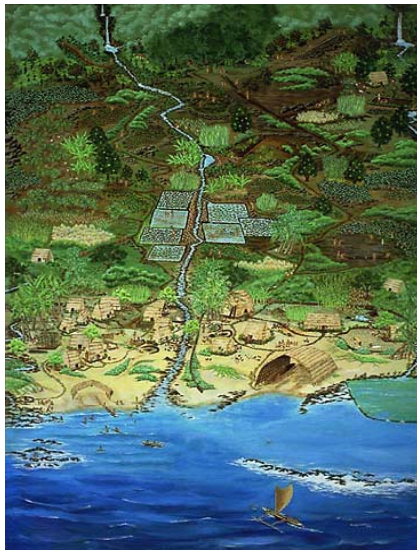
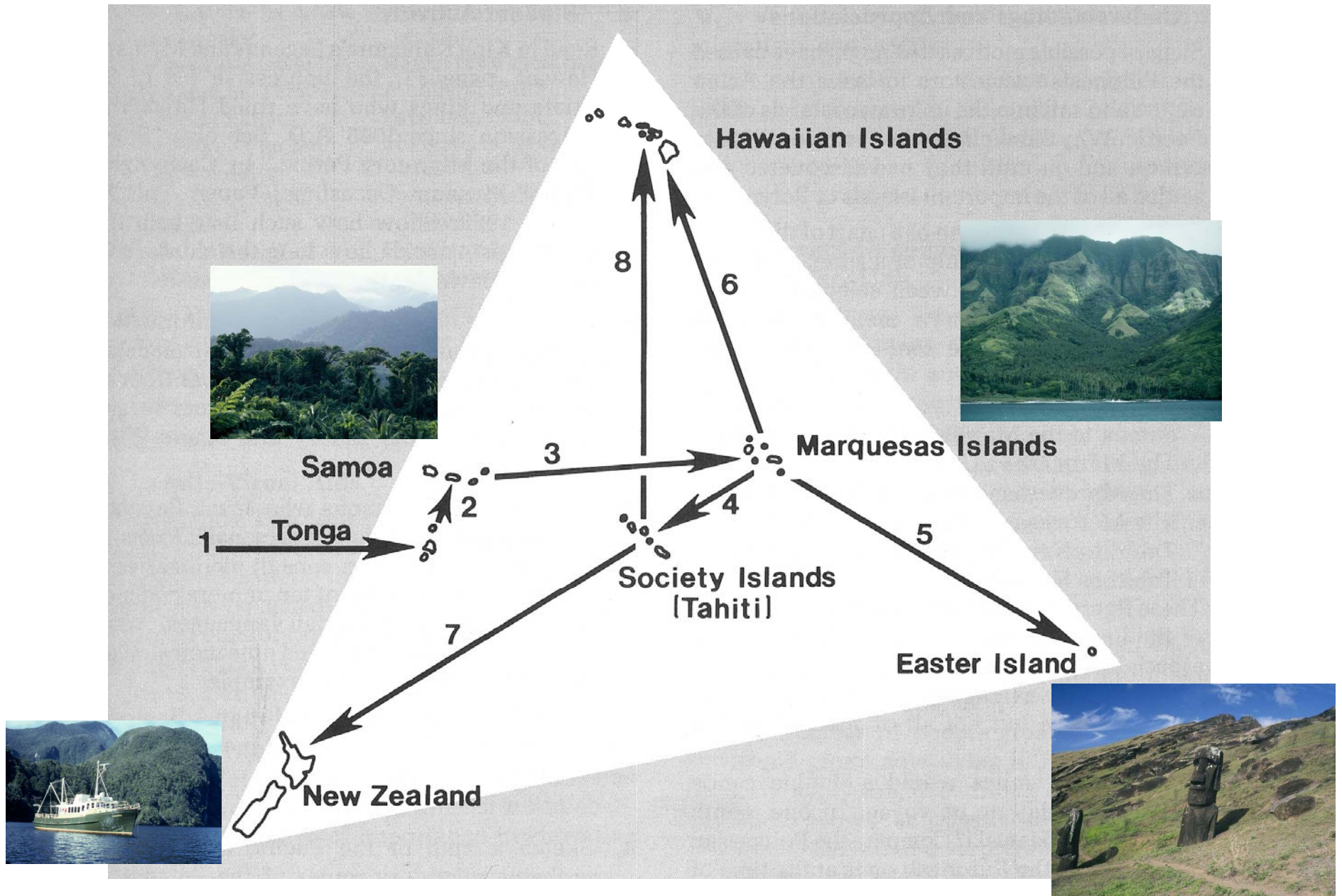


# NREM 301

## Hawaiian Resource Management

Dr. Greg Bruland





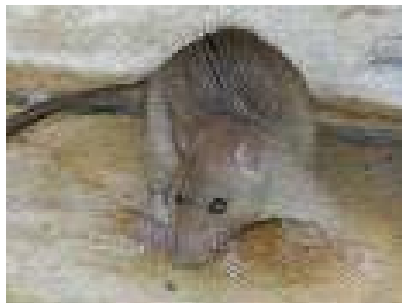
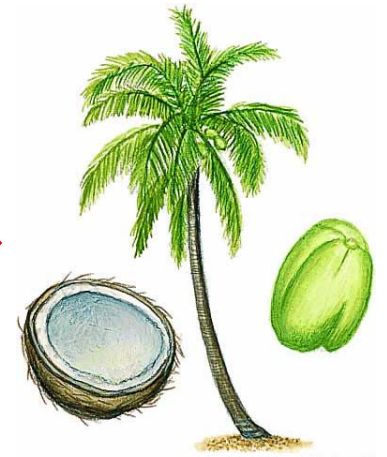
# Polynesian Settlement Pattern

(Mitchell 1982)



