Ocean & Coastal Management 148 (2017) 204–213

Contents lists available at ScienceDirect

Ocean & Coastal Management

journal homepage: www.elsevier.com/locate/ocecoaman

Erosion and the beaches of Negril

Christine McDougall [a, b, *]

[a] Project Dragonfly, Miami University, Oxford, OH, USA
[b] Westland Mountain Road, Negril, Westmoreland, Jamaica

ARTICLE INFO

Article history:
Received 28 January 2017
Received in revised form
2 August 2017
Accepted 12 August 2017

Keywords:
Erosion
Ecosystem services
Coastal squeeze
Corporate environmental responsibility
Eutrophication

ABSTRACT

In Negril, beach erosion is a major environmental concern, caused by similar anthropogenic stressors impacting populated coastal areas worldwide. This review recapitulates the environmental circumstances leading to beach erosion in Negril through the lens of global and regional trends, arguing in favor of the ecosystem approach for long term mitigation. Evidence points to depleted coastal ecosystems and services, calling for the restoration of the neglected Negril Environmental Protected Area (NEPA) which contains the entire tidal flow of the beach barrier system. The looming threat of eutrophication adds the reduction of nutrient fluxes to the equation of sustainability, requiring adequate sewage treatment and wetland restoration. Perspectives for restoration and the societal constraints pertaining to protected area management are addressed, concluding that the pressing restoration and management of ecological integrity in Negril needs to be a government, business and local community collaboration, connecting not only habitat but people as allies in the battle against biodiversity loss.

Contents

* 878 6th Street, Chibougamau, Quebec, G8P1W2, Canada.
E-mail address: mcdougc2@miamioh.edu.

http://dx.doi.org/10.1016/j.ocecoaman.2017.08.008
0964-5691/

1. Introduction

In Jamaica, Negril's 6.4 km Long Bay and 1.5 km Bloody Bay are separated by a rocky promontory and a small island named Booby Cay (Fig. 1) (ten Ham et al., 2006; Robinson et al., 2012). The bays' beaches are part of a sand barrier system fronted inland by the Great Morass and seaward by a coastal platform submerged in 10 m of water (Robinson and Hendry, 2012). This shelf, 2 km from the shore, ends where the island slope drops and creates a drowned cliff line (Robinson and Hendry, 2012). A series of breaks, giving water depths of 100 m at 3.5 km and 500 m at 6 km offshore (United Nations Environment Programme (UNEP), 2010), descend to the ocean floor 2000m below (Robinson and Hendry, 2012). Fringing coral reefs are located on the outer shelf 3 km from the shore at depths of 20 to 50 m (UNEP, 2010). Sea grass beds run between the shelf and a landward sand carpet extending to the beach, spotted with pockets of sea grass and patch reefs (UNEP, 2010). A 500 m shallow patch reef is situated 1.4 km offshore in the middle of Long Bay (CL Environmental, 2014). Both bays exhibit low beach ridges of less than 2 m and are void of a backshore storm berm or dune complex (UNEP, 2010). Inshore, the beaches are backed by the Great Morass, an expanse of wetlands measuring roughly 24 km^2 and reaching depths of over 12 m (Robinson et al., 2012). The Great Morass encompasses mangroves, swamps and marshlands dominated by sawgrass (*Cladium jamaicense*) (NEPA, 1998).

For the past 50 years, erosion has afflicted Negril's beaches, as witnessed by 15 m of shoreline recession in the southern extremity of Long Bay (University of West Indies (UWI), 2002). Some sections are more affected than others, with the shore exhibiting an alternating pattern of intense erosion and constant accretion (Fig. 2) (UNEP, 2010). Nonetheless, the rate of erosion has been established at 1 m $year^{-1}$ in Long Bay and 0.5 m $year^{-1}$ in Bloody Bay (UNEP, 2010). If left unchecked erosion could lead to the disappearance of Negril's beaches within 10–30 years (ten Ham et al., 2006; McKenzie, 2012).

