

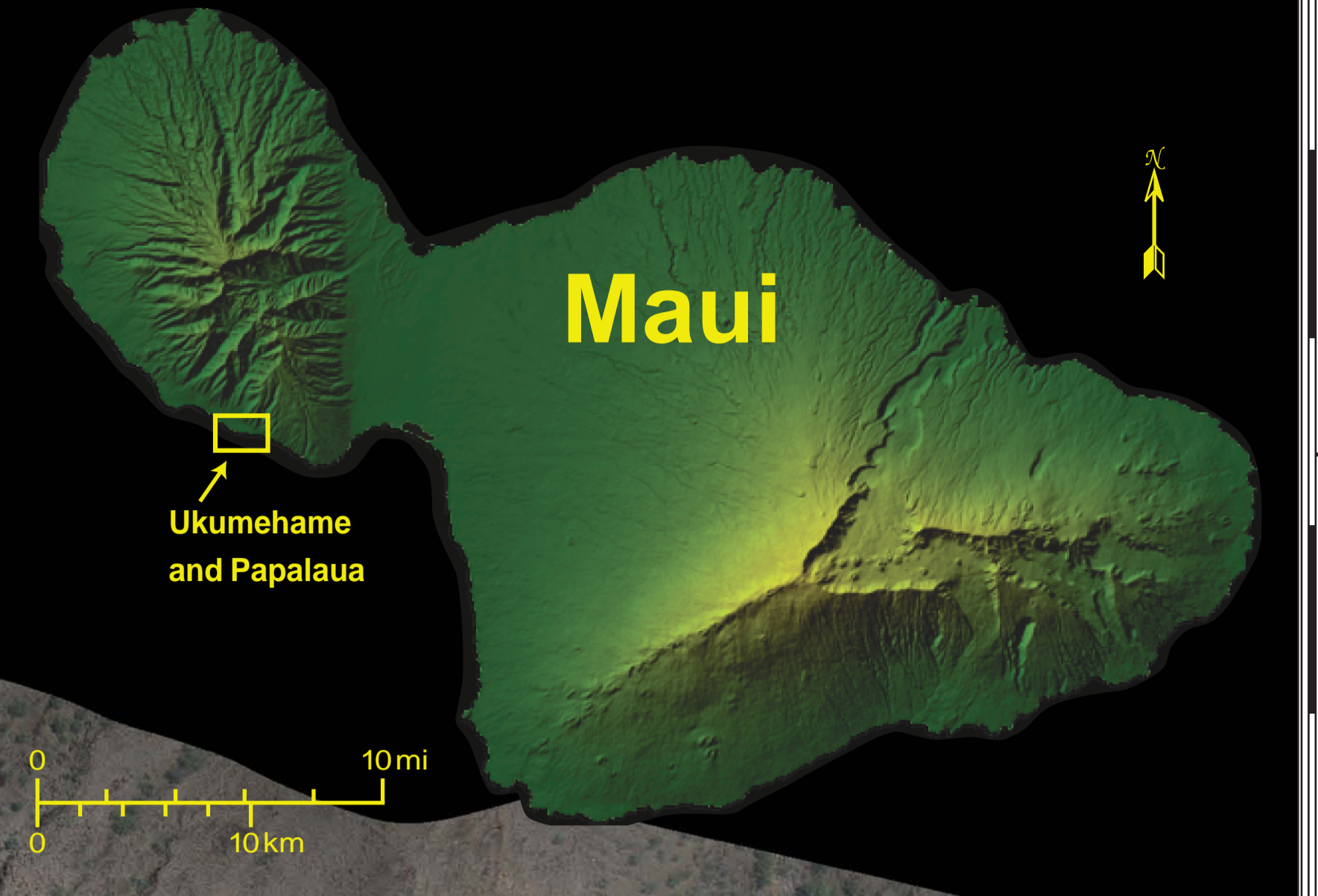
Ukumehame and Papalua, Maui, Hawaii

Annual Erosion Hazard Rates

The Ukumehame and Papalua area (transects 0 – 142) extends from Aalaloa Pali in the southeast to Ukumehame Gulch in the northwest. The shoreline is comprised of sandy and cobble beaches with several sections of hardened shoreline protecting Honoapiilani Hwy. Offshore is a fringing reef system and basaltic rock hard bottom. There are two beach parks in this area: Ukumehame and Papalua. These parks provide convenient features for description purposes.

