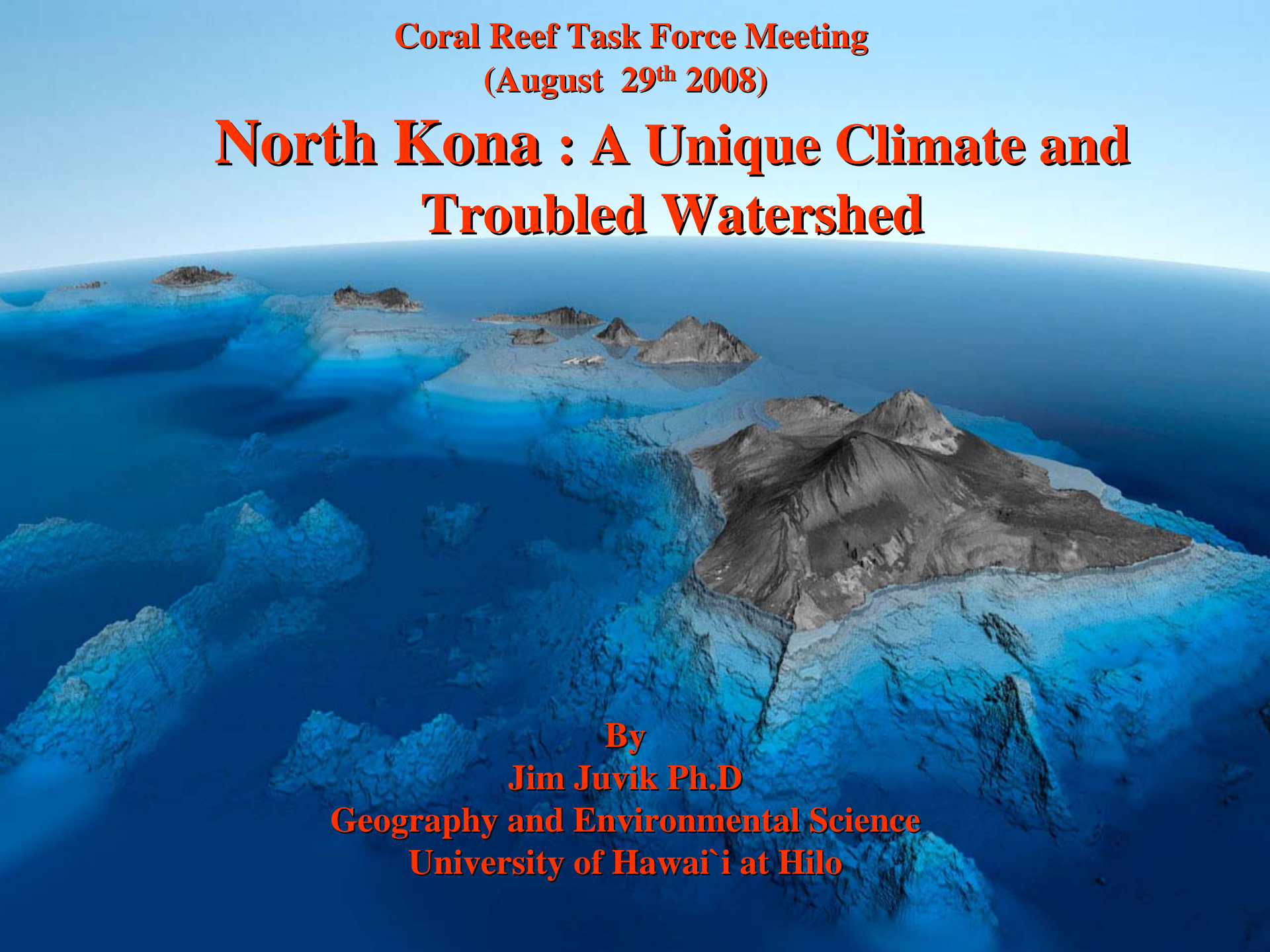


**Coral Reef Task Force Meeting
(August 29th 2008)**

North Kona : A Unique Climate and Troubled Watershed

**By
Jim Juvik Ph.D
Geography and Environmental Science
University of Hawai`i at Hilo**



An aerial photograph of a mountain range with a river valley. The mountains are rugged and brownish, with a river valley cutting through them. The surrounding area is green and hilly. The sky is blue with some white clouds.

*ʻAʻole pono ka mālama ʻana i ka ulu lāʻau
i mālama pono i ka wai`*

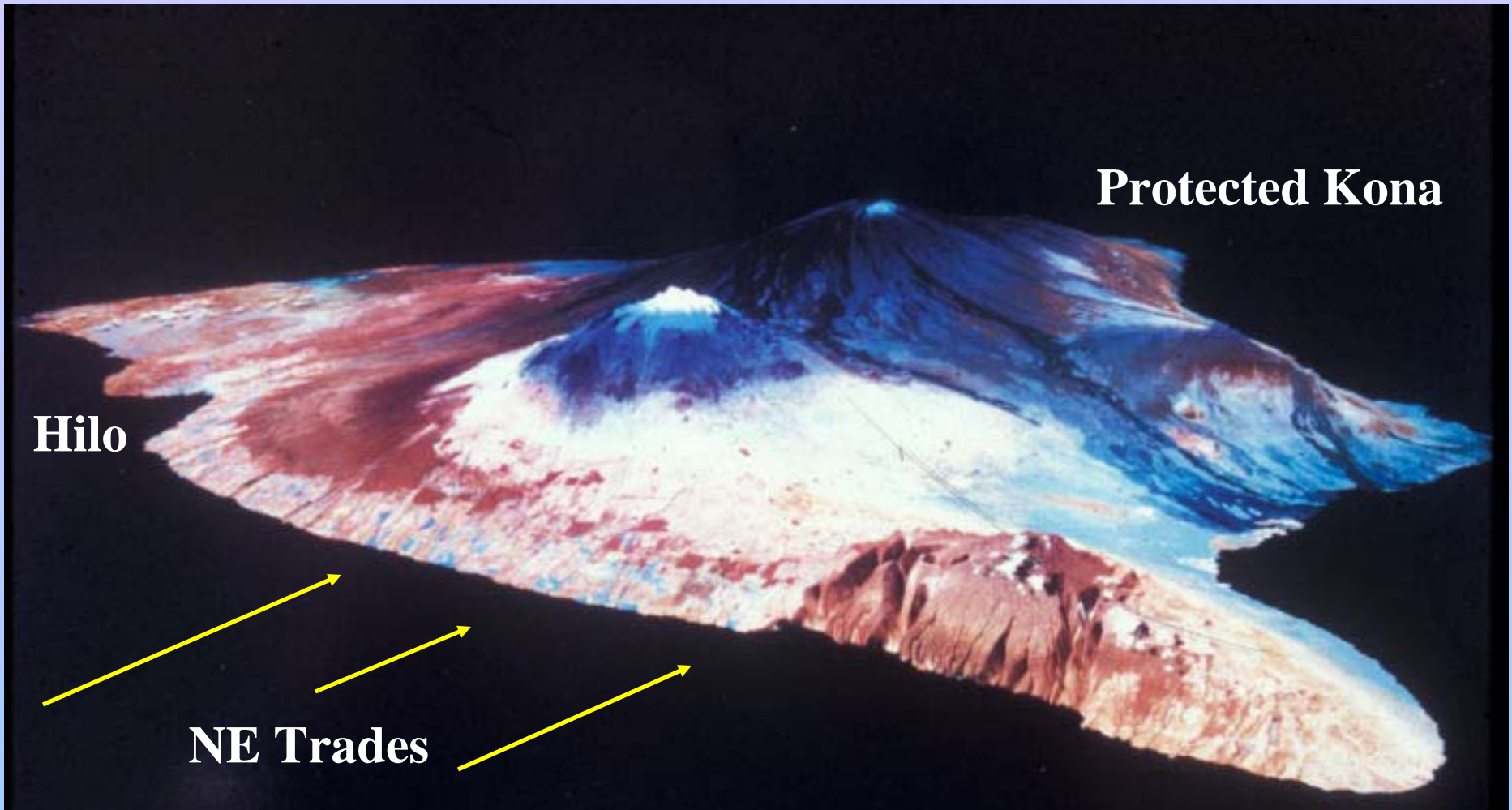
An aerial photograph of a mountain range, likely the Kona mountains in Hawaii. The image shows a central valley with a winding road, surrounded by steep, forested slopes. The terrain is rugged and mountainous, with some areas appearing more densely vegetated than others. The overall scene is captured from a high angle, showing the topography and the layout of the land.

