

Modeling Resources in Windward Kohala

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While the traditional concept of the *ahupua'a* (a community based territory) assumes that each land division should have access to all the bounty of the land available from *mauka* to *makai*, in theory securing each self-sufficient sustainability, this does not necessarily mean equal access to resources. In north Kohala, while most *ahupua'a* meet the description in terms of geographic layout (fig.1), there are questions regarding their sustainability and self-sufficiency. I have created a GIS based map for the windward Kohala *ahupua'a* boundaries. In this study I examine where various *ahupua'a* fall with respect to coastal access, water resources, land area--all of which factor into disparities in resource distribution. I also examine where inter-community resource sharing was promoted by these disparities

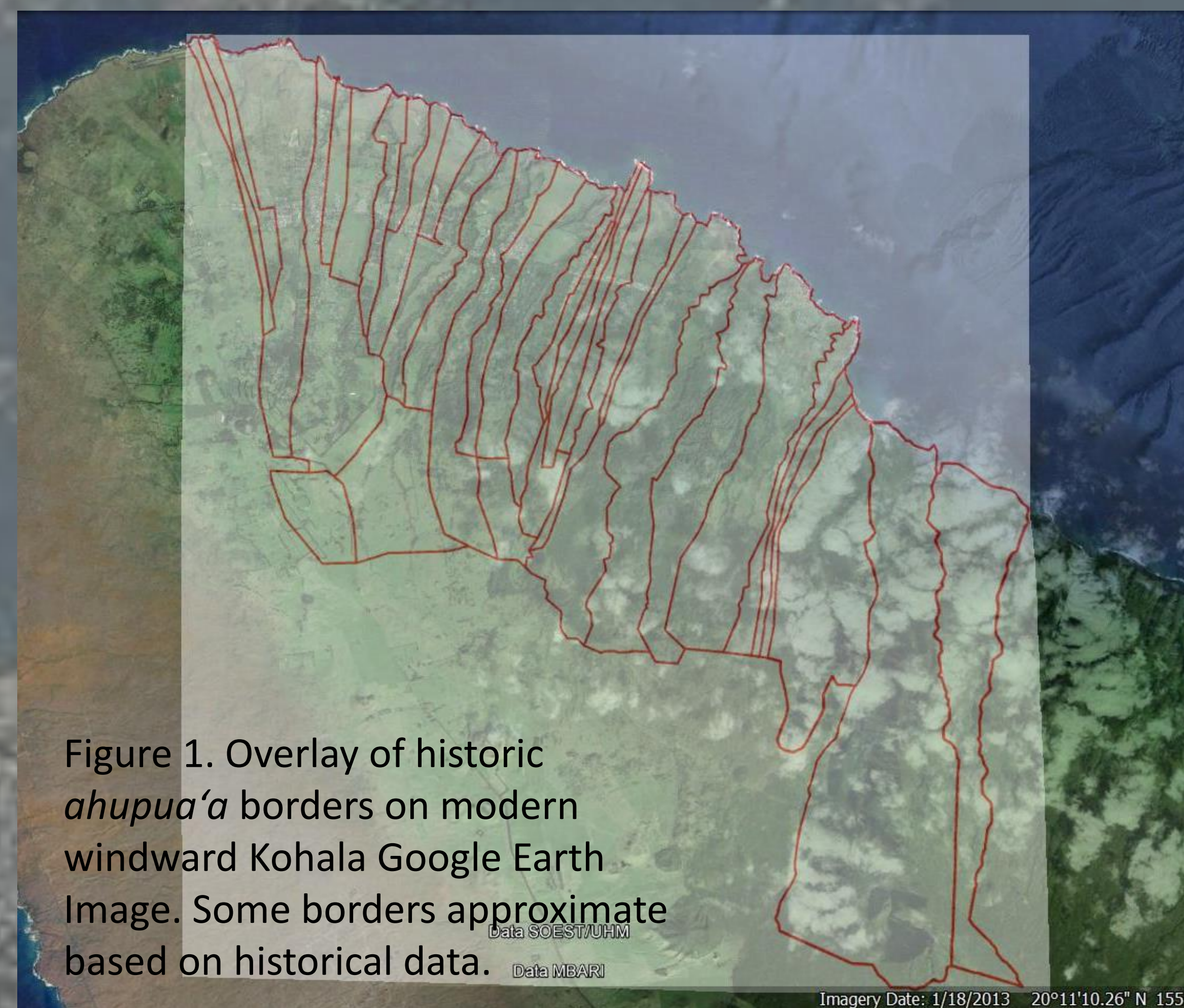


Figure 1. Overlay of historic *ahupua'a* borders on modern windward Kohala Google Earth Image. Some borders approximate based on historical data.

