

Coastal Assessments Along the Southern Shore – A Review

Introduction

The members of Waterkeepers® Bahamas have identified increased coastal erosion to be a priority concern for the citizens of the Bahamas. This increased erosion will continue into the long term as a result of elevated sea levels caused by global warming, but Bahamian coastlines are also at risk to the harmful effects of environmentally insensitive beach developments in the short term. Several beaches across Grand Bahama including Williams Town Beach, Taino Beach near Smith's Point, and the Easternmost section of Bishop's beach have already suffered extreme cases of rapid beach loss because of shoreline developments. In an effort to get out ahead of this issue, Waterkeepers Bahamas is conducting assessments of undeveloped coastlines which are frequented by Bahamians and tourists. In doing so, we are collecting long term data on the natural tidal marks, slope and seasonal changes of frequented, underdeveloped Grand Bahama beaches. This way, if any one of these beaches begins to demonstrate significant changes, Waterkeepers Bahamas will have years of data at its disposal to help it assess and identify the cause of the change. In addition, if any future development is planned on these beaches, Waterkeepers Bahamas would be better able to advise such a development on the dynamic coastal ecosystem it is affecting, hopefully reducing the development's impact.

Methods

Focusing on the southern shore of Grand Bahama Island, nine sections of beach have been identified as a priority for future management. These beaches were selected because of their frequent use by Bahamians and/or tourists, establishing their importance for the future of safe, swimmable Bahamian waters in the future. The 9 beaches selected are:

- Lover's Beach near Eight Mile Rock
- Xanadu Beach in Bahamia
- East Palm Beach near the Williams Town Cemetery
- Manta Ray Beach, east of Island Seas Resort
- Coral Beach
- Taino Beach
- Banana Bay/Fortune Beach
- Barbary Beach
- Gold Rock Beach



Measurements of the gradient of each beach slope are being taken to establish a baseline for the normal state of each aforementioned beach. Measurements are taken with the hydraulic beach profiler pictured in Image 1. At each beach, 2 slopes within a few hundred feet of each other are measured on a monthly basis.

Left - A hydraulic beach profiler used to measure beach slope.

Preliminary Results

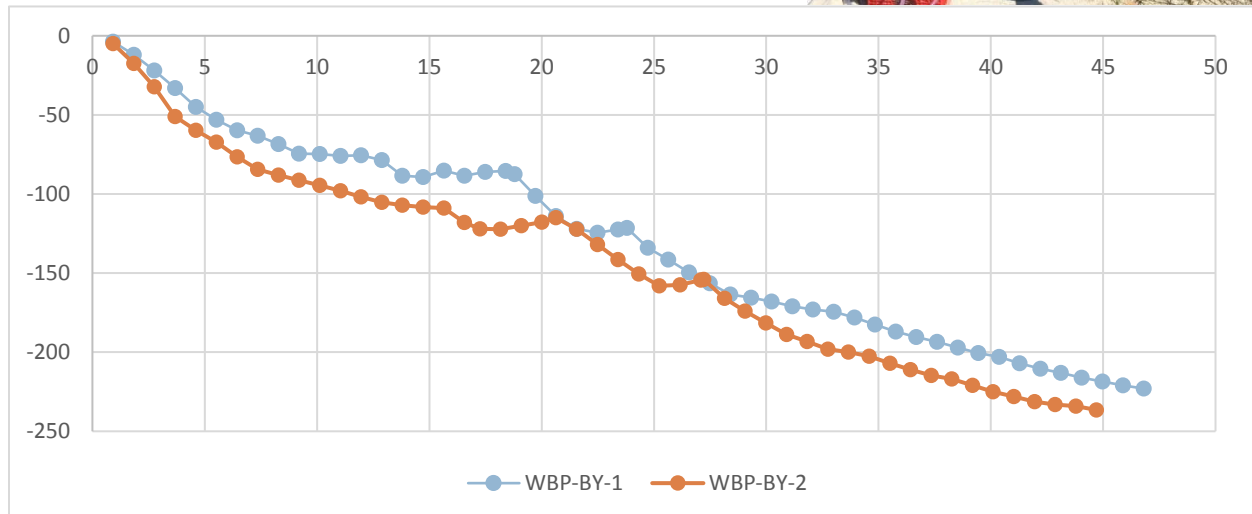
Barbary Beach

Being the easternmost beach involved in the study, Barbary is unique in that it is the most remote of any of the beaches. It is also the widest and its total slope from dunes to low tide is the second shallowest of those studied at this current time (-5.03cm/m). This wide, soft slope provides strong evidence that Barbary encounters strong, naturally constructive beach development throughout the year. Several factors could contribute to this, including:

