

# Building the Sustainable Urban Landscape



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**SO ISA**  
**MYRTLE BEACH, SC**  
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# Acknowledgments



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- Dale Westemeier, City of Greenville
- Danny Burbage, Charleston
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And for long-term inspiration:

- Drs. Don Ham, Kim Coder, and Ed Gilman

# Overview



- Sustainability defined
- Components of the SL
  - Design intent-
    - Aesthetics
    - Function: size & access
    - Ecosystems services
    - Cost effectiveness
- Sustainable spaces

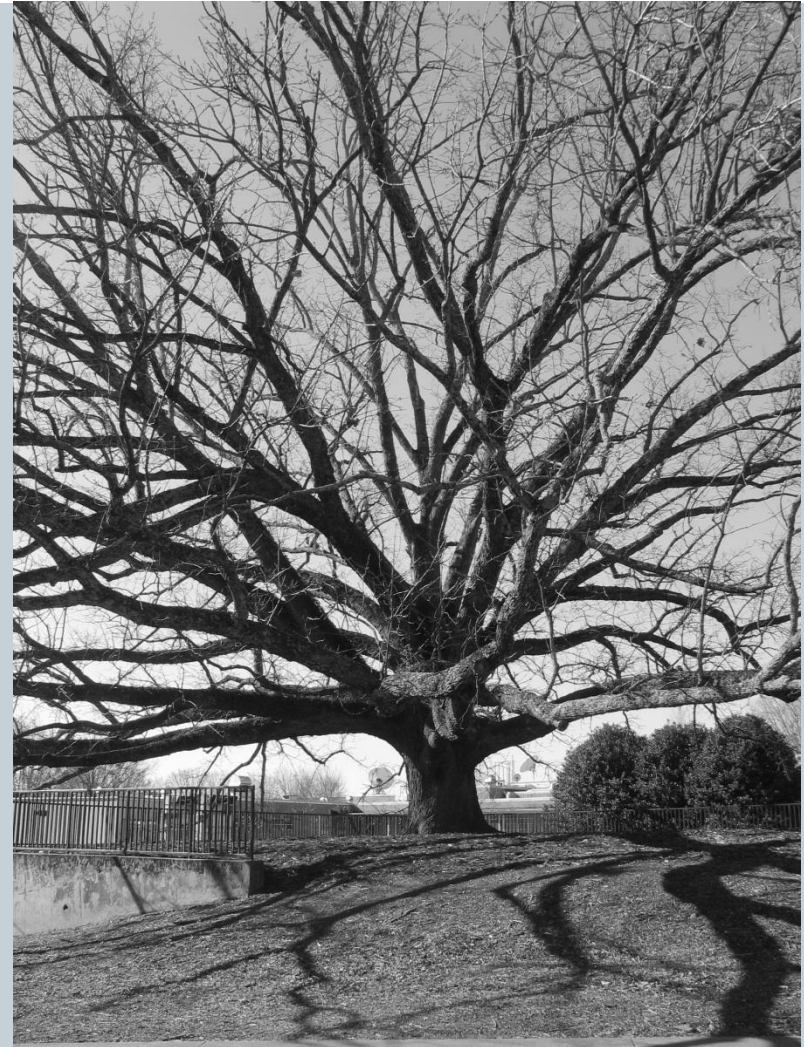
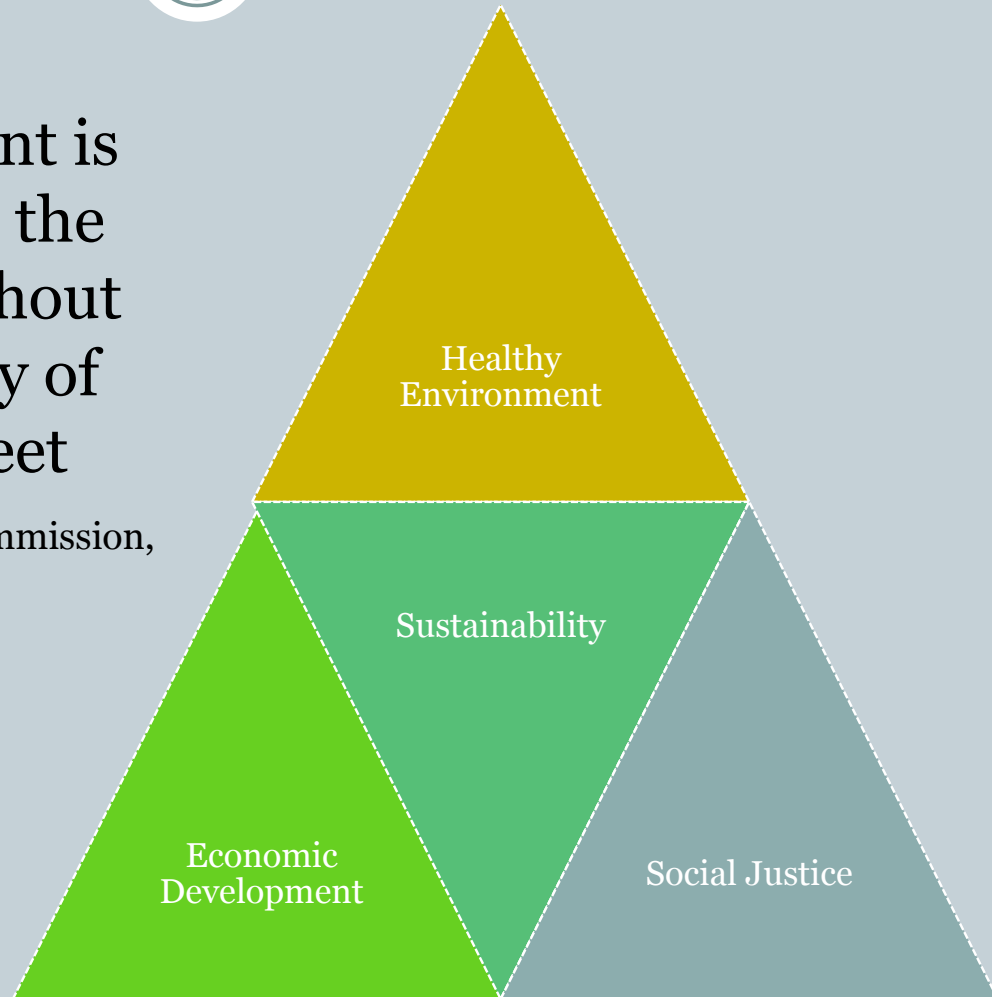


