RETENTION PONDS AND DETENTION PONDS
THE RECOVERY PROCESS

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You see them along the roadways, in neighborhoods, and in business complexes—the icon of development in Florida: stormwater ponds, one solution to the environmental changes shaped by progress.

Development of a plot of land adds to its history of uses; natural woods, an open field grazed by cows, a pine plantation, an orange grove, or the family estate is developed into a neighborhood, a business, or an industrial center. These changes in land use can affect how the land responds to rainfall. The increased impervious area, compaction of the natural soils, filling of existing depressions, and introduction of pollutants result in less infiltration, more runoff volume, a higher rate of runoff, a reduction in storage capacity, and degradation of stormwater quality. Stormwater ponds are designed to mitigate these changes by providing storage, attenuating peak discharge rates, and improving water quality.

You may have noticed that some stormwater ponds hold water while others are dry. This difference is not simply based on the length of time from the last significant storm event. Some stormwater ponds are designed to be dry within three days after a storm, while others are designed to hold water year round. Both types of ponds provide storage of stormwater runoff, attenuation of peak runoff rates, and treatment for stormwater quality.

Retention ponds and detention ponds are two of the types of stormwater ponds commonly constructed. Retention ponds are supposed to be dry until a significant storm event occurs. Stormwater gradually leaves the retention pond by infiltration into the soils and by evaporation. Retention ponds are used in locations where the high ground water table elevation during the wet season—seasonal high water table (SHWT)—is below the bottom of the pond, and the soils allow infiltration of the required volume within the allotted time. Detention ponds gradually release stormwater through an outlet structure to adjacent surface waters rather than through infiltration into the soils. Detention ponds can be designed as wet or dry. Wet detention ponds are constructed so that the pond bottom is below the SHWT elevation. Dry detention ponds set the pond bottom above the SHWT.

In order to provide storage, a pond must "recover" a required volume of stormwater within an allotted period of time to make room for runoff from the next storm. Recovery of a detention pond is typically achieved by the design of a discharge orifice, which is sized to release a required volume within an allotted time. Recovery of a retention pond, however, depends on the soil and aquifer characteristics at the pond location. Soil characteristics of concern include available pore space within the soils and rate of water flow through the unsaturated soil. The characteristics of the soils directly below the pond bottom are of particular importance because soil characteristics usually change with

depth. Aquifer characteristics of concern are SHWT elevation, rate of water flow through the saturated soils, and depth to an impermeable layer. As a retention pond recovers, the stored water flows vertically through the unsaturated soils until the voids in the soils below the pond fill up, at which time saturated horizontal flow becomes the primary mode of recovery. The water leaving the pond temporarily mounds up in the soils under the pond. In cases where the SHWT is far below the pond bottom, the groundwater mound does not reach the pond bottom and the entire volume stored recovers by vertical infiltration. However, some retention ponds are located where the SHWT is closer to the pond bottom; the groundwater mound intersects the pond bottom so that vertical infiltration is negligible, and recovery is by saturated horizontal flow. The time required for recovery of a retention pond can vary significantly based on these factors. Understanding the factors that influence the function of a stormwater pond is critical to the successful design of these stormwater management systems.