## Double-hulled Polynesian voyaging canoes

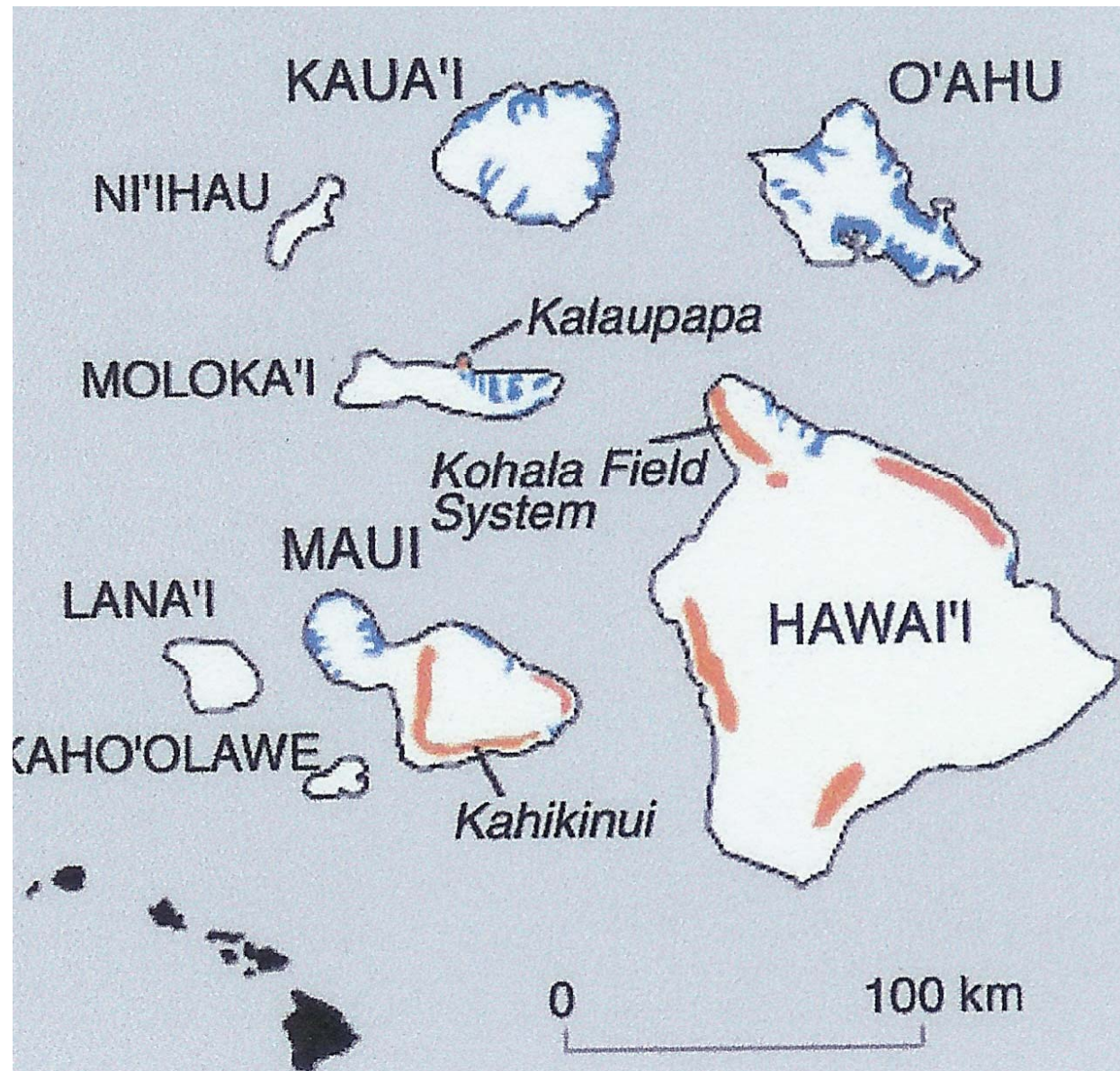






## **Settlement of a windward valley in Hawai'i**

(Kane 1997)



The distribution of irrigated taro wetland systems (blue) & rainfed dryland agricultural systems (orange) across the Hawaiian archipelago.

(Vitousek et al. 2004)



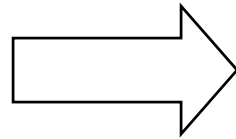
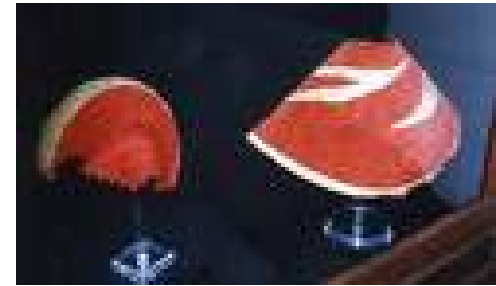
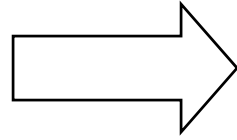
**A view off the Hanalei River valley & irrigated taro wetland agricultural system**



**A view off the remains of the leeward Kohala dryland agricultural system on Hawai'i. Field walls run parallel to contours over an area of 60 km<sup>2</sup>.**

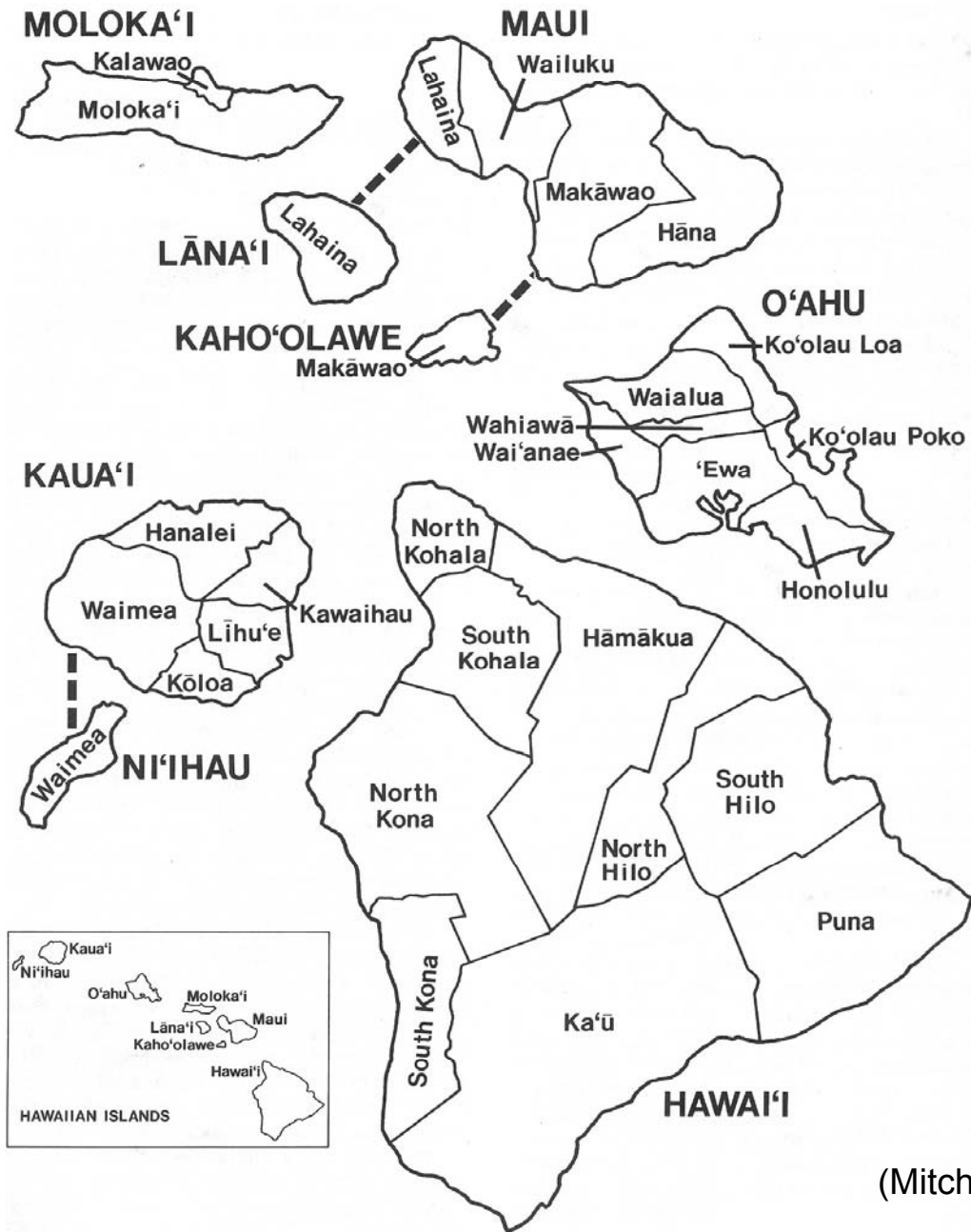
(Vitousek et al. 2004)





(Kane 1997)

# Current Names of the Moku or Districts



(Mitchell 1982)

