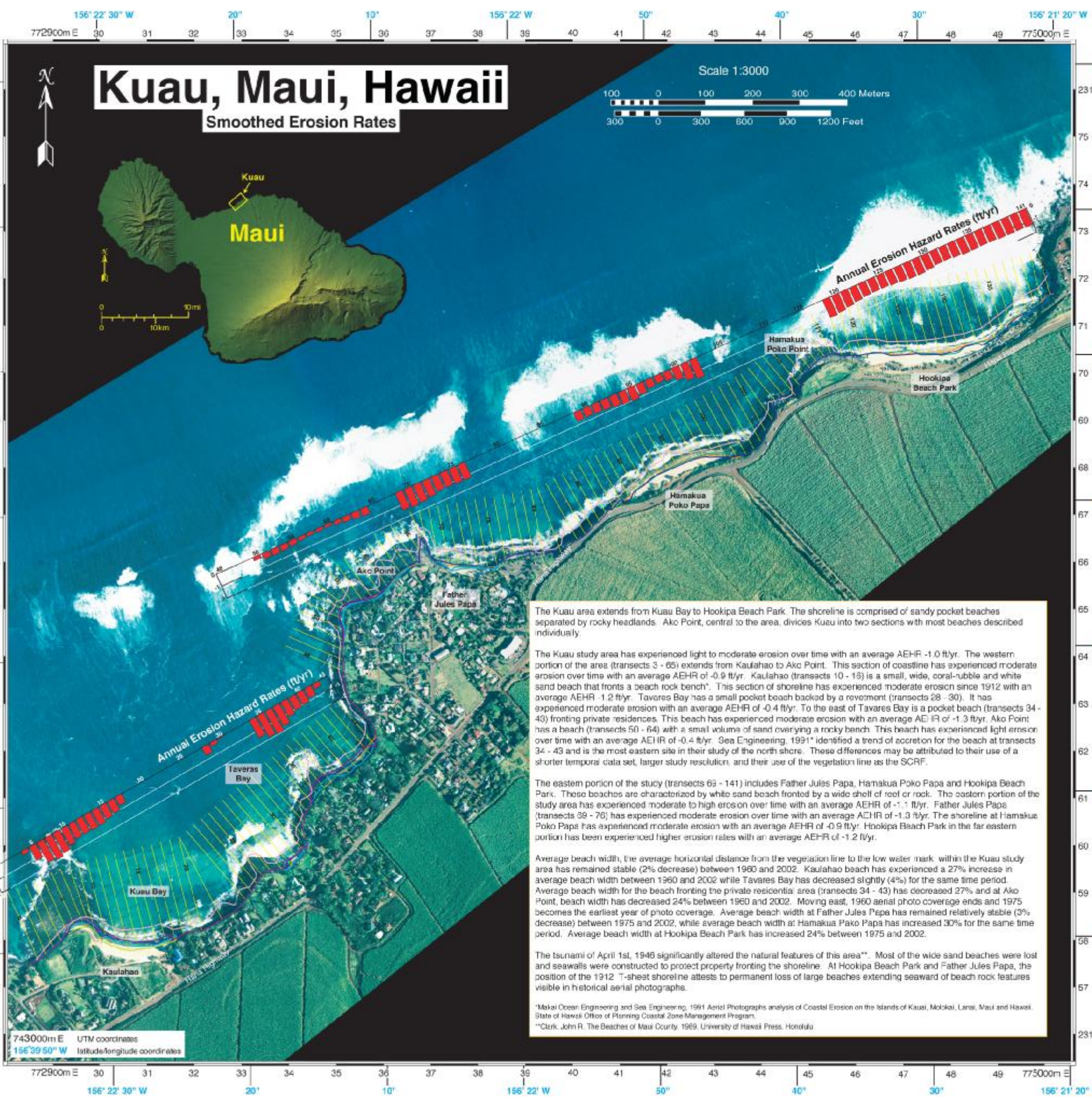


# Kuau, Maui, Hawaii

## Smoothed Erosion Rates



### HISTORICAL SHORELINES

- 1912
- Oct 1960
- Mar 1975
- Aug 1987
- Mar 1988
- May 1997
- Feb 2002
- Erosion rate measurement locations (shore normal transects)

Historical beach positions, color coded by year, are determined using ortho-rectified and georeferenced aerial photographs and National Ocean Survey (NOS) topographic survey charts. The low water mark is used as the historical shoreline, or shoreline change reference feature (SCRF).

For situations in which there is coastal armoring or rocky shoreline seaward of any vegetation, the vegetation line is drawn along the seaward side of the rock or armoring. If there is no sandy beach in these areas, both the vegetation line and the SCRF are delineated along the mean high water line.

Movement of the SCRF is used to calculate erosion rates along shore-normal transects spaced every 20 m (66 ft) along the shoreline. The 1987 SCRF is not used in the calculation of the AEHR, however it provides a gauge of seasonal uncertainty.

