The Regosols are essentially of the coarse-textured coral sands along the coast with a relatively low productive capacity. These soils are used for recreation, military purposes, grazing, and forage production.

The Lithosols encompasses most of the rough broken lands not included in any of the other groups. These soils have a very low productively level and much of the area is in forest reserves. (Land Study Bureau 1967:5-6)

Current soil maps for Hawai'i utilize the comprehensive Soil Taxonomy System later developed by the Soil Conservation Service. Instead of soil genesis, this system emphasizes soil properties such as soil depth, moisture, temperature, texture, structure, cation exchange, capacity, base saturation, clay mineralogy, organic matter content, and presence of oxides of iron, aluminum, & salts. (Macdonald et al. 1983:181)

According to this afore-mentioned soil classification system, the coastal plain of Mānā is noted as Entisols [soils with no subsurface horizon development], while the mountain region of grassy and forested areas are comprised mostly of Mollisols [soils that have a soft surface due to the presence of organic matter, oxides, kaolinite, & montmorillonite], and near the steep slopes of valley edges of higher elevations are listed as Ultisols [soils that have an accumulation of silicate clays, kaolinite, & montmorillonite].
(Macdonald et al. 1983:182) (Department of Geography 1983:46)

PLAINS

Mānā coastal plain on the southwestern edge of the island is composed of earthy and marly (a mixture of calcareous material and clay) lagoon deposits, calcareous beach and dune sand, beachrock, and alluvium. It is a gently sloping, wave-cut terrace at the base of ancient sea cliffs. (MacDonald et al. 1983:293,469) Well borings show that these sediments are about 125 feet thick near the base of the mountain ridges and may be 400 to 500 feet thick at the seaward edge of the coastal plain. (AECOS 1982:13-1) This coastal plain between the foot of these cliffs and the shoreline is more than two miles wide in the center, tapering to the north and to the southeast. (AECOS 1982:13-2)

This area was greatly affected by Pleistocene submergence and emergence and by recent Holocene sea level fluctuations. The presence of marine cliffs throughout the island of Kaua'i attest to the effects of the sea on these submerged lands. In the case of the Mānā plains, where the sea retreated there remained a large marshy constructional plain. This emerged coastal plain formed swamps and marshes that were ideally suited to the development of aquaculture ponds by the early inhabitants. (Kikuchi 1987:5)

These ponds, referred to as *loko pu'uone*, were formed by bodies of water being stranded by a natural sand barrier. Some of these ponds were later altered by digging ditches which allowed the sea to enter and exit during times of high tide. The three *loko pu'uone* of the Mānā plains were cited as being Kawai'eli, Kolo, and Nohili. (Kikuchi 1987:9) In addition to afore-mentioned ponds, Limaloa was also described has having similar types of fishes and characteristics of a *loko pu'uone*. (Kilauano 1991) [see Figure 8]

These ponds (also known as the swamps of Mānā) were mostly brackish water. Fresh water run-off from stream beds of the mountain region, artesian springs, or water that percolated out of adjacent aquifers were mixed with seawater that entered through channels during incoming tides. This produced a highly productive estuarine environment that was suitable for the stocking of fish that were able to survive the various fluctuations of salinity. (Keala 1990:4)

Types of these fishes included; *'anae* (mullet), *awa* (milkfish), *āholehole/āhole* (flagtail), *pāpio/ulua* (jackfish), *'ō'io* (bonefish), *nehu* (anchovy), *awa 'aua* (tarpon), *'o'opu* (goby), *kākū* (barracuda), *moi* (threadfish), *weke* (surmullet), as well as a variety of others. (Keala 1990:6)

These types of ponds usually came under the jurisdiction of the *ali'i* (royalty) of the area, whereby, providing a convenient and ever-available supply of fresh seafood for the *ali'i* and its entourage. The extent of utilization and capacity of fish stock of these ponds determined the amount of people needed to manage them. The appointed *konohiki* (land overseer) of Mānā would have managed these ponds with the assistance of the *kia'i loko* (resident pond keeper). (Keala 1990:10-12)