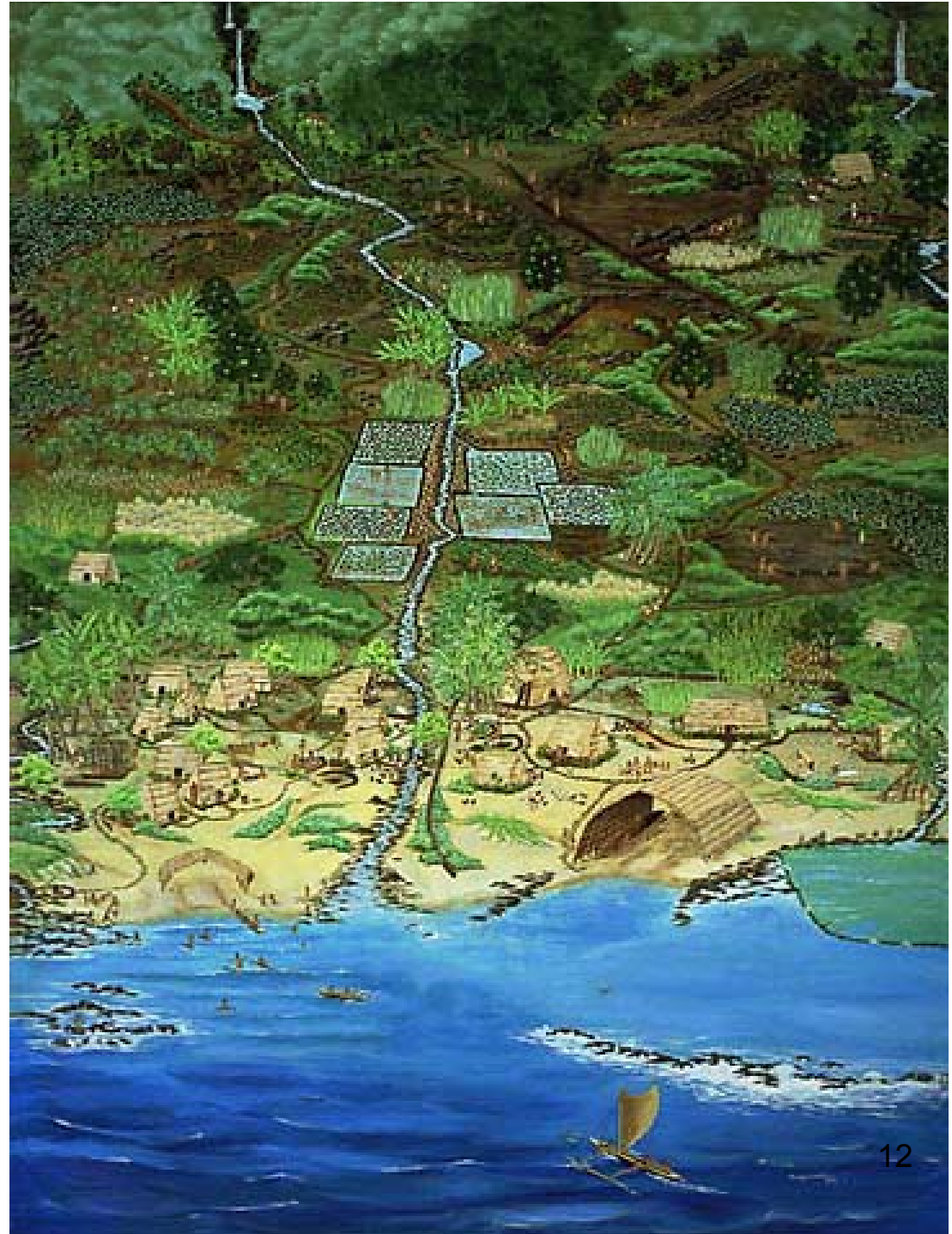


**The pig's head carved out of kukui wood on an alter of stones marking the boundary of an ahupua'a.**

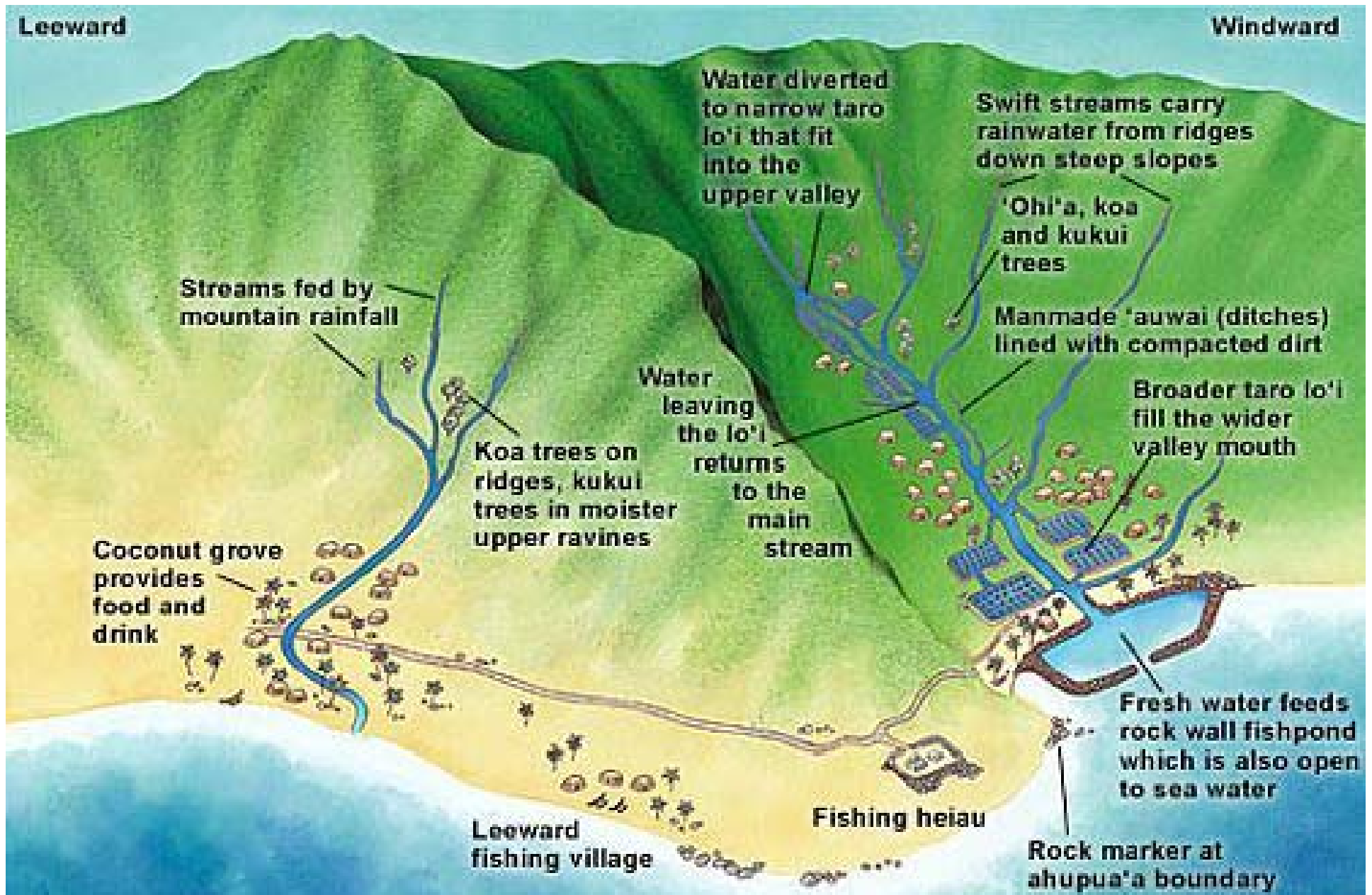
(Mitchell 1982)