Photo by Ellen Vincent

Centennial Oak *Quercus macrocarpa*, Clemson campus

# Sustainability: historic def. 1987

“Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (World Commission, 1987, p. 8).



Issue triad pyramid by Ellen Vincent

# Gro Harlan Brundtland (b. 1939)

5

- Norwegian Minister for Environmental Affairs (1974-1979)
- Prime Minister of Norway (Feb –Oct 1981, May 1986-Oct 1989)
- Chair of United Nations World Commission on Environment and Development, published *Our Common Future* (April, 1987) aka The Brundtland Report
- Commissioners: 22 people 21 countries



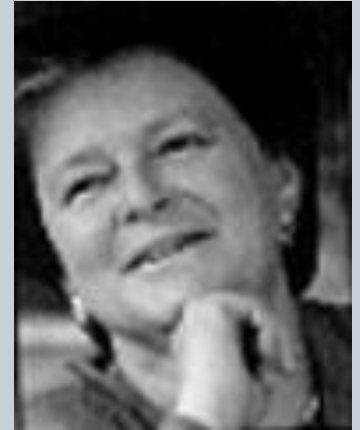
[http://www.kennuncorked.com/images/multiple\\_locations/sus\\_history\\_gro\\_harlem\\_brundtland.gif](http://www.kennuncorked.com/images/multiple_locations/sus_history_gro_harlem_brundtland.gif)

# Sustainability



- “The ‘**environment**’ is where we all live; and ‘**development**’ is what we all do in attempting to improve our lot within that abode. The two are inseparable” –Gro Harlem

