Effects on Water Levels and Waves

Extreme events, such as hurricanes, create storm surge, with water from the ocean forced through inlets toward the land. Data from the Federal Emergency Management Agency indicate that surges caused by Category 3 or stronger hurricanes will flood the region regardless of whether the restoration is completed, and there are no data to support the premise that the current condition has or can provide special protection from such major storms. Analysis of historical data and targeted modeling indicated that high water in the area (setup) is primarily due to water being pushed through the inlets during periods of strong winds from an easterly direction (see figure below).

Wind setup and waves

- 10-year wind: 36 miles per hour
- 10-year water elevation: 2.4 feet > NAVD88
- Fetch A: 0.58 miles
  Fetch B: 0.78 miles
  Fetch C: 0.86 miles
- Channel bed: -2 feet
- Saltmarsh bed: +0.3 feet

Scenario for estimating the effect of restoration on setup and waves.

Due to the limited fetch (the distance traveled by wind or waves across open water), winds cannot generate substantial local setup or waves as high as a foot even after the area is restored. This modeling applied standard methods used by the U.S. Army Corps of Engineers, and it was based on rather severe and unusual conditions, with 2.4 feet of water above the datum and a 36 mile per hour wind. Both events are predicted to occur only once every 10 years, and the setup is almost equal to the 2.5 feet predicted for category 2 hurricanes. Furthermore, the modeling did not consider the dampening effects of shallow areas in open water (including shoals or oyster reefs) or vegetation recolonizing restored surfaces. Native plants that recruit to the area, such as wetland grasses and mangroves, will ameliorate wave energy, with research in a wave pool showing that one-year old smooth cordgrass occurring at a density of 37 shoots per 0.25 m^2 can reduce wave energy by ~32% (Manis, J., 2013. Assessing the effectiveness of living shoreline restoration and quantifying wave attenuation in Mosquito Lagoon, Florida. University of Central Florida M.S. Thesis). Additional modeling showed that a few piles of spoil along the line of fetch will reduce the waves by 50-60%. This reduction is expected to occur because some piles of spoil will not be touched during the project.