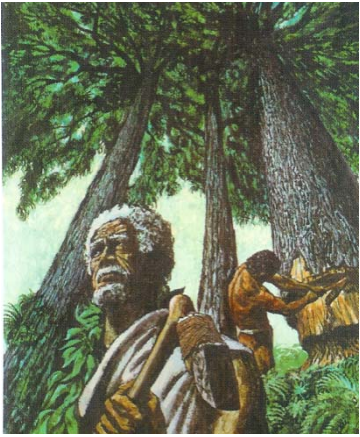
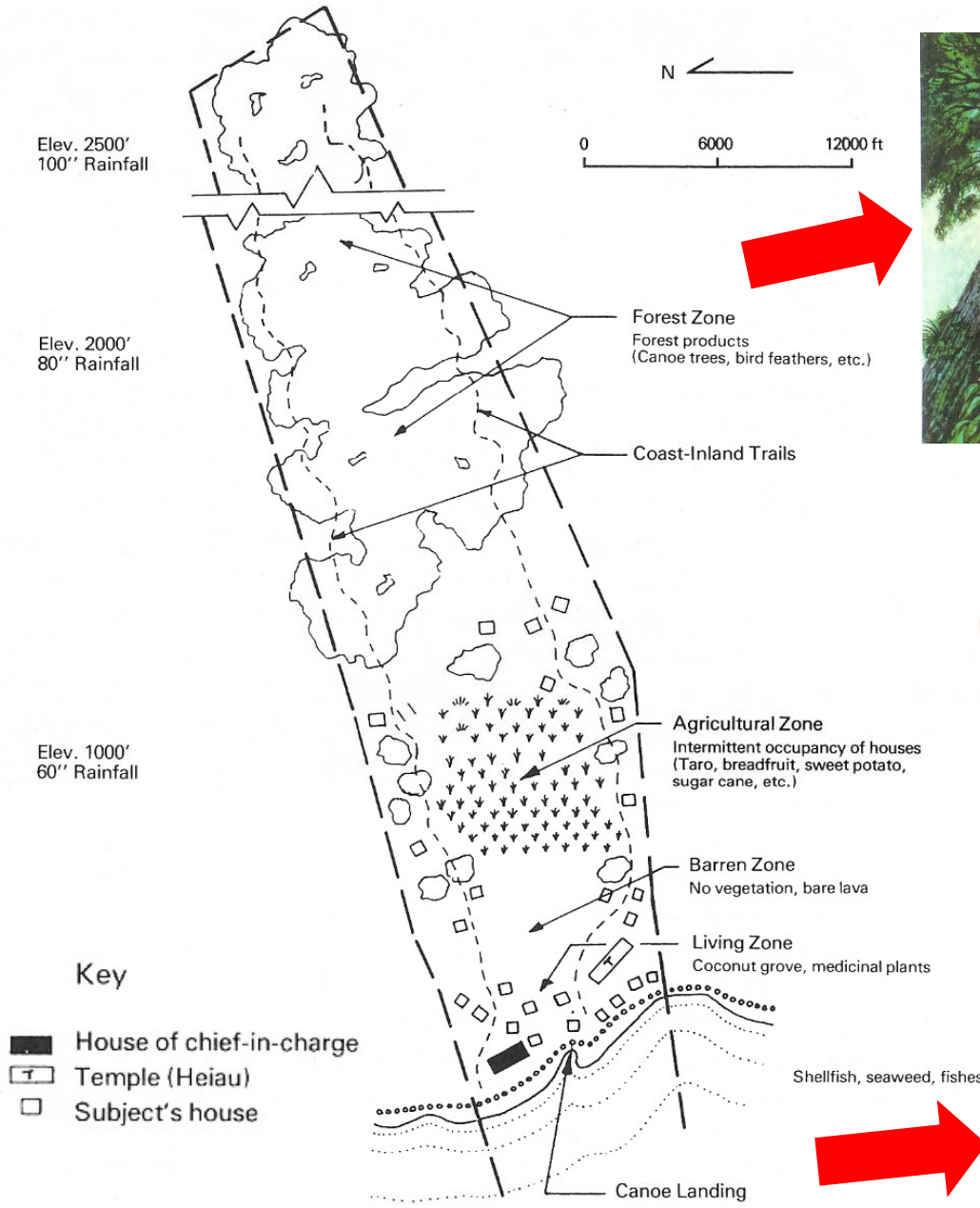
# The Ahupua'a

(Kamehameha Schools  
Press)

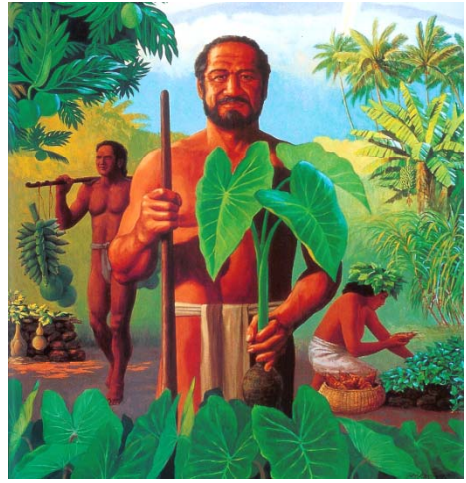


# Leeward vs Windward Ahupua'a





(Kane 1997)

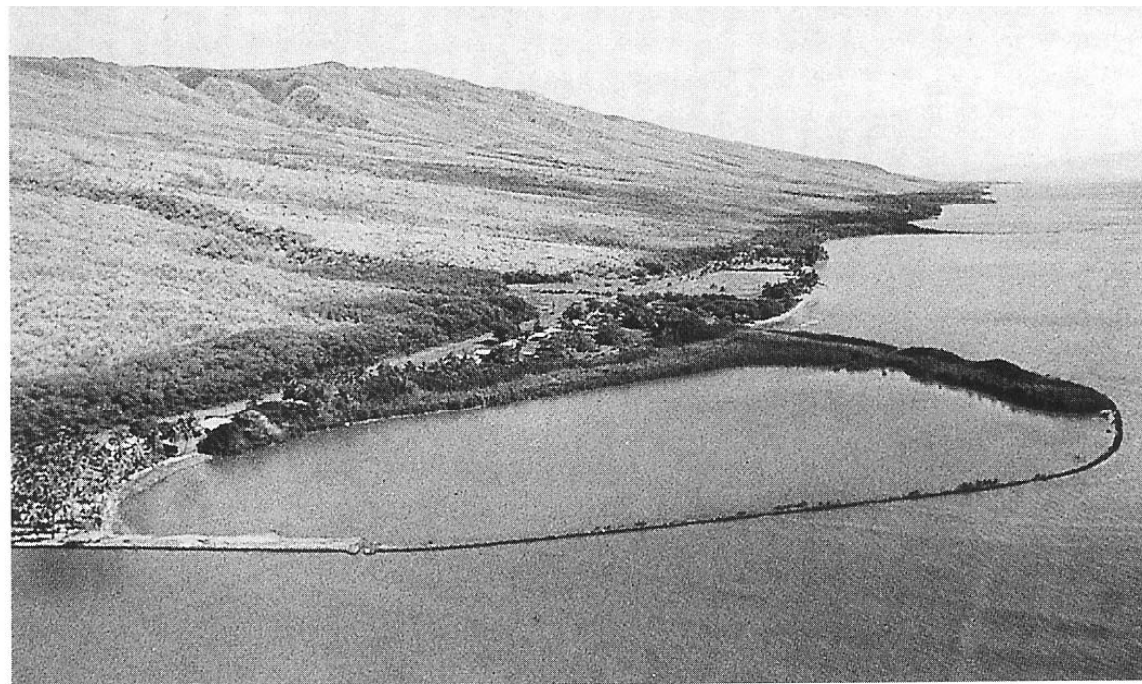
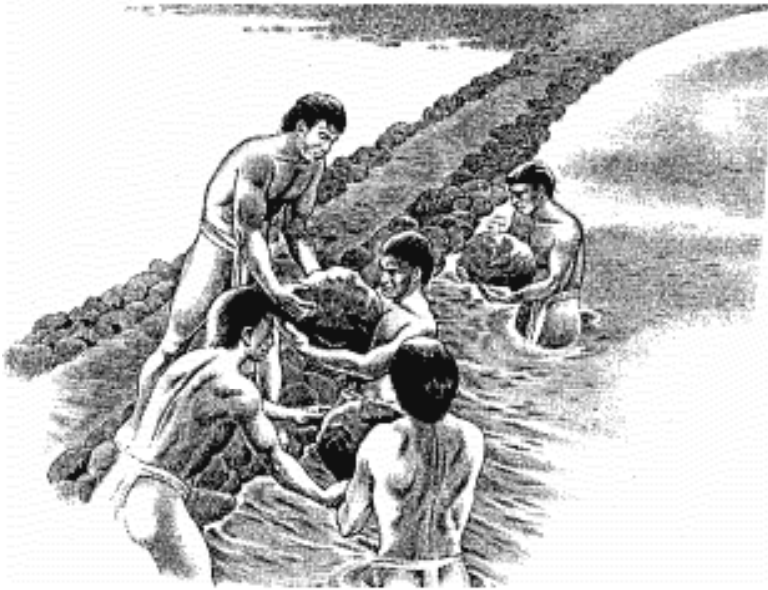