Kona Climate Controls:

- 1. Protective Mountains (Block Trade Winds)**
- 2. Dry mauka zone (Trade Wind Inversion)**
- 3. Land-Water Differences (Diurnal Wind Reversal)**
- 4. Summer Heating (Convictional Rainfall)**



1. Protective Mountains (Block Trade Winds)



Protected Kona

Hilo

NE Trades

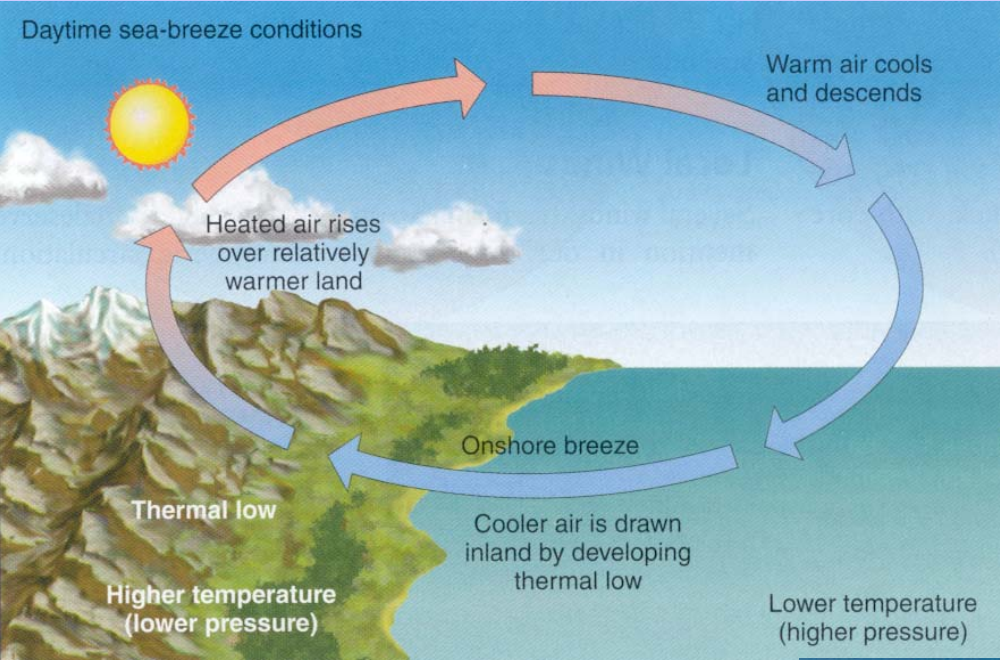
2. Dry Mauka Zone (Above Inversion)



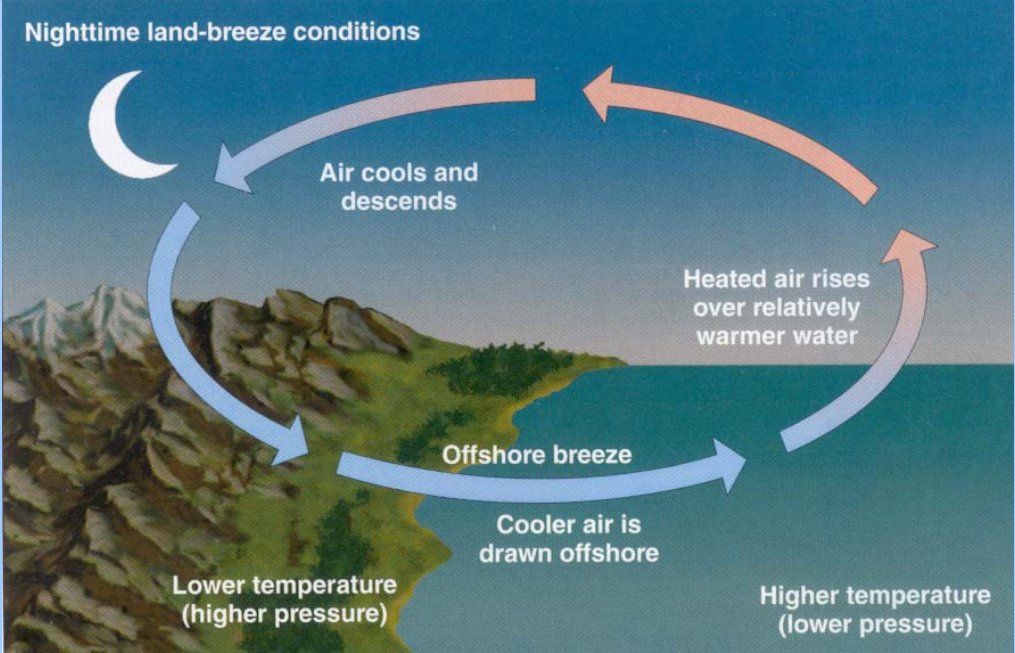
**Vog trapped below temperature inversion at
5,500 ft. on Hualalai**

January 16, 2004 at 9 am

3. Land-Water Differences

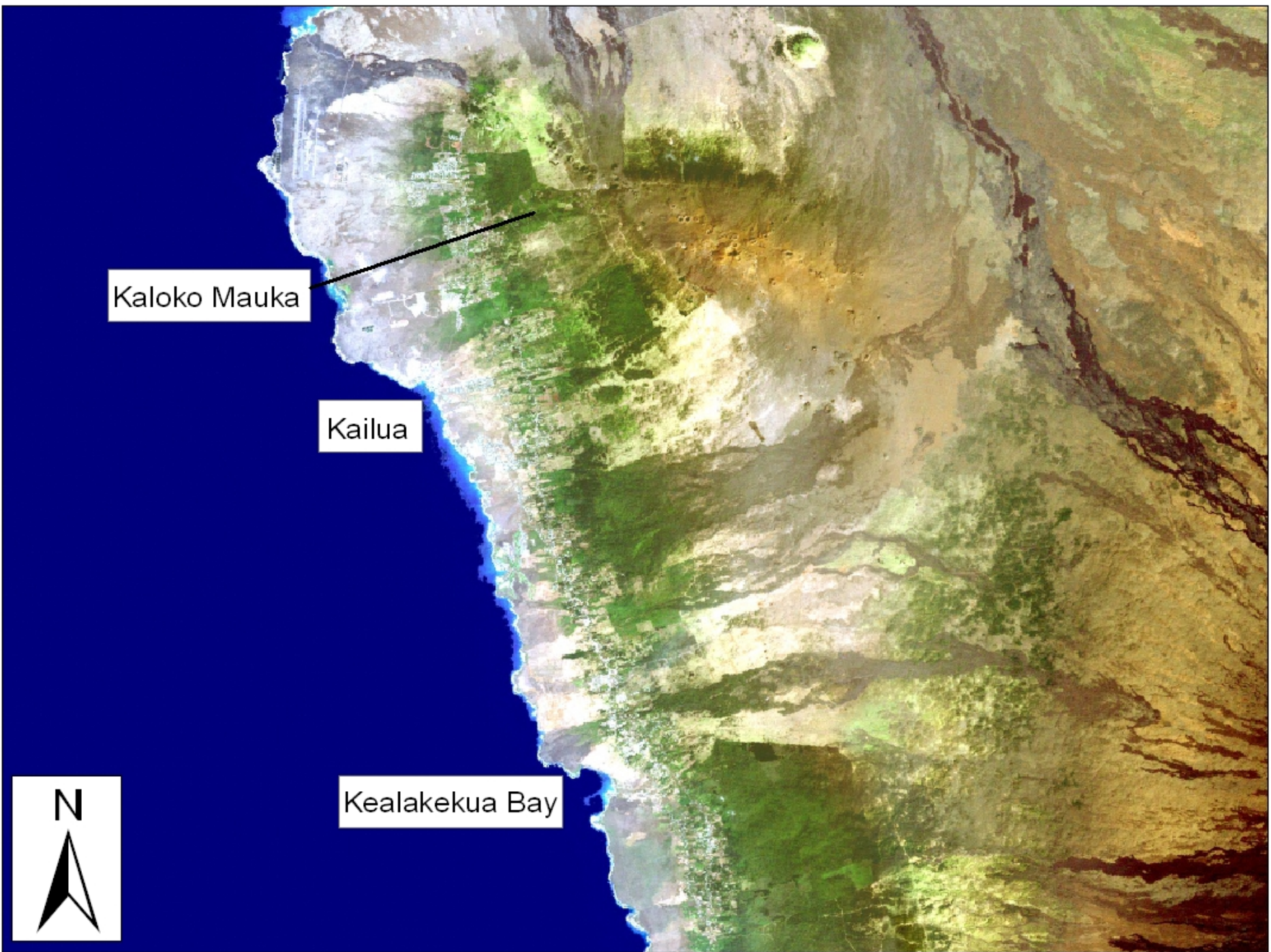


Thermal Circulation: Kona diurnal land-sea breeze





Keauhou, Kona – Early Morning or Afternoon?

