

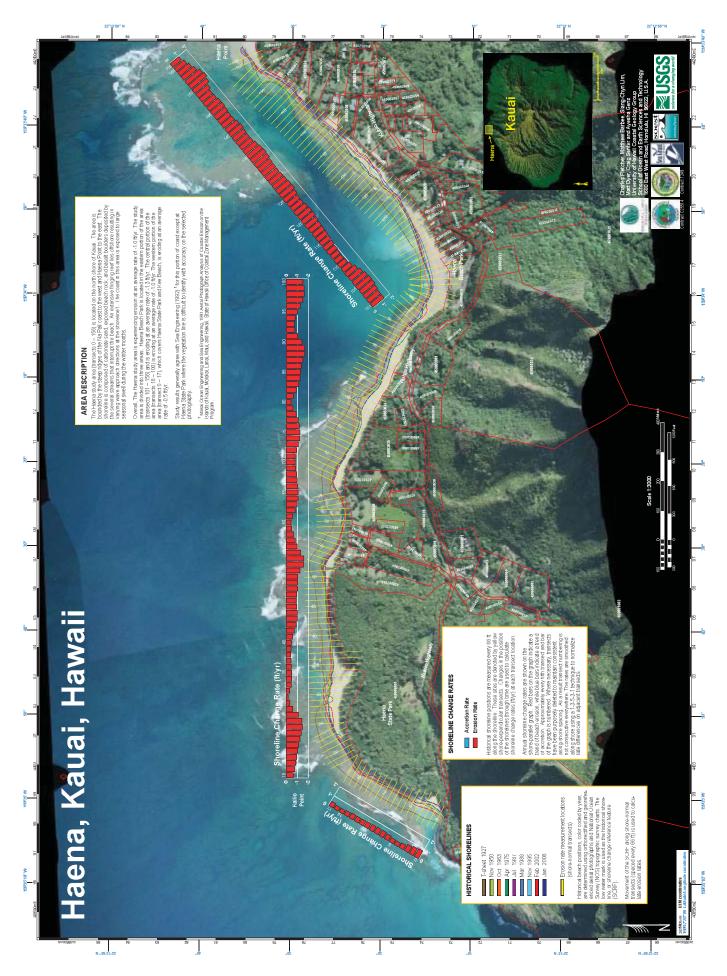
Chapter 3: Appendix E Kaua'i Shoreline Erosion Maps

The appendix contains low resolution Kaua'i Shoreline Study Erosion Maps adjusted to letter size paper.

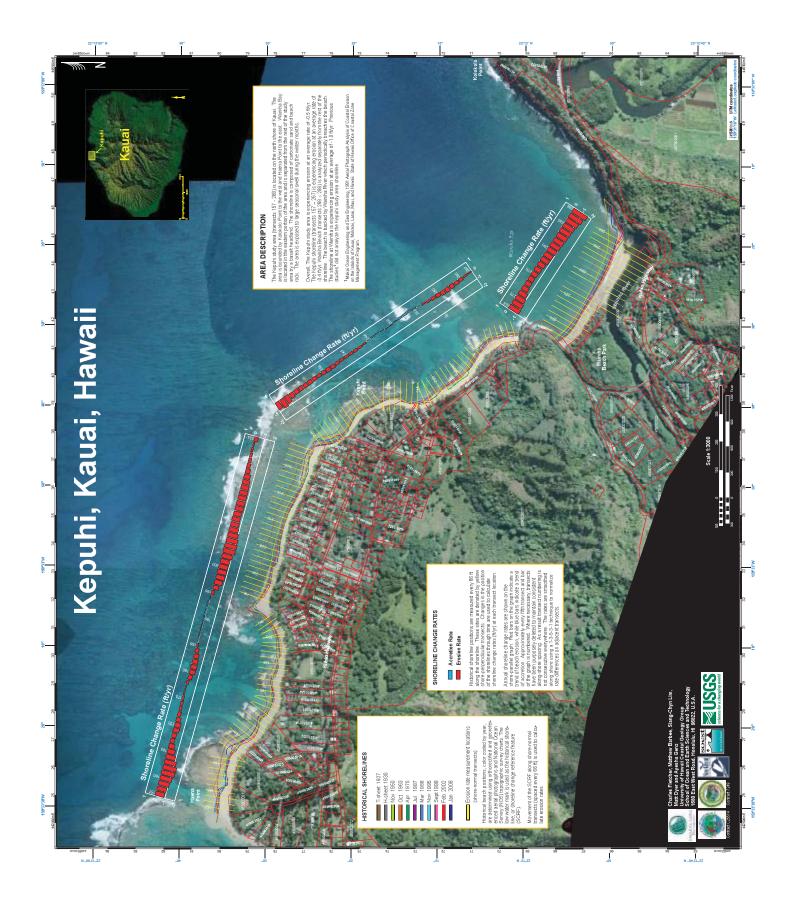
For larger resolution erosion maps, please check the Kauai Shoreline Study Erosion Maps Website at the following URL:

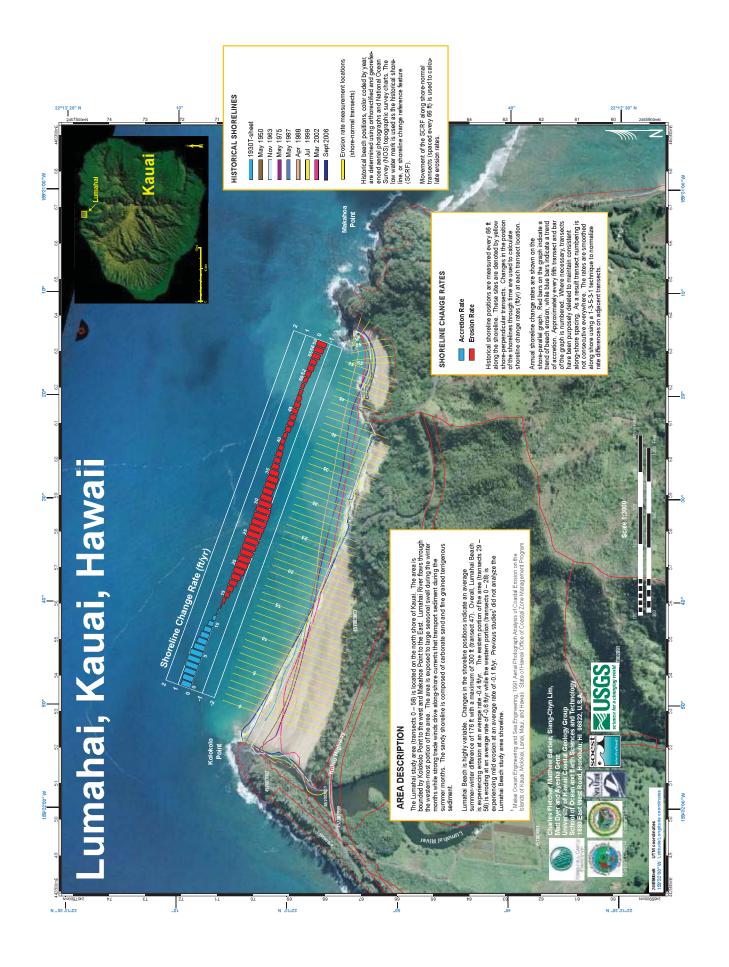
http://www.soest.hawaii.edu/coasts/kauaicounty/KCounty.html

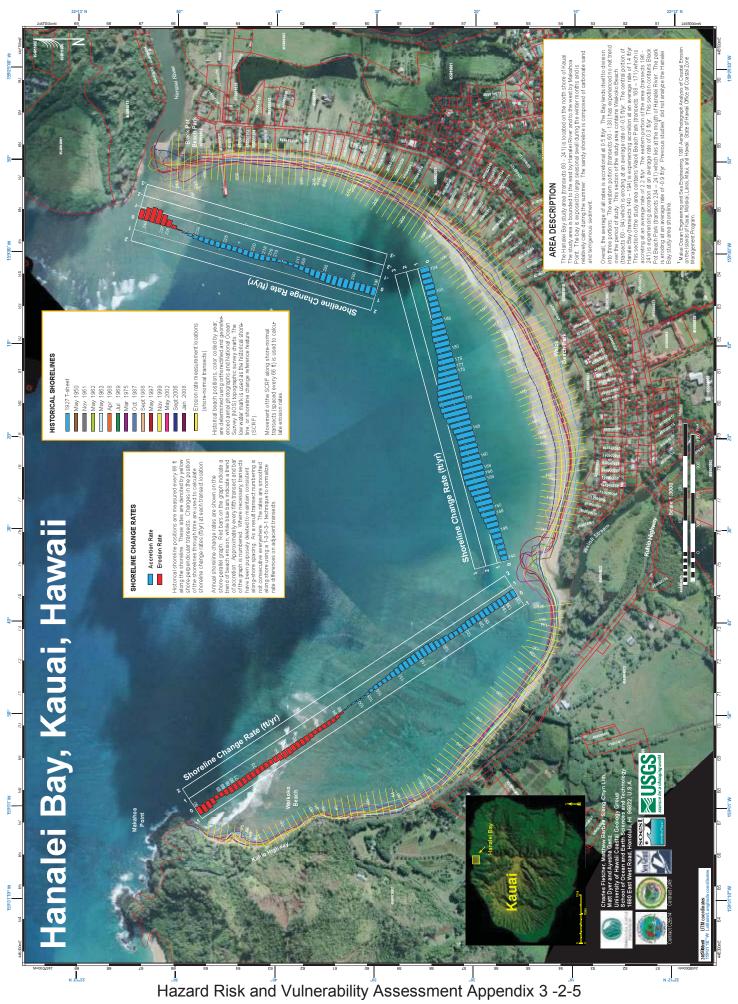
The website also include transect plots and shoreline change rates in table form.