(Kane 1997)



(Kane 1997)

**Generalized map of an ahupua'a showing zonation of resources with elevation** (Apple 1965) 14



(Ziegler 2002)

Fishpond, loko kuapā, on the southern coast of Moloka'i

# Types of Hawaiian Fishponds

- Loko kuapā: seashore ponds with stone walls built on a reef

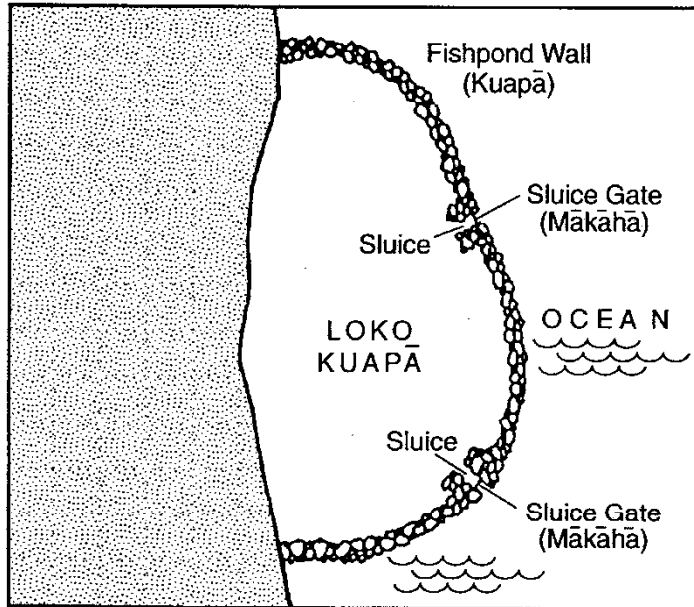


Figure 5: Loko kuapā. (Modified Kikuchi, 1976)

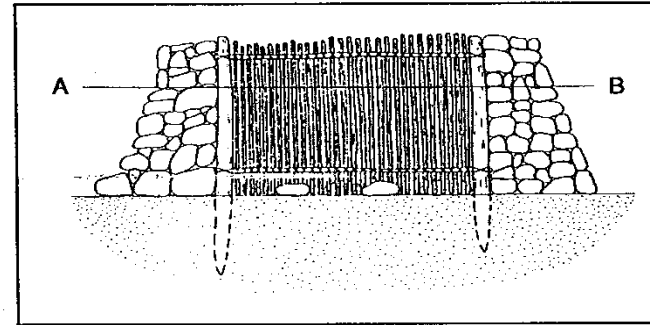


Figure 8: Side view of a mākāhā. Line A-B indicates water level. (Summers, 1964)

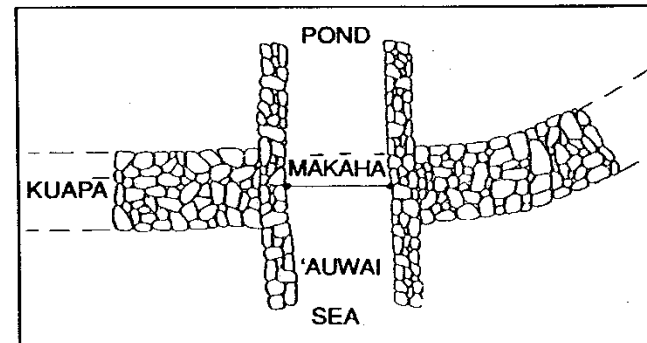


Figure 9: Top view of 'auwai o ka mākāhā. (Summers, 1964)

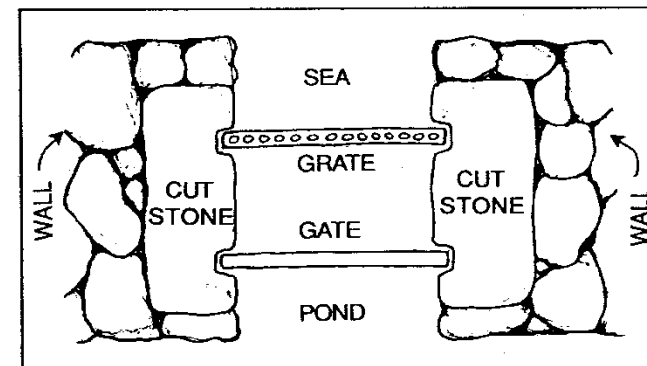


Figure 10: Drawing of typical mākāhā area in fishpond wall. (Modified from Kelly, 1975)



# Types of Hawaiian Fishponds

- Loko i'a kalo:  
taro fishponds

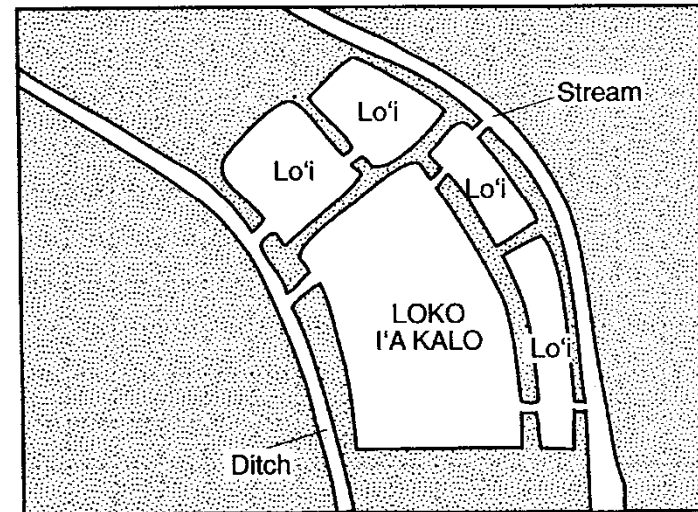


Figure 2: Loko i'a kalo - taro fishpond. (Modified Kikuchi, 1976)

