

MANAGING MAUI'S DYNAMIC SHORELINES

What are the erosion response options?

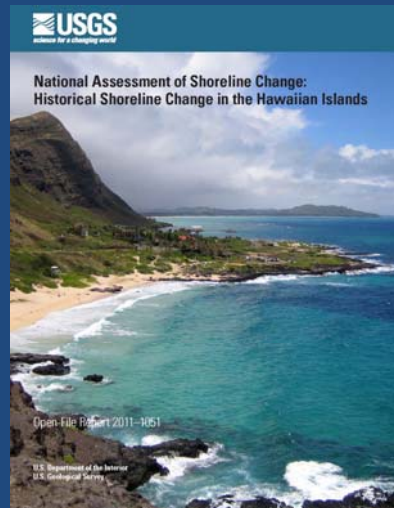
*Maui County Council Planning Committee Discussion
October 6, 2016*



04.22.2015

EROSION IS WIDESPREAD ON MAUI

- 85% of Maui shorelines are eroding over the long-term.
- Maui's beaches are experiencing the highest rates of erosion for the Hawaiian islands.
- Maui has the highest percentage of beach loss (11%).



Fletcher, Charles et. al., 2011. *National Assessment of Shoreline Change: Historical Shoreline Change in the Hawaiian Islands*. U.S. Geological Survey Open-file Report 2011-1051, 55p.

Maui has lost more than four miles of sandy beach in past century — report



By LEE MADA, News Column

HONOLULU — Eighty-five percent of sandy beaches from the mid- and late 19th century have been lost on Maui in the past century, according to a U.S. Geological Survey and University of Hawaii report released last week.

Those percentages were the highest in the report covering 150 miles of sandy shoreline or “essentially every beach” on Maui, Oahu and Kauai.

The entire Kihunui coast is eroding, except for a handful of places where sand is being replaced by rocks,” said Charles Fletcher, associate dean of the University of Hawaii School of Ocean and Earth Science and Technology and lead author of the report “National Assessment of Shoreline Change: Historical Shoreline Change.”

Kaanapali Beach has shown an annual erosion rate of 3.2 feet over the last century, according to a U.S. Geological Survey study of Hawaii report. Maui has lost 4.2 miles of sandy beach in the past century, according to the report, which is titled “National Assessment of Shoreline Change: Historical Shoreline Change in the Hawaiian Islands.”

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Lanterns light up the night in Lahaina. Photo by [Name] for the Star Advertiser.

WALLS NO MATCH FOR WAVES

New research predicts a doubling of coastal erosion by mid-century in Hawaii



New research from scientists at the University of Hawaii at Manoa and the Hawaii Department of Land and Natural Resources brings into sharper focus just how dramatically Hawaii's beaches might change as sea level rises in the future.

Chronic erosion dominates the sandy beaches of Hawaii, causing beach loss in 4 of every 5 years.



Handwork of gravitational attraction

Sea level rise may cause a doubling of beach erosion by 2050, researchers say.

Erosion likely result of supermoon tidal increases rather than storms

The Maui News

SUNDAY, March 15, 2015 \$2.00



Forces of nature threaten roadway

Hauling sand to erosion 'hot spot' on S. Kihunui Road studied as option

By KAREN FORD, The Editor

South Maui's Kihunui Road is a scenic drive, but it's also a road that's threatened by forces of nature. A study is under way to see if hauling sand to the beach will help protect the road from erosion.

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Lanterns light up the night in Lahaina. Photo by [Name] for the Star Advertiser.

WALLS NO MATCH FOR WAVES

West Side beaches and properties face erosion from large surf



Hotel tax might be tapped to fix eroding beaches



June 5, 2016

The Maui News

SUNDAY, June 5, 2016 \$2.00



'Beach-quality sand' discovered as erosion reaches 'crisis' level

Mayor says county not responsible for threat to West Maui condos

By CHRIS SUGGONO, Staff Writer

KAHANA BAY — Maui County shoreline planners are "dazed" after discovering more than 300,000 cubic yards of "beach-quality sand" off Kahana Bay, which could replenish the beachfront of numerous condominiums that have been

September 22, 2016



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State hears public concerns over highway seawalls

September 22, 2016
BY LOUISE ROCKETT, Lahaina News

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WEST MAUI - Driving to Lahaina is a gamble these days, with Honoapiʻilani Highway, between Puamana and the Pali, under attack from fire, flooding, landslides, reckless drivers, road closures, sinkholes, seawalls, high tides, waves and gridlock.

But now a positive, enlightened force has come forward to lead the way and forge a new path.