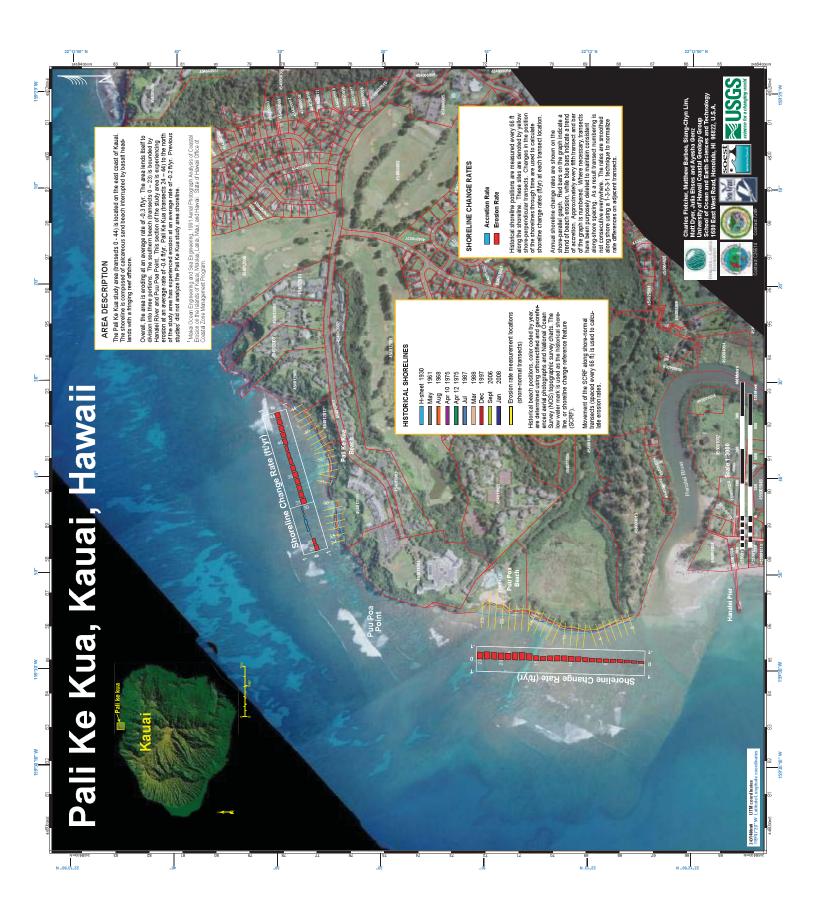


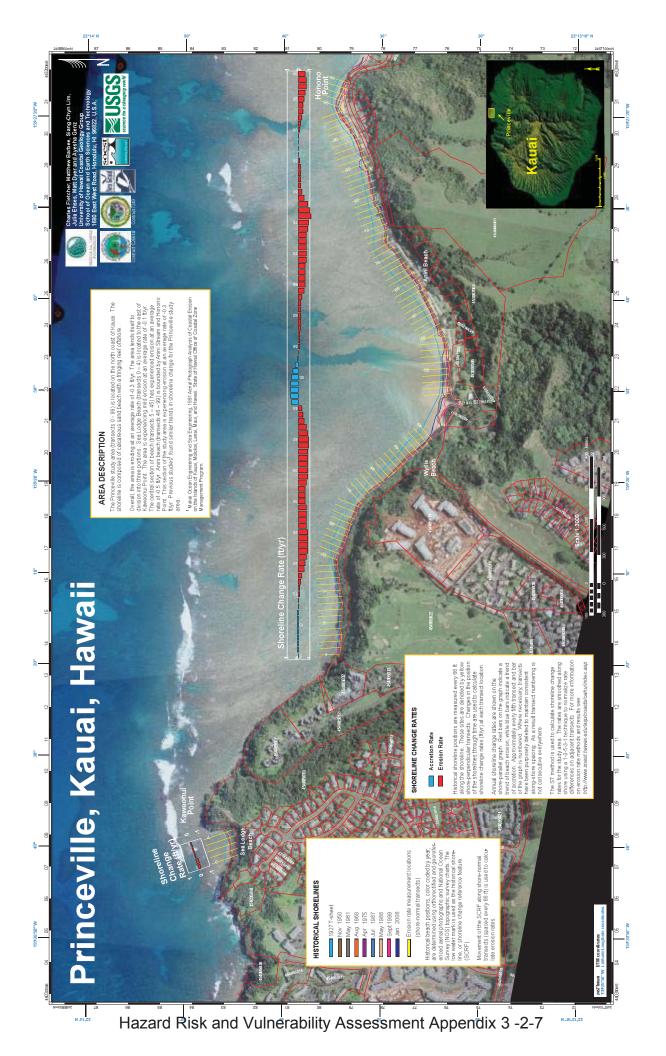
Chapter 3 Appendix E 3E-2

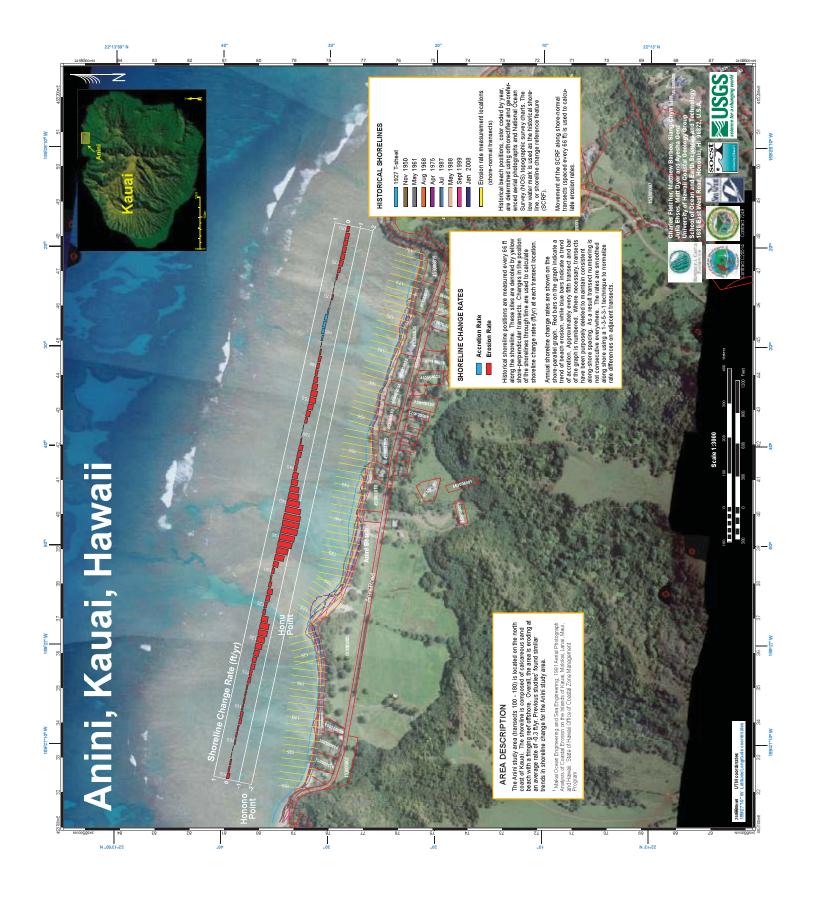


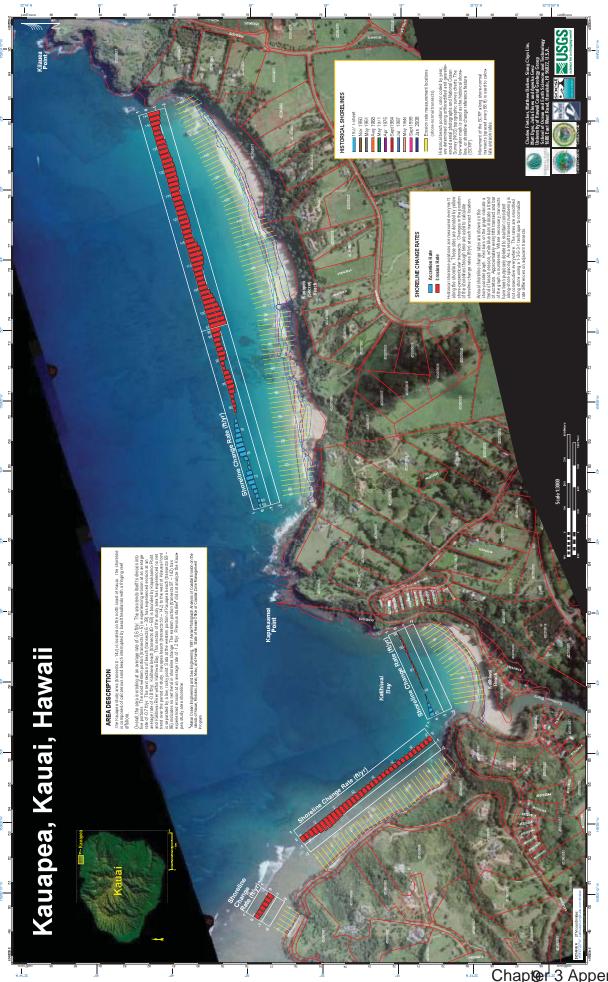


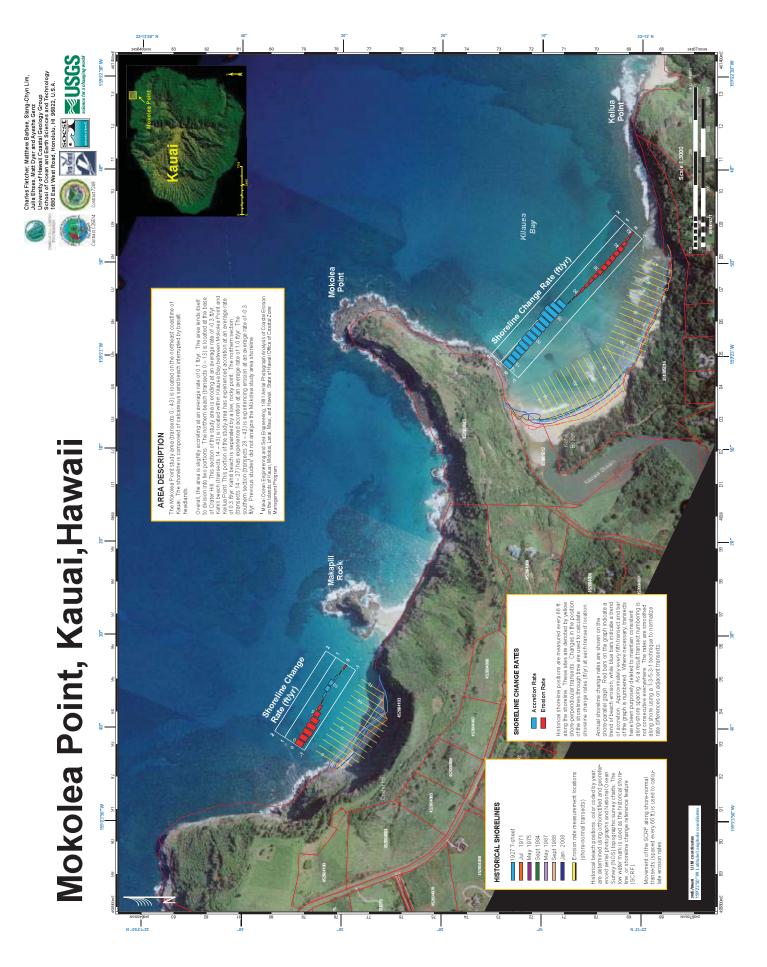


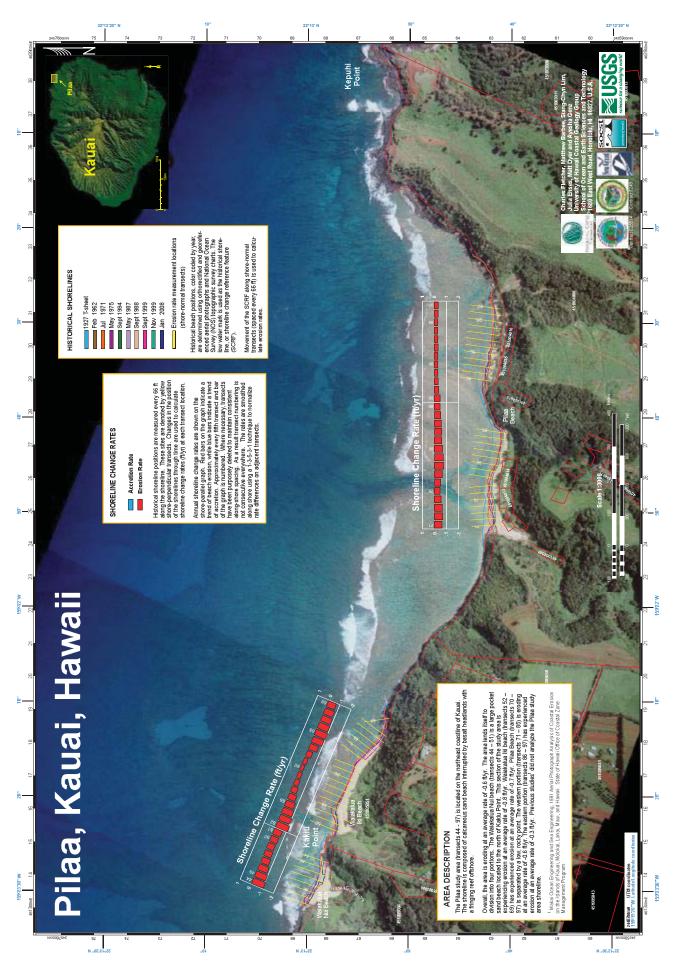


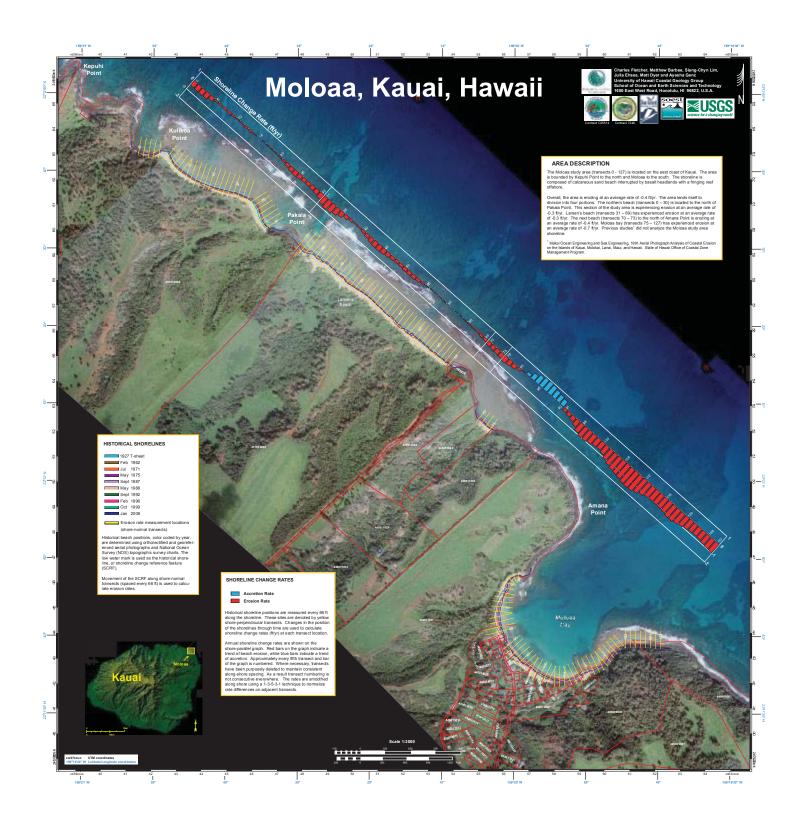


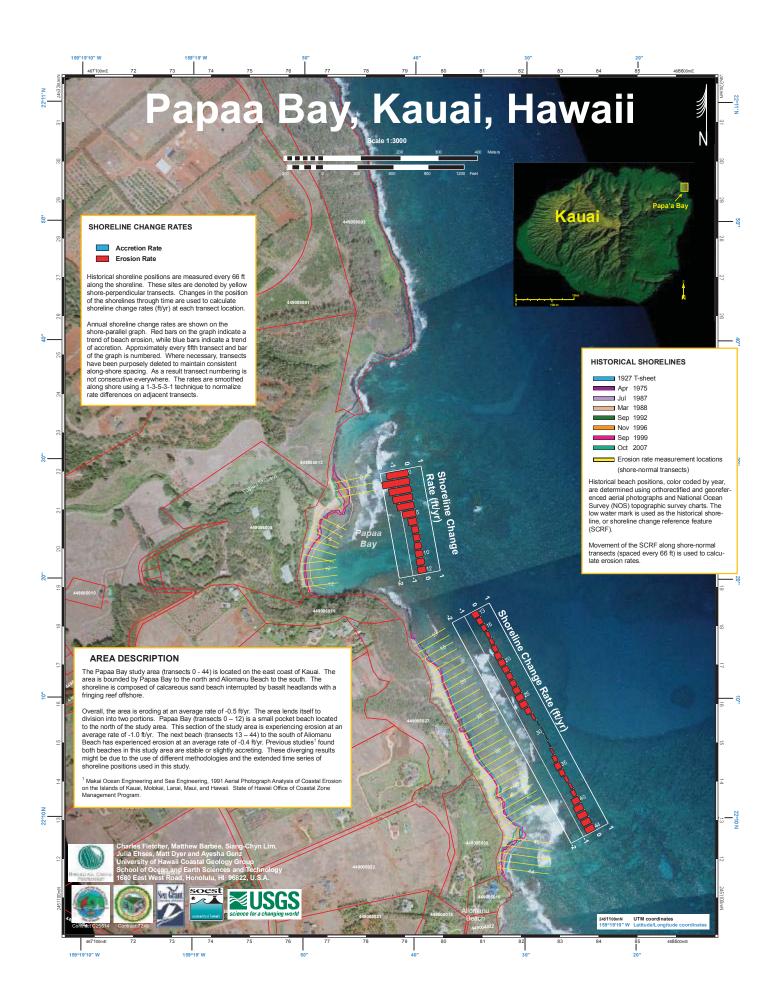












Anahola, Kauai, Hawaii



Lae Lipoa, Kauai, Hawaii

Shoreline Change Rate

Lae Lipoa

Shoreline Change Rate (ft/yr)

Chan

SHORELINE CHANGE RATES

Accretion 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 shoreline sthrough time are used to calculate shoreline change rates (ft/yr) at each transect location.

Annual shoreline change rates are shown on the shore-parallel graph. Red bars on the graph indicate a trend of beach recision, while bub bars indicate a trend of accretion. Approximately every fifth transect and bar of the graph is numbered. Where necessary transacts have been purposely deleted to maintain consistent along-shore spacing. As a result transect numbering is not consecutive everywhere. The rates are smoothed along shore using a 1-3-5-3-1 technique to normalize rate differences on adjacent transacts.

HISTORICAL SHORELINES

 1927 T-sheet

 Nov 1950

 Apr 1975

 Jul 1987

 May 1988

 May 1992

 Sept 2000

 Oct 2007

Erosion rate measurement locations (shore-normal transects)

Historical beach positions, color oded by year, are determined using orthorectified and georefi enced 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).

Movement of the SCRF along shore-normal transects (spaced every 66 ft) is used to calculate erosion rates.

18 44

AREA DESCRIPTION

The Lae Lipoa study area (transects 0 - 51) is located on the east coast of Kauai. The area extends south from Kahala Point to Pohakuloa Point. The shoreline is composed of carbonate sand, basalt rock headlands, and exposed beach rock.