The area as a whole has experienced moderate erosion since 1912 with an average AEHR of -0.7 ft/yr. The western portion (transects 75 - 142) of the area includes Ukumehame Beach Park. This section of shoreline has experienced moderate erosion over time with an average AEHR of -0.6 ft/yr. The eastern portion of the area (transects 0 - 70) includes Papalua State Wayside Park. This section of shoreline reflects the area trend with an average AEHR of -0.7 ft/yr. Between Ukumehame Beach Park and Papalua State Wayside Park, abutting the highway (transects 50 - 74) is a focus of significant shoreline erosion with an average AEHR of -1.9 ft/yr.

Average beach width, the average horizontal distance from the vegetation line to the low water mark, within the Ukumehame and Papalua area has varied over time. As a whole, average beach width has increased 1% between 1949 and 2007. Where revetments have been installed, beach width change and erosion have resulted in the loss of approximately 450 ft of beach. Beach width in the eastern portion of the area has decreased 9% between 1949 and 2007 while the western portion of the area has increased 20% for the same time period. Beach width along the portion of coast abutting Honoapiilani Hwy has decreased 32% between 1949 and 2007.



TRANSECT	AEHR (ft/yr)	TRANSECT	AEHR (ft/yr)
0	0.241	72	-3.359
1	0.225	73	-2.956
2	0.156	74	-2.139
3	0.107	75	-1.612
4	0.080	76	-1.359
5	0.095	77	-1.238
6	0.134	78	-1.138
7	0.156	79	-1.106
8	0.136	80	-1.122
9	0.078	81	-1.157
10	-0.001	82	-1.200
11	-0.098	83	-1.248
12	-0.185	84	-1.289
13	-0.225	85	-1.298
14	-0.177	86	-1.255
15	-0.099	87	-1.201
16	-0.063	88	-1.135
17	-0.084	89	-1.049
18	-0.031	90	-0.954
19	-0.033	91	-0.867
20	0.100	92	-0.815
21	0.197	93	-0.760
22	0.264	94	-0.681
23	0.298	95	-0.584
24	0.297	96	-0.511
25	0.256	97	-0.470
26	0.200	98	-0.438
27	0.165	99	-0.403
28	0.159	100	-0.385
29	0.172	101	-0.384
30	0.178	102	-0.395
31	0.174	103	-0.408
32	0.122	104	-0.421
33	0.001	105	-0.439
34	-0.184	106	-0.461
35	-0.411	107	-0.483
36	-0.647	108	-0.514
37	-0.880	109	-0.549
38	-1.092	110	-0.589
39	-1.259	111	-0.612
40	-1.374	112	-0.616
41	-1.449	113	-0.612
42	-1.489	114	-0.608
43	-1.463	115	-0.613
44	-1.414	116	-0.619
45	-1.312	117	-0.612
46	-1.248	118	-0.590
47	-1.065	119	-0.554
48	-1.089	120	-0.490
49	-1.154	121	-0.416
50	-1.253	122	-0.349
51	-1.318	123	-0.151
52	-1.383	124	-0.089
53	-1.458	125	0.035
54	-1.543	126	0.235
55	-1.530	127	0.413
56	-1.429	128	0.441
57	-1.386	129	0.288
58	-1.442	130	0.069
59	-1.576	131	-0.102
60	-1.732	132	-0.204
61	-1.861	133	-0.282
62	-1.954	134	-0.362
63	-2.027	135	-0.409
64	-2.094	136	-0.415
65	-2.117	137	-0.402
66	-2.087	138	-0.393
67	-2.007	139	-0.366
68	-1.920	140	-0.278
69	-2.030	141	-0.125
70	-2.488	142	0.034
71	-3.174		

HISTORICAL SHORELINES

- 1912 T-sheet
- Nov 1949
- Oct 1960
- Mar 1975
- Jul 1987
- Mar 1988
- May 1997
- June 2007
- 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 Annual Erosion Hazard Rate (AEHR). It is used in determining seasonal uncertainty.