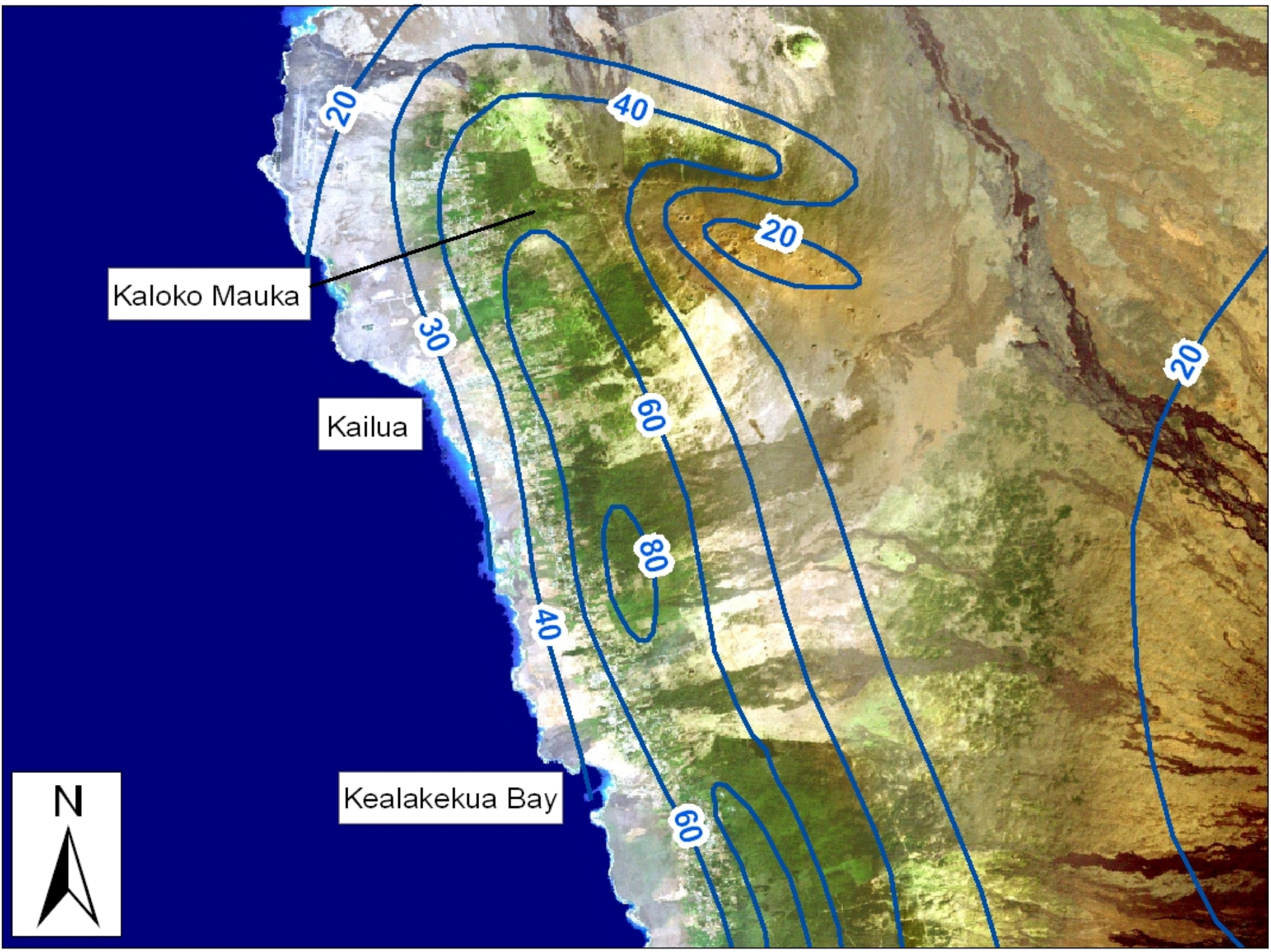


Kaloko Mauka

Kailua

Kealakekua Bay





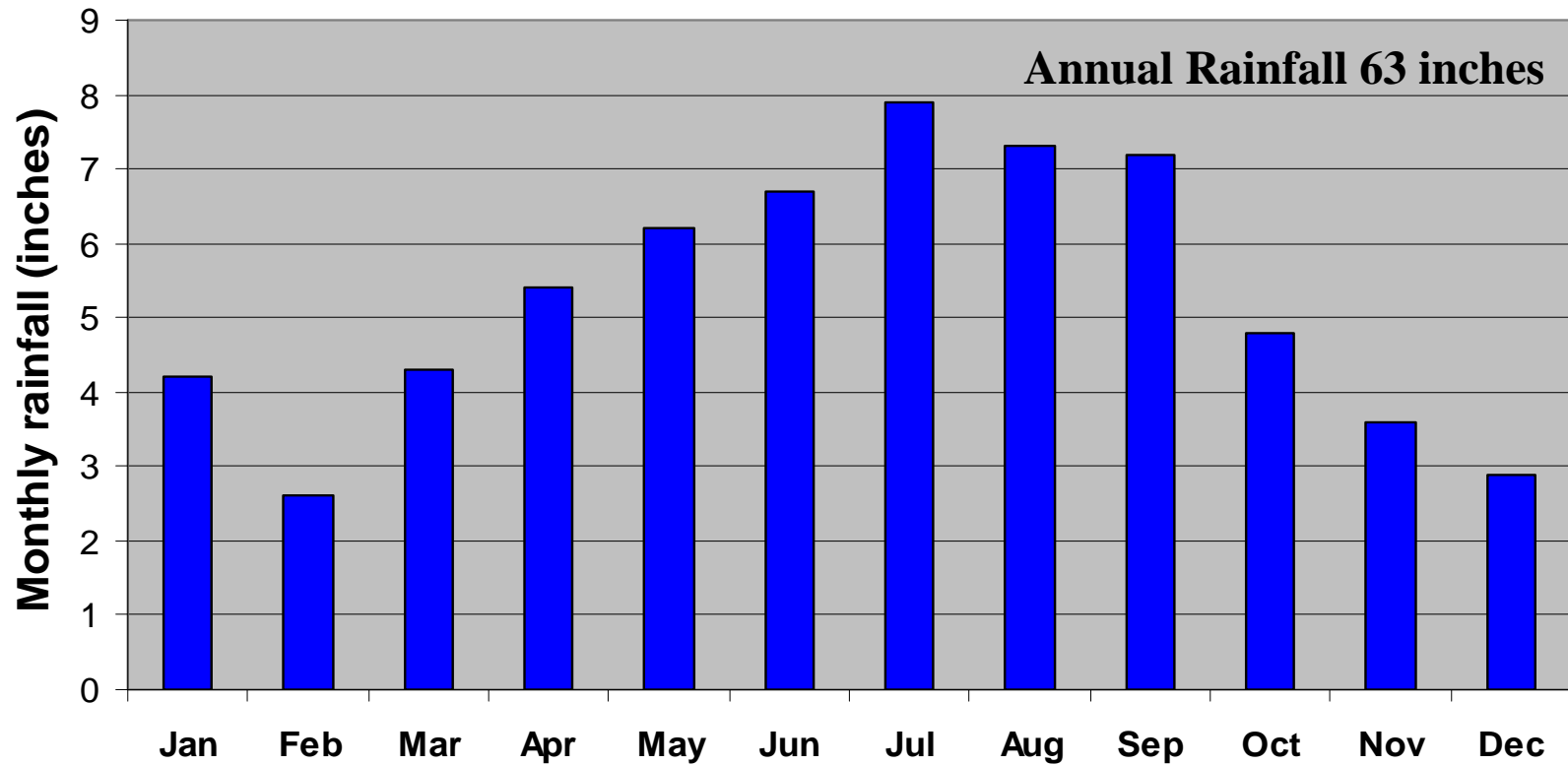
Kaloko Mauka

Kailua

Kealakekua Bay



Kainaliu average monthly rainfall (1949-2005)