Overall, the area is experiencing erosion at an average rate of -0.4 ftyr. The shoreline lends itself to division into four sections. The northern beach (transects 0 – 22) is eroding at an average rate of -0.4 ftyr. South of Lae Lipce Point (transects 23 – 32) the shoreline has experienced erosion at an average rate of -0.4 ftyr. The section of beach at transects 33 – 46 is experiencing erosion at an average rate of -0.3 ftyr. The southernmost beach (transect - 51) is a small pocket beach that has experience erosion at an average rate of -0.3 ftyr.

¹ Makai Ocean Engineering and Sea Engineering, 1991 Aerial Photograph Analysis of Coastal Erosio on the Islands of Kauai, Molokai, Lanai, Maui, and Hawaii. State of Hawaii Office of Coastal Zone Management Program.

Charles Fletcher, Matthew Barbee, Stang-Chyn Lim, Matt Dydr and Ayesha Genz University of Hawaii Costatal Goology Group School of Oosen and Earth Sciences and Technology 1680 East West Road, Honolulu HI 96822, U.S.A.

Donkey Beach, Kauai, Hawaii

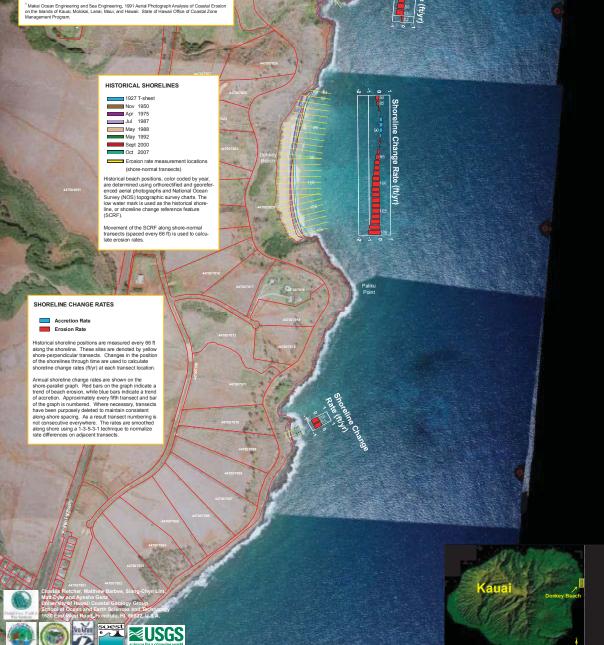
AREA DESCRIPTION

22°07' N

The Donkey Beach study area (transects 52 - 111) is located on the east coast of Kauai. The area is bounded by Pohakuloa Point to the north and Paliku Point to the south. The shoreline is composed of carbonate sand, and basalt rock headlands.

Overall, the area is experiencing erosion at an average rate of -0.4 ftlyr. The shoreline lends itself to division into five pocket beaches. The northern beach (transects 52 – 64) is eroding at an average rate of -0.5 klyr. South of Angabala Point (transects 66 – 81) the beach has experienced erosion at a average rate of -0.4 ftlyr. The next beach (transect 52) has experienced erosion at 0.2 klyr. Donkey beach (transect s67 – 81) the pocket beach with a steep foreshore. This area has experienced erosion at an average is experiencing erosion at an average rate of -0.7 ftlyr. Previous studies' did not analyze the Donkey Beach study area shoreline.

¹ Makai Ocean Engineering and Sea Engineering, 1991 Aerial Photograph Analysis on the Islands of Kauai, Molokai, Lanai, Maui, and Hawaii. State of Hawaii Office of Mananement Pronzem



Scale 1:3000

19

Cha

Shoreline Change Rate



Wailua Bay, Kauai, Hawaii

SHORELINE CHANGE RATES retion Rate Erosion Rate

HISTORICAL SHORELINES

Feb 1927 T-sheet
Nov 1950
Mar 1972
Apr 1975
Jul 1987
May 1988
Sept 1992
May 1992
Sept 2000
Feb 2002
Oct 2007
Jan 2008
Erosion rate measurement lo
(shore-normal transects)
Historical beach positions, color coded are determined using orthorectified and
enced aerial photographs and National
Survey (NOS) topographic survey chart

JSGS

Lydgate, Kauai, Hawaii

AREA DESCRIPTION

The Lydgate study area (transects 0 – 144) is located on the east coast of Kauai south of the Wallua River mouth. The shoreline is composed of carbonate sand beach interrupted by occasional outcops of beachrock with a fringing red offshore. The area is exposed to persistent ladewinds and rough seas throughout the year.

Overall, the area is experiencing erosion at an average rate of -0.4 flyr. The area lends taself to division into three portions. The most nothern portion (transacts 0 - 4) has experienced erosion over time with an average rate of -0.7 flyr. Previous atuldes found accretion for flib bacch but stated that it is relatively unstable, attenting between accretion and erosion. There are prevent summing log-over (timetods 1 - 1) of an of the back (transacts 1 - 104) has experienced erosion with an average rate of -0.3 flyr.

ean Engineering and Sea Engineering, 1991 Aerial Photograph Analysis of Cr ds of Kauai, Molokai, Lanai, Maui, and Hawaii. State of Hawaii Office of Coa

HISTORICAL SHORELINES

Jul 1927 T-sheet Nov 1950 Apr 1975 Jul 1987 May 1988 Sopt 1992 Mar 1997 Feb 2002 Jan 2008 Erosion rate measurement locations

Eroson rate measurement locations (shore-normal transects)
Historical beach positions, color coded by year, are determined using onthrectlified and generifie enced aerait photographs and National Goean Survey (NOS) topographic survey charts. The low water mark is used as the historical shore-line, or shoreline change reference feature (SCRF).

Movement of the SCRF along shore-normal transects (spaced every 66 ft) is used to calc late erosion rates.

SHORELINE CHANGE RATES Accretion Rate

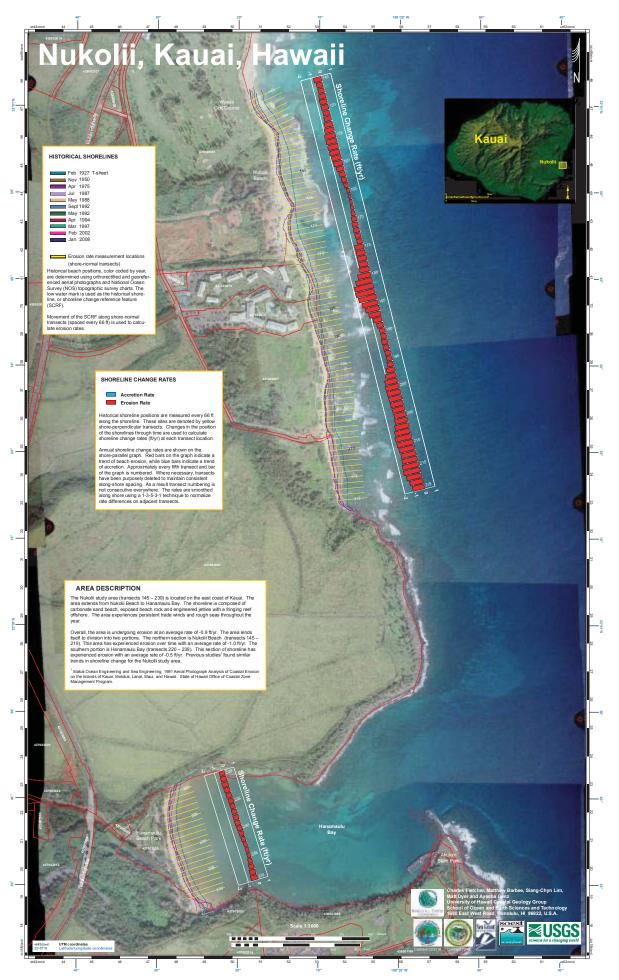
Historical shoreline positions are measured every 66 ft along the shoreline. These sites are denoted by yellow shore-perpendicular transects. Changes in the position of the shorelines through time are used to calculate shoreline change rates (ft/yr) at each transect location.

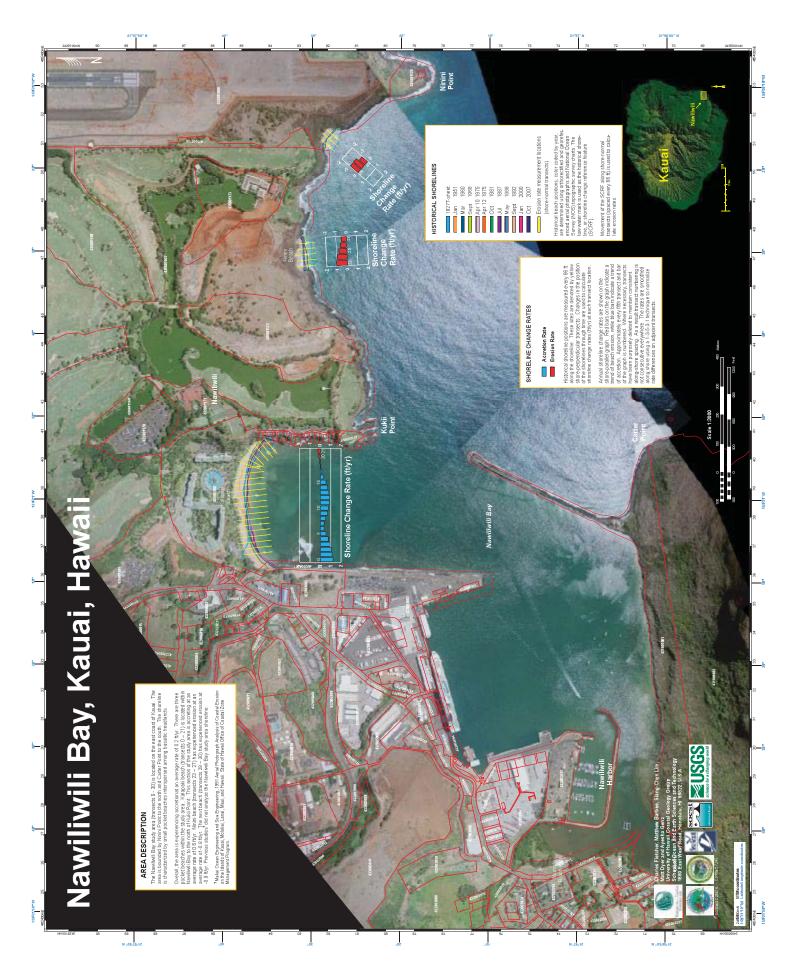
Stotenie Cuangle rates (197) at each trainsect location. Annual shoreline change rates are shown on the shore-parallel graph. Rod bars on the graph include a time of or basch resistion, while bulk associational are and of accretion. Approximately every fifth transect and bar of the graph is numbered. Where necessary transacts have been purposely deteid to maintain consistent along-shore spacing. As a result transect numbering is not consecutive everywhere. The rates are smoothed along shore using a 1-3-5-31 technique to normalize rate differences on adjacent transects.

