LOCAL-SCALE DRAINAGE, RUNOFF, AND RECHARGE DELINEATION IN THE SOUTH MIAMI HEIGHTS AREA

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Miami-Dade County is prone to urban flooding due to low topography and poor drainage. Sea-level rise may reduce hydraulic gradients and limit drainage capacity, increasing the likelihood of flooding and saltwater contamination. Climate change may intensify flooding by increasing the frequency and magnitude of storm tides and extreme events.

Drainage, runoff, and recharge are poorly quantified, but are important factors in predicting the effects that sea-level rise and extreme-weather events may have on flooding in urban areas. South Miami Heights has an intricate, small-scale drainage system that includes catchment basins, vertical French drains, water-control structures, canals, and culverts. These features could potentially increase the introduction of saltwater from storm surge into the aquifer. Storm surge from Hurricane Irma, for example, traveled nearly 8 miles upstream in the Snapper Creek canal where it contaminated a small canal and lake with saltwater, which seeped into the aquifer and toward a well field.

To better quantify the influence of urban drainage, runoff, and recharge on a local-scale hydrologic budget, water levels in catchment basins and vertical French drains in South Miami Heights are being monitored. Data collected from these small-scale drainage features and from an extensive surface-water and groundwater-monitoring network were used to aid in the development and calibration of a local-scale MODFLOW 6 groundwater flow model. Geophysical logs, core observations, and published hydrogeologic studies were used to define the aquifer properties in the model.

Preliminary model results show that the simulated groundwater levels are sensitive to recharge-rate estimates and hydraulic conductivity. Water-level fluctuations in the drains during recharge events will be used to estimate recharge volumes and rates. The model simulations, with the recharge estimates as input parameters, will be evaluated. The simulated changes in groundwater elevation from sea-level rise and storm surge will lend insight into urban flooding and drainage.

PRESENTER BIO: Scott Prinos is a supervisory hydrologist working for the Caribbean-Florida Water Science Center, U.S. Geological Survey, in Davie, Florida. He has been the lead investigator or co-investigator on a variety of interdisciplinary projects which included borehole and surface geophysical surveys, geochemical examinations, mapping, statistical analysis, website development, and hydrostratigraphic analysis.