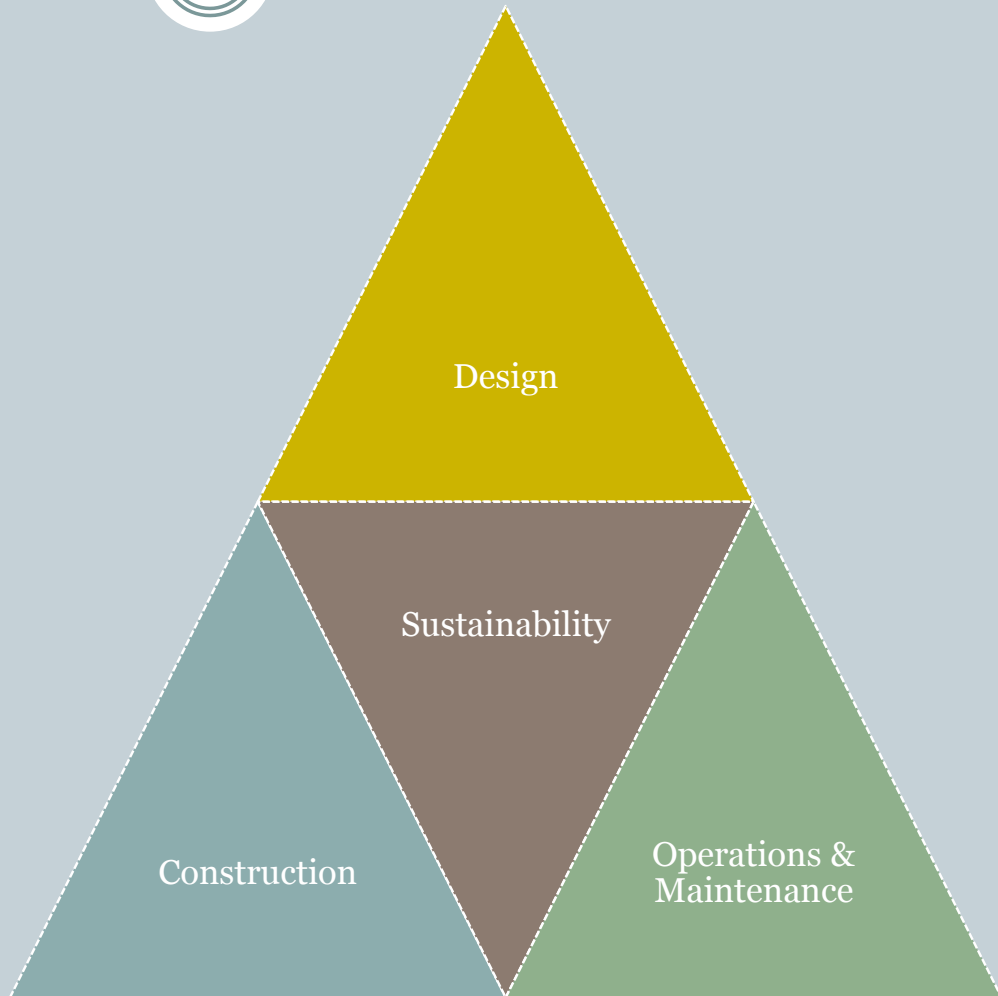
**Brundtland** (The Case for Sustainable Landscapes, 2009, p. 8).



# Sustainability: modern def. 2009



“Sustainability is defined as design, construction, operations, and maintenance practices that meet the needs of the present without compromising the ability of future generations to meet their own needs (*The Case for Sustainable Landscapes*, 2009, p. 5).



Issue triad pyramid by Ellen Vincent



# THE SUSTAINABLE SITES INITIATIVE™



- [www.sustainablesites.org/](http://www.sustainablesites.org/)



- <http://asla.org/>
- <http://www.wildflower.org/>
- <http://www.usbg.gov/>





# Sustainable landscapes parts



- Alignment (**cooperative communication**) is needed between design, installation, and maintenance phases (p. 15).



# Absence of alignment



- Designed bed lines are altered by installation professionals
- Plant selection is altered by installers due to availability
- Plants not suited to the area are called for in the design
- Soil is damaged due to compaction during construction



Photo by Ellen Vincent

# Absence of alignment



- Existing tree's roots are damaged during construction
- An intended screen is pruned (p. 18)
- A layer is destroyed by limbing up a tree (p. 18)



Mexico City (Web)

# Design/intent



- Design intent is the designer's vision for a site.
- This conventionally deals with (1) **aesthetic** and (2) **functional** landscape goals.
- Sustainable design adds (3) **ecosystems services** to the design intent (p. 18).





# Design intent - aesthetics



- **adj. 1. concerned with beauty or the appreciation of beauty. 2. sensitive to beauty.**  
■ **n. 1. philosophy of the beautiful, esp. in art. 2. set of principles of good taste and the appreciation of beauty.** (Oxford Desk Dictionary and Thesaurus, 2007, p. 14).



