The Council Quarterly

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LIVING INFRASTRUCTURE

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With urban forest management, Arbor Day events, and the planting of trees, we pay homage to trees as work horses, not show horses. They cool urban heat islands, sequester carbon, shelter wildlife, and filter air and stormwater. There's even been research indicating they reduce car crashes by reducing the speed of traffic.

It's important to treat trees as planned, primary infrastructure, not simply accent features and afterthoughts. In a family framework of infrastructure, shrubs and groundcover are a tree's smaller siblings, and their concrete cousins may include streets, sidewalks, storm drains, retention walls, and utility poles.

Expertise will allow us to plant trees strategically as we develop, maintain, renovate, and advance built environments. Universities will provide the research, science, and team leaders to join business and industry professionals to foster expertise. Certifications, professional development, training, and experience will also have a part to play.

Expertise should be employed from the start - the moment one decides to build. That made a big difference in the Tioga

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community, northwest of Gainesville. Twenty-five years ago a nurseryman partnered with a developer. Together, they continue to add homes and greenery to a community that combines modern amenities with the style of an old Southern town.

Trees - just as streets, underground utilities, and sidewalks - were integrated into the early planning as living infrastructure. As a result, tree conflicts and root damage to roads, underground utilities and sidewalks have been avoided. Shade from the canopy of trees has increased the comfort and use of walking trails, playing fields, and other recreational amenities. Their beauty

has attracted visitors and an economy to Tioga. The nurseryman's familiarity with tree stock, soil requirements, and climate conditions guided the selection of trees that would live and remain healthy for three quarters of a century.

We shouldn't take that for granted. Some research estimates the average lifespan of an urban tree to be as little as 13 years. A USDA study says we're losing tens of millions of city trees from development, fire, hurricanes, insects, and disease—and tens of millions of dollars in the payoffs that healthy urban forests could deliver.

Treating urban trees as if they are disposable needs to stop. It's a challenge to enlighten both professionals and homeowners about the proper care and management of trees, forests, and living infrastructure. In Florida we need more city arborists. We need better understanding of how trees function and their site requirements. We need to know more about which trees are most resilient to hurricanes so we can avoid injury to people and damage to property. We need to invest in the health of our living infrastructure. All this will require science, research, and engaged students and faculty.

The University of Florida Institute of Food and Agricultural Sciences (UF/IFAS) School of Forest, Fisheries, and Geomatics Sciences (SFFGS) is adding faculty members with the capability of employing artificial intelligence to the study of urban trees. For example, advanced technology of AI-equipped drones allow us to count citrus trees with 98 percent accuracy. Think of how this could help monitor urban tree inventories.

The new UF/IFAS Dean of Extension—the university's leader of statewide outreach of university-based science to 22 million Floridians - has three degrees in urban forestry. Florida has Extension agents active in urban forestry in Jacksonville, Tampa, Gainesville, and other cities. Together, UF/IFAS and SFFGS, are preparing the next generation of natural resource professionals to help manage Florida's future forests.

In private industry, the Florida Nursery, Growers and Landscape Association (FNGLA), and other professional organizations are getting involved and weighing in on public policy regarding trees and urban forests. Landscape architects, nurserymen, and other tree-care professionals have established relationships with urban planners that make it more likely that the right trees will be planted in the right places, at the right times.

This nation is about to invest more than a trillion dollars in its roads, bridges, ports, and tunnels. When moving Florida forward, let's not forget that trees are an essential element of our infrastructure.

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STUMP THE FORESTER

QUESTION: How do trees help mitigate storm water, or flooding issues?

