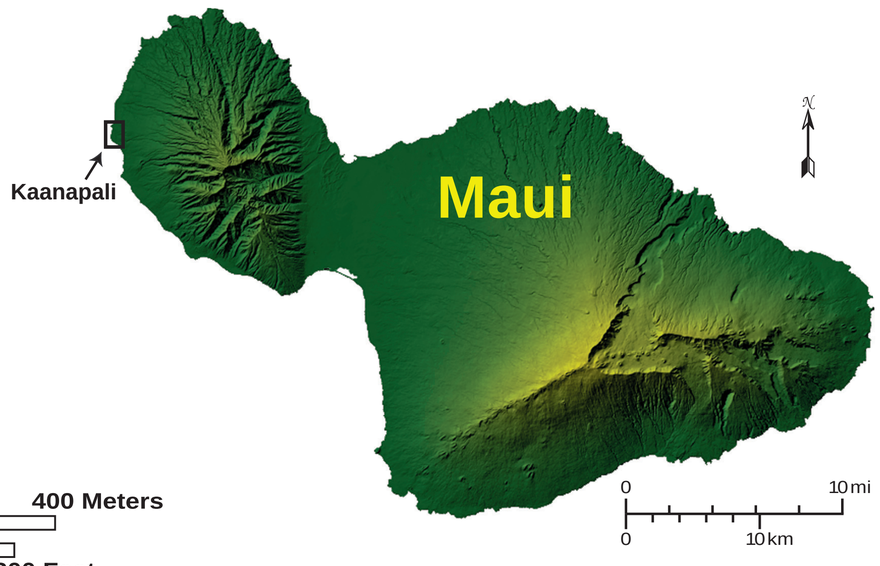
Kaanapali, Maui, Hawaii

Annual Erosion Hazard Rates



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2012

Grant Agreement G2824

The preparation of this poster was financed in part by the Coastal Zone Management Act of 1972, as amended, administered by the Office of Ocean and Coastal Resource Management, National Ocean Service, National Oceanic and Atmospheric Administration, United States Department of Commerce, through the Office of Planning, State of Hawaii.

Scale 1:3000

100 0 100 200 300 400 Meters

300 0 300 600 900 1200 Feet

156°41'50" W 40" 30" 20" 10" 156°41' W

739300m E 94 95 96 97 98 99 740000m E 01 02 03 04 05 06 07 08 740900m E

231600m N 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44 43 42 41 40 39 38 37 36 231500m N

20°55'40" W 30" 20" 10" 20°55' W 30" 20" 10" 20°54'30" W 50" 40" 20°54' W 30" 20" 10"

The Kaanapali study area extends continuously from Hanakaoo Beach Park in the south to Kekaa Point (Black Rock) in the north. The coastline is comprised of a seasonally dynamic large continuous white sand beach exposed to both kona storm activity and seasonal swell events. Offshore, sand with rubble and patches of coral reef begin south of Kekaa Point and grow into a shallow fringing reef near Hanakaoo Point. South of Hanakaoo Point, fringing reef and beach rock dominate the offshore setting. Hanakaoo Point is central to the area and provides a convenient feature around which to describe the shoreline.

As a whole, the study area (transects 943 – 1068) has experienced light to moderate erosion since 1912 with an average AEHR of -0.3 ft/yr. The northern portion (transects 1014 - 1068) has experienced long term erosion reflective of the area as a whole with an average AEHR of -0.3 ft/yr. The southern portion (transects 943 - 1014) has experienced moderate erosion over time with an average AEHR of -0.8 ft/yr. Hanakaoo Point (transects 1010 - 1020) is the most seasonally unstable section of coast in this area with a measured average seasonal difference in the low water marks of 54 feet.

Average beach width, the average horizontal distance from the vegetation line to the low water mark, within the Kaanapali study area has varied greatly over time. As a whole, average beach width has decreased 35% between 1949 and 2007. The northern portion of the area has experienced a 19% decrease in average beach width between 1949 and 2007 while there has been a 35% decrease in average beach width in the southern portion over the same time period.

Kekaa Pt.

Sheraton Resort

Kaanapali Beach Hotel

Westin Maui

Hanakaoo Pt.

Maui Marriot

Hyatt Regency

Hahakea Stream

Hanakaoo Beach Park

Honoapiilani Highway

Annual Erosion Hazard Rates (ft/yr)

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
- 1932 T-sheet
- Nov 1949
- Mar 1961
- May 1963
- Apr 1969
- Mar 1975
- Jul 1987
- Mar 1988
- Nov 1992
- May 1997
- Apr 2007
- 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.

2291500m N UTM coordinates

156°27'10" W latitude/longitude coordinates

TRANSECT	AEHR (ft/yr)
943	-1.209
944	-1.426
945	-1.642
946	-1.771
947	-1.771
948	-1.662
949	-1.550
950	-1.510
951	-1.610
952	-1.823
953	-2.020
954	-2.021
955	-1.989
956	-1.936
957	-1.823
958	-1.620
959	-1.328
960	-1.075
961	-0.863
962	-0.697
963	-0.638
964	-0.636
965	-0.609
966	-0.539
967	-0.457
968	-0.391
969	-0.359
970	-0.359
971	-0.380
972	-0.401
973	-0.426
974	-0.460
975	-0.510
976	-0.559
977	-0.589
978	-0.593
979	-0.565
980	-0.503
981	-0.433
982	-0.396
983	-0.406
984	-0.453
985	-0.512
986	-0.549
987	-0.566
988	-0.567
989	-0.577
990	-0.589
991	-0.592
992	-0.564
993	-0.510
994	-0.455
995	-0.431
996	-0.432
997	-0.422
998	-0.373
999	-0.288
1000	-0.199
1001	-0.148
1002	-0.168
1003	-0.245
1004	-0.347
1005	-0.430
1006	-0.500
1007	-0.577
1008	-0.645
1009	-0.674
1010	-0.649
1011	-0.585
1012	-0.531
1013	-0.526
1014	-0.550
1015	-0.528
1016	-0.472
1017	-0.401
1018	-0.305
1019	-0.193
1020	-0.090
1021	-0.013
1022	0.034
1023	0.053
1024	0.049
1025	0.029
1026	0.000
1027	-0.030
1028	-0.057
1029	-0.056
1030	-0.012
1031	0.067
1032	0.144
1033	0.183
1034	0.164
1035	0.113
1036	0.071
1037	0.060
1038	0.071
1039	0.093
1040	0.119
1041	0.145
1042	0.176
1043	0.213
1044	0.256
1045	0.322
1046	0.400
1047	0.467
1048	0.497
1049	0.496
1050	0.495
1051	0.524
1052	0.589
1053	0.659
1054	0.708
1055	0.743
1056	0.765
1057	0.776
1058	0.773
1059	0.770
1060	0.775
1061	0.787
1062	0.792
1063	0.778
1064	0.720
1065	0.602
1066	0.447
1067	0.322
1068	0.247

Maui Shoreline Atlas 2007