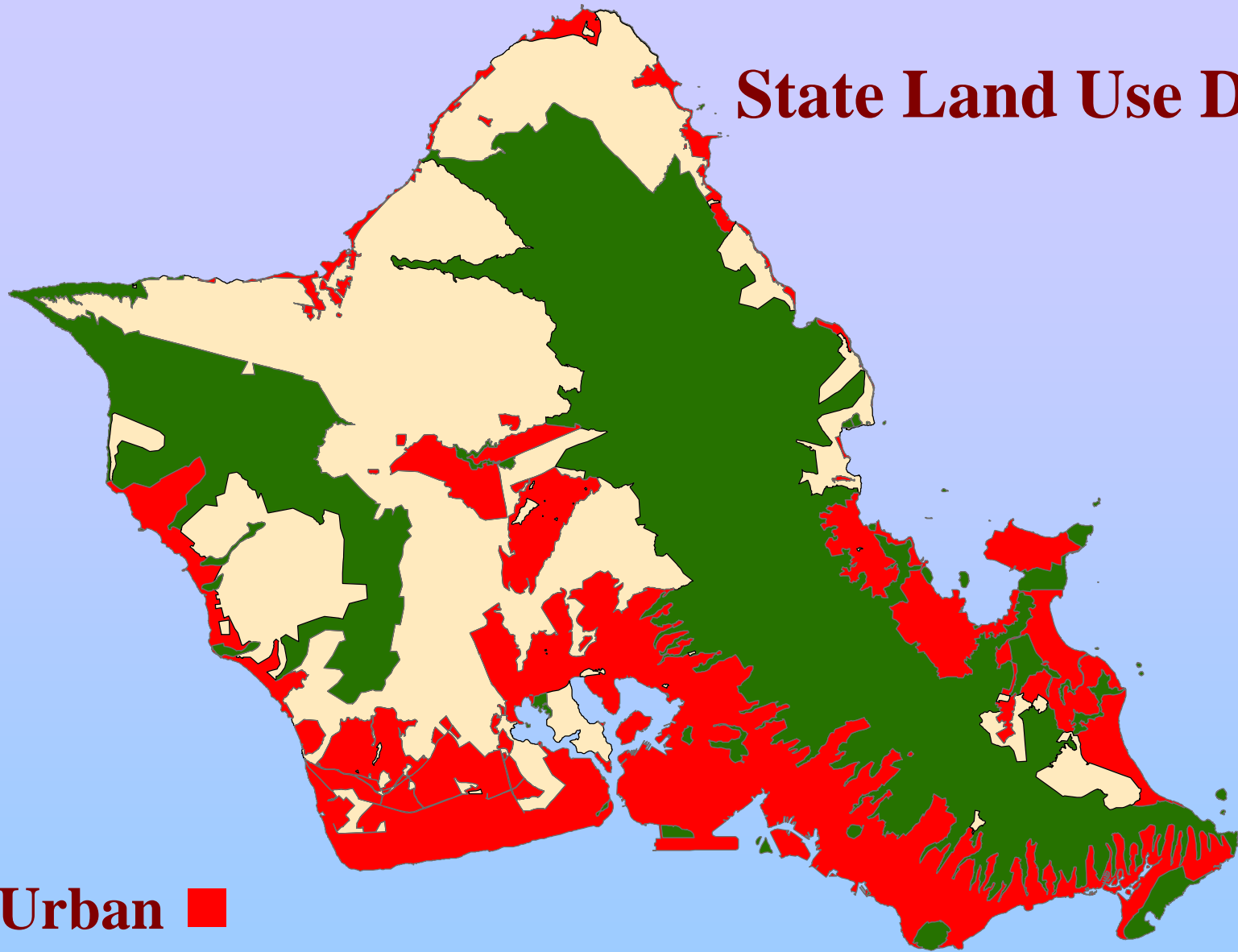


What good are Forest Watersheds ?