### EROSION RATES

- Annual Erosion Hazard Rates (AEHR)

Erosion rates are measured every 20 m along the shoreline. These sites are denoted by yellow shore normal transects. The Annual Erosion Hazard Rate (red), is a spatially smoothed center weighted average of calculated erosion rates. Five contiguous transects are incorporated in the smoothing process. The transects are weighted: 1-3-5-3-1 with the smoothed rate assigned to the center transect. The AEHRs are shown on the shore-parallel histogram graph. Colored bars on the graph correspond to shore-normal transects; approximately every fifth transect and bar are numbered. Where necessary, some transects have been purposely deleted during data processing; as a result, transect numbering is not consecutive everywhere. Where complete beach loss has occurred, erosion rate calculations apply only to the time period when a beach existed.

For most of the Kuau study area, the 1912 T-sheet is included in erosion rate calculations. The T-sheet in the section of shoreline at Aho Point (transects 50 through 64) is unclear as to whether the indicated shoreline feature is sand or headland. The T-sheet shoreline is not used in erosion rate calculations for this portion.

The Kuau area extends from Kuau Bay to Hookipa Beach Park. The shoreline is comprised of sandy pocket beaches separated by rocky headlands. Aho Point, central to the area, divides Kuau into two sections with most beaches described individually.

The Kuau study area has experienced light to moderate erosion over time with an average AEHR of -1.0 ft/yr. The western portion of the area (transects 3 - 65) extends from Kaulahao to Aho Point. This section of coastline has experienced moderate erosion over time with an average AEHR of -0.9 ft/yr. Kaulahao (transects 10 - 15) is a small, wide, coral-rubble and white sand beach that fronts a beach rock bench\*. This section of shoreline has experienced moderate erosion since 1912 with an average AEHR of -1.2 ft/yr. Tavares Bay has a small pocket beach backed by a rockment (transects 28 - 30). It has experienced moderate erosion with an average AEHR of -0.4 ft/yr. To the east of Tavares Bay is a pocket beach (transects 34 - 43) fronting private residences. This beach has experienced moderate erosion with an average AEHR of -1.3 ft/yr. Aho Point has a beach (transects 50 - 64) with a small volume of sand overlying a rocky bench. This beach has experienced light erosion over time with an average AEHR of -0.4 ft/yr. Sea Engineering, 1991\* identified a trend of accretion for the beach at transects 34 - 43 and is the most eastern site in their study of the north shore. These differences may be attributed to their use of a shorter temporal data set, larger study resolution, and their use of the vegetation line as the SCRF.

The eastern portion of the study (transects 65 - 141) includes Father Jules Papa, Hamakua Poko Papa and Hookipa Beach Park. These beaches are characterized by white sand beach fronted by a wide shell of reef or rock. The eastern portion of the study area has experienced moderate to high erosion over time with an average AEHR of -1.1 ft/yr. Father Jules Papa (transects 39 - 76) has experienced moderate erosion over time with an average AEHR of -1.3 ft/yr. The shoreline at Hamakua Poko Papa has experienced moderate erosion with an average AEHR of -0.9 ft/yr. Hookipa Beach Park in the far eastern portion has been experienced higher erosion rates with an average AEHR of -1.2 ft/yr.

Average beach width, the average horizontal distance from the vegetation line to the low water mark within the Kuau study area has remained stable (2% decrease) between 1960 and 2002. Kaulahao beach has experienced a 27% increase in average beach width between 1960 and 2002 while Tavares Bay has decreased slightly (4%) for the same time period. Average beach width for the beach fronting the private residential area (transects 34 - 43) has decreased 27% and at Aho Point, beach width has decreased 24% between 1960 and 2002. Moving east, 1960 aerial photo coverage ends and 1975 becomes the earliest year of photo coverage. Average beach width at Father Jules Papa has remained relatively stable (3% decrease) between 1975 and 2002, while average beach width at Hamakua Poko Papa has increased 30% for the same time period. Average beach width at Hookipa Beach Park has increased 24% between 1975 and 2002.

The tsunami of April 1st, 1946 significantly altered the natural features of this area\*\*. Most of the wide sand beaches were lost and seawalls were constructed to protect property fronting the shoreline. At Hookipa Beach Park and Father Jules Papa, the position of the 1912 T-sheet shoreline attests to permanent loss of large beaches extending seaward of beach rock features visible in historical aerial photographs.

\*Makai Ocean Engineering and Sea Engineering, 1991 Aerial Photographs Analysis of Coastal Erosion on the Islands of Kauai, Molokai, Lanai, Maui and Hawaii. State of Hawaii Office of Planning Coastal Zone Management Program.  
 \*\*Clark, John R. The Beaches of Maui County. 1989. University of Hawaii Press, Honolulu

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