FLORIDA URBAN FORESTRY COUNCIL

The Council Quarterly

Quarterly Newsletter of the Florida Urban Forestry Council *2019 Issue One*

URBAN FORESTS AND STORMWATER STUDIES

Submitted by Karen Firehock, Executive Director - Green Infrastructure Center Inc.

There are many threats affecting the health, stamina, and expansion of Florida's urban forests. The most severe threats come from storms and land clearing. When these two threats come together, the consequences can be doubly devastating. Converting treed landscapes to paved surfaces – rooftops, roads, sidewalks and parking areas – will generate extremely high runoff volumes and velocities during storm events. Excessive stormwater will carry pollutants, erode soils, fill in canals, streams and bays, and stress a city's infrastructure. Keeping trees in place and strategic tree plantings will help Florida reduce the detrimental effects of stormwater runoff.

What do trees have to do with stormwater? Plenty! One large canopy tree can soak up thousands of gallons of rainfall every year! And if the tree is growing within a forest, the understory shrubs and plants soak up even more water. Increasingly severe storms and hurricanes such as Matthew, Irma, and Michael removed thousands of trees. Unfortunately, the fear of tree damage during storms tends to reduce replacement plantings. While less dramatic than a hurricane, development can bring about greater loss of canopy as entire properties are cleared, or remaining trees are damaged during construction.

To determine how forests can best be used to combat stormwater, the nonprofit Green Infrastructure Center Inc. (GIC) received funding from the Southern Region of the U.S. Forest Service to study trees and stormwater in Florida, Alabama, Georgia, North Carolina, South Carolina, and Virginia. The Florida Forest Service administered the state grant for comparison studies for Orange County, the City of Miami Beach, and the City of Jacksonville.

The GIC mapped tree canopy and modeled stormwater interception and uptake of tree canopies. The GIC also reviewed the quality and scope of existing urban forest management programs and policies. Landcover and tree canopy maps revealed potential planting areas, estimated planting

continues on pg. 2

INSIDE:

PRESIDENT'S MESSAGE

Trees have VALUES and are valuable for communities of any size. That is our theme for this issue of The Council Quarterly *and is a message I speak almost daily as a Landscape Economist. The measurement of values that trees provide, and which are most important, can vary depending on who is asking for tree values to be calculated and reported.*

Reductions for stormwater volumes and intensity of rainfall onto soils are tree values engineers and planners need to know more about. Improvements for physical and mental health from viewing and visiting urban-forested parks and properties are tree values that doctors, health insurers and sociologists need to know more about. Increased real estate values--and replacement costs for losses of trees--are tree values that real estate agents, appraisers, and lawyers need to know more about. We know trees are diverse for the many species and sizes that grow in Florida, so it is logical that the values of trees are also diverse. With more research we'll continue to learn more about trees and tree values.

Our recent 2019 Urban Forestry Institute communicated many tree values to attendees through the educational presentations. Success stories were shared in the presentations. Networking opportunities gave all of us new ideas and precedent projects to support our plans to improve urban forests in each of our communities. I like to say that we are improving our shared environment one tree at a time (or property at a time) with the work we do.

Your Florida Urban Forestry Council promotes the tree values we know about, supports needed research to expand our knowledge about trees and their values, and educates us about the influence these values can have on THE DECISIONS FOR URBAN PLANNING, DESIGN, AND MAINTENANCE TO PRESERVE AND EXPAND OUR URBAN FORESTS IN FLORIDA.

Thanks for your continued interest and support for the urban forests of Florida. Spend some time enjoying an urban forest near you today--it can be valuable time for your life.

In Support,

John Harris
FUFC President

NEWSLETTER ADVERTISING ANNUAL RATES:

Business-card size advertisement: $75
Quarter page advertisement: $115
Half-page advertisement: $225
Full page advertisement: $450

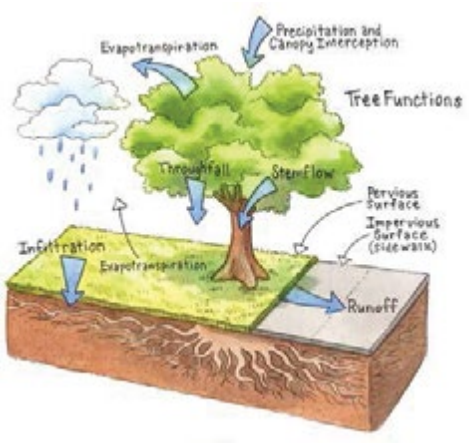
To place an advertisement in *The Council Quarterly*, please contact Sandy Temple, *FUFC Executive Director* **(407-872-1738).**

continued from pg. 1

costs, and optimal places for planting trees, or retaining existing canopy, for combatting stormwater. A ***Trees and Stormwater Calculator Tool*** was developed to estimate how much water trees could soak up during different storm events. One could also calculate the reductions in nitrogen, phosphorus and sediment runoff. Each city received a case booklet summarizing the findings.