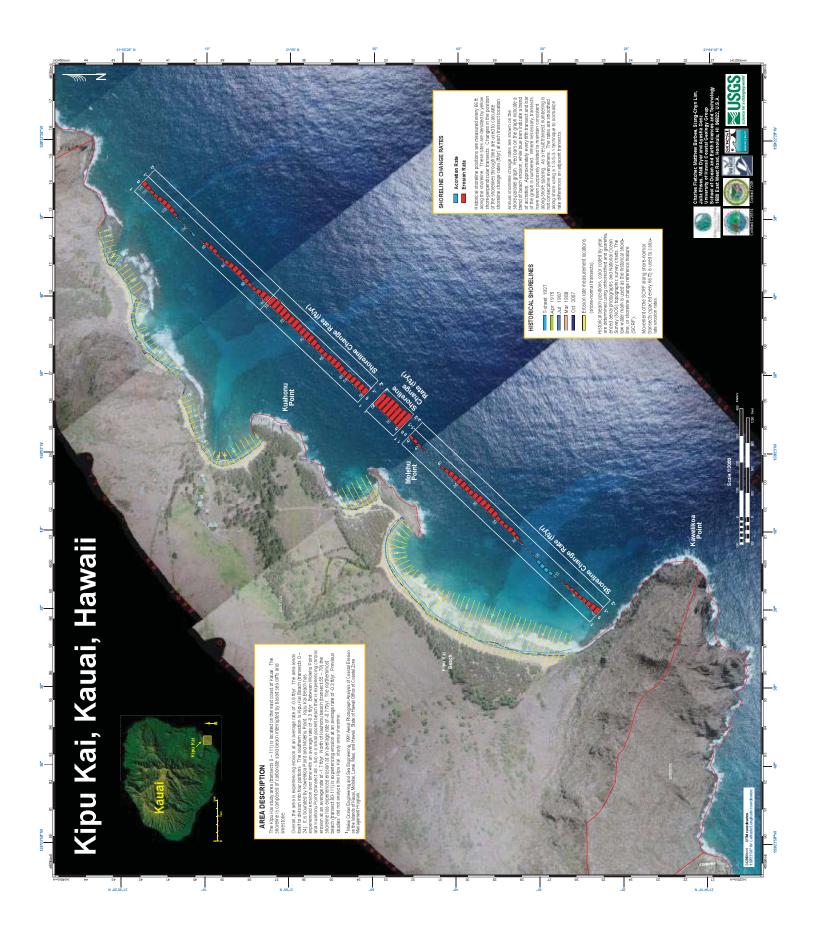
150020' W

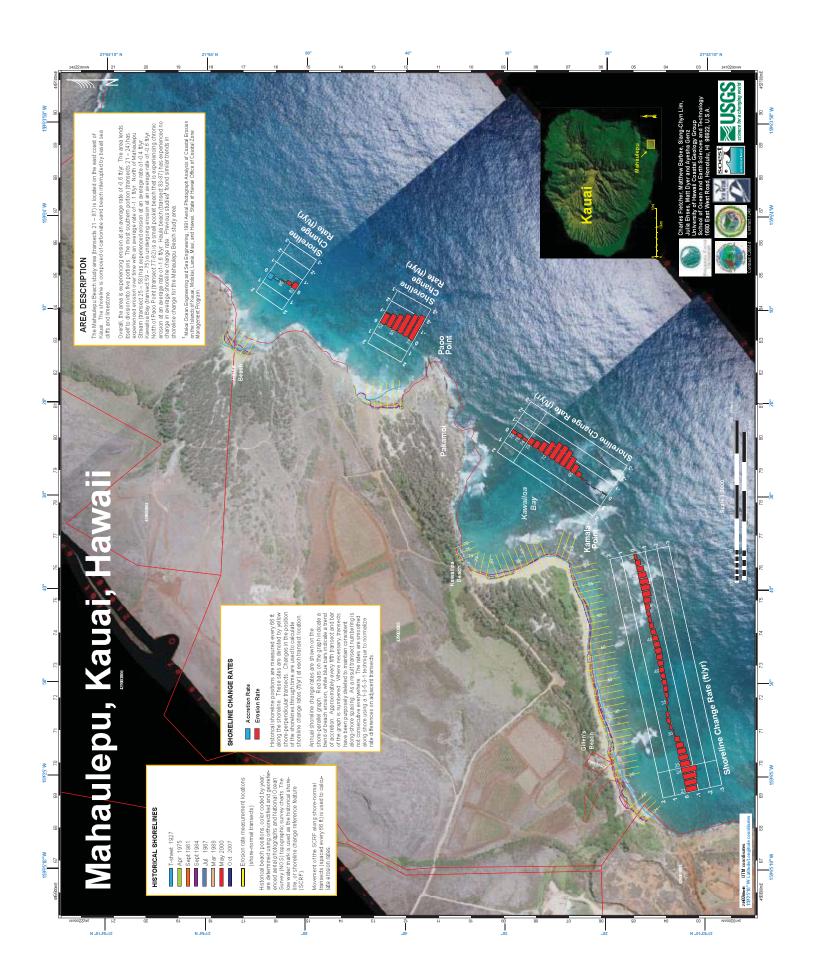
U.S.A **EUSGS**

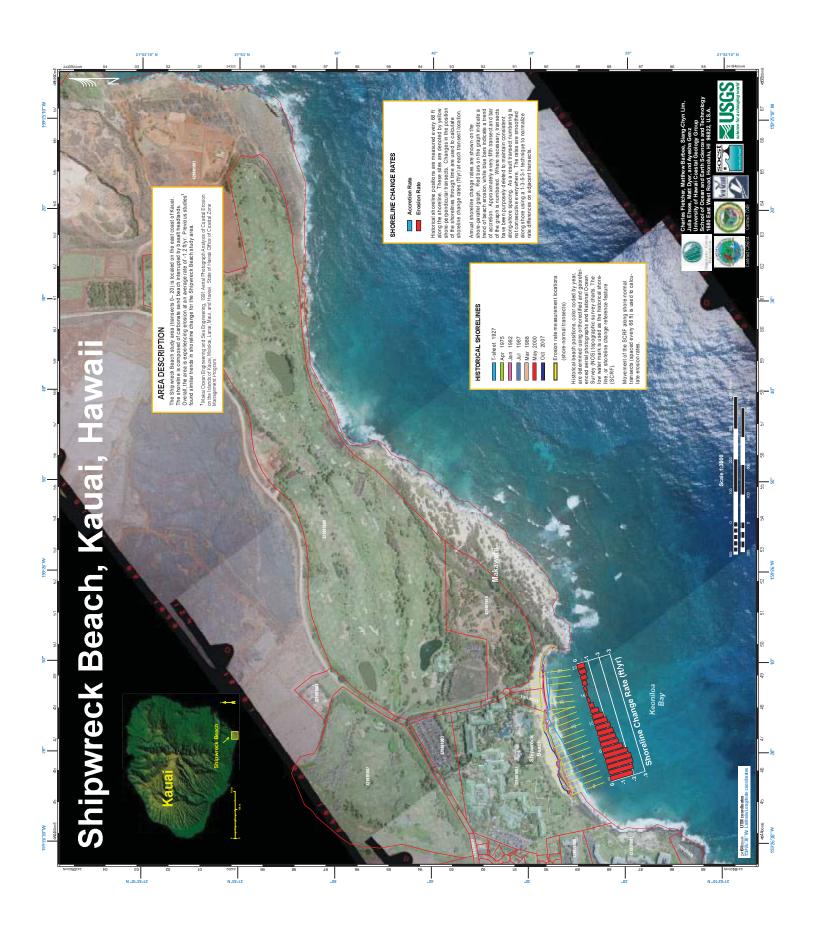
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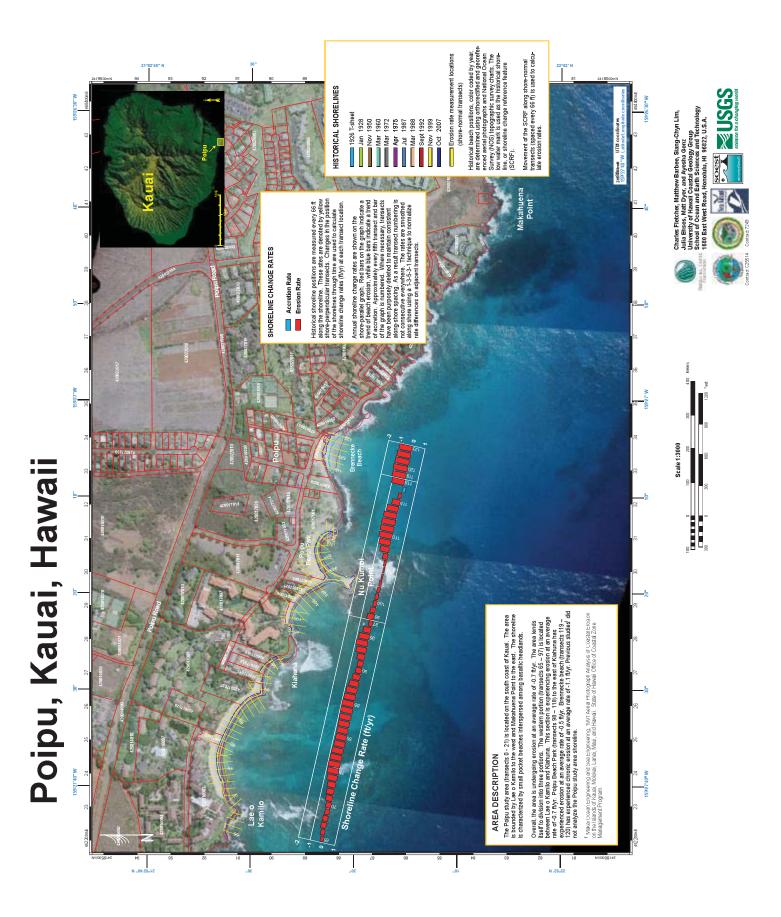






