

Quantifying condition of coral reef communities in the Kahana and Honōkahua Priority Watersheds, West Maui

Project Information

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Background

The Hawaii Coral Reef Strategy identified the coral reef ecosystem along the West Maui watersheds (Ka'anapali to Honolua) as a State Priority Management Area. Coral reefs in the region are severely affected by sedimentation and siltation stress, due to excessive terrigenous runoff from prolonged and deficient land-use practices.

This project will address continue data collection in the W Maui area that have been the center of CRCP-supported monitoring efforts. Last year's project "FY16 Quantifying condition of coral reef communities in the Kahana and Honokahua Priority Watersheds, West Maui (ID:**31141**)" succeeded in providing reef conditions in two of the 5 watersheds in W Maui, and overall coral reef fish and benthic assemblages in the W Maui priority area. Previously, CRCP funded the FY14 project "Determining the efficacy of watershed management activities in the Wahikuli and Honokowai watersheds, West Maui (ID 1077)" which provided sediment loading dynamics for two of the five watersheds. Thus, there is a baseline for corals, fish, and benthic habitat already established, and partial sediment data for the two southern watersheds, but the area is missing critical sediment data for three of the five watersheds. This project will address this data gap in the missing northern three watersheds, plus provide additional data in the two southern watersheds, filling in the picture of sediment loading. By the end of this project, we will have a fuller understanding of coral reef communities and benthic assemblages, plus sediment loading, across the entire priority area.

This project seeks funds to complement the ongoing long-term benthic monitoring by expanding efforts to the stream mouths and overlaying it with coral community and demographic metrics, and sediment flux and turbidity data that can be used to track and evaluate the efficacy of implemented LBSP management practices. Sediment traps and sediment pods provided initial information on sediment loads, sediment accumulation rates, and sediment composition, and the camera imagery will allow for visual assessment of stream-sediment pollution plumes.

Project

CRCP project 1077 provided baseline for seven locations associated with main watershed drainages; project 31141 expanded the baseline for northern Honōkōwai and southern Kahana. This FY17 proposed extension will provide needed sediment data across these same seven sites, thus linking the biological baseline to the sediment loading data.

The CRCP project funding was intended to pay for year 1 supplies and equipment, which took place. This initial instrument set up and deployment was completed in collaboration with USGS in year 1 of this study; further sediment sample collection and analysis will be carried out by collaborations with local partners.

Methods

Sedimentation

Sediment loading was assessed based on deployment of sediment traps. An array of sediment traps was deployed at each of the shallow monitoring sites at Honolulu, Kahana, Mahinahina, Honōkōwai and Wahikuli (Figure 1 and Table 1). Installation description and specifics can be found in Storlazzi et al. (2009, 2011) and Field et al. (2012). Table 1 lists the dates, site locations, and analyses performed on the sediment samples. Table 2 provides the results of the sediment composition analyses by size class (sand, silt, clay).

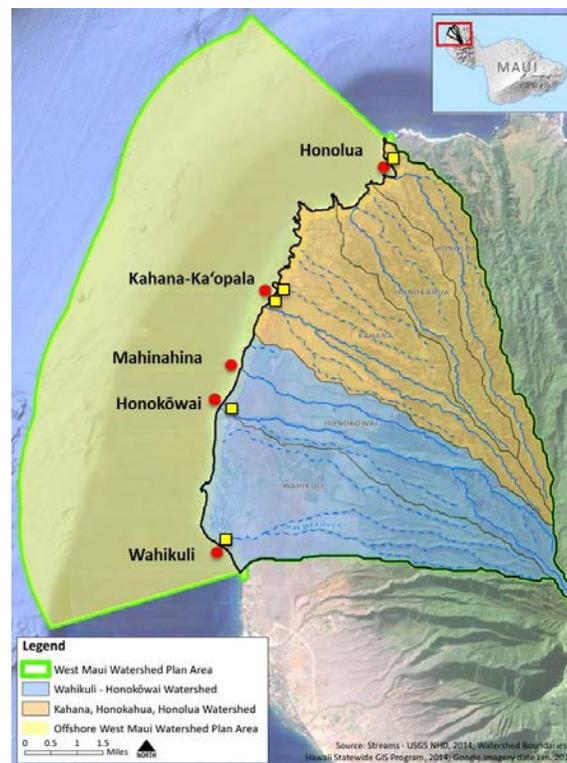


Figure 1. General location of the major study sites on west Maui. Deployment location of sediment traps is indicated by red circles and coastal cameras by yellow squares. Modified from: <http://www.westmauir2r.com/>

Table 1. Site location of sediment traps deployed at each permanent monitoring sites.

Sample I.D.	Date Collected	Time (HST)	Latitude	Longitude	Sample Type	Analyses Requested
Honolua	4/3/2018	9:00	21.01406	-156.63955	trap	grain size, % CaCO ₃ by GS class
Kahana	4/3/2018	10:30	20.97761	-156.67929	trap	grain size, % CaCO ₃ by GS class
Mahinahina	4/3/2018	11:00	20.96335	-156.68518	trap	grain size, % CaCO ₃ by GS class
Honōkawai	4/3/2018	12:00	20.94993	-156.69205	trap	grain size, % CaCO ₃ by GS class
Wahikuli	4/3/2018	13:00	20.91036	-156.69151	trap	grain size, % CaCO ₃ by GS class

Table 2. Sediment composition terrigenous (TERR) vs carbonate (CaCO₃) and size fraction analysis of samples collected on sediment traps at five permanent monitoring stations on West Maui