State Land Use Districts

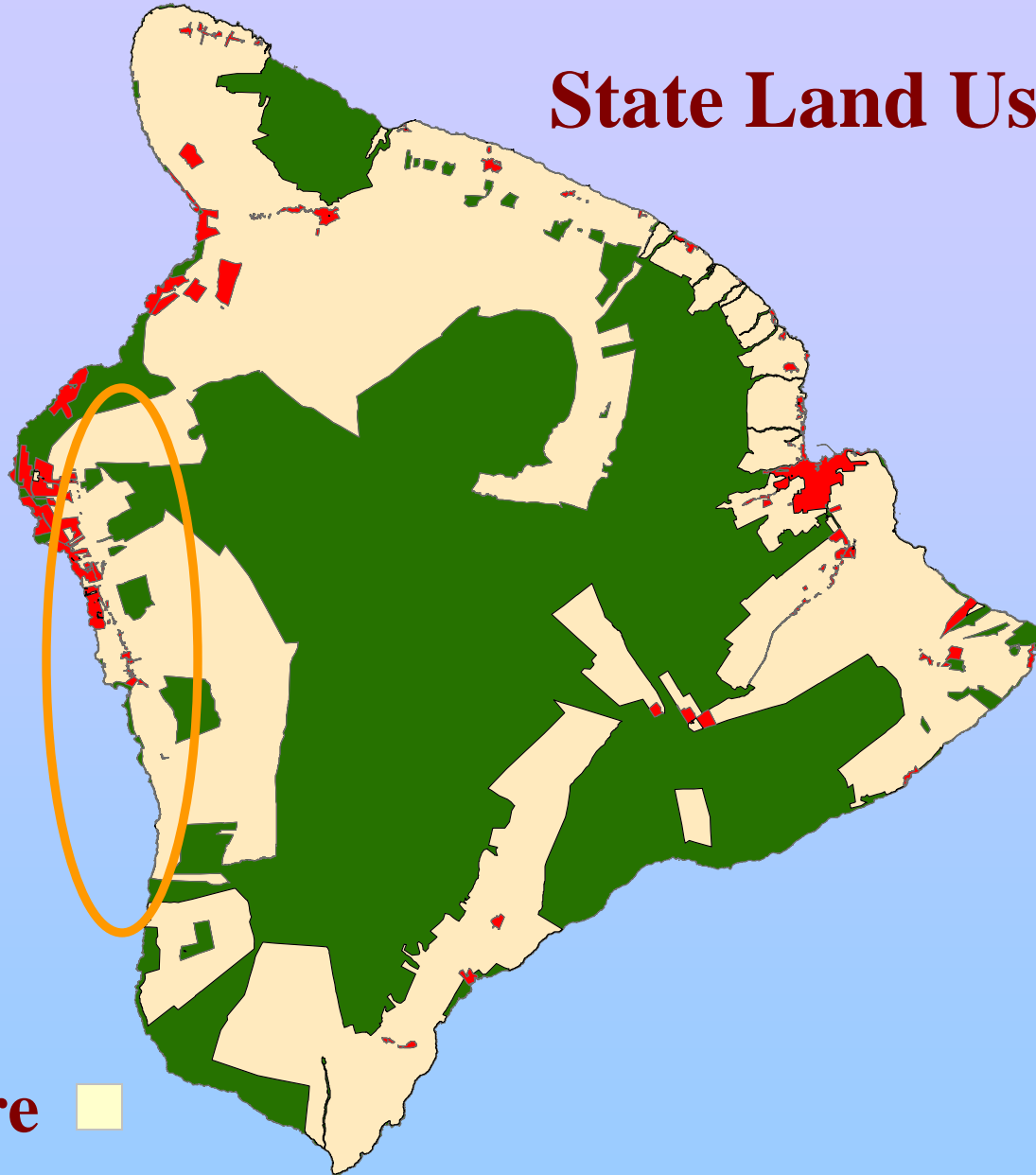


Urban ■

Agriculture ■

Conservation ■

State Land Use Districts



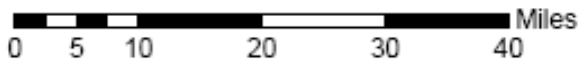
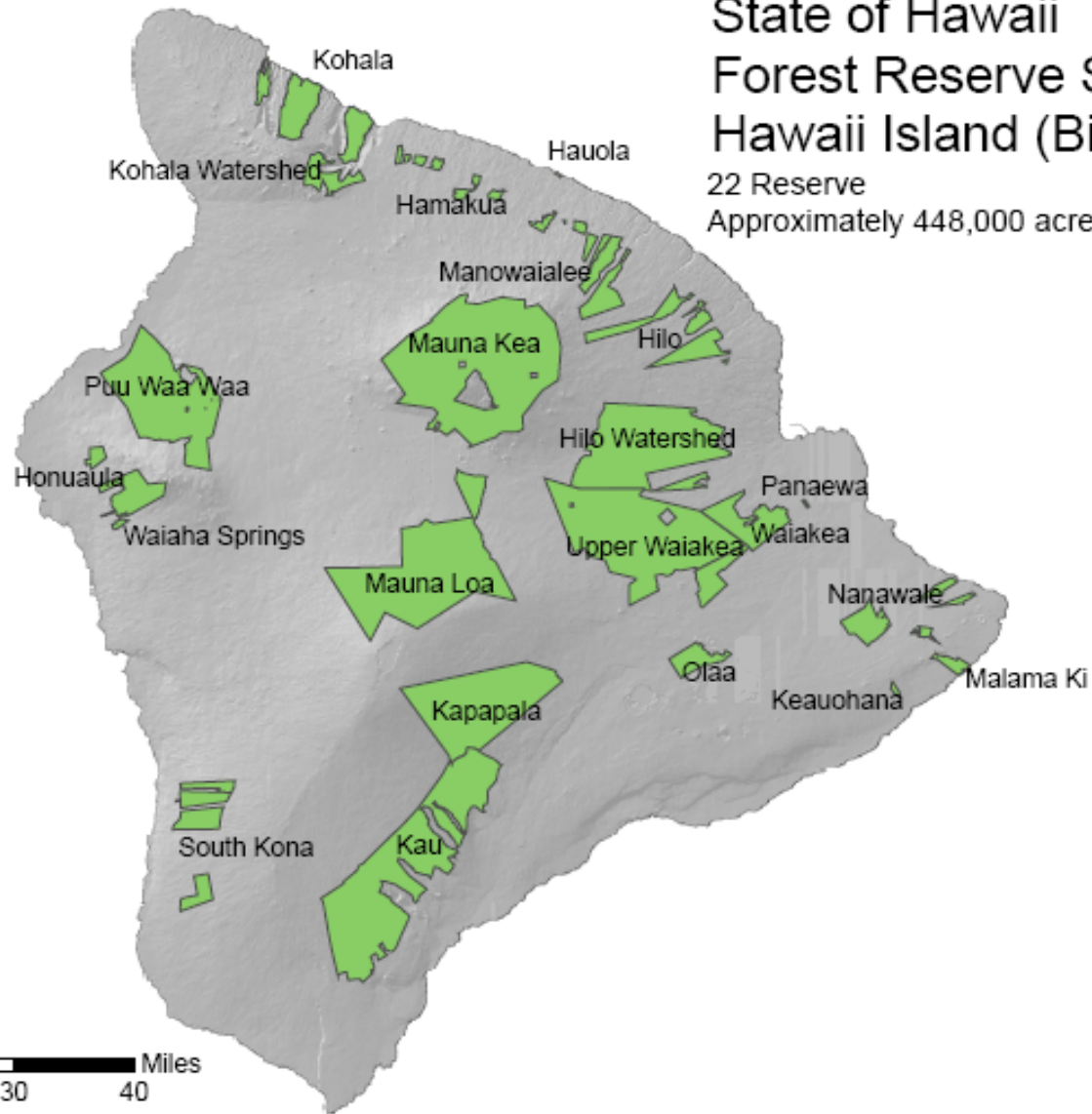
Urban ■

Agriculture ■

Conservation ■






State of Hawaii Forest Reserve System Hawaii Island (Big Island)

22 Reserve
Approximately 448,000 acres



November 2007

Mauka Hawaiian Forests Provide Essential Ecosystems Services:

-  **Clean Water (Surface and Ground Water)**
-  **Flood and Erosion Protection**
-  **Biodiversity Conservation**
-  **Cultural Resources**
-  **Recreation**