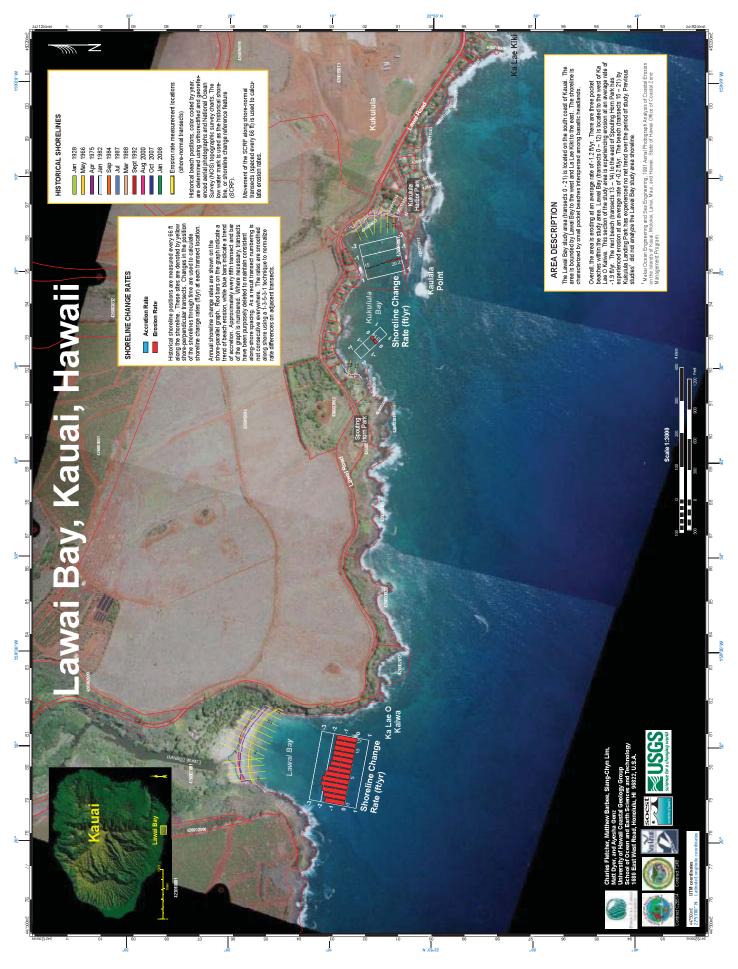


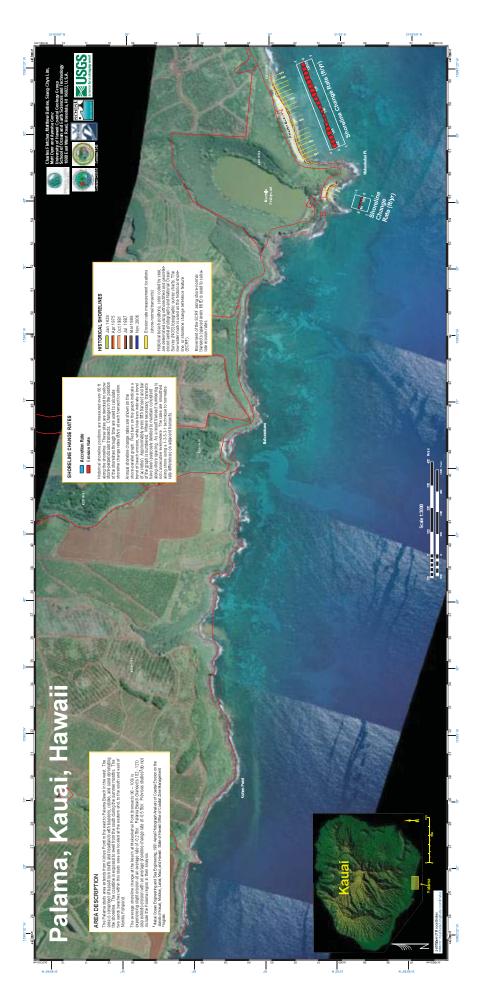


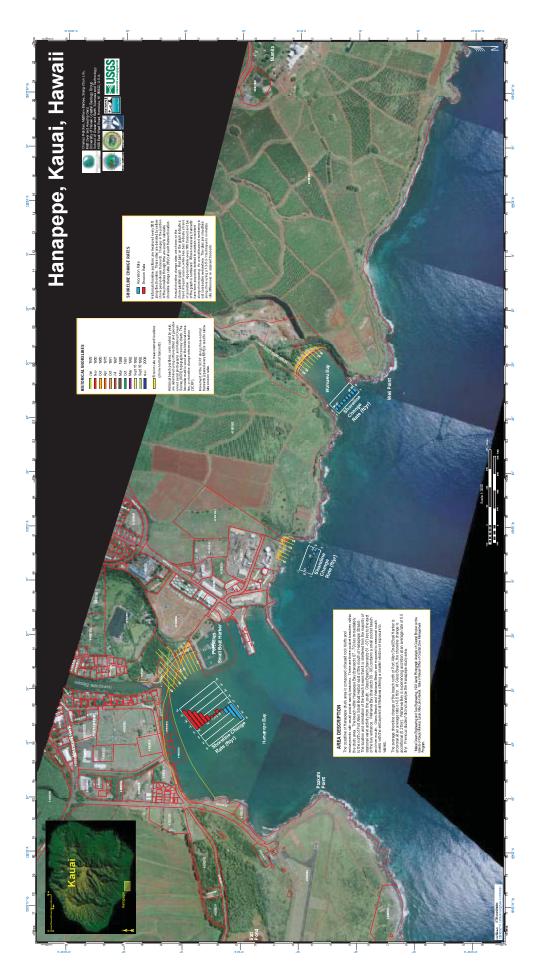


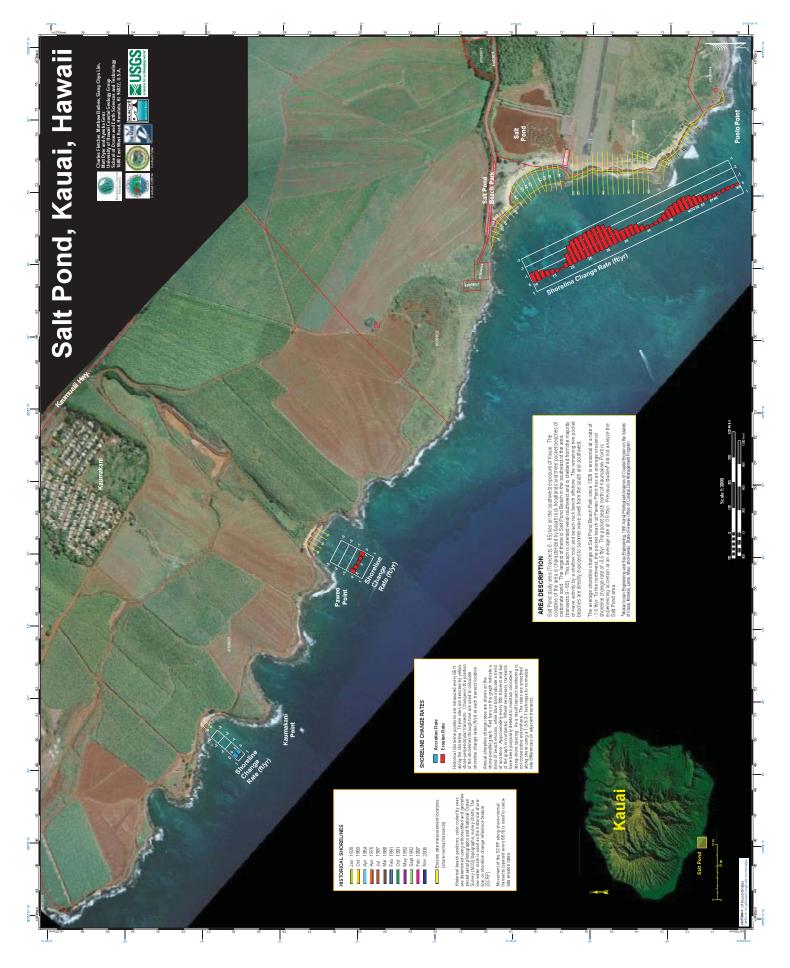
West Poipu, Kauai, Hawaii











Koki Point, Kauai, Hawaii

Scale 1:3000

AREA DESCRIPTION

The Koki Point study area is located on the southwest shore of Kauai. The area extends north from Hoaka Point to Mahinauli Guich. The shoreline is composed of basalt rock headlands, sand perched on rocky shoreline, and sand beaches. The area is exposed to swell from the south and southwest during the summer as well as persistent trade winds.