Occupy Olowalu," a West Side social media phenom, has taken a stand. For the past week (as of deadline Sept. 19), the determined activists have camped out on the shoreline just south of Awalua, and miraculously their messages, posted on signs along the roadside and on Facebook, are being heard: #nomoreseawalls, #protectourshorelines, #movetheroad.

Article Photos

COASTAL EROSION

Combination of Causes:

1. Sea-Level Rise (*chronic erosion*)
2. Seasonal Wave Conditions & Storms that Move Sand (*episodic erosion*)
3. Human Impacts to Sand Supply (*chronic erosion*)



EROSION RESPONSE OPTIONS

preferred strategies

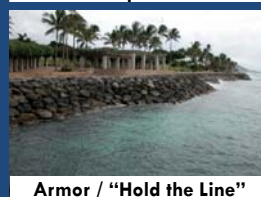
- Do nothing
- Managed retreat (*setbacks*)
- Adaptation (*elevate, reconfigure*)
- **Beach nourishment and/or Dune Restoration**
- Temporary or permanent erosion control (*sand pushing, geobags, groins*)
- Armoring (*permanent rock revetment or seawall*)



Do Nothing



Adaptation



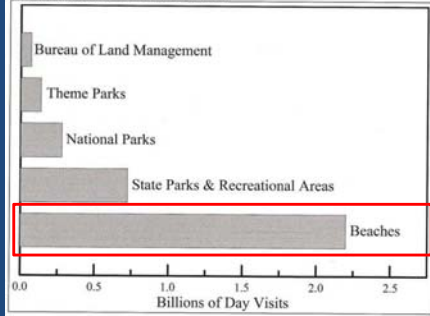
Armor / "Hold the Line"

RECENT ARMORING DECISIONS

YEAR	LOCATION	DECISION	COST
2016	Hololani Condominiums (West Maui)	approved, conditions to restore beach and remove	\$3 million
2016	Argyropoulos property (North Shore)	approved, not yet built	\$0.5 million
2015	Wailuku-Kahului Wastewater Reclamation Facility (North Shore)	approved and completed	\$5.8 million
2013	Honoapiilani Highway at Launiupoko (West Maui)	completed under emergency proclamation	\$6 million
2012	Honoapiilani Highway at Ukumehame (West Maui)	completed under emergency proclamation	\$7 million
2011	Honoapiilani Highway at Olowalu (West Maui)	approved, put on hold (2016)	\$2 million

ECONOMIC VALUE OF BEACHES

Figure 6. Day visits to beaches compared with day visits to the other major tourist attractions in the United States.



Beaches are the leading tourist destination in the United States (day visits = 2.2 billion per year).

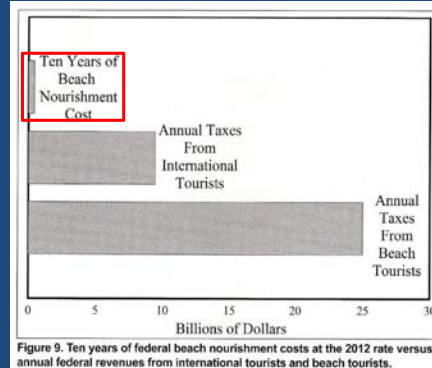


Figure 9. Ten years of federal beach nourishment costs at the 2012 rate versus annual federal revenues from international tourists and beach tourists.

Beach nourishment is a good return on investment (cost = small fraction of tax revenue from tourist dollars).

Houston, James, 2013. The economic value of beaches – a 2013 update. *Shore & Beach*, 81(1), 3-11.

ECOSYSTEM SERVICES OF BEACHES



TAKEAWAYS SO FAR

- Existing development is threatened by chronic and worsening coastal erosion.
- Armoring (seawalls) has been the primary response to protect threatened development, causing beach loss.
- Beach restoration (sand nourishment) is the only engineering tool that can protect both the built environment and the natural environment.
- In appropriate cases, response can shift to beach restoration as an alternative to armoring.