Big Island Vegetation Zones

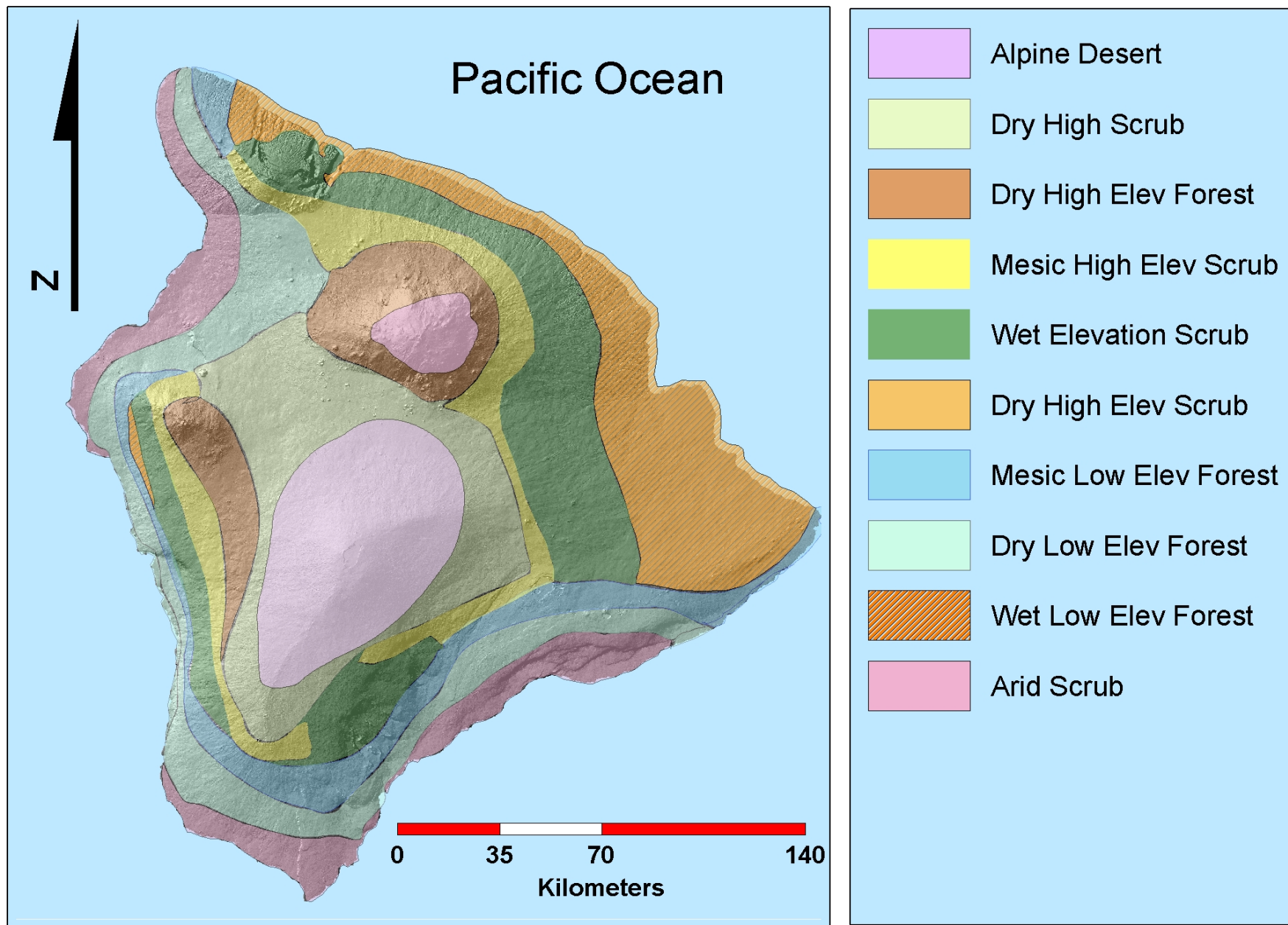




PHOTO: J. Jeffery

Water balance Inputs

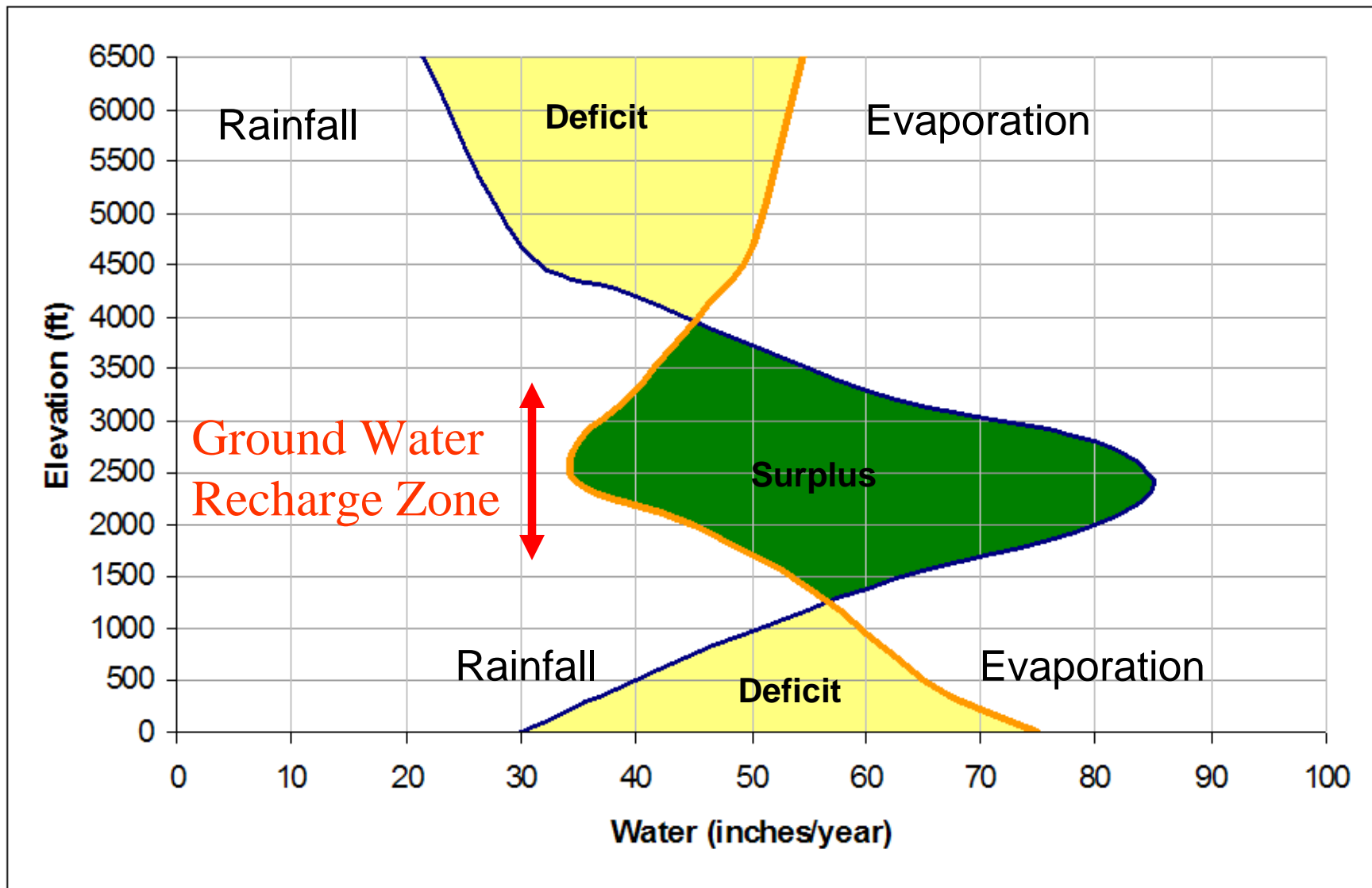
Evaporation

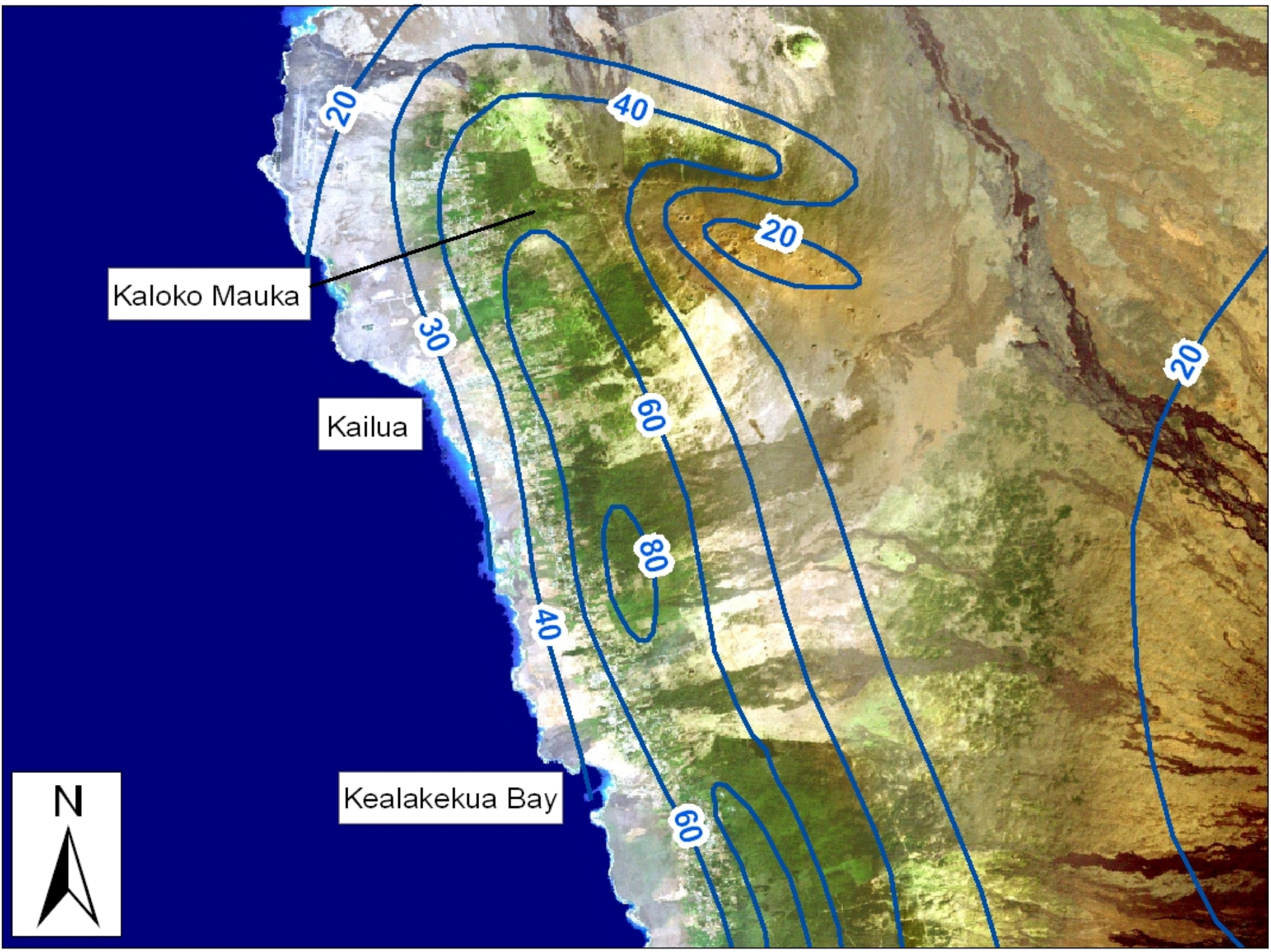


Rain



Central Kona Generalized Annual Water Balance Western Slope, Mauna Loa & Hualalai





Kaloko Mauka

Kailua

Kealakekua Bay





Louvered Screen Fog Interceptor



Water Balance of the Cloud Forest Canopy

$$R + C_i = S + E + T + SF$$

- 💧 R =Rainfall
- 💧 C_i =Cloud-water
- 💧 S =Canopy Storage
- 💧 E =Evaporation
- 💧 T =Canopy Throughfall
- 💧 SF =Stemflow
(typically >5% of rainfall)