There are six beaches within the Koki Point area. Between Koki Point and Hoaka Point there are two small beaches. The southern beach (transects 0 – 5) is experiencing ignitible recision at an average rate of -1.2 ft/v. The northern beach (transects 7 – 9) is experiencing ignitible recision at an average rate of -0.6 ft/vr. North of Koki Point is a small beach (transects 11 – 15) experiencing erois on at an average rate of -0.7 ft/vr. The norther beach (transects 12 – 4) is eroding at an average rate of -0.2 ft/vr. The northern beach (transects 17 – 24) is eroding at an average rate of -2.9 ft/vr while the northern section (transects 25 – 31) is changing over the period of study (-0.9 ft/vr. The sandy beach at Kaluapuhi (transects 22 – 61) is experiencing erosion at an average rate of -0.9 ft/vr. Previous studies 1 did not analyze the Pakala study area.

¹ Makai Ocean Engineering and Sea Engineering, 1991 Aerial Photograph Analysis of Coastal Erosion on the Islands of Kauai, Molokai, Lanai, Maui, and Hawaii. State of Hawaii Office of Coastal Zone Management Program.

SHORELINE CHANGE RATES



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 shoreline change rates are shown on the shore-parallel graph. Red bars on the graph indicate a trend of bacch 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 rates are smoothed along shore using a 1-3-5-3-1 technique to normalize rate differences on adjacent transect.

HISTORICAL SHORELINES

Apr	1975
Jul	1987
Mar	1988
May 26	1992
 May 27	1992
Sept	1992
Nov	1999
Nov	2006

 Erosion rate measurement locations (shore-normal transects)

Historical beach positions, color coded by year, are determined using orthorectified and georeferenced aerail 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).

Movement of the SCRF along shore-normal transects (spaced every 66 ft) is used to calculate erosion rates.

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Chapter 3 Appendix E 3E-31

Pakala, Kauai, Hawaii

Charles Fletcher, Matthew Barbee, Siang-Chyn Lin, Matt Dyrr and Ayasha Genz Berley Hawley Charles (Costal seology Group Berley Hennoldy), Higher Honology Biol East West Road, Honolub, Higher José William Charles (Costal Sector), Higher Honology Biol East West Road, Honolub, Higher José Biol East West Road, Honolub, Higher Honology Biol East West Road, Honolub, Higher Ho



(shore-normal transects)

listorical beach positions, color coded by year, re determined using orthorectified and georefe need aerial photographs and National Ocean urvey (NOS) topographic survey charts. The wwater mark is used as the historical shorene, or shoreline change reference feature

Movement of the SCRF along shore-normal transects (spaced every 66 ft) is used to calcu

nal shore-perpe

listorical 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 channe rates (ft/v) at each transect location

SHORELINE CHANGE RATES

Accretion Rate

Erosion Rate

Annual shoreline change rates are shown on the hone-parallel graph. Red bars on the graph indicate a trend of beach ension, while blue bars indicate a trend of accretion. Approximately every filt thansect and bar of the graph is numbered. Where necessary transacts have been purposed y deleted that maintain consistent along-shore spacing. As a result transect numbering is not consecutive everywhere. The rates are smonther along done using a 1-35-31 technique to normalize rate differences on adacent transacts.

AREA DESCRIPTION

The Pakala study area is located on the south west shore of Kauai. The area extends to the south from the Waimea River to include Pakala Point. The shoreline is composed of terrestrial and carbonate sand beaches, rocky shoreline, and basath theadinad. The area is exposed to swell from the south and southwest during the summer as well as persistent trade winds.

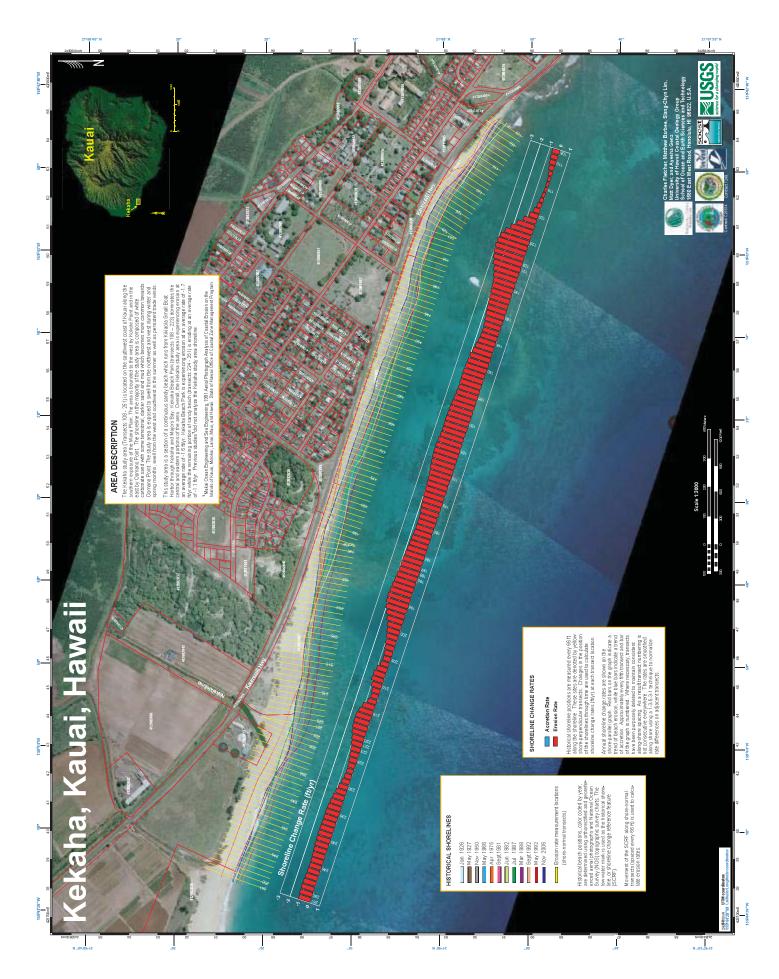
There are several sectors within the Pakala study area defined for analysis and description. In the southern portion of the area, to the south of the small barge landing, there is a section of sandy beach (transacts 64 – 69) experimently entry of a 1 an average rate of -0.6 ftyp, Pakala Point (transacts 54 – 96) divides an ephemeral beach (transacts 73 – 133) into two sections for description purposes. The southern section (transacts 76 – 40) is experimental period and average rate of -0.5 ftyr, while the northern section (transacts 96 – 133) is accreting at an average rate of 0.2 ftyr.

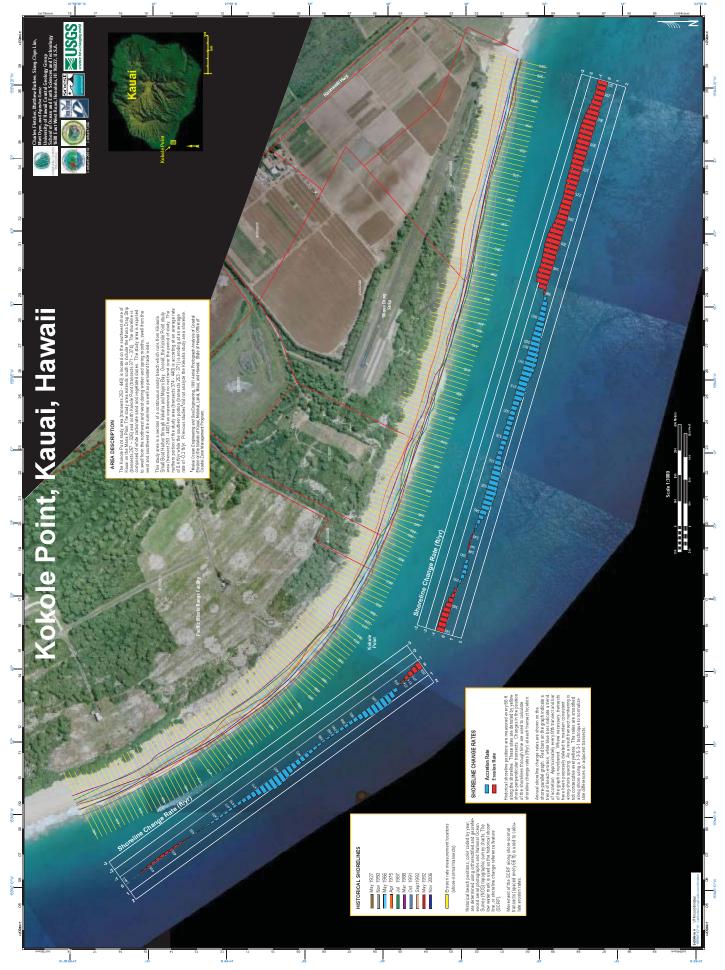
Makaweli Landing lies between transects 133 and 135. It marks the southern extent of a large continuous sandy beach (transects 135 – 250) that is experiencing erosion at an average rate of -0.2 ftlyr. The beach terminates at a low relef basalt nocky coasiline (transects 251 – 254) that is occasionally fronted by sand. This section has experienced no net trend in shoreline position over the period of study. The northern-most section is depriencing erosion at an average rate of -0.5 ftlyr. Previous studies' did not analyze the Pakala study area shoreline.

¹ Makai Ocean Engineering and Sea Engineering, 1991 Aerial Photograph Analysis of Coastal Erosion on the Islands of Kaus Mohkai Langi Maui and Hawaii State of Hawaii Office of Coastal Zone Management Program.