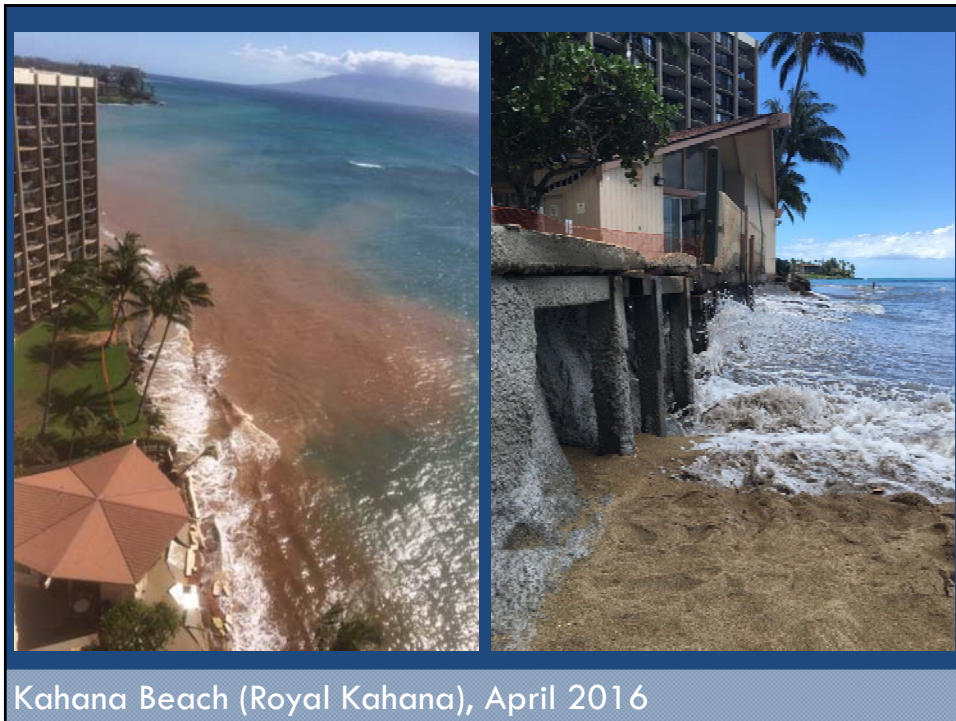
KAHANA BAY COASTAL EROSION

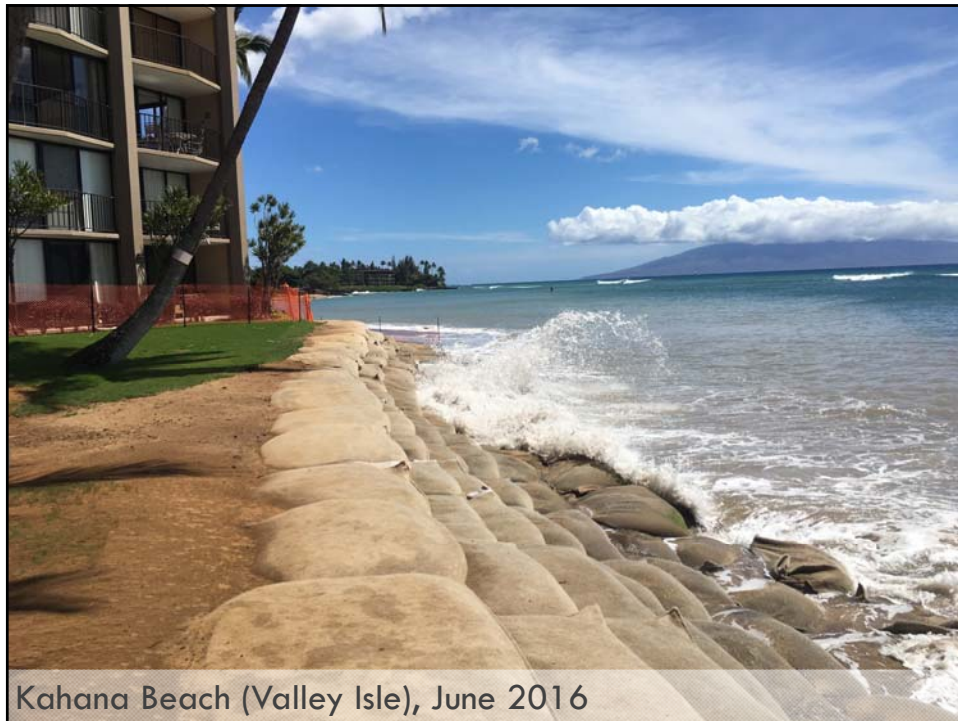
- Older existing condos were built close to the ocean & are now threatened by erosion.
- Long-term erosion of 0.7 ft/yr has led to narrowed beaches.
- Armoring has contributed to erosion.
- Episodic (seasonal) erosion is now more damaging.
- The formerly wide sandy beach has protected condos through the years.











