

Puamana, Maui, Hawaii

Annual Erosion Hazard Rates

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.

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.

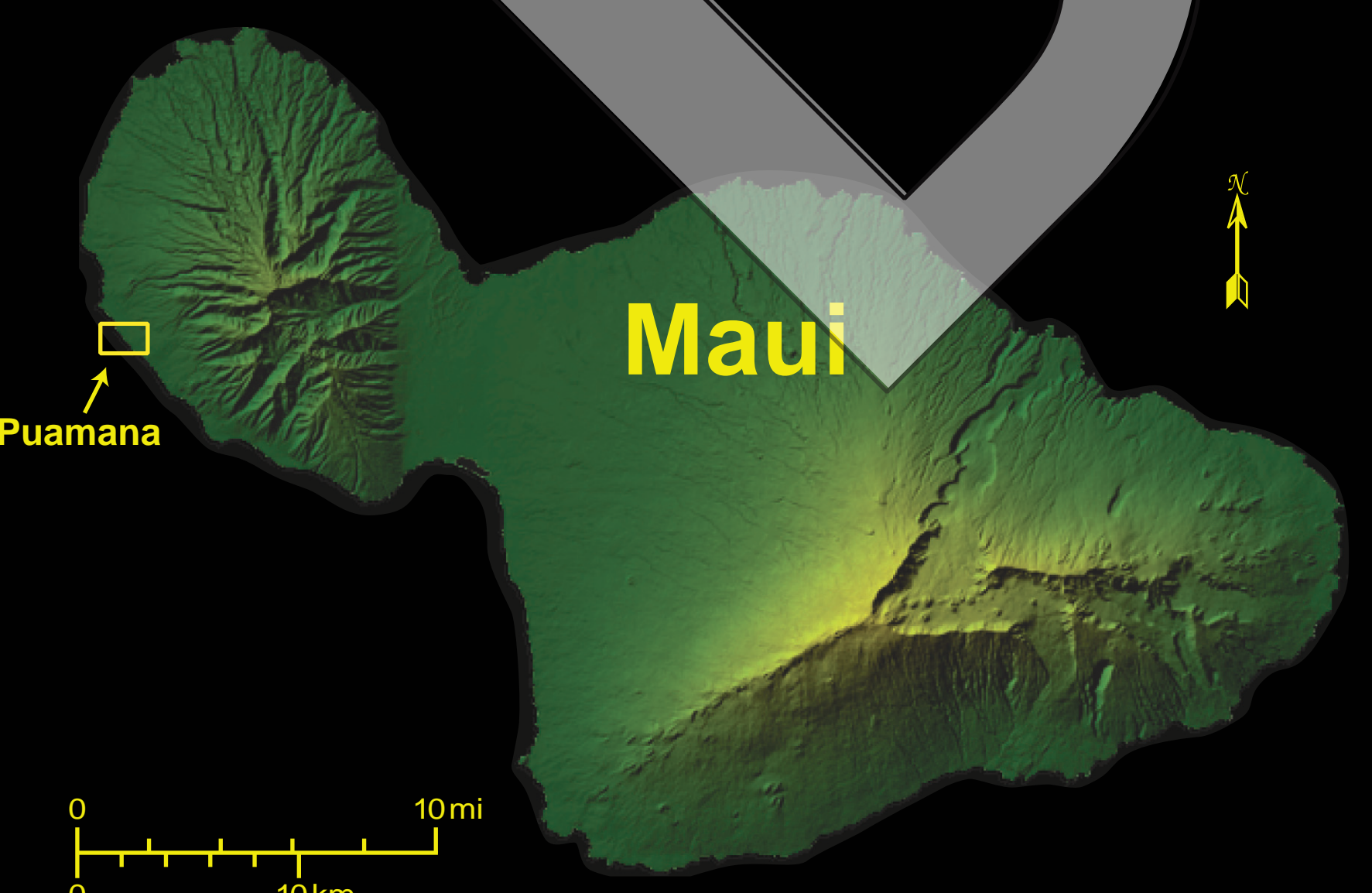
Movement of the SCRF is used to calculate erosion rates along shore-normal transects spaced every 20 m (66 ft) along the shoreline. The 1987 SCRF is not used in the calculation of the Annual Erosion Hazard Rate (AEHR). It is used in determining seasonal uncertainty.

The Puamana study area (transects 648 - 778) is centered on Puamana Beach Park between Lahaina Boat Harbor to the north and Paunau Beach Park in the south. The shoreline is comprised of both sandy and cobble beaches broken by hardened shoreline. Coastal armoring first appears in 1949 to the north of Puamana Beach where private homes are threatened by shoreline change. Puamana Beach Park is located in the approximate center of the study area and provides a convenient feature to divide the area for description purposes.