Majors Bay, Kauai, Hawaii





AREA DESCRIPTION

Maps tag visus/ area (trained: 442 - 500) is located on the southwest should only a southwest should be a southwest should be a southwest to the southwest should be the training the training the southwest should be a southwest to the southwest should be the training the southwest should be a southwest to the southwest should be a southwest to the should be a southwest to the southwest southwest should be a southwest should be a southwest to the southwest sout

brough Keikha and Majors Bay. Overall, the Majors Bay study area is experiencing accretion at an average rate of 0.9 flyr. The northern portion of the study area (transects 522 - 639) is experiencing content on at an average rate of 1.1 flyr while the southern portion (transects 442 - 520) is accreting at an average rate of 0.6 flyr. Previous studies did not analyze the Kekaha study area shoreline.

nds of Kauai, Molokai, Lanai, Maui, and Hawaii. State of Hawaii Office of Coastal Zone Management Progr

May	1962
Мау	1966
Apr	1975
Jul	1987
Mar	1988
Oct	1991
Sept	1992
Мау	1992
Nov	2006

Erosion rate measurement locati (shore-normal transects)

Historical beach positions, color coded by year are determined using orthorectilled and georef enced 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

Movement of the SCRF along shore-normal transects (spaced every 66 ft) is used to calculate erosion rates. SHORELINE CHANGE RATES

Accretion Rate

91 159147 W

Н

Historical shoreline positions are measured every 68 a along the shoreline. These sites are denoted by yello shore-perpendicular transects. Changes in the positi of the shorelines through time are used to calculate shoreline change rates (IVyr) at each transect location

Annual shoreline change rates 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 the graph is numbered. Where necessary, transe data of the graph is numbered. Where necessary, transe data large-shore spacing and a second transect numbering is not consecutive everywhere. The rates are smoothed shore shore using 3,3-55-51 technique to nomalize.

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Chapter 3 Appendix E 3E-37

159-46 W



Shoreline Change Rate (ft/yr)

AREA DESCRIPTION

ً ∥ N

UTM coordinates

159:47'40

The Mana study area is located on the west coast of Kauai on the Mana Plain. The area includes the air strips of the Pacific Missile Range with Mana Point at the center of the area. The shoreline is characterized by extensive beach rock backed by vegetated sand dures and broken by catooale sand baach. The study area is exposed to swell from the northwest and west during winker and spring months, swell from the west and southwest in the summer as well as persident thand winds.

Kauai

The area is divided into three discrete sections for analysis and description purposes. The southern-most section (transects 0 – 15) is experiencing ension at an average rate 0-2.6 Bivy. The next section to the north (transect 17) indicates no net frend in shoreline change. The northern-most section (transects 20 – 33) is ending at an average rate of -0.4 Biyr. Previous studies² did not analyze the Mara study area shoreline.

Nakai Ocean Engineering and Sea Engineering, 1991 Aerial Photograph Analysis of lastal Erosion on the Islands of Kauai, Molokai, Lanai, Maui, and Hawaii. State of waii Office of Coastal Zone Management Program.

HISTORICAL SHORELINES

	May	1927
1	Nov	1950
1	May	1962
	May	1966
2	Apr	1975
ų,	Sept	1984
5	Jul	1987
1	Mar	1988
	Oct	1991
	Sept	1992
ž	Nov	2006

Erosion rate measurement locations (shore-normal transects)

Historical beach positions, color coded by year, are determined using orthorectified 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).

Movement of the SCRF along shore-normal transects (spaced every 66 ft) is used to calculate erosion rates.

-/

SHORELINE CHANGE RATES

Accretion 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 shoreline sthrough time are used to calculate shoreline change rates (ft/yr) at each transect location.

Ancuel shore change rates are shown on the shore-parallel graph. Red bars on the graph indicate a trend of back resist, while bars indicate a trend of accretion. Approximately every (fifth transed and bar of the graph is numbered. Where necessary, transects have been purposely detected to maintain consistent along-shore spacing. As a result transed numbering is not consocutive everywhere. The rates are smoothed along shore using a 1-36-331 technique to normalize rate differences on adjacent transects.

yn Lim,

159°46'40" W

22:01

2

22/02" N

USGS

soest

Barking Sands, Kauai, Hawaii

HISTORICAL SHORELINES May 1927 May 1920 May 1962 Apr 1975 Jul 1987 Mar 1988 Oct 1991 Sept 1992 Nov 2006

Kauai

Sept 1992 Nov 2006 Erosion rate measurement locations (shore-normal transects)

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22031

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

Movement of the SCRF along shore-normal transects (spaced every 66 ft) is used to calculate erosion rates.

SHORELINE CHANGE RATES

Accretion 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 shoreline change rates are shown on the shore-parallel graph. Red bars on the graph indicate a trend of bacah rosion, 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 deted to maintain consistent along-shore spacing. As a result transect numbering is not consecutive everywhere. The rates are smoothed along shore using a 1-36-3-31 technique to normalize rate differences on adjacent transects.

AREA DESCRIPTION

The Barking Sands study area is located on the west coast of Kauai on the Mana Pain. The area is bounded by Nohil Point to the north and the Pacific Missle Pange air strip in the south. The shoreline is characterized by extensive beach rock backed by vegetated sand duries and borken by carbonate sand beach. The study area is opposed to swell from the northwest and west during winter and spring months, swell from the west and southwest in the summer, as well as persident index winds.

The area is divided into two discrete sections for analysis and description purposes. The southern section (transects 36 – 67) is experiencing erosion at an average rate $0 \cdot 20$ tyr. The ronthern section (transects 69 - 79) is comprised of a small pocket of sand that has been ending at an average rate of -20 tyr. Previous studies' did not analyze the Barking Sands study area shoreline.

¹ Makai Ocean Engineering and Sea Engineering, 1991 Aerial Photograph Analysis of Coastal Erosion on the Islands of Kauai, Molokai, Lanai, Maui, and Hawaii. State of Hawaii Office of Coastal Zone Management Program. **F**1

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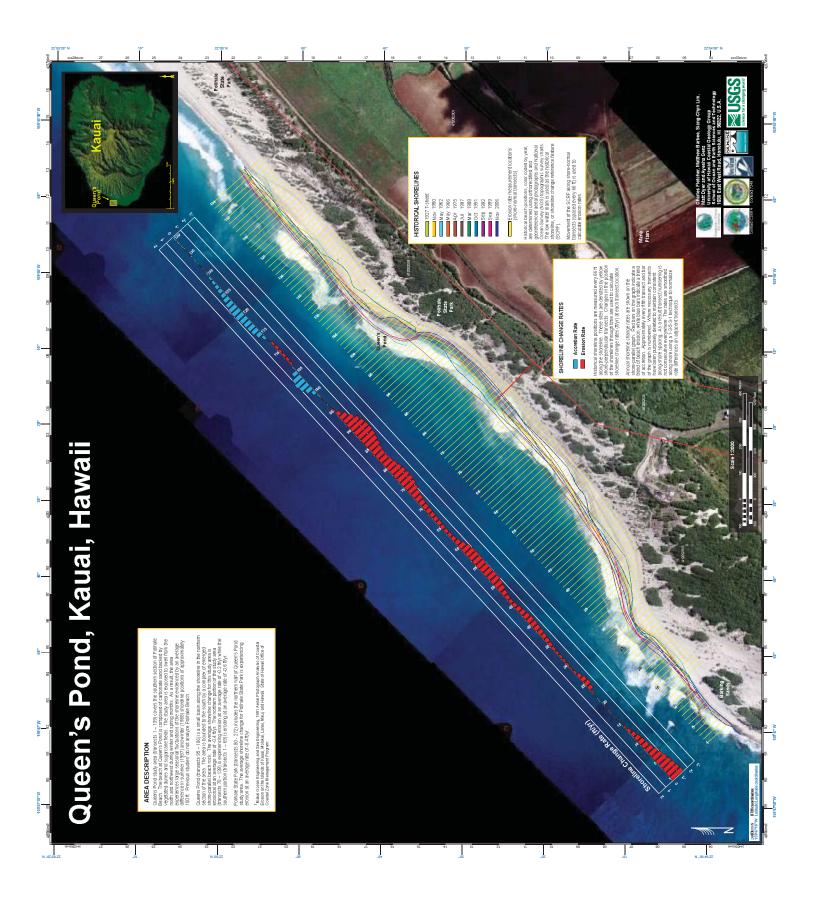
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Polihale, Kauai, Hawaii



Erosion rate measurement loc (shore-normal transects)

Historical beach positions, color coded by year, are determined using orthorectified 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).

Movement of the SCRF along shore-normal transects (spaced every 66 ft) is used to calculate erosion rates.

SHORELINE CHANGE RATES

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 (t/yr) at each transect location.

Annual shoreline change rates are shown on the shore-paralle graph. Red bars on the graph indicate trend of beach erosion, while blue bars indicate a tren of accretion. Approximable verey fifth transect and bar of the graph is numbered. Where necessary transect have been purposely deleted to maintain consistent along-shore spacing. As a result transect numbering not consecutive everywhere. The meta are smoother along shore using a 1–33–31 technique to normalize along shore using a 1–35–31 technique to normalize along shore using along shore using sho

AREA DESCRIPTION

AREA DESCRIPTION Polhale study area (transect \$40 - 272) lies on the northwest exposure of the Mana Plain where ii intersects the steep ridges and valleys of the Na Pair coast. The shoreline in the majority of the study area is composed of white carbonates and backed by vegetated dunes. In the study area is exposed to swell from the north and northwest duning white and spring months. As a result, the area experiences large second fluctuations of the shortline evidenced by an average difference in summer (1967) and winter (1968) shoreline positions of approximately 90 ht.

This area is a continuation of Polihale Beach which extends through the Queen's Pond area to the south. The average shorehice change for this tauty area is erosional at a rate of -0.5 thyr. The northern portion of the study area (transacts 207 - 272) is eroding at an average rate of -0.1 thyr while the southern portion (transacts 140 - 206) is eroding at an average rate of -0.1 thyr.

Polihale State Park (transects 80 through 272) extends through Polihale into Queen's Pon study areas. The average shoreline change for Polihale State Park is erosional at an average rate of -0.4 ftlyr. Previous studies' do not analyze Polihale Beach.

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¹ Makai Ocean Engineering and Sea Engineering, 1991 Aerial Photograph Analysis of Coastal Erosion on the Isli of Kauai, Molokai, Lanai, Maui, and Hawaii. State of Hawaii Office of Coastal Zone Management Program.

≝USGS

Hikimoe Vallev