<http://www.google.com/imgres?q=mona+lisa&hl=en&client=firefox-a&rls=org.mozilla:en-US:official&biw=1440&bih=707&gbv=2&tbn=isch&tbnid=DkvaxqVB7OmcJM:&imgrefurl=http://www.artnewsblog.com/famous-paintings/mona-lisa/index.htm&docid=Nj3d4e0VsSi24M&w=386&h=600&ei=y1NaTtrlDuru0gHB2LmUCQ&zoom=1&iact=hc&vpx=538&vpy=100&dur=2890&hovh=280&hovw=180&tx=89&ty=158&page=1&tbnh=166&tbnw=108&start=0&ndsp=24&ved=1t:429,r:2,s:0>

# Beauty from above



Photo by Ellen Vincent

Charleston, SC

# Winter beauty



Photo by Ellen Vincent

Logan International Airport



# Shared vertical space beauty



Photos by Ellen Vincent

Boston, MA

# High density green space beauty



Photo by Ellen Vincent

Boston, MA



# Symbolic beauty



Photo by Ellen Vincent

Greenville, SC

# Powerful beauty



Photo by Ellen Vincent

Greenville, SC

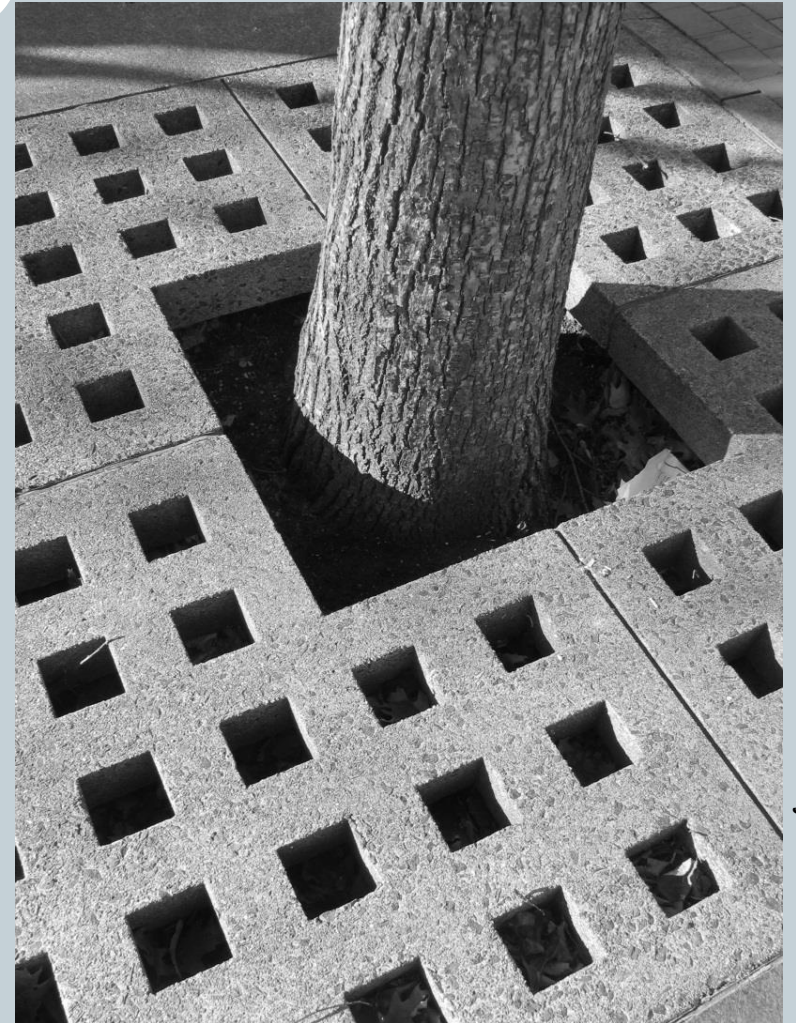
# Design intent - function



- The design **function** affects **how the landscape will be used** by employees, clients, customers, the public, or homeowners (p. 21).
- Two major **categories** of function:
  1. **Size** is appropriate for use and maintenance
  2. There are suitable **access** points and circulation routes