The project is timely because storms are increasing and urban forests are declining. The construction of stormwater ponds is an attempt to manage the ill effects of stormwater and runoff. Though retention ponds can detain runoff and allow sediment and other pollutants to settle and break down, they are very expensive to build and maintain. Alternative land use and intrinsic value is limited. If not maintained, underground piping and drains are subject to overflows. In coastal communities where sea level is rising and high tides cause reverse flooding, salt water can backflow through the city's stormwater infrastructure and cause 'sunny day' or tidal flooding.

There is abundant research showing that urban flooding, and its inherent problems, are increasing. For example, research conducted in Miami Beach, by the University of Miami and Florida State University, found that "significant changes in flooding frequency occurred after 2006. Rain-induced events increased by 33% and tide-induced events increased by more than 400%" (Wdowinski et al 2016). The tide-induced floods have affected mostly low-lying neighborhoods in the western part of the city, where development replaced mangrove wetlands (Wdowinski et al 2016). Reducing impervious surfaces and increasing vegetation are ways to ease the frequency and intensity of flooding. Vegetation--trees in particular--will intercept, disperse, and draw water from saturated soils through their natural transpiration process. The relationship between rainfall volumes and types of land cover (pavement, lawn, tree canopy, forests) can be measured and determined.



Tree canopy reduces the proportion of precipitation that becomes stream and surface flow, also known as water yield. A study by Hynicka and Divers (2016) accounts for the role tree canopy plays in capturing stormwater in a water yield equation:

$$R = \frac{(P - C_i - I_a)^2}{(P - C_i - I_a) + S}$$

Where R is runoff, P is precipitation, Ia is the initial abstraction for captured water (the fraction of the storm depth after which runoff begins), and S is the potential maximum retention after runoff begins for the subject land cover (S = 1000/CN – 10). Canopy interception (Ci) is subtracted from precipitation (P) to account for the water that trees take up.

Major factors determining soil retention are:

- The hydrologic soil group (defined by surface infiltration rates and transmission rates of water through the soil profile, when thoroughly wetted)
- Land cover types
- Hydrologic condition – density of vegetative cover, surface texture, seasonal variations
- Treatment – design or management practices that affect runoff

The GIC study produced a highly detailed land cover analysis useful when identifying potential planting sites in the future. The land cover analyses can be used for many other applications, to include the cooling potential of heat islands, walkability, trails, wildlife habitats, parks, and when developing comprehensive master plans.

The trees and stormwater models and calculator tools can be used to estimate the impact of the current canopy, possible losses to that canopy, and potential for increasing that canopy. For example, during a 24-hour rain event, the trees of Miami Beach can take up an average of 8.5 million gallons of water. That's about 13 Olympic swimming pools of water! For the same event, a loss of 10 percent of the urban tree canopy would increase runoff by 2.23 million gallons. Increasing canopy coverage from the current 17 to 20 percent would decrease runoff by 1.3 million gallons. For a larger city such as Jacksonville, calculations reveal that during a 24-hour rain event, trees absorb 1.377 billion gallons!

The key finding from the GIC study was that retaining, or allowing for mature trees and forest canopy, will have the greatest impacts when decreasing runoff from stormwater. Retaining or planting trees will bring added benefits to the community too--fostering clean air, walkability, and attractive residential and commercial land use. The recent Million Trees Miami Assessment found that a higher tree canopy percentage is associated with lower overall hospitalization numbers from illnesses and for chronic conditions such as asthma.

As a city develops, its policies, codes and management practices steer the future of its urban forest and the future rates of runoff. The project's ***Codes, Policies and Practices Audit Tool*** shows how each city can improve its regulations and practices to maximize stormwater infiltration and support a healthful urban forest. The tool scored each community and showed where improvement was needed. Series questions come into play challenging the role that existing practices and policies play when expanding or decreasing the creation of future pervious or impervious surfaces.

Unwittingly a city's policies could be undermining local efforts to conserve trees. For example, allowing trees to be planted in insufficient tree wells is useless if trees do not survive or reach a long-life expectancy. Similarly, if communities are planting hundreds of trees, while thousands are being lost to excessive land clearing, the net result is a declining urban forest. Addressing local standards and requirements for parking lots, tree plantings, landscape, and conservation practices may be the most effective way to protect urban trees.

Overall, the 12-community study found insufficient soil volume standards; extreme land clearing; lack of consultation with municipal arborists; excessive pavement requirements; lack of emergency plans and risk assessment; inadequate utilization of the private sector and tree advocacy groups to achieve planting goals; lack of urban forest management plans; and unenforced fines for code violations were key elements threatening the advancement and enhancement of urban forests.

Linking trees with stormwater management--recognizing trees as a functional part stormwater infrastructure--is a recommended best practice. Other best practices include involving urban foresters in predevelopment reviews; strict tree removal permits; use of structures and surfaces to support urban trees; strong relationships with tree advocate groups and urban forest councils; high tree canopy retention requirements; tree risk assessment mapping; and education of elected and appointed officials.

Final reports are completed including steps to replicate the stormwater calculator tool and maps, links to the Codes, Policies and Practices Audit Tool and best recommended practices. Community case studies and the final reports are available at http://www.gicinc.org/trees_stormwater.htm