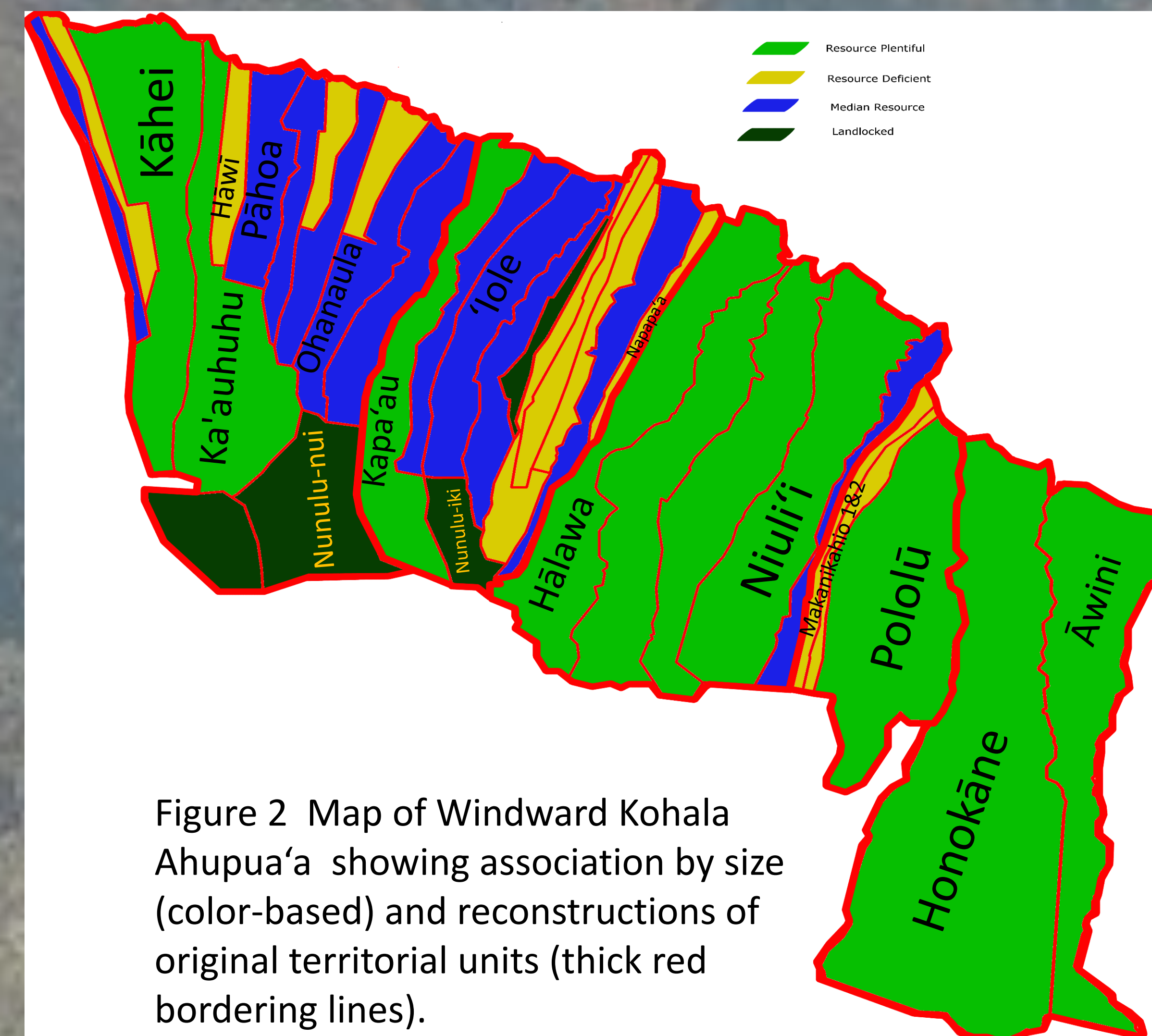


Figure 2 Map of Windward Kohala Ahupua'a showing association by size (color-based) and reconstructions of original territorial units (thick red bordering lines).

