

USDA Forest Service

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Second Wednesdays | 1:00 – 2:15 pm ET

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Forest Service
Urban Natural Resources Stewardship

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MORE THAN GOOD LOOKS: HOW TREES INFLUENCE URBAN STORMWATER MANAGEMENT IN GREEN INFRASTRUCTURE PRACTICES



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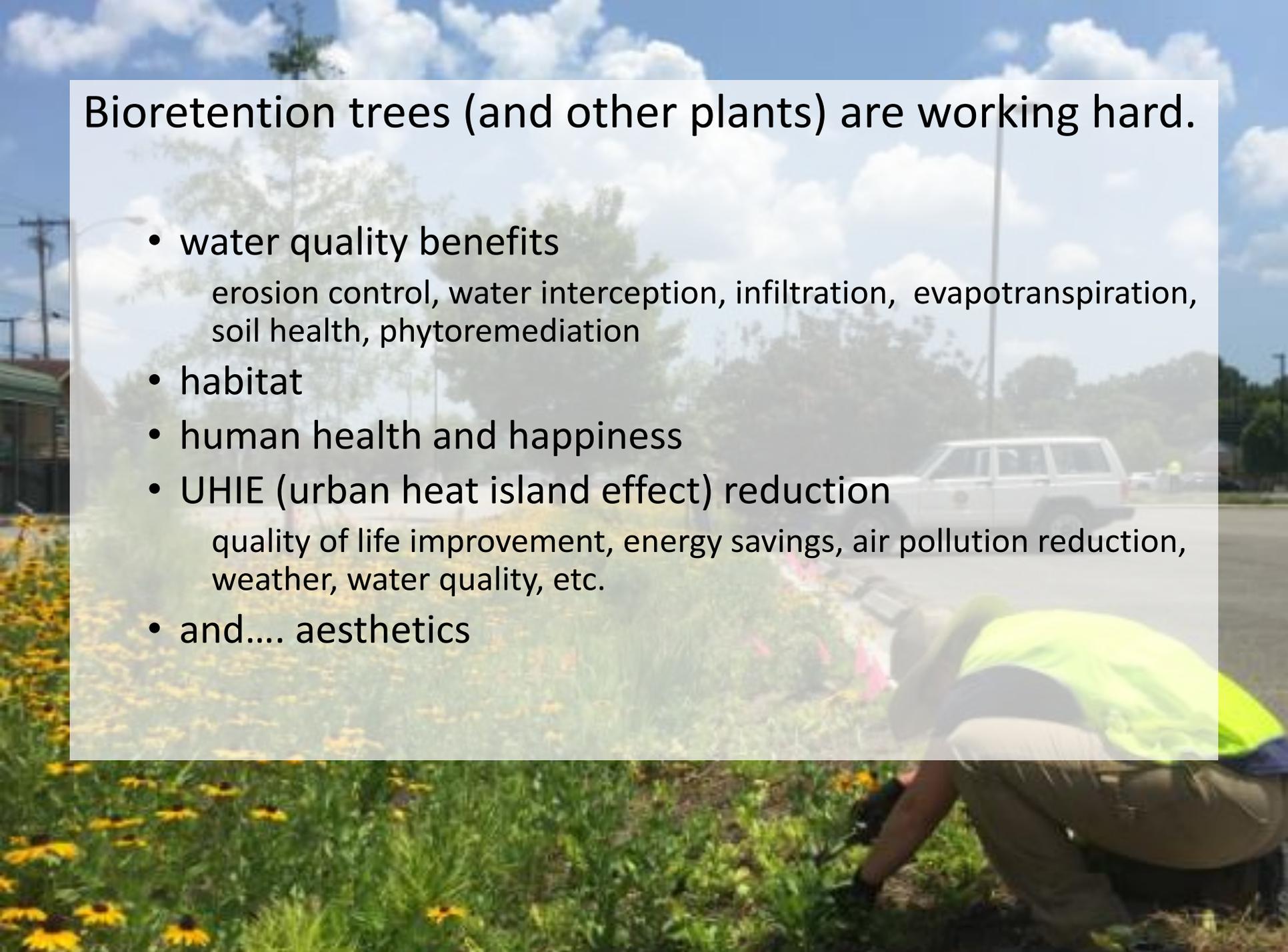
A Field and Maintenance Perspective from Chattanooga



