Impact of Hurricane Sandy on the Ecology of the New Jersey Shorelines: Recovery and Resilience

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ABSTRACT

The ecological resilience of the North Jersey shorelines was evaluated following Hurricane Sandy. Three locations were selected each representing a different ecosystem: Sand beaches in Raritan Bay, a wetland system, and a site on the Passaic River a mile inland of Newark Bay. These systems were historically freshwater to brackish, and it was important to quantify the stress within them as a result of the intrusion of large volumes of seawater and sand onto them. Sampling transects were set across sand beaches whose inland areas where flooded, and the flooding persisted one week after the end of the storm. The hypothesis was that this residential flooding altered the ambient flux of chemicals in terms of quality and quantity. Measurements of pore water are being acquired, and they are analyzed for nutrients, metals, and salinity. The wetland system was brackish, and the hypothesis to test was that the behavior of the wetland switched from methanogenesis to sulfate reduction. Sediment samples are being analyzed for sulfide, nutrients, metals (Iron, Manganese, etc), and PAHs. The model MARUN, a finite element model for density-dependent flow in variably-saturated media will be used to interpret the results. In the Passaic River, fish count data were collected before and after Hurricane Irene (in 2011), and are being compared to those from after Hurricane Sandy. The hypothesis being tested is that the impairment of the Passaic River due to Hurricane Sandy is more severe than that due to Hurricane Irene due to the large storm surge of the prior.

Coastal areas in urban centers are being stressed by increased population density and activity. While the quantification of this stress is challenging, it becomes extremely difficult in the presence of major but infrequent stressors such as hurricanes. In addition, urban coastlines consist of a mixture of anthropogenic structures, controlled (or regulated) estuaries, beach face morphology, and wetlands. Maintaining such a system whole requires various tools and measurements, each adapted to a particular ecosystem. In this project, site-specific measurements were made in three ecosystems: Beach face, wetland, and estuary residential areas, and the goal of the project is to provide data that could be used to better construct a model for coastline sustainability. The results of this study will be communicated to various stakeholders, including impacted local communities and the State of New Jersey.