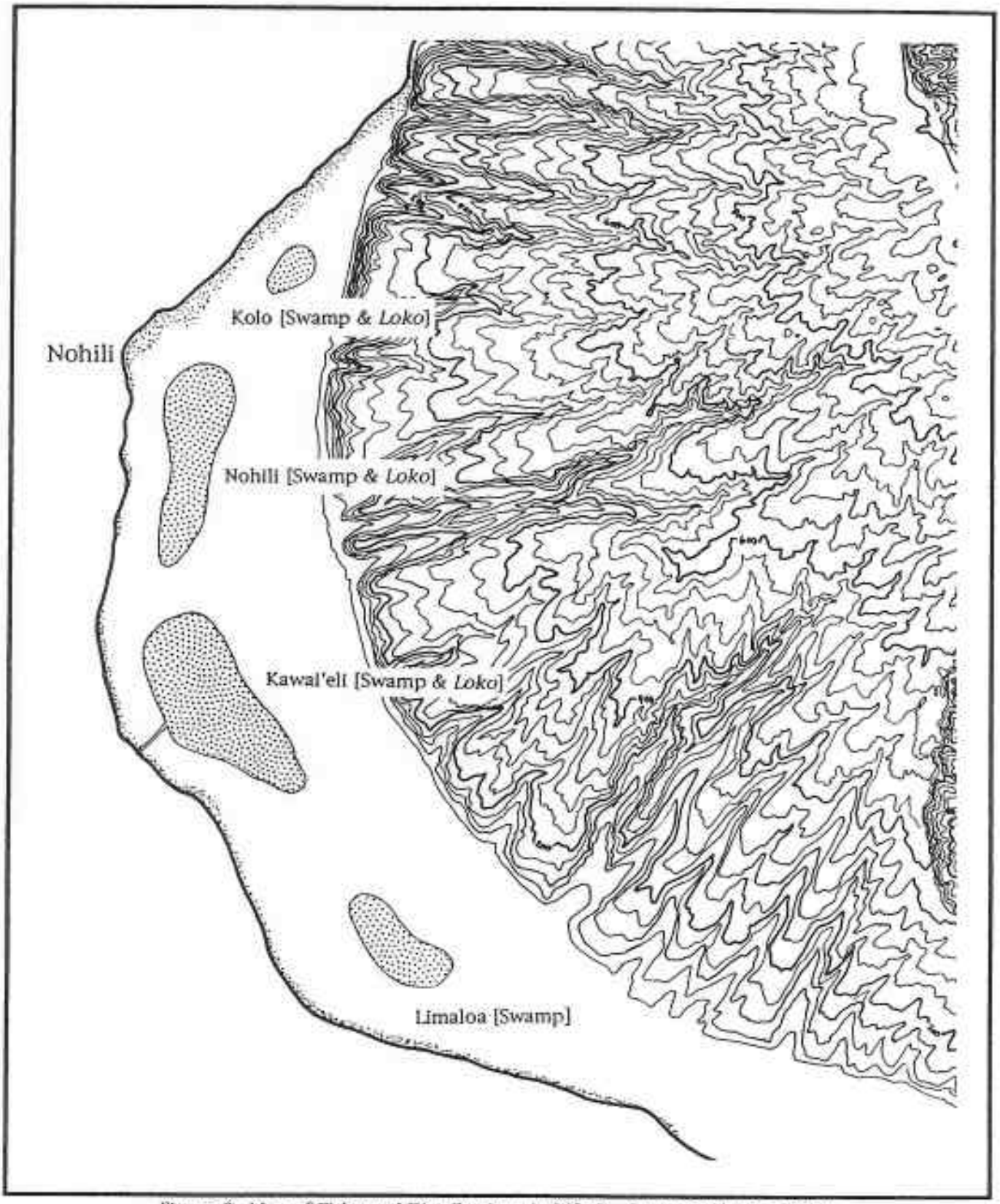

Figure 8: Map of Fishpond Distributions in Mānā Source: (Flores 1991)

The brackish water ponds, marshes, and wetlands of Mānā also provided an important habitat and nesting environment for Hawaiian waterbirds. (AECOS 1982:13-5) Types of these birds included the *koloa maoli* (duck), *'auku'u* (night heron), *āe'o* (stilt), *'alae 'ula* (gallinule), and *'alae kea* (coot).

Previously during the heavy rains of the rainy season, vast areas were completely flooded due to the runoff from the mountain areas and the poor soil drainage. This flooding was to such an extent that you could travel inland by canoe from Waimea to Kolo.

Since those times, the plains of Mānā have been drained-off of the waters that once extended over these lands. As a result, the noted swamps (Kawai'eli/Wai'eli, Kolo, Limaloa, and Nohili), ponds, and marsh lands no longer exist. They were also once used for limited taro cultivation, pasture and grazing lands, and rice cultivation. Today, the plains area are mostly cultivated in sugarcane by Kekaha Sugar Company with the exception of those lands under military use.

Mirages occurred along the plains especially near Limaloa due to the aridness and extreme heat. Although the waters have long since been drained from this area and the terrain changed, the mirages still appear on occasions today on the highway that passes through this area. The area of Limaloa is also noted for its mirages of people and village homes being built on particular moonlit nights led by the ancestral deity with the same name.

MOUNTAINS

The former sea cliffs increases in height from less than 300 feet near Waimea to 1,200 feet at Polihale while being dissected by valleys and gulches of intermittent streams. (AECOS 1982:13-2) These ridges extend up to the western rim of the Waimea Canyon with the peak of Pu'ukapele being the highest point at the 3654 foot elevation for this mountain region of Mānā.

This mountain region provided the early Hawaiian inhabitants resource materials and house construction materials such as timber, *pili* grass, and volcanic stones not available along the coastal plain. The gulches and valleys near the cliff bases provided suitable areas for the cultivation of taro, sweet potatoes, bananas, and other similar food