- Loko pu'uone:  
brackish water ponds,  
separated from the  
sea by a sand ridge

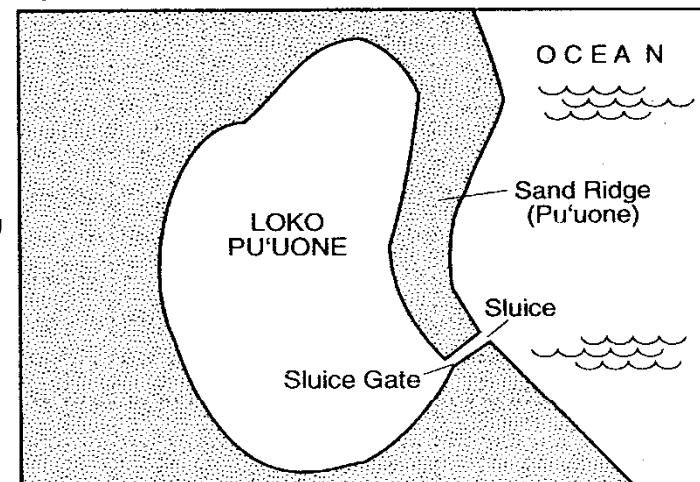
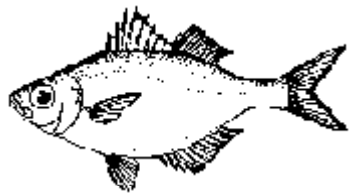
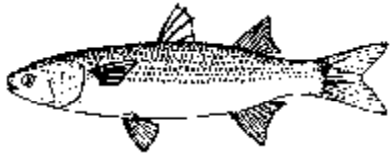


Figure 4: Loko pu'uone - brackish water pond. (Modified Kikuchi, 1976)

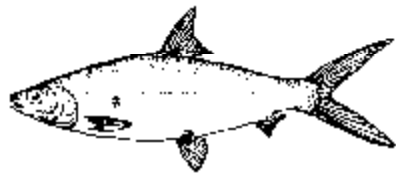
**Fishponds stocked with:**



āholehole  
(Hawaiian flagtail)  
*Kuhlia sandvicensis*

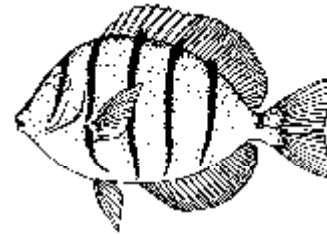


‘ama‘ama  
(mullet)  
*Mugil cephalus*

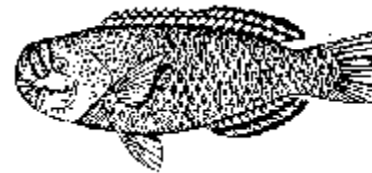


awa  
(milkfish)  
*Chanos chanos*

**Other fish entering ponds:**



manini  
(convict tang)  
*Acanthurus triostegus*



uhu  
(parrotfish)  
*Scaridae family*



‘ō‘io  
(smallmouth bonefish)  
*Albula glossodonta*

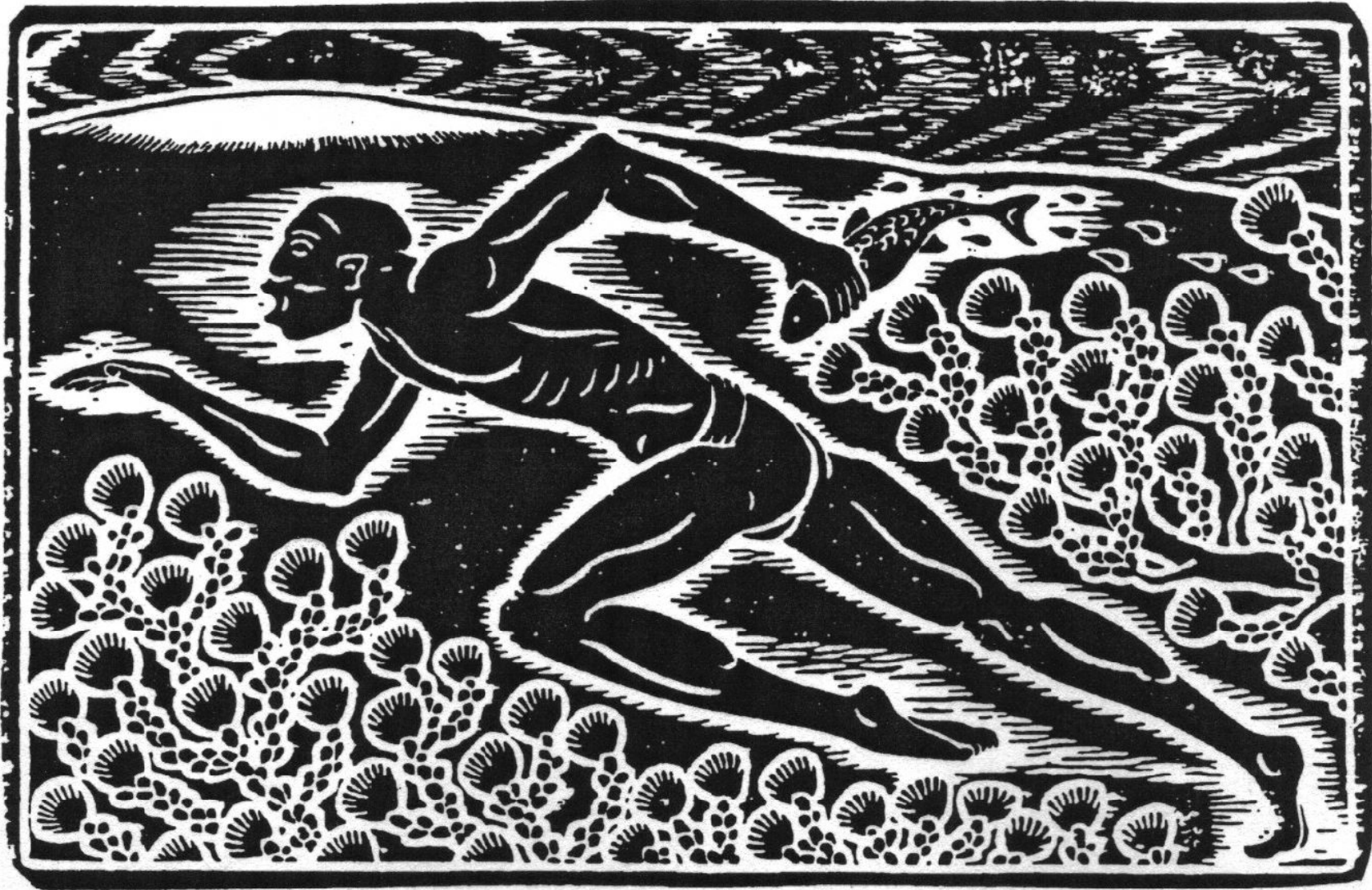
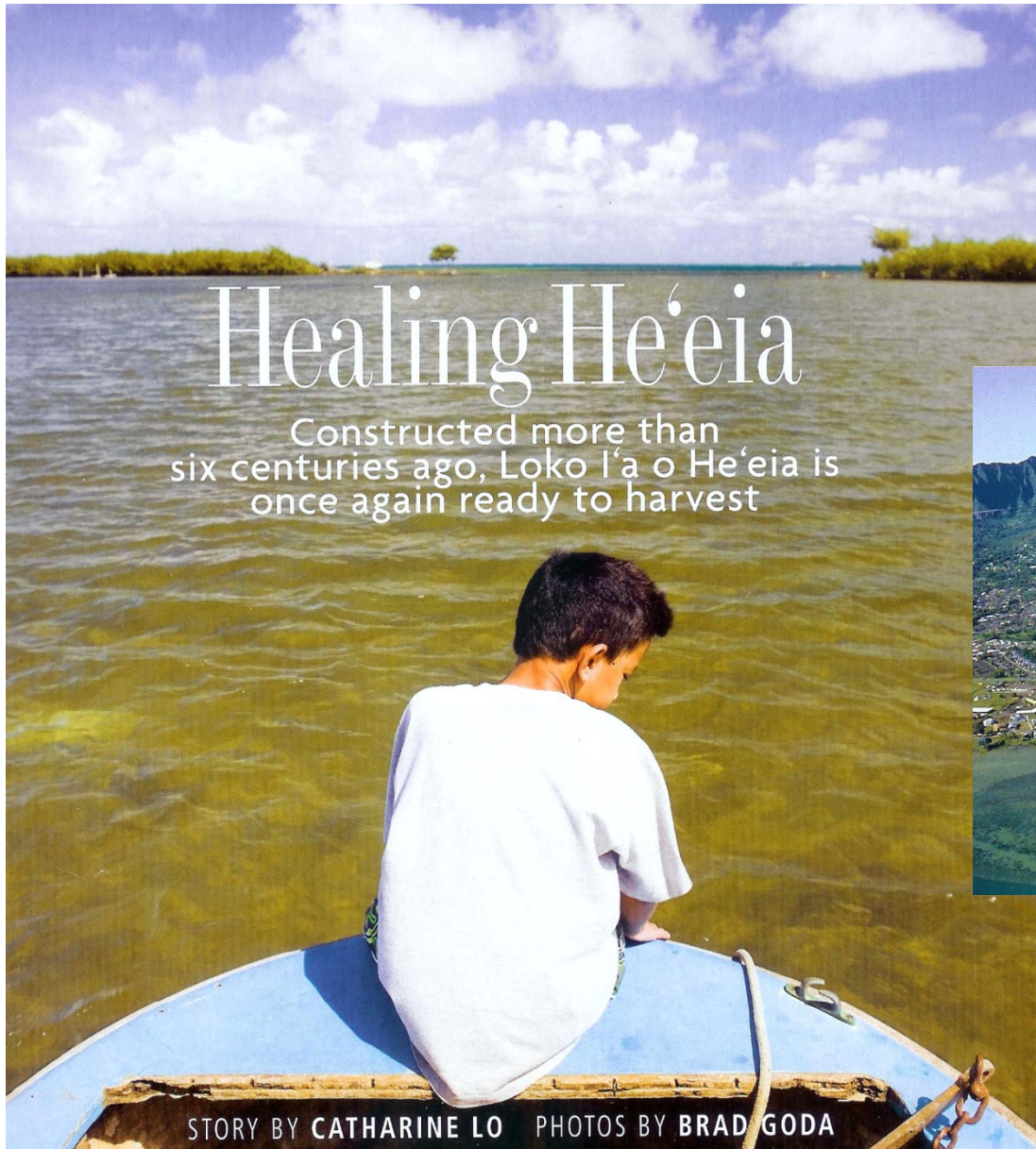