Sample ID	Date	Latitude	Longitude	BULK %TERR	BULK %CaC O ₃	SAND %TERR	SAND %CaC O ₃	SILT %TE R	SILT %CaC O ₃	CLAY %TE R	CLAY %CaC O ₃
Honolua	4/3/2018	21.01406	156.6395	41.03	58.97	35.73	64.27	89.62	10.38	79.42	20.58
Kahana	4/3/2018	20.97761	156.6792	15.47	84.53	8.12	91.88	40.45	59.55	49.11	50.89
Mahinahina	4/3/2018	20.96335	156.6851	12.63	87.37	19.93	80.07	62.08	37.92	51.04	48.96
Honōkawai	4/3/2018	20.94993	156.6920	19.16	80.84	18.11	81.89	67.93	32.07	59.50	40.50
Wahikuli	4/3/2018	20.91036	156.6915	64.06	35.94	46.86	53.14	95.65	4.35	94.93	5.07

Coastal Cameras: Monitoring Existence and Extent of Sediment Plumes

At five stream mouths in the priority watershed area a pair of Covert brand cameras were mounted; see Figure 1 and Table 3 for camera deployment location. These cameras are outfitted with polarized lenses and cases, and are set to take still photographs every 30 minutes during daylight hours. The cameras are maintained quarterly, when battery replacement, downloading of SD cards and cleaning of the case takes place. The images below collected at Kahana stream mouth before, during, and after Tropical Storm Olivia (Sept 12, 2018) illustrate the utility of the coastal cameras (Figure 2, provide a visual record of the extent and duration of sediment plumes following rain events and/or high wave events in some areas that drive coastal erosion.

Table 3. Site location of the coastal camera deployments

Location	Latitude	Longitude	Description
Honolua Bay	21.01644	-156.6386	Grassy side of cliff N of bay
Kahana Stream	20.97683	-156.6774	Vacation rental N of stream- kiawe tree
Ka'opala	20.98083	-156.6738	Seebart Carport roof- pole mounted
Kaanapali Shores	20.94961	-156.6892	Rooftop of Kaanapali Shores on Mauka-middle side
Hyatt Spa	20.91136	-156.6906	1st story- wall mount

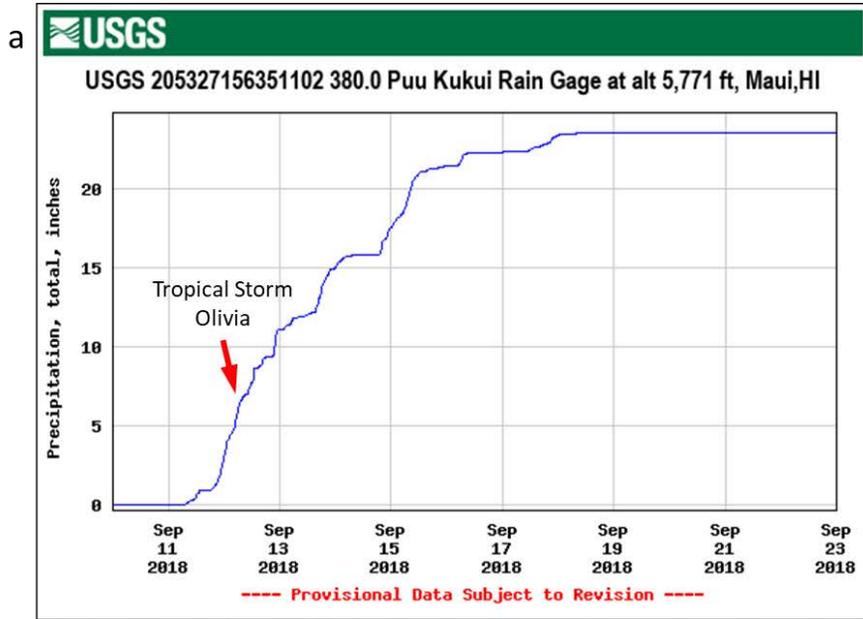


Figure 2. Utility of the coastal cameras providing visual records of the extent and duration of sediment plumes following rain events on West Maui. a) Total precipitation at the Kukui rain gage during tropical Storm Olivia); b) Kahana stream mouth 9/11/18, one day before Tropical Storm Olivia; c) Tropical storm Olivia 9/12/18 brings sediment and debris; d) one week after the storm on 9/19/18, sediment persists far from the coast; e) more than a month after Tropical Storm Olivia on 10/14/18, the coastal waters remain turbid.

Moving Forward

Project data has provided a static view of sediment loads into the sites identified, along with a visual account of the strong sediment plumes associated with large rain events. By itself, this snapshot is of limited use – the real benefit will come with time, allowing us to obtain a long-term understanding of the local sediment loads dynamics.

Over the next few years, equipment set up by this project will monitor changes in sediment loading and the resulting coral community demographics, as the watershed management projects are implemented.

Moving forward, Maui's Division of Aquatic Resources has agreed to support this project by providing quarterly retrieval and servicing of the sediment traps deployed by this project at all its locations. In addition, Maui's Ridge to Reef staff will also retrieve the images at the cameras at the same quarterly interval, plus cover the funding for the ongoing laboratory analysis from the sediment traps.

These new local collaborations will provide a multi-year analysis of sediment characterization in the west Maui region. Those interested in this upcoming data should contact project staff.

References

S Storlazzi C, Field M, Bothner M, Presto M, Draut A (2009) Sedimentation processes in a coral reef embayment: Hanalei Bay, Kauai. *Marine Geology* 264 (3), 140-151

Storlazzi CD, Field ME, Bothner MH (2011) The use (and misuse) of sediment traps in coral reef environments: theory, observations, and suggested protocols. *Coral Reefs* 30 (1), 23-38

Field ME, Chezar H, Storlazzi CD (2012) SedPods: A low-cost coral proxy for measuring net sedimentation. *Coral Reefs* 32: 155-159