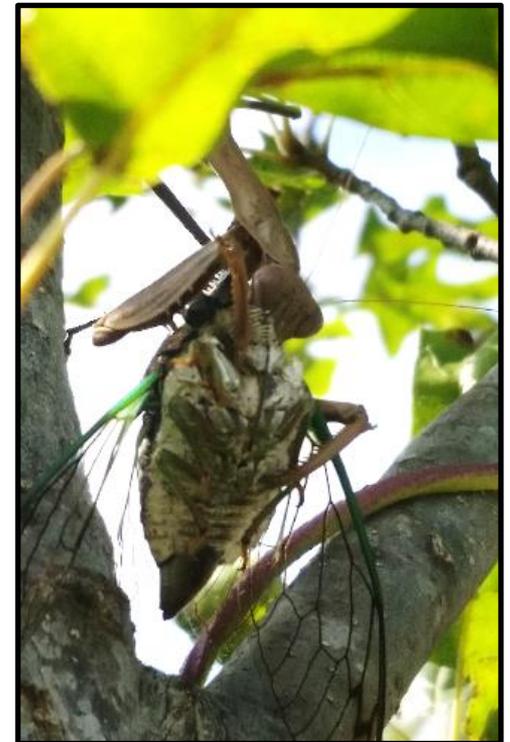
Lyn Rutherford, Sustainable Landscaper
Water Quality Program – Watershed Stewardship
City of Chattanooga

Bioretention trees (and other plants) are working hard.

- water quality benefits
 - erosion control, water interception, infiltration, evapotranspiration, soil health, phytoremediation
- habitat
- human health and happiness
- UHIE (urban heat island effect) reduction
 - quality of life improvement, energy savings, air pollution reduction, weather, water quality, etc.
- and.... aesthetics



- Bioretention is an opportunity for more diversity.
 - higher diversity of native plant species supports more pollinators, other insects, wildlife
 - Diversity of root morphology increases benefits to water quality – erosion control, nutrient removal, diverse microbial communities
- Trees anchor the landscape.
 - aesthetically for design, public perception
 - ecological services will increase with time
- Trees provide shade for my team!





Chattanooga Water Quality Program

Phase 1 under NPDES permit since 1996

- stream health monitoring, regulations to reduce pollution and flooding, protection of water and people
- Green Grants, Rain Smart
- inspection and maintenance of City owned stormwater devices
- education and outreach



City bioretention sites with trees:

- “naturalized”- diverse, high function, less formal, education site, natural, wild
- “biomimicry gardens”- diverse, modern design, grass matrix, bio mimicking, high function, education sites, gardens
- “golf courses”- low diversity, turf and mulch heavy, high maintenance, function?



- *Acer rubrum*
- *Amalanchier arborea*
- *Betula nigra*
- *Ilex cassine*
- *Ilex decidua*
- *Ilex verticillata*
- *Ilex vomitoria*
- *Liquidambar styraciflua*
- *Magnolia virginiana*
- *Malus sargentii* 'Tina'
- *Nyssa sylvatica*
- *Pinus Palustris*
- *Platanus × acerifolia*
- *Quercus phellos*
- *Quercus nigra*
- *Quercus bicolor*
- *Quercus robur*
- *Rhus glabra*
- plenty of volunteers and exotic invasives

Design Challenges:

- “right plant, right place”
- designing for maintenance strategy
- trees planted in turf, outside the planted area
- nothing planted under trees (multi level canopy)
- designing with older trees?
- forgetting the land around the site

challenges to tree health = challenges to site's WQ function

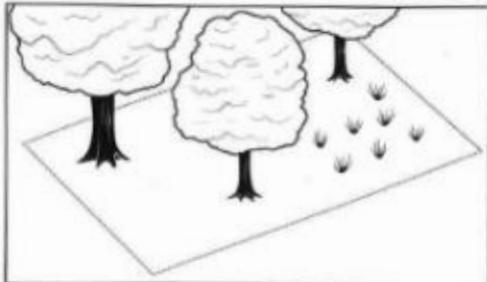
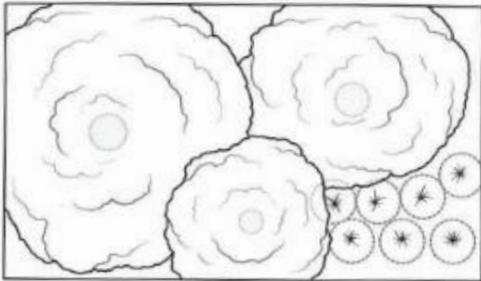