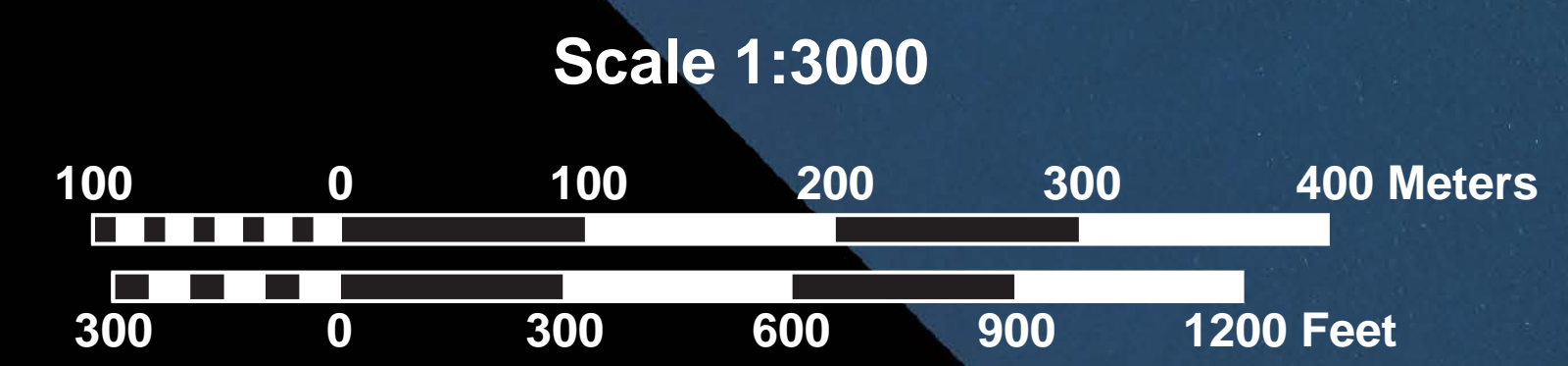
As a whole, the Puamana area has experienced moderate to severe erosion with an average AEHR of -0.3 ft/yr. The southern portion (transect 654 - 697) of the area includes Paunau Beach Park. This section of shoreline has experienced moderate erosion over time with an average AEHR of -0.8 ft/yr. The northern portion (transects 703 - 778) has experienced slight accretion over time with an average AEHR of 0.1 ft/yr.

Average beach width, the average horizontal distance from the vegetation line to the low water mark, has varied greatly within the Puamana study area between 1949 and 2007. Overall, the area has experienced a 27% decrease in average beach width. Where revetments have been installed, beach width change and erosion have resulted in the loss of approximately 1050 ft of beach. Average beach width in the southern portion of the area has decreased 36% between 1949 and 2007 while average beach width in the northern portion of the area has decreased 21% for the same period.

TRANSECT	AEHR (ft/yr)	TRANSECT	AEHR (ft/yr)
648	Hard	714	-0.728
649	Hard	715	-0.218
650	Hard	716	-0.228
651	Hard	717	-0.294
652	Hard	718	-0.443
653	Hard	719	-0.682
654	-0.912	720	-0.976
655	-0.940	721	-1.369
656	-0.963	722	-1.592
657	-0.904	723	Hard
658	-0.761	724	-0.558
659	-0.668	725	-0.495
660	-0.610	726	-0.393
661	-0.561	727	-0.270
662	-0.505	728	-0.151
663	-0.462	729	-0.058
664	-0.431	730	-0.010
665	-0.412	731	-0.015
666	-0.408	732	0.010
667	-0.419	733	0.218
668	-0.423	734	0.601
669	-0.418	735	1.014
670	-0.418	736	1.282
671	-0.435	737	1.436
672	-0.457	738	1.506
673	-0.496	739	1.501
674	-0.562	740	1.415
675	-0.662	741	1.257
676	-0.767	742	1.085
677	-0.859	743	0.909
678	-0.922	744	0.754
679	-0.961	745	0.618
680	-0.984	746	0.502
681	-1.012	747	0.383
682	-1.045	748	0.260
683	-1.066	749	0.143
684	-1.066	750	0.048
685	-1.069	751	-0.005
686	-1.088	752	-0.038
687	-1.130	753	-0.052
688	-1.182	754	-0.057
689	-1.210	755	-0.047
690	-1.206	756	-0.014
691	-1.186	757	0.034
692	-1.158	758	0.106
693	-1.151	759	0.216
694	-1.202	760	0.344
695	-1.290	761	0.458
696	-1.294	762	0.546
697	-1.214	763	0.628
698	Hard	764	0.680
699	Hard	765	0.677
700	Hard	766	0.621
701	Hard	767	0.528
702	Hard	768	0.417
703	-0.683	769	0.294
704	-0.578	770	0.149
705	-0.432	771	-0.032
706	-0.299	772	-0.231
707	-0.236	773	-0.401
708	-0.188	774	-0.560
709	-0.140	775	-0.704
710	-0.089	776	-0.739
711	-0.110	777	-0.688
712	-0.282	778	-0.575
713	-0.549		



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



County of Maui
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USGS science for a changing world
CZM Hawaii
NOAA
Maui Shoreline Atlas 2007