ANNUAL EROSION HAZARD RATES (AEHR)

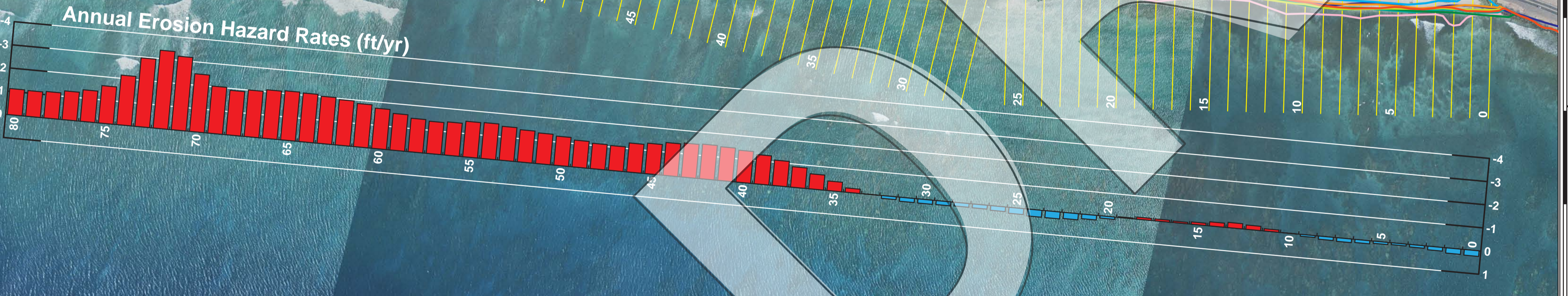
- Accretion Rate
- Erosion Rate

Historical shoreline positions are measured every 66 ft along the shoreline. These sites are denoted by yellow shore-perpendicular transects. Changes in the position of the shorelines through time are used to calculate shoreline change rates (ft/yr) at each transect location.

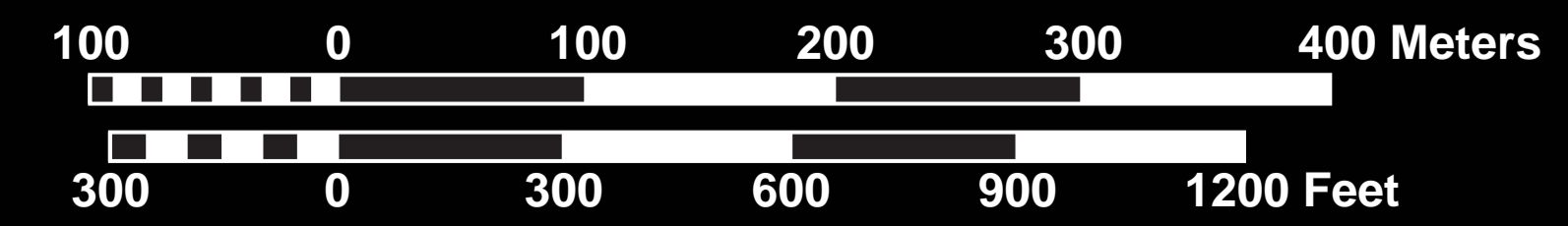
Annual erosion hazard rates (AEHR) are shown on the shore-parallel graph. Red bars on the graph indicate a trend of beach erosion, while blue bars indicate a trend of accretion. Approximately every fifth transect and bar of the graph is numbered. Where necessary, transects have been purposely deleted to maintain consistent along-shore spacing. As a result transect numbering is not consecutive everywhere.

The Single Transect (ST) method (Genz et al., 2009) is used to calculate erosion hazard rates for the study area. The rates are smoothed alongshore using a 1-3-5-3-1 technique to normalize rate differences on adjacent transects. For more information on erosion rate methods and results see: <http://www.soest.hawaii.edu/coasts/erosion/index.php>

Genz, A.S., Frazer, L.N., and Fletcher, C.H. (2009) Toward parsimony in shoreline change prediction (II): Applying basis function methods to real and synthetic data. *Journal of Coastal Research*, vol. 25, no. 2: 380-392.



Scale 1:3000



2291500m N UTM coordinates
156°27'10" W latitude/longitude coordinates