

DRAINAGE AND STORMWATER DETENTION PONDS IN A RAPIDLY-URBANIZING LANDSCAPE, SOUTHWEST FLORIDA

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The Village of Estero, FL, incorporated 2015, inherited drainage infrastructure built by county, state, and federal agencies. Development along flowways and within floodplains, has become vulnerable to flooding during major storms; Hurricane Irma in 2017, with over 10 inches' rainfall, left portions of Estero inundated for several days. The objective of this research was to investigate how anticipated runoff and flooding may be affected by the rapid changes of the region's built and natural drainages; the built environment, especially rapid growth in impervious surfaces; and the design, location, and detention capacity of the many stormwater management ponds required by Florida regulations in residential communities under Water Management District guidance. Because the ponds are owned and operated by private entities, no public agency has complete information about their number, location, volume capacity, or how they respond to intense precipitation. Research methods included aerial imagery to inventory existing ponds – not known to the municipality as they are on private property – and mark their points of discharge to the drainage system. Data were also acquired from permits issued at the time of construction, which may, decades later, be imprecise about as-built geometry and deteriorated conditions decades later. Estero's 20 mi² area includes 63 private community developments, together containing 761 stormwater detention ponds. Growth was concentrated into a distinct time period: the decade 1995-2005 accounted for some 75% of all current paved acreage in the Estero, draining through a system whose backbone was constructed before 1990 with spurs and tributaries installed incrementally with little cumulative analysis. Communities vary widely: those built before 1990 on average had many more, and smaller, ponds than those after 1995. High-density, small-footprint communities, built in all decades, have high proportion of impermeable surfaces; while 15 large-acreage communities center on golf courses, with more permeable surfaces, most built after 1995.

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