- a healthy offshore reef promoted by the protection imposed on Peterson's Cay National Park
- a lack of nearby coastline development
- a healthy variety of dune vegetation growing on the beach



Images depicting Barbary Beach's dune vegetation from inland (left) and from the shore (right). A variety of sea-grape, grasses, vines and shrubs can be seen amidst a moderate Casuarina infestation, possibly contributing to the beach's well-developed slope.



Above - Graphical representation of Barbary beach's slope at two different transects (WBP-BY-1 & WBP-BY-2) during the month of June. Three small but distinct berms can be noted at approximately 15m, 20m, and 25m, demonstrating the different heights of high tide under different environmental conditions.

Banana Bay, Taino Beach and Coral Beach

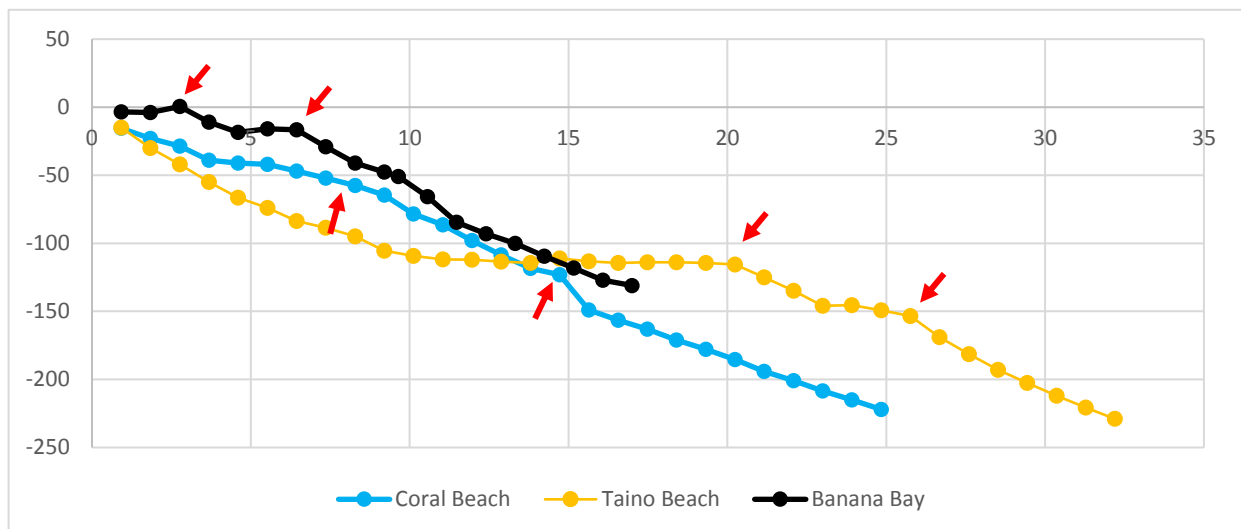
These three beaches represent different strips of coastline between the southernmost outlet of the Grand Bahama Waterway and the easternmost outlet of Bell Channel Waterway near Smith's Point. They demonstrate key points of interest for the future of swimmable Bahamian waters as they are 3 of the most popular beaches for residents in eastern Freeport.



Left - Satellite view of the southern shore of Grand Bahama between Smith's Point and Fortune Beach. Identified on the map are:

*Yellow – Coral Beach
Orange – Taino Beach
Red – Banana Bay*

Each of these beaches is moderately developed at this time, with any one of them at risk of facing more development in the future. They also all demonstrate similar beach profiles, depicted below, with very similar total beach slopes of -7.75cm/m , -7.77cm/m and -6.92cm/m for Coral Beach, Taino Beach and Banana Bay respectively. Continued observation at these seemingly similar and geographically adjacent sites will provide significant insight into the possible effects of seasonally changing tides and winds on the southern shore's beaches.



