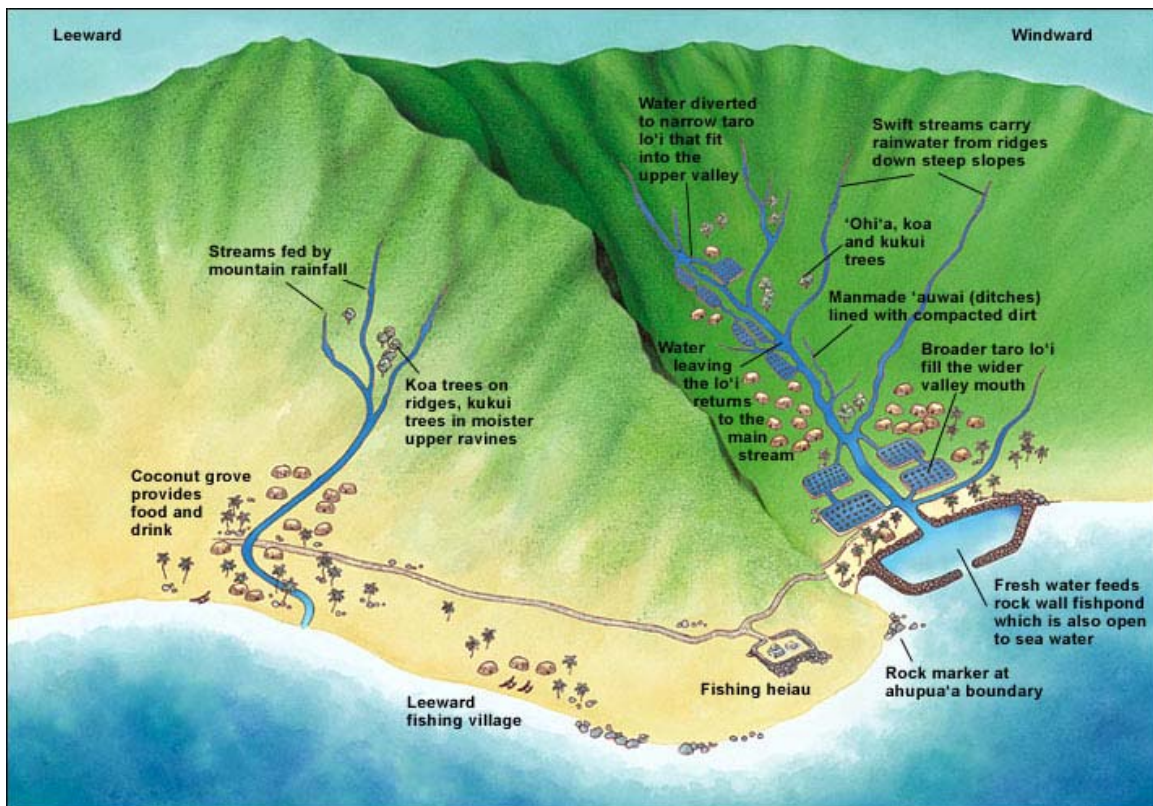
Aia i lalo, i ka honua, i ka wai hü, Deep in the ground,
inn the gushing spring
I ka wai kau a Kāne me Kanaloa in the ducts of Kane and
Kanaloa
He wai puna, he wai e inu, A well spring of water, to
quaff
He wai e mana, he wai e ola. A water of magic power,
the water of Life!
E ola nö, 'eä! Life! O give us this life!
Aia ilaila ka wai a Kane There is the water of Kane.



This chant reflects the water cycle as Hawaiians did before and now. They grew plants where the water was very abundant or not.

In pre-contact Hawai'i, the land was divided into districts and then into smaller sections called ahupua`a. The lines of an ahupua`a mirrored the lines of the natural ecosystem: its boundaries stretched from the mountain top through upland forests and river valleys to flatlands and the shore. Every tenant of an ahupua`a was given access to upland timber for houses and canoes, to agricultural lands for growing crops, and to the ocean for fishing and travel by sea. Everyone was allowed to take what they needed to live a full life: spiritually, educationally and physically. But a deep sense of responsibility also governed the ahupua`a: no one could remove or take more than what they

could immediately use. The ahupua`a system ensured that natural systems were kept in balance and acknowledged the inherent relationships between land and sea, and water and life. Island topography produced very different communities in leeward and windward areas. Hawaiians gravitated to wetter windward valleys and used abundant stream water to cultivate their staple food, taro. Fishponds built at stream mouths provided a ready source of protein. Drier leeward areas supported smaller communities which often hugged the coast, giving easy access to ocean fishing areas. Sporadic rainfall and intermittent streams could not support wetland taro. The main crop was sweet potato. Farmers sometimes carried water to their crops in gourd containers.