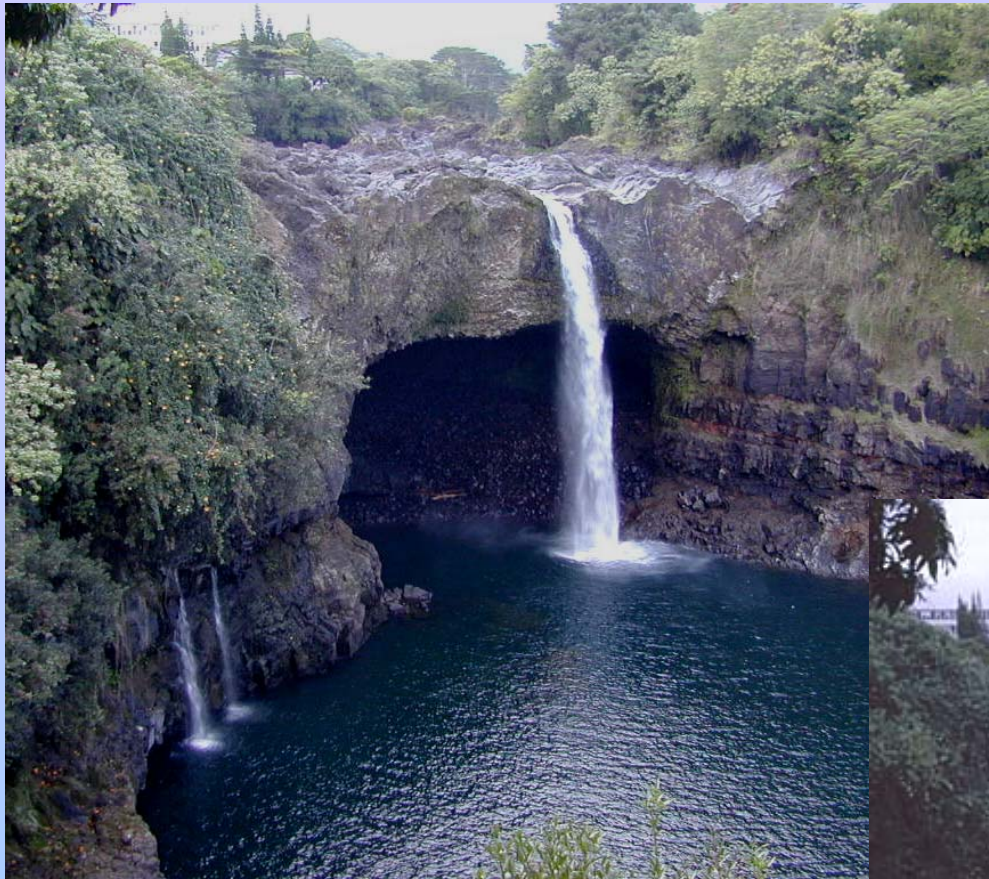


Canopy Throughfall

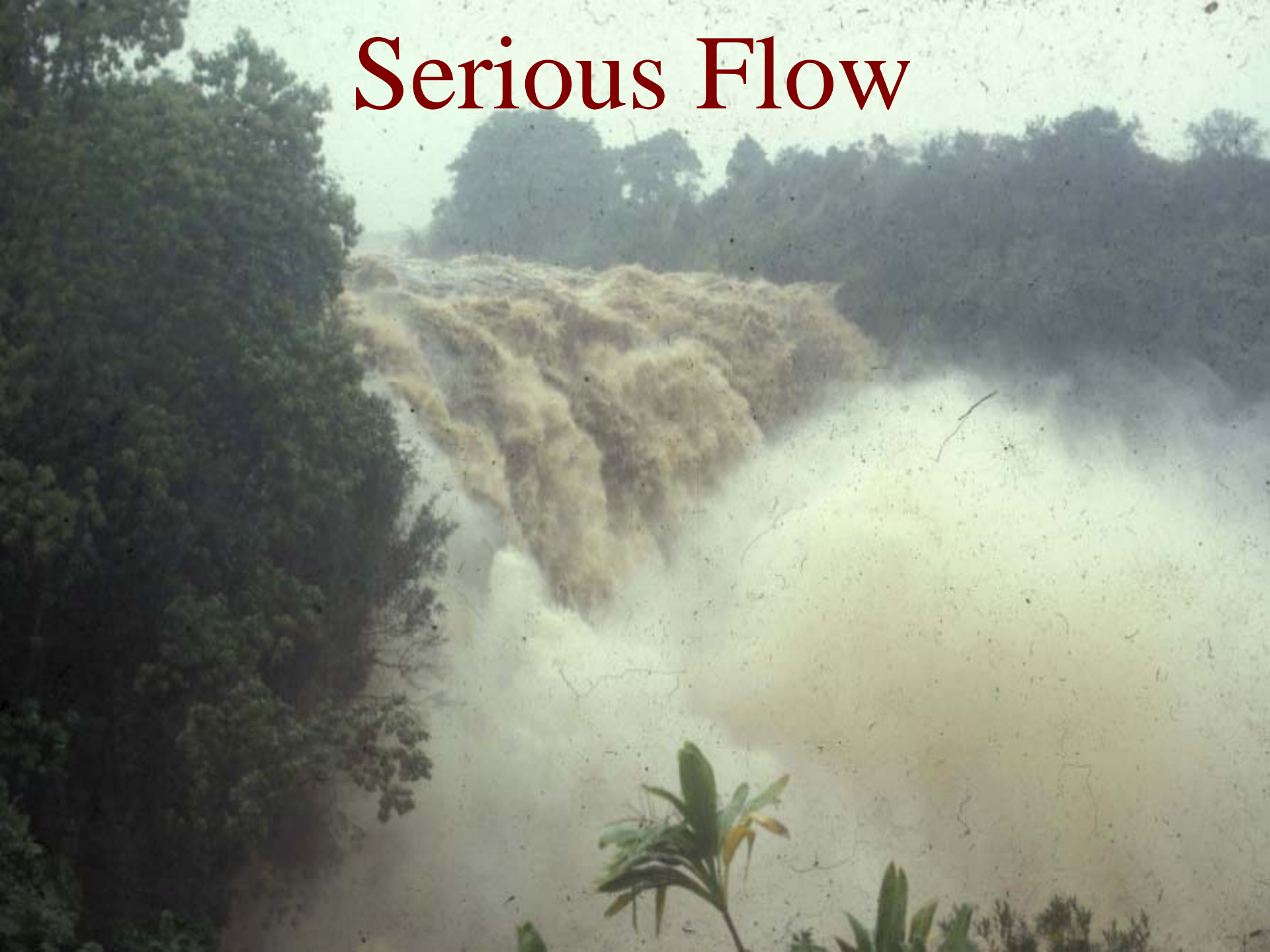


Rainbow Falls

Low and High flow



Serious Flow











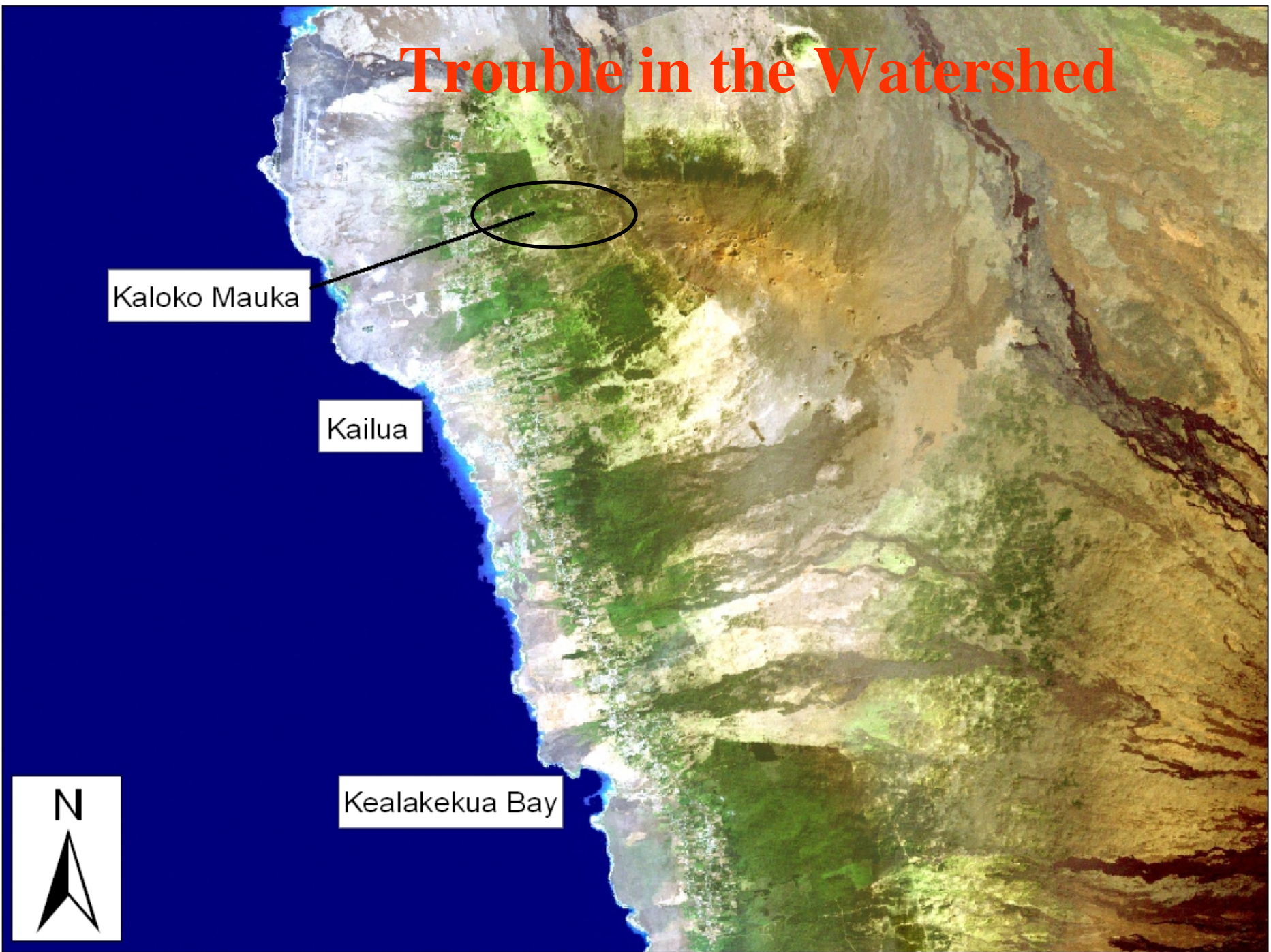


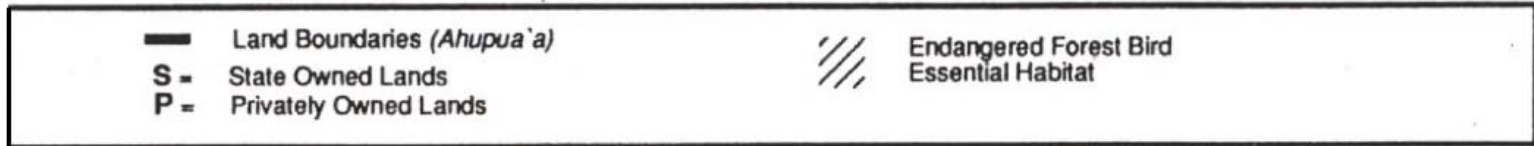