Diagram: Thomas Rainer and Claudia West, Planting in a Post Wild World



Installation Challenges

- concrete dust? pH issues
- poor nursery stock
 - overly pruned
 - infested
- beat up in transport
- planted too deep
- planted too high
- circling roots not addressed
- straps too tight, never removed
- mulch volcanoes
- fertilizer
- garbage in planting pit
- ...unskilled or rushed install team?



cut leader

challenges to tree health = challenges to site's WQ function

Maintenance and Environmental Stress

- who's doing the maintenance?
 - hand-off SOP
 - budgeting
- mowing crew
- herbicide crew
- traffic
- people
- drought
- disease



challenges to tree health = challenges to site's WQ function

over pruned nursery stock



contaminated nursery stock

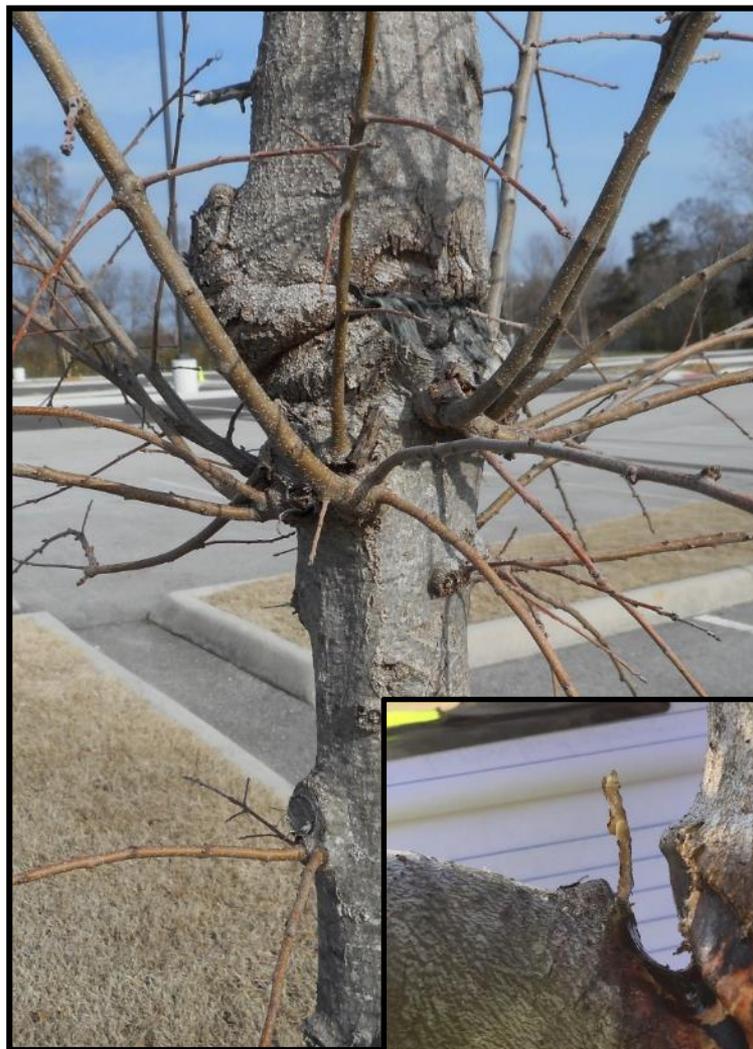


way too deep, poor nursery stock, wire cage, burlap

design, install issues



staking and label tag issues



A Mulch Volcano Erupts



Joe Boggs, OSU Extension©



weed whacker, mowing damage



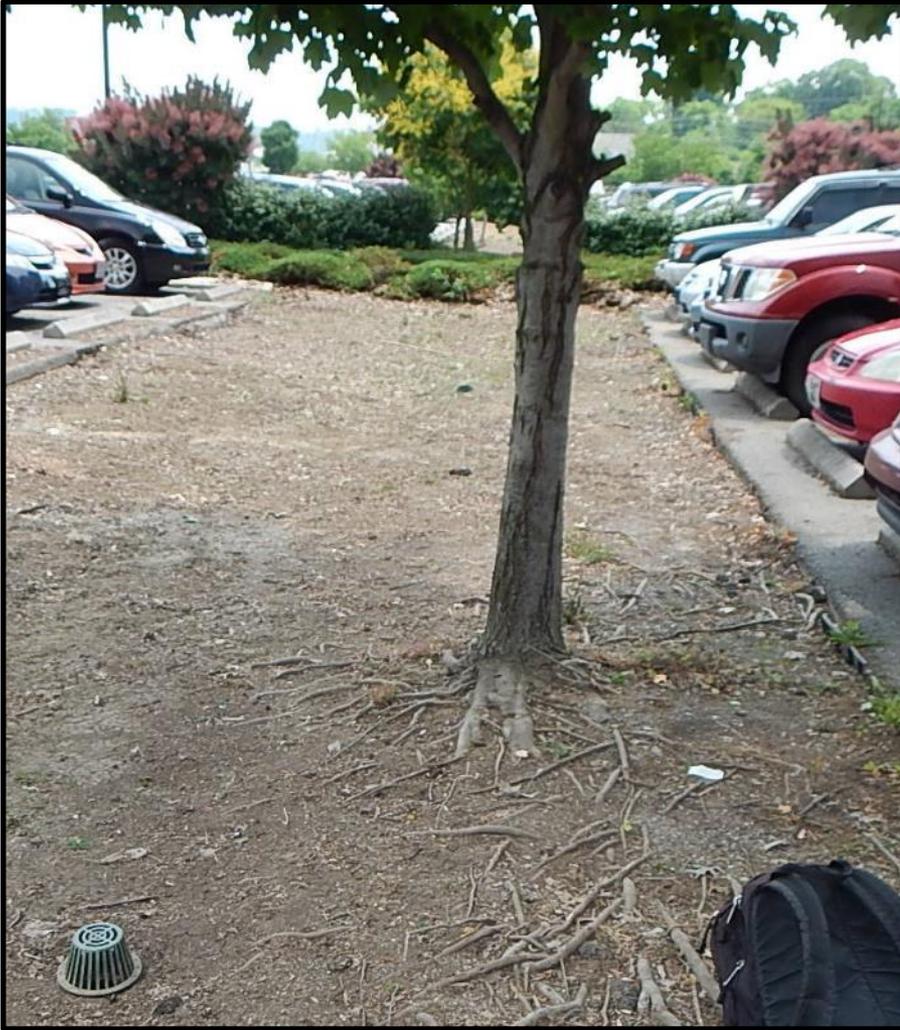
vehicle damage in parking lot



herbicide application under powerlines



drought, too deep planting, mowing damage?



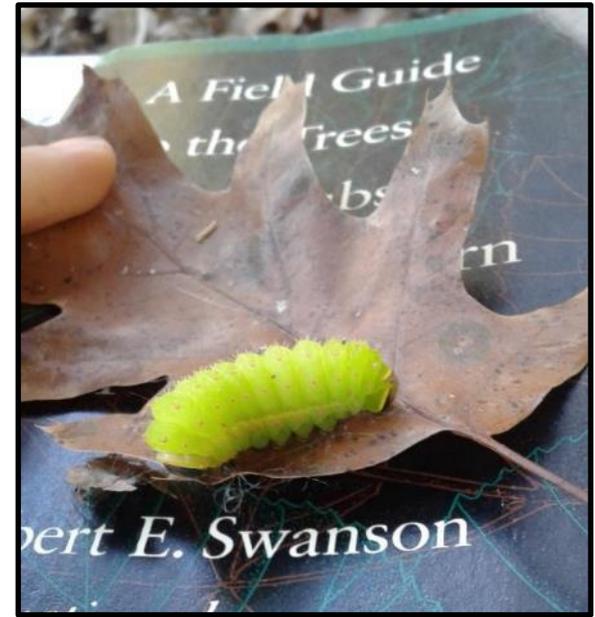
design and maintenance issues



ROW crew? mowing crew? citizen?