# Design for the lower extremities: roots and feet



Boston Photos by Ellen Vincent

Promoting walking and protecting root systems are worthy investments



Function –root zone size ► replace sidewalk



Photo by Ellen Vincent

Charleston, SC



# Function –root zone size ► replace sidewalk



Photo by Ellen Vincent

Charleston, SC

# Function –root zone size ► replace sidewalk



Photos by Ellen Vincent

Charleston, SC



# Function –root zone size ► remove pavement



◄ Before

▲ After

Photos courtesy of Dale Westermeyer. City of Greenville

Main Street, Greenville, SC

# Function – size ► remove concrete



Photos courtesy of Dale Westermeyer, City of Greenville

Main Street, Greenville, SC



# Function - size ► install silva cells



Photos courtesy of Dale Westemeier. City of Greenville

Main Street, Greenville, SC

# Function - size ► install silva cells



Photos courtesy of Dale Westemeier. City of Greenville

Main Street, Greenville, SC



# Function -access- Long lines, but no wait



Boston  
Photos by Ellen Vincent

Promoting walking and protecting root systems are worthy investments



# Function - access



Photos by Ellen Vincent



Rock Quarry Park has no truck access. Mowers are carried in by hand. Mulch is blown in from the street above.

Rock Quarry Garden, Greenville, SC

# Function - access



Photo by Ellen Vincent

Charleston, SC



# Function - access



Photo by Ellen Vincent

New mall in Greenville, SC

# Design intent - ecosystem services

- Ecosystem services are the goods and services provided by healthy ecosystems
- Examples:
  - Pollination of crops by bees, bats, or birds
  - Flood protection provided by wetlands
  - Filtration of air and water by vegetation and soils (The Case for Sustainable Landscapes, 2009, p. 6).

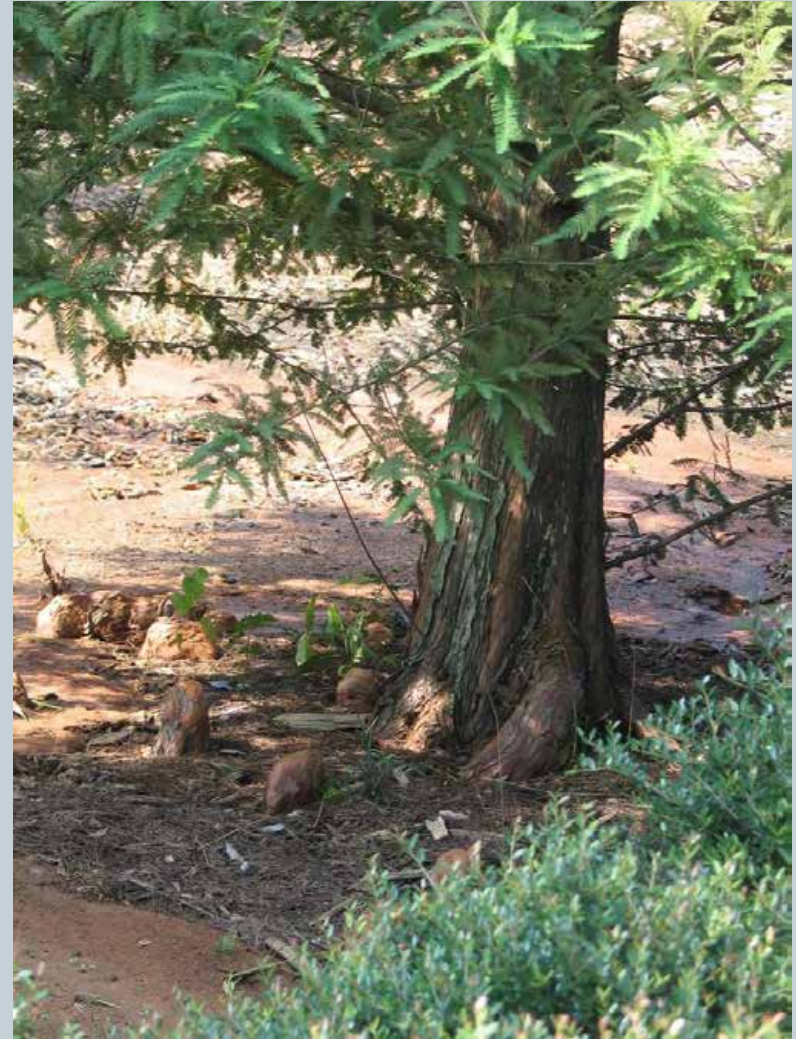


Photo by Ellen Vincent

Bald cypress *Taxodium distichum*



# Ecosystem services



- Not currently accounted for in our economic calculations (The Case for Sustainable Landscapes, 2009, p.6).
- Usually under-considered by land use decision makers.
- + May be **increased** by using healthy ecosystems as a model during development.
  - See Biomimicry Institute 'Ask Nature' Web page at <http://www.asknature.org/>.

