

SURFACE AND SUBSURFACE HYDROLOGY AND FLOOD MITIGATION IN ESTERO RIVER HEADWATERS, SOUTHWEST FLORIDA

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Climate change has produced increased precipitation, and increased frequency of intense high-precipitation events, in southwest Florida where suburban land use has developed with runoff management, stormwater detention, and flood conveyances sized and designed for smaller events than are now the norm. This ongoing research investigates the role of wetlands, detention ponds, and conveyances in flood mitigation, using the campus of Florida Gulf Coast University (FGCU) in Fort Myers, Florida as an instrumented laboratory to assess hydraulic connectivity and hydrologic responses of the natural and constructed systems. The campus operates 14 stormwater detention ponds, required by Florida regulations for residential and commercial development. Ponds are designed for water quality protection but widely misconstrued as flood protection. Previous research demonstrated that runoff storage - thus flood mitigation capacity - is minimal in the campus ponds but successfully achieved by the extensive campus wetland system. In Fort Myers, wet weather season rainfall (June - September) constitutes 65% of the annual average 135 cm, producing substantial year-long elevation fluctuation in water table and surface waters. The research uses data for the 2020 and 2021 wet weather seasons from a network of elevation gauges on the FGCU campus, including data at 10-minute intervals from automated stations at 5 ponds and up to 7 piezometers. Results show that groundwater-surface water interaction varies by season, producing plentiful excess storage capacity in dry season – when flood protection is least needed. Surface water elevation change from a single event can be dramatic – threatening flooding – when ponds and wetlands fill to capacity during the wet weather season, but the extensive FGCU wetlands have been able to accommodate even Hurricane Irma’s 2017 20-cm one-day rainfall. Conclusions have broad implications for future management decisions throughout Florida about landscape design for flood mitigation.

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