When examining the *ahupua'a* borders in their current form, disparities in size are particularly notable. While some, such as Honokāne and Kāheī dwarf the surrounding communities, others such as the Makanikahio 1 and Makanikahio 2, as well as Napapa'a are so small as to be restricted in their resource access (fig 4). Additionally, those *ahupua'a* which lack size, almost invariably have poor sea access or in some few cases, such as Nunulu-iki and Nunulu-nui are entirely landlocked. Based on the location of the large *ahupua'a* in relation to their smaller neighbors, as well as the implications of the border shapes and intersections, it is reasonable to infer that land divisions in windward Kohala were originally part of larger, integrated, "super ahupua'a" in the past. The boundaries of these large units are indicated in heavy red on the boundaries in Figure 2.

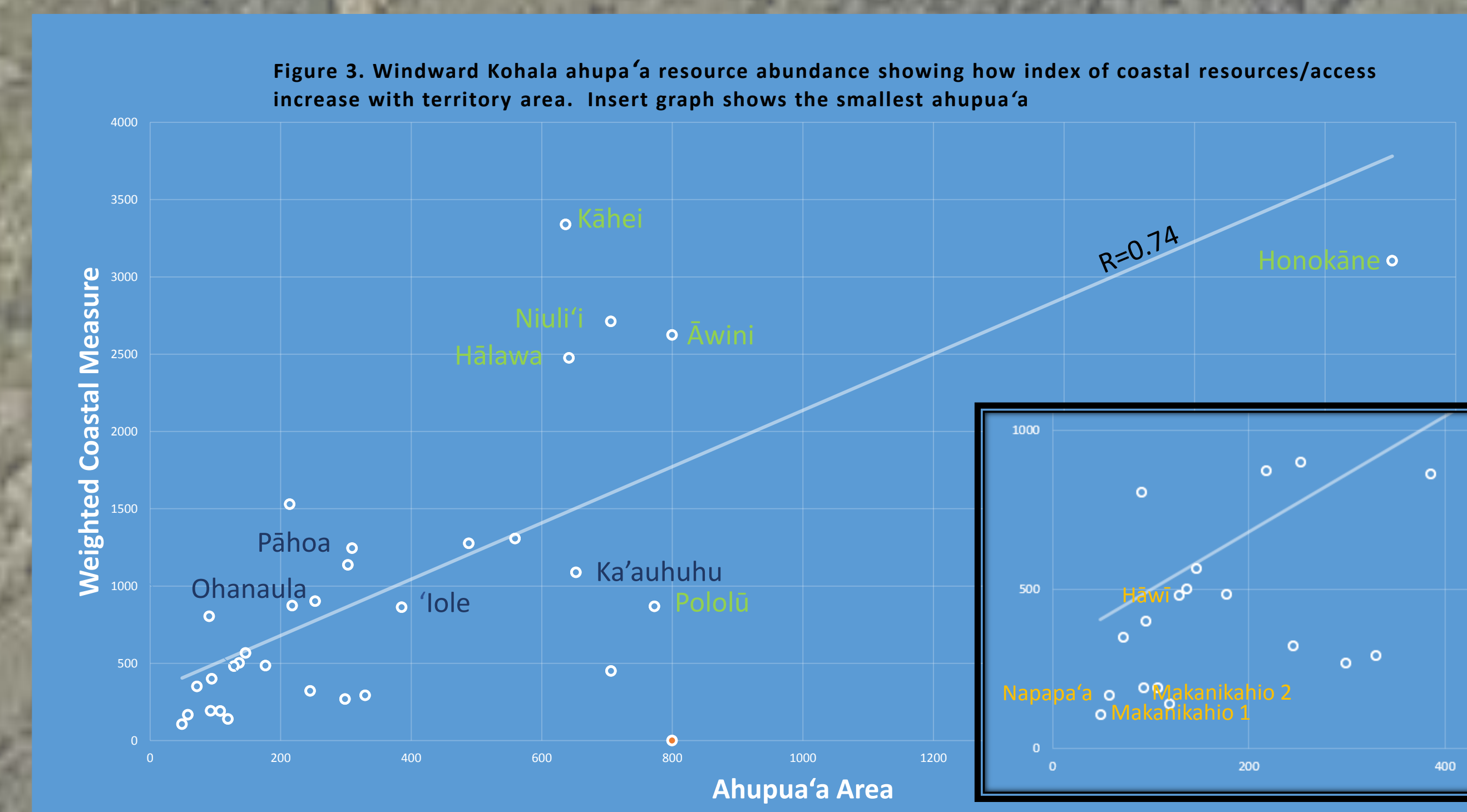


Figure 3. Windward Kohala ahupua'a resource abundance showing how index of coastal resources/access increase with territory area. Insert graph shows the smallest ahupua'a