BEACH RESTORATION STUDY

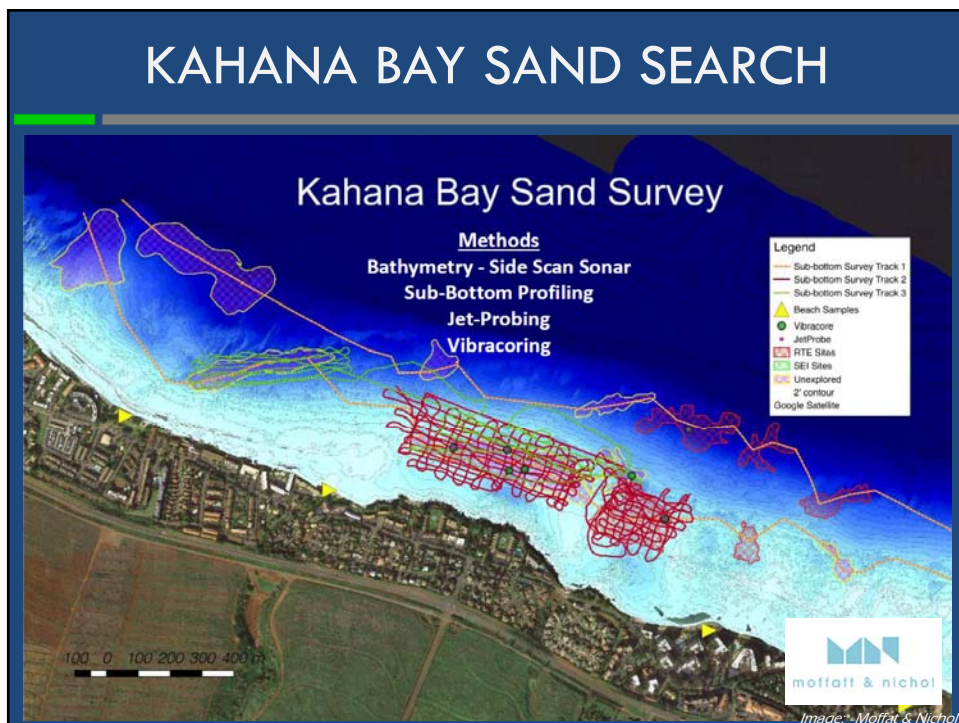
1. Objective was to initiate a Kahana Bay erosion mitigation study* and partnership approach.
2. Solicit owners' support to match \$160,000 committed by the County Council for the 1-yr study.

ACCOMPLISHED!!

*The 1-year study would evaluate a regional beach nourishment solution by:

- 1) Investigating potential offshore sand sources (sand = options);
- 2) Assessing alternative structure configurations.

KAHANA BAY SAND SEARCH



KAHANA BAY: SAND SEARCH RESULTS

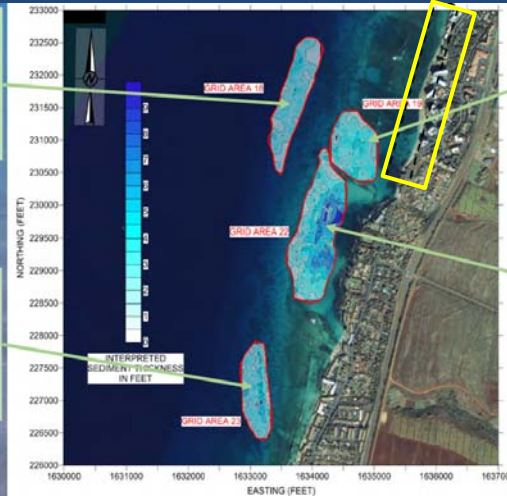
Estimated Sand Volume: 405,000 cubic yards!

Sand Deposit 18

- 69,000 cy
- 16.4 acres
- 2.6' avg thickness
- 45' deep

Sand Deposit 23

- 60,000 cy
- 12.0 acres
- 3.1' avg thickness
- 24' deep



Sand Deposit 19

- 71,000 cy
- 14.1 acres
- 3.1' avg thickness
- 15' deep

Sand Deposit 22

- 205,000 cy
- 28.5 acres
- 4.5' avg thickness
- 12' deep



KAHANA BAY: RESTORATION CONCEPTS

50,000 cy
50 feet of beach
Groins at every property



Image: Moffatt & Nichol



WHAT NOW?

- Partnership building to continue planning, design, permitting, and implementation of a regional beach restoration project.
- “Kahana Bay Restoration Foundation” is forming for decisions, outreach, and project funding.
- EA/EIS is next major step (including other baseline studies, alternatives, and engineering drawings).
 - Cost = ~\$600,000
- Two possible implementation paths:
 - US Army Corps of Engineers, Honolulu District, Section 103 Shoreline Protection Program; OR
 - Private consultant approach.

Mahalo Nui Loa

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