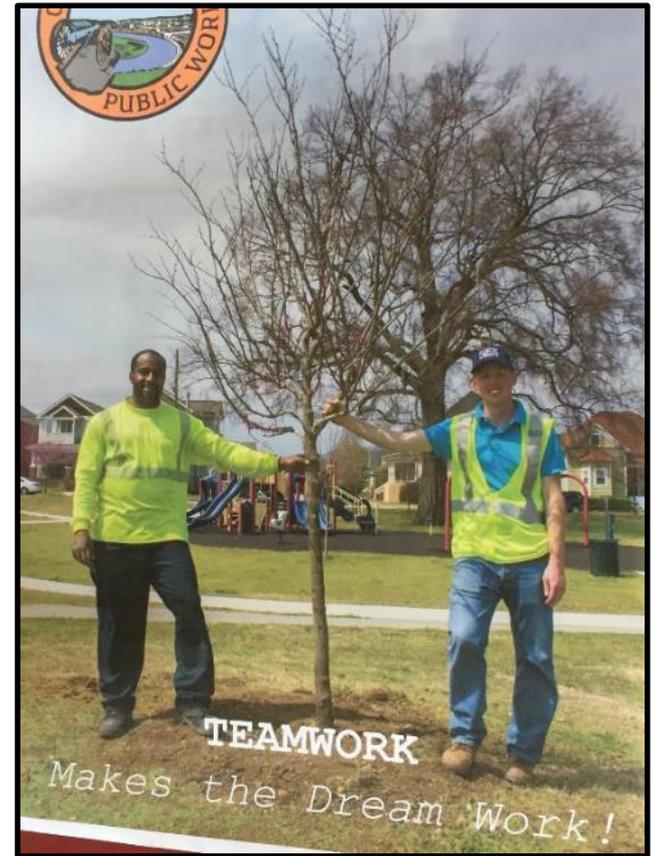
Why aren't we using trees?

- cost?
- no background, resources?
- leaves?
 - nutrient load
 - clogging inlets or outlet
 - added maintenance
- obstacle for mowing?
- succession of site?
- too much shade?



Moving Forward

- Collaboration is essential:
 - you can't know what you don't know.
- biomimicry
 - site as a living system
 - diversity
 - adaptive management for succession
- supply and demand for knowledgeable maintenance, accreditation



More intelligent use and care of trees in bioretention! Let's prolong the life of the site.

Let's manage our urban spaces for more uses: stormwater, habitat, communities.

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Resources

- Tallamy, D.W. (2007) *Bring Nature Home*. Portland, OR: Timber Press, Inc.
- Rainer, T., West, C. (2015) *Planting in a Post Wild World*. Portland, OR: Timber Press, Inc.
- Ecological Landscape Alliance, <https://www.ecolandscaping.org/>
- http://www.bwsr.state.mn.us/native_vegetation/Plant_Function_Resources.pdf
- <https://www.urbanforestrysouth.org/resources/library/trees-in-bioretenction>
- Hightshoe, G.L. (1988) *Native Trees, Shrubs, and Vines for Urban and Rural America*. New York, NY: Wiley & Sons Inc.

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Thanks for your help!

- **Don Green** LEED AP - Water Quality Supervisor, City of Chattanooga
- **Gene Hyde** - City Forester, City of Chattanooga
- **Karna Levitt** PLA, ASLA, CPSWQ, TN EPSC Level II - Landscape Architect 2, City of Chattanooga
- **Lucy Ellis** - Water Quality Tech. Watershed Stewardship, City of Chattanooga
- **Maria Price** PE, M. ASCE - Engineering Manager, City of Chattanooga
- **Wyn Miller** PLA – Project Manager, Knox County
- **TN Valley Wild Ones** – native plant and sustainable landscaping non-profit