An analysis of the comparative land mass to the weighted coastline length across all 35 *ahupua'a* in windward Kohala yielded a very high and positive correlation ($r=0.74$) between these two measurements (see Figure 3). Coastal and land resources for any given *ahupua'a* are likely to be similar in scale. A number of *ahupua'a* are deficient across two variables. Here we focus on the resource relationships among the easternmost gulches and Pololū. Makanikahio 1 and 2 are both extremely small, and have coastal access that is entirely composed of cliff line, while nearby Pololū is large in area, with one of the finest bays in the region. Despite this Pololū is relatively poor in water resources, having perennial sources only at the marsh near the coast, and in the upper most tributaries. Makanikahio 2, on the other hand has surplus water from Waikalae Stream but has relatively little land that can be irrigated. As a result we find water being diverted from an high elevation irrigation ditch (denoted by the green line in fig.4) by the border of Makanikahio 2 and diverted downslope into a dry gully that empties into the coastal marsh which effectively enlarges the area for irrigated taro cultivation. Having access to water for irrigation even at high elevations was an resource used to offset deficits elsewhere.

Ahupua'a	Area (ha)	Weighted Coastline Index	Stream Length
Pololū	772.7	868.5m	420m (lower)
			1070m (upper)
Makanikahio 1	48.9	106.5m	369m
Makanikahio 2	98.3	193.5m	480m

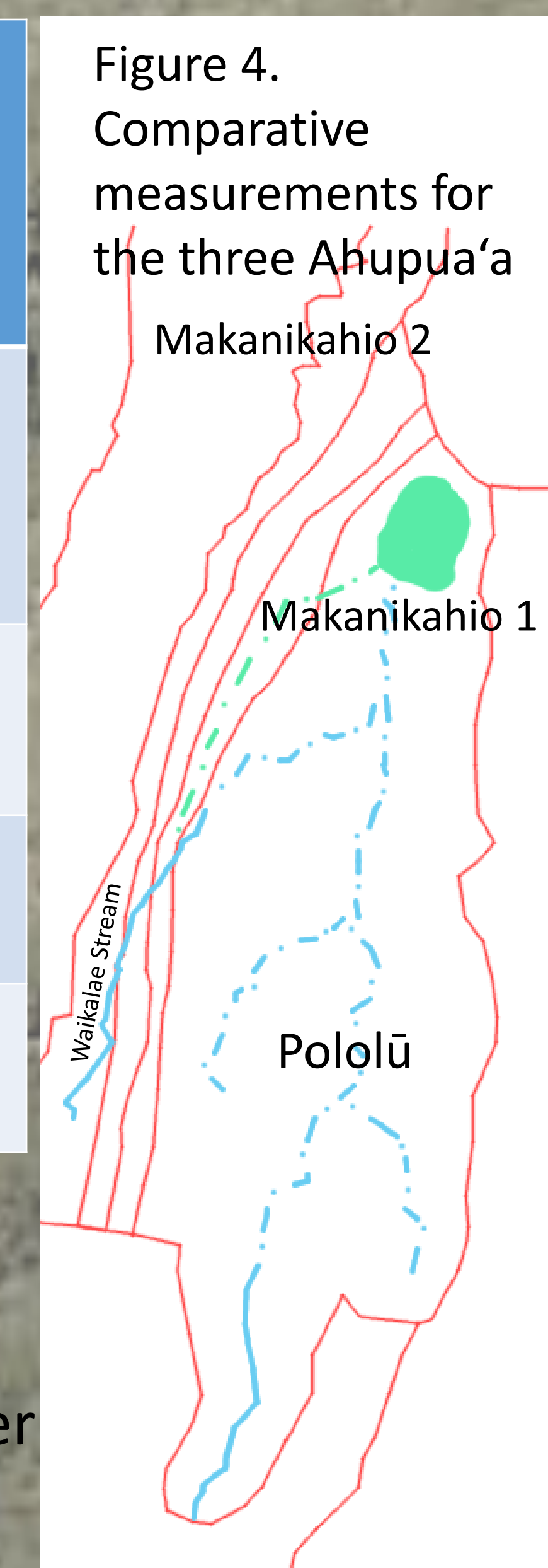


Figure 4. Comparative measurements for the three Ahupua'a

Factors In Resource Self-Sufficiency

- Land Area: determines agricultural potential as well as available catchment for water.
- Coastal Access: determines whether the people of a given ahupua'a can access marine resources. In this study coastal measurements were weighted based on total length, accessibility (embayments) and utility of the individual coastal area.
- Stream Access: determines the viability of wetland agricultural potential and, of course, to supply the local population with water.

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