ANSWER: In a single word, "naturally." Trees and forest systems help mitigate storm water and flooding issues naturally. Trees are evolutionarily designed to survive and thrive as living pumps. The vascular and root systems are living pipes. Through the process of transpirational pull, water is absorbed by osmosis from soils at the roots and released as vapor back into the air at the leaf. The vascular tissues (xylem & phloem) connecting roots and leaves operate as cellular pipes that provide a continuous column of water through the trunk, branches, and twigs. Water escaping through the leaves pulls water up through the water column with the forces of adhesion, cohesion, and pressure gradients. The movement of water in the xylem, and photosynthates in the phloem, are examples of longitudinal, or axial transport. Simply put, trees are designed to pump water. There is no better mechanism made by man or created by nature more

effective than trees at pulling available water from the capillary space in saturated soil. Did you know that a mature shade tree, on a hot summer day, can release 30-40 gallons of water a day through the natural process of transpiration? The amount of water released will depend on the tree species, canopy size, site conditions, and weather. However, severe, or prolonged flooding can deplete the soil of free oxygen needed for aerobic respiration. If saturated conditions persist for long periods of time roots will die and the natural pump will cease to operate.

Trees and forests are effective, practical, and desirable tools when managing stormwater runoff. This is especially important in urban, suburban, and land-use areas where natural systems, prior to development, have been disrupted or altered.

Trees are important components of effective green stormwater infrastructure – if planned, installed, and maintained properly.

Within city rights-of-ways trees – tall, natural, long-lived, arbor-pumps – will share space with other utilities. Shaping and maintaining the tree will be necessary
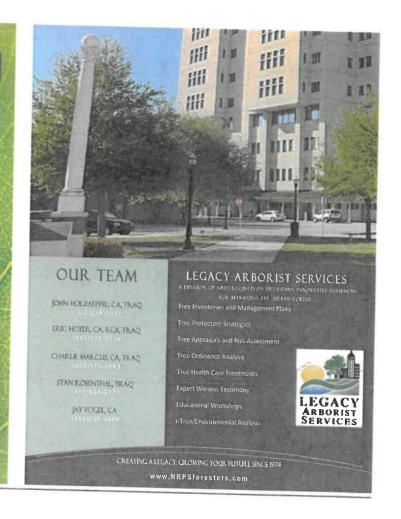
for an arbor-pump to safely operate near overhead electric lines. As wood, trees are not a good conductor of electricity, but the live vascular system can be a great conductor. The column of water within the vascular tissue has conductive material within the sap – iron, potassium, water, salts, carbon, and other minerals. Even the air space along the surface of a tree can provide an electrical path to ground.

Increasing canopy cover alone may not substantially decrease the problems associated with stormwater and flooding. However, when trees are installed with permeable soil designs the benefits and effectiveness of trees/forests can be substantial.

In urban and highly developed areas, storm water will flow over various impervious surfaces and bypass a tree's ability to capture, reduce, store, and transpire runoff. Overflow becomes a nonpoint source pollutant as it picks up, carries, and discharges motor oil, lubricants, asphalt salts, litter, and other hazardous substances into nearby lakes, rivers, and aquatic systems.

Leaf litter accumulating on impervious surfaces can itself become a pollutant. Timely litter management is essential when integrating trees into existing storm management systems. Leaf litter falling on pervious surfaces are effectively cycled in the soil underlying trees.

Incorporating natural/forest areas into stormwater regulations and management designs is beneficial environmentally and economically. The cost of installation and maintenance is justifiable relative to other infrastructure alternatives. The overall benefits are not limited to the reduction of overland water flow, increased water infiltration, and the drawing of water from saturated soils. There is a whole host of co-benefits (air filtration, carbon sequestration, water quality, cooling effects, aesthetics, wildlife habitat, sight & sound barriers, increased property value, recreational, and employment opportunities) urban trees/forests will contribute to planned designs.

How best to integrate trees/forests into existing stormwater utility programs and infrastructure is another question. In a single word, the answer is, "teamwork." Design engineers, hydrologists, urban foresters, arborists, private tree care professionals, landscape architects, policy makers, tree advocates, informed civic organizations, and other urban forest partners will be needed to install and maintain trees and forest systems to optimal health and function.

Answer provided by Joe Anderson – JEA Utility Forester, ISA Certified Arborist