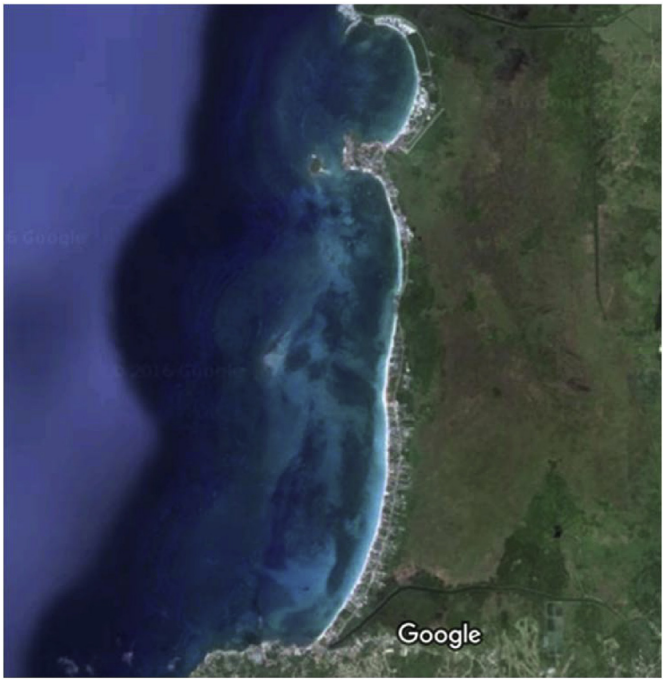

Fig. 1. Satellite image of the coast and the wetlands of Negril, Jamaica. Reprinted from Google Earth, 2016. Retrieved from https://www.google.com.jm/maps/@18.3188974,-78.3319422,9699m/data=!3m1!1e3. Copyright (2016) by DigitalGloge, CNES/Astrium, Data SIO, NOAA, US Navy, NGA, GEBCO & Google.

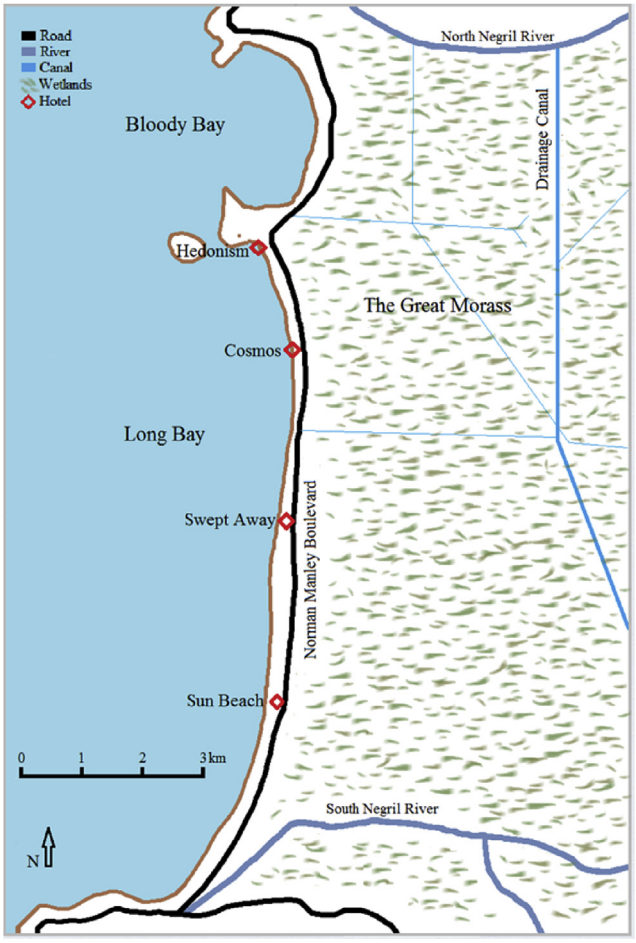

Fig. 2. Map of Long Bay beach illustrating the canalization of the Great Morass and the pattern of sand accretion and erosion: constant erosion in front of Hedonism, accretion between Cosmo's and Swept Away, and a cycle of accretion and erosion from Sun Beach to the Negril South River.

Negril's coastline has moderate hydrodynamics with small tidal ranges and northeast-southwest currents that do not surpass 0.2 m s^{-1} (UNEP, 2010). More energetic weather or wave induced currents, strong enough to take over the weak tidal flow, occasionally hit the coast (UNEP, 2010). Both bays are protected from dominant northwest winds and shallow coastal waters damper the refraction of the waves, creating a longshore drift that is mostly accretional (ten Ham et al., 2006). This longshore drift does not directly transport sediments out of the system's boundaries but redistributes sand on the beaches (ten Ham et al., 2006). However, longshore transport mostly happens during stormy weather, when it carries to areas less protected from cross-shore waves a considerable amount of sand that is then swept out to sea (ten Ham et al., 2006). Most frequently, storm induced swell waves are the ones that transport sand past the island shelf (ten Ham et al., 2006).

In consequence, the beaches' vulnerability to erosion is exacerbated by climate change that increases and intensifies regional storm events, and accelerates sea level rise (Nicholls et al., 2007). As it rises, the sea level deepens nearshore waters, heightening waves and increasing the offshore transport of sand (Bird and Lewis, 2015). For Negril's 300 m to 700 m wide beach barrier system that lies at most 2 m above sea level, the anticipated sea level rise is between 0.3 cm and 0.6 cm $year^{-1}$ and the projected average