Rivers brought life to the landscape. A moderate rainfall sent waterfalls spilling into rivers that carried water to lower elevations. As water flowed to the ocean, it passed through countless wetland taro pond fields before it returned to the river to continue seaward. As it neared the shore, it rejuvenated marshes and wetlands and ran into loko`ia (fishponds).

Strict rules governed the use of water in ancient Hawai'i, and it was a grievous offense to waste or misuse the precious liquid. The ali'i ai moku (district chiefs) were the trustees of water and exercised control over it as an instrument of the gods. They established and enforced regulations over water use in upland areas of an ahupua`a so that a pure flow was always available to those who lived at lower elevations. In addition, they set rigid schedules for cleaning and diverting water from rivers and streams. Rights and privileges to water were earned, not guaranteed. Farmers were expected to keep their taro fields free of weeds and clutter and to help clean communal streams and rivers. Those who failed in either regard were dispossessed of their land and banished. If a farmer dared to water his taro fields without the approval of the Luna wai, he was put to death. Disobeying water regulations jeopardized all; the gods were seen to be merciless in this regard. **E OLA NO `EA!**

I recently graduated with two Associate in Applied Science degrees one in Agriculture and one in Hawaiian Life

Styles Mahi'ai Program from Hawai'i Community College. I completed two summer internship programs with UH-HIP working for the USDA Forest Service in Hilo doing project involved with invasive alien plant species. As an Agriculturalist and a Hawaiian, I wanted to learn more about such a precious resource as water. I am attending the University of Hawai'i at Hilo to attain a Bachelor's of Science degree in Agriculture, specializing in Tropical Horticulture. I sought this internship because I wanted to learn how to collect data from water sources, apply the data to the work, and learn what the data means.

USGS Water personnel in Hawai'i and the Pacific collect data on stream flow, suspended sediment, lake and reservoir stage, ground water level and salinity and other water quality parameters, aquatic ecology, rainfall, and evapotranspiration, and carry out interpretive studies on the quantity and quality of surface and ground water.

Surface Water:

Nationally, USGS surface-water data includes more than 850,000 station years of time-series data that describe stream levels, stream flow (discharge), reservoir and lake levels, surface-water quality, and rainfall. The data are collected by automatic recorders and manual measurements at field installations across the Nation.

Ground Water:

The Ground-Water database contains ground-water site inventory, ground-water level data, and water-quality data. The ground-water site inventory consists of more than 850,000 records of wells, springs, test holes, tunnels, drains, and excavations in the United States. Available site descriptive information includes well location information such as latitude and longitude, well depth, and aquifer.

The USGS annually monitors ground-water levels in thousands of wells in the United States. Ground-water level data are collected and stored as either discrete ground-water level measurements or as continuous record. Data from some of the continuous record stations are relayed to USGS offices nationwide through telephone lines or by satellite transmissions providing access to real-time ground-water data.

Water Quality:

The U.S. Geological Survey collects and analyzes data on the chemical, physical, and biological properties of water, sediment, and tissue samples as part of a variety of projects ranging from national programs to studies of more local interest. NWISWeb provides access to USGS surface-water, ground-water, and water-quality data collected throughout the Nation.

OBJECTIVES

To learn about all phases of a watershed based approach to coastal water quality management with emphasis on the following:

- Gathering and assessing background information about watershed hydrology, land cover, resource management, and water quality
- Monitoring watershed conditions, including nutrient and sediment loading of streams; stream habitat and biological integrity; land use conversion and land cover change; and water quality management practices
- Constructing benefit-cost templates for economic evaluation of water quality impairment and polluted runoff control
- Computing water quality goals based on analysis of the background information and monitoring data
- Developing management plans to achieve these goals by reducing pollutant loads and improving watershed conditions
- Assess the implementation of these management plans using benefit-cost templates and input from watershed stake holders

METHODOLOGY

Created along the way is the attitude I took with these principles involved:

- Construction of wooden sheds to house data collection equipment
- Record data from equipment within constructed sheds
- Input data to computer based programs for publication
- Survey streams to include indirect surveys, biological surveys, etc.
- Build and install Crest Height Gages (CSW)

SUMMARY

Although I was not able to complete every method and principle mentioned above, the experience gained from this internship and working with professional data collectors of the USGS has given me a very deep sense of responsibility for our precious resource, water.

The data collected from surface water, ground water, nutrient and sediment runoff, biological assessments of streams, and indirect surveys of streams; tells me the future of our source is greatly assumed to be plentiful. The source is forever recharging, however if we the public do not become better stewards for this resource, we may in the future not have the clean pristine water for our needs.