Above - Graphical representation of transect results at Coral Beach, Taino Beach and Banana Bay during the month of June. At each site, two distinct high tide berms can be noted (indicated with red arrows). The similarities in their slope allude to possibly similar degrees of beach development, wave action and wind direction as a result of their close geographic proximity.

Lovers Beach

Lovers Beach is and will likely continue to be an outlier when compared to other beaches on Grand Bahama's southern coast. Its difference from other beaches in the study is likely in no small part due to the beach's geographical location. The perpendicular distance from the shoreline at Lovers to open ocean is approximately 350 meters. For comparison, this perpendicular distance at Taino Beach is 2000 meters; even the nearest beach to Lovers, Xanadu Beach, is 1000 meters from the open ocean. These large expanses of shallow water offshore assist the development of beaches by:

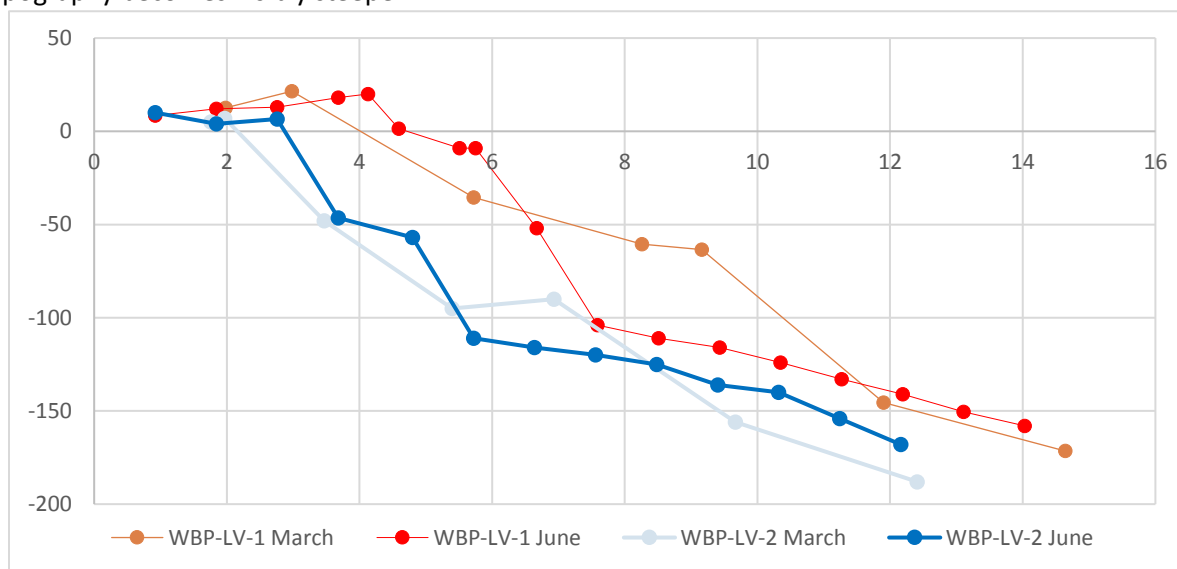
- converting energetic waves into calmer, constructive waves
- protecting from erosion due to hurricane and storm surges
- allowing a space for coral reef development, which creates sand for nearby beaches

Without these offshore features, Lovers Beach is likely exposed to more frequent erosion. This could possibly contribute to the particularly steep slope noted at the transect sites (an average of -12.64cm/m during the last few months).

In addition, Lovers is also one of the few beaches that has been monitored for the full 5 months of the study duration. With this long-term data, we can begin to view the changes that this beach undergoes on a yearly basis. In the figure below, the lighter lines represent the beach slopes at each transect (WBP-LV-1 & WBP-LV-2) during the month of March; the darker lines represent these slopes during June. Though the total slope changes little over the course of 5 months, the beach topography becomes visibly steeper.