Figure 4. "Makoa," an illustration of the Hawaiian fish couriers who carried fresh fish over long distances from royal ponds to the travelling court of ancient Hawaiian kings. Print: Dietrich Varez, Volcano, HI.

(Costa-Pierce 1987)

# Fishpond Restoration



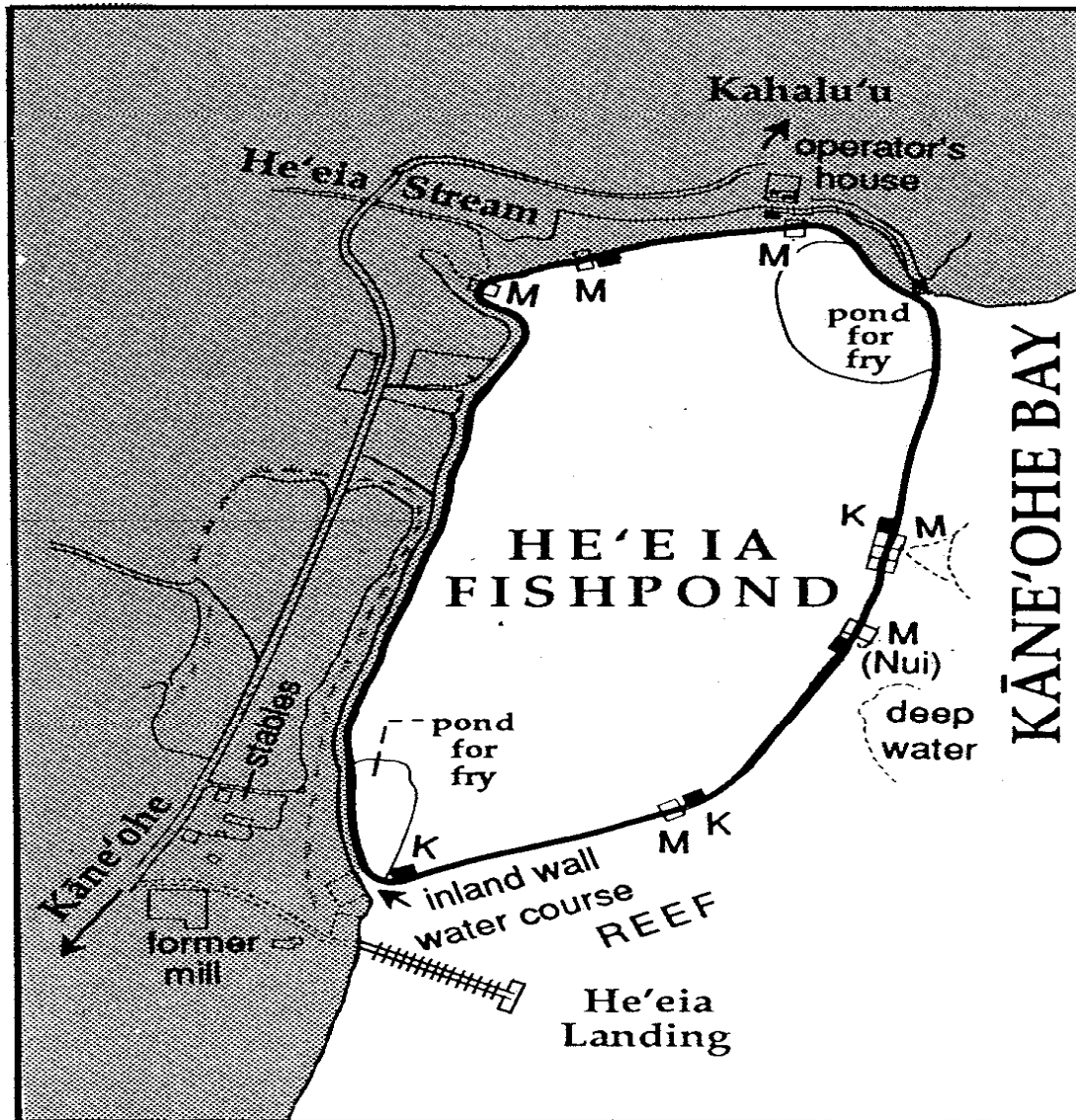


FIGURE 25: Plan of He'eia Fishpond about 1930. (Modified from Kelly, 1975) M= mākāhā K= hale kia'i



