

# STORMWATER MANAGEMENT

## How Trees Aid in Stormwater Management

by Amber Atwood Levy and Anne Murphy

Trees and forested areas play a critical role in preserving the ecological health, character, natural beauty, and historic heritage of our Township. Tredyffrin is a largely built out community of wooded hillsides and curving roads. Many of the original drainage channels have been encroached upon by historical development which preceded existing stormwater, steep slope, and floodplain regulations. While the Township works on trying to mitigate the effects of some of this past development through stormwater remediation projects, restoration and protection of our existing natural landscape including maintaining current tree canopy levels is key to keeping our precious, native soils in place, mitigating stormwater flows, and recharging our groundwater.

Trees are important to stormwater because they capture and reuse large amounts of water. In particular, trees with trunk diameters of 30" or greater make the most significant contributions to runoff control. A single large, mature oak tree can capture 40,000 gallons of rainfall per year (source: <https://www.usgs.gov/special-topic/water-science-school/science/evapotranspiration-and-water-cycle>). Conifers also intercept a lot of stormwater due to their year-round needle-leaf coverage.

Trees help reduce flooding through infiltration, interception, evaporation, and foliar (leaf) transpiration (see diagram). Interception and evapotranspiration also decrease runoff volume with larger trees providing exponentially more benefit than smaller trees. An average sized mature tree with a 25-foot diameter canopy can manage the 1-inch rainfall from 2,400 square feet of impervious surface, the footprint of a typical single-family home (EPA, Stormwater Trees Technical Report, 2017). The absorption and interception of rainwater by large canopy trees as well as evergreens reduces volume and peak flow during storms. Many of us have experienced rainfall slowly dripping from large trees during a downpour. Tree canopy reduces rainfall intensity by 20%, increasing lag time by up to three hours, reducing flooding by allowing both natural and township systems to manage and infiltrate stormwater more effectively. (Eric Kuehler, USDA Forest Service, "Give Me the

Numbers: How Trees and Urban Forests Really Effect Stormwater Runoff")

Infiltration of stormwater recharges our underground aquifers which keeps our streams flowing during dry periods, helping to keep trees healthy, but also reducing flooding. Research has found that infiltration is on average 8X greater under tree canopies. (Eric Kuehler et al, USDA). This recharging of rainfall to groundwater is a natural form of stormwater control which trees do through their extensive root and leaf area systems. It helps maintain a more consistent base flow in streams during dry periods and helps reduce severe and rapid "out of bank" flooding during downpours. Clearing even relatively small numbers of trees from a property can increase runoff to downstream neighbors, and aggravate downstream erosion. Once heavy rains are in direct contact with compacted lawn or eroded topsoil, the capacity of the soil to absorb and retain at least some of the stormwater is significantly impaired. Preservation of woodland remnants

whenever possible is also important since native forest soils may have taken hundreds of years to develop and are not readily replaced.

According to the Nature Conservancy "A Green Path to a Stable Climate", trees help moderate climate extremes and can help reduce the reoccurrence of extreme storms and cloudbursts, both locally and regionally. The evaporation and transpiration of moisture drawn up by trees from the ground restores moisture to the atmosphere where it can create a cooling effect and more gradual, regular rainfall, instead of violent cloudbursts.

In conclusion, preventing or slowing tree loss and replacing what is being lost whenever possible is one important tool the Township and residents can utilize to slow and offset future increases in stormwater flows while protecting our Township's natural heritage, beauty, and quality of life.