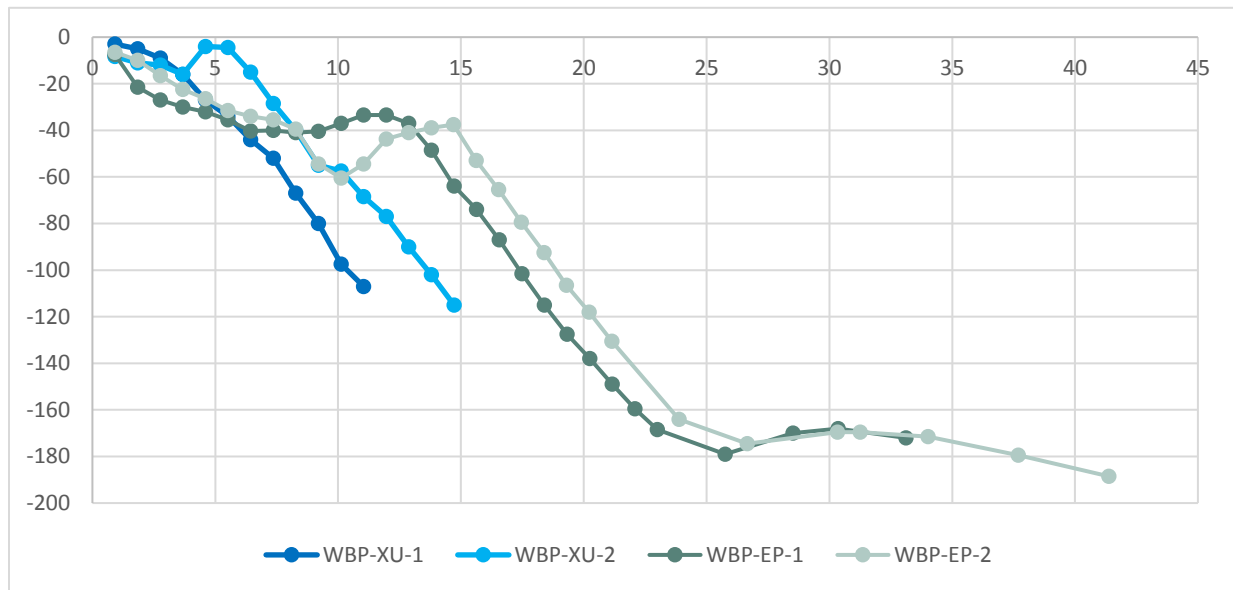


Above – An image of the transect sites at the steep Lovers Beach shore on its southeastern end.



Above – Graphical representation of transect results at two transects along Lovers Beach, with red lines representing WBP-LV-1 and blue lines representing WBP-LV-2. The beach slopes have receded approximately 2.5 metres in 5 months, though the total beach slopes have remained similar.

Other Results



Above – Graphical representations of transect results at Xanadu Beach (WBP-XU-1 & WBP-XU-2) and East Palm Beach (WBP-EP-1 & WBP-EP-2) during the month of June. These transect locations are approximately 1 mile apart, only separated by 2 canal outlets. They demonstrate the possibility of similar dune development and beach profiles, with East Palm Beach being significantly longer. Further studies over the course of several months may reveal similar changes to each beach with the passage of time.

Preliminary Conclusions

Up to its current stage, the study provides two possible implications as to the conditions and changes affecting beaches along the southern shore of Grand Bahama. Firstly, beaches appear to demonstrate a high degree of similarity when occupying nearby geographical locations. This similarity persists despite varying degrees and types of development, as seen in both the comparisons between Coral Beach, Taino Beach and Barbary Beach and in the comparison between Xanadu Beach and East Palm. This information may imply that the current level of development along these coastlines is not impairing the beach's slope. Instead, natural factors dictated by the surrounding vegetation and offshore conditions are the driving forces behind each profile.

The one beach where this natural similarity is not seen is near Island Seas Resort and Manta Ray Restaurant. There, development projects along the beach have been placed all the way up to the high tide mark. There is no dune and no backshore. Whether this increased beach erosion has been caused by those specific development projects, or by the sea wall just 0.5 miles to the West is unclear at this time.

Finally, on the only beach where relatively extensive temporal data has been obtained, Lovers Beach, it can be noted that the beach has steepened into the summer months. This provides a cursory implication that the beach is undergoing stronger wave action during the summer months than in winter. Whether this is the case on Grand Bahama's other beaches has yet to be determined, but profiling over the next 6-12 months will be able to answer this question.