### **Fishpond at Kaloko-Honokōhau National Historic Park, Hawai'i.**

- Walls angled to diffuse wave energy
- Gate allows water exchange w/ pond, prevents larger fish from escaping
- Efforts underway to enable Kaloko Fishpond to be used for aquaculture

## Arrival of Captain Cook at Kealakekua Bay



(Kane 1997)

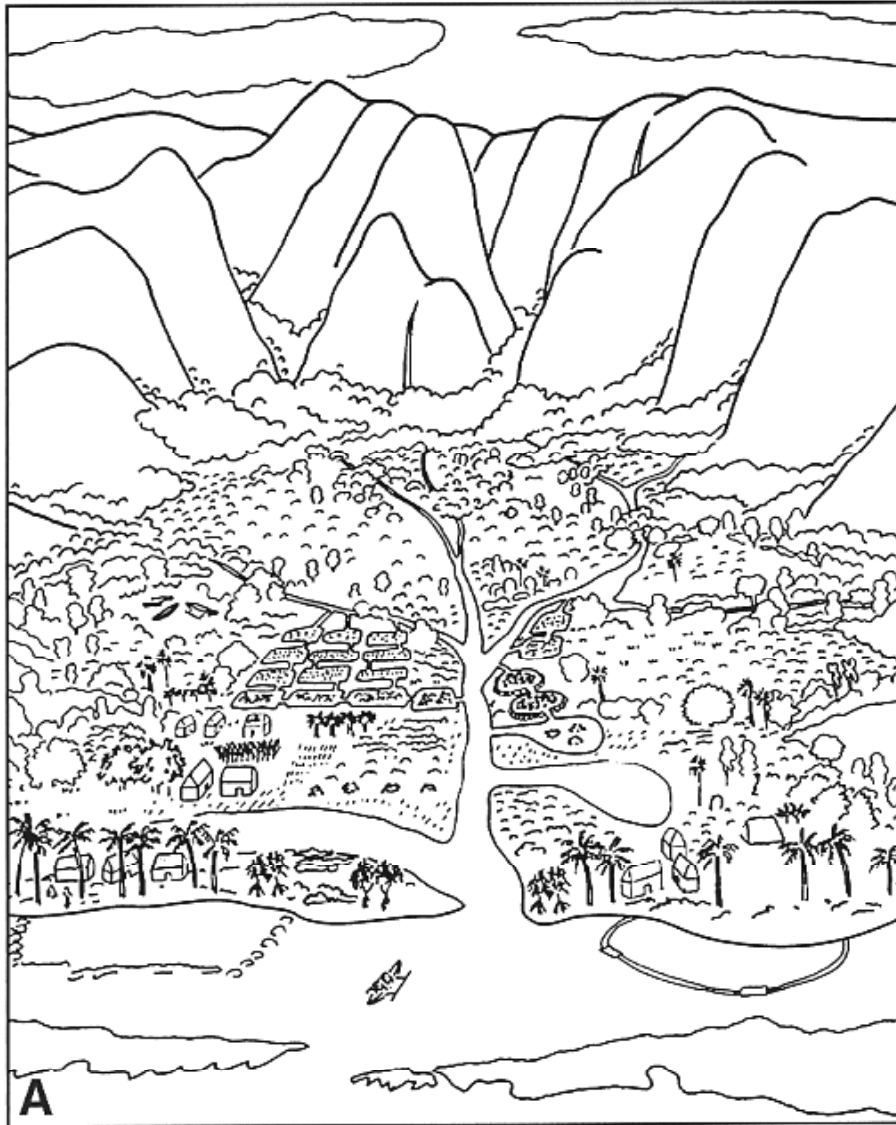


Europeans introduce  
a new wave of alien  
animal & plant  
species & associated  
land-use change,  
degradation

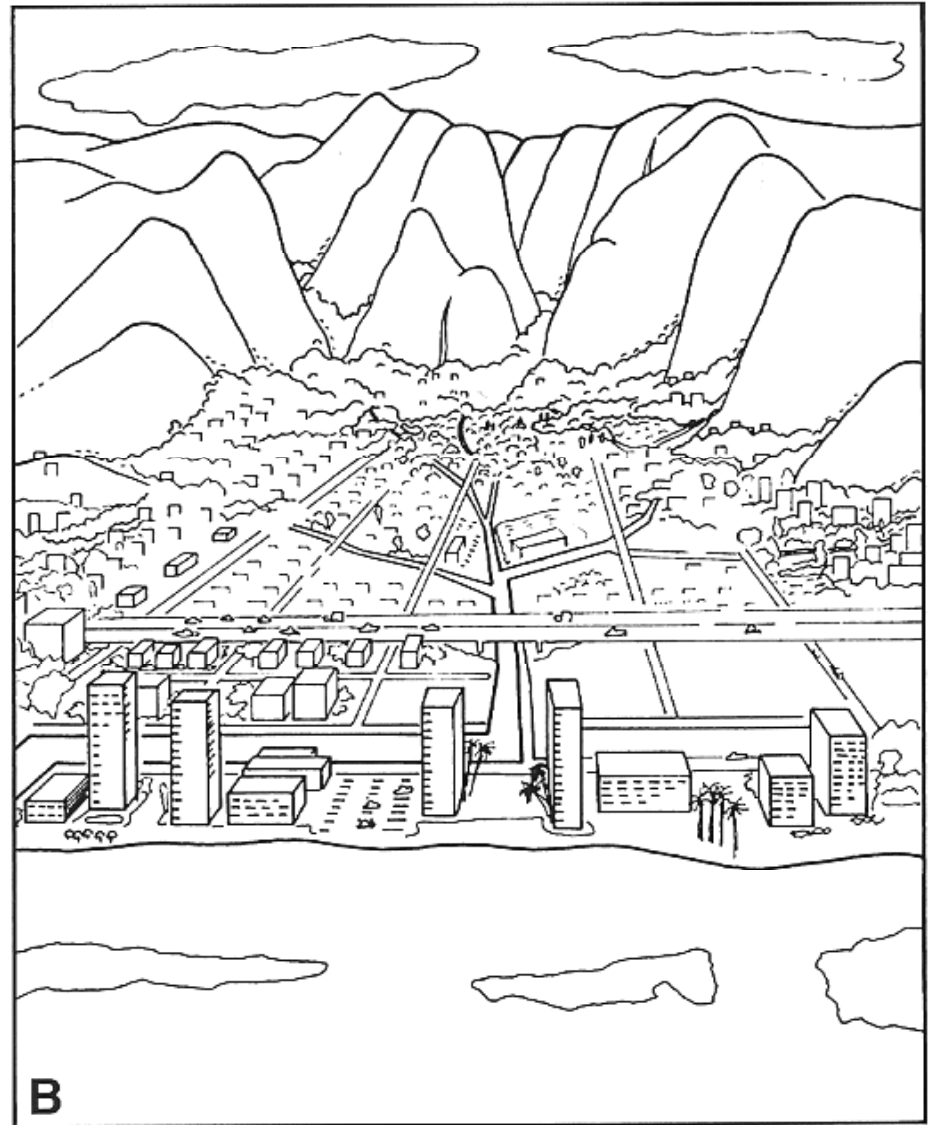




# Hawaiian Era Ahupua'a



# Present Day Ahupua'a



(Kaneshiro et al. 2005)