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Abstract

Mangroves are intertidal, forested wetlands that provide a number of important ecosystem services. Throughout the world and in the United States Virgin Islands (USVI), mangroves are threatened by development despite their ecological value. Located on the southeastern end of St. Thomas, USVI, the St. Thomas East End Reserve (STEER) includes 9.6 km^2 of significant coastal resources, including the largest intact stand of mangroves on the island. This area, known as Mangrove Lagoon, is largely considered one of the most important fisheries nursery habitat in and around St. Thomas. The western edge of Mangrove Lagoon is bordered in part by Bovoni Landfill, an unlined landfill in operation since the late 1970s. In the U.S., landfills are the most common method of solid-waste disposal and in densely-populated, small-island nations they can be problematic. Water that filters through landfill waste produces leachate, an often toxic liquid that can contaminate groundwater and adjacent natural systems. The focus of this study is to measure groundwater chemistry, flowpaths, and flux rates within the mangrove system adjacent to Bovoni Landill using a series of shallow and deep well clusters spread across the study area. We will use a combination of field measurements and modelling to better understand how groundwater is moving through the system, including flowpaths and rates. Additionally, we will measure water chemistry to better understand the influence of the landfill on adjacent mangroves. Specifically, our proposed methods include hydrogeological measurements (including physical and water chemistry measurements), subsurface stratigraphic characterization through the collection of geologic cores, and computer modelling using FiPy and USGS SEAWAT. These questions are of interest scientifically, but they are also of direct management concern to STEER, the Virgin Islands Waste Management Authority (VIWMA, who operates the landfill), the Virgin Islands Department of Planning and Natural Resources (VI DPNR), and the Environmental Protection Agency. Additional benefits of the proposed work include: (1) establishment of baseline data for potential long-term groundwater monitoring of the site, past the 2014 closure date of the landfill, (2) communication of study results to (a) local stakeholders at

STEER core planning group and community meetings, (b) individuals at VIWMA and DPNR, (c) scientific audiences at the Coastal and Estuarine Research Federation meeting and through the peer-reviewed literature, (3) training of one graduate student from the University of the Virgin Islands (UVI)in aspects of geology, an area of study for which there are no upper-level courses currently offered at UVI, (4) development of new course material and educational cross-collaboration between UVI and the University of Maine (the home institutions of the two co-PIS on this project), and (5) production of data to be used in support of a larger proposal to the National Oceanic and Atmospheric Administration s Coral Reef Conservation Program Domestic Coral Reef Conservation Grants program in FY14 and/or the National Science Foundation' s Hydrologic Sciences program.