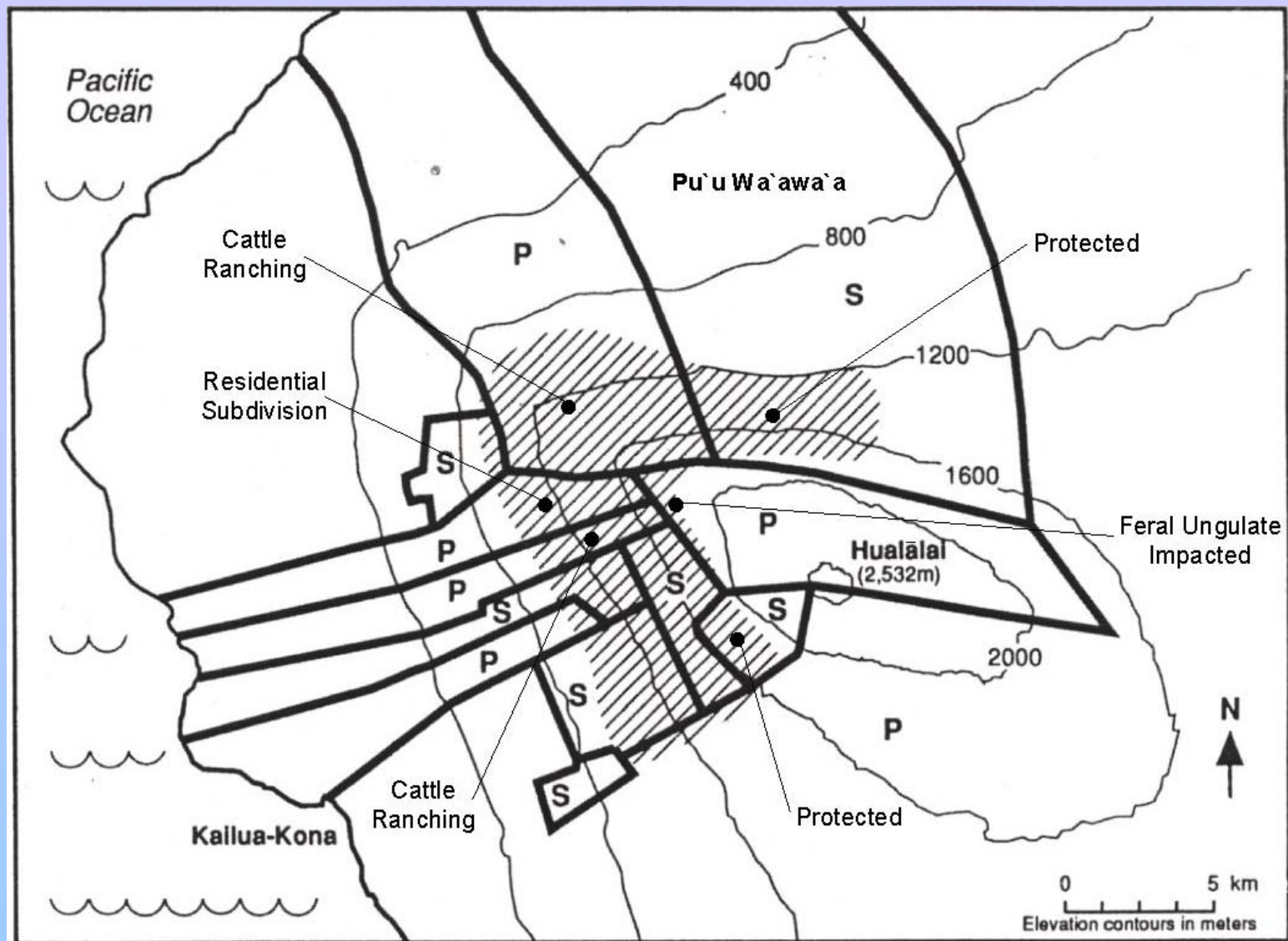
Trouble in the Watershed

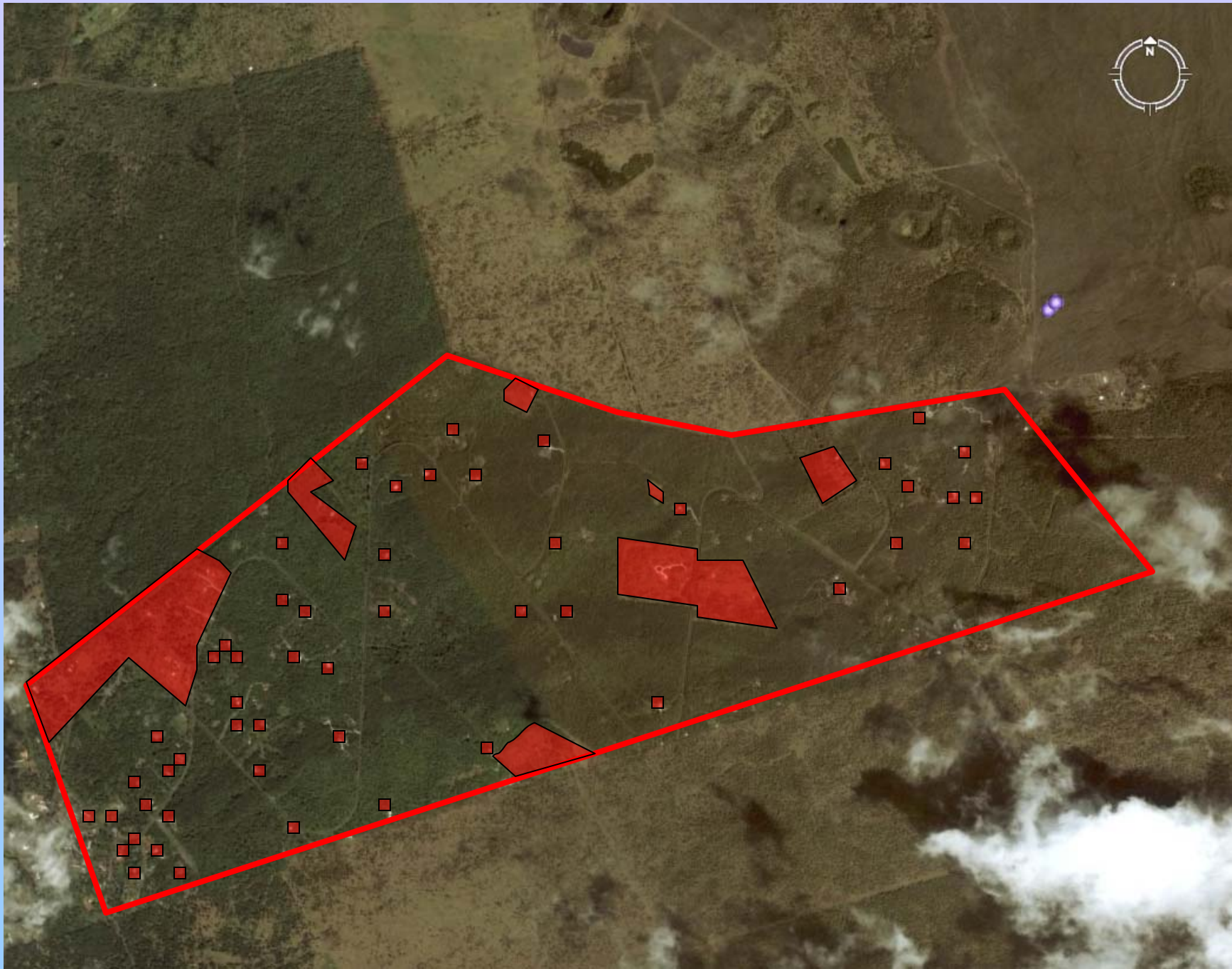
Kaloko Mauka

Kailua

Kealakekua Bay









Ola i ka wai a ka `ōpua.

There is life in the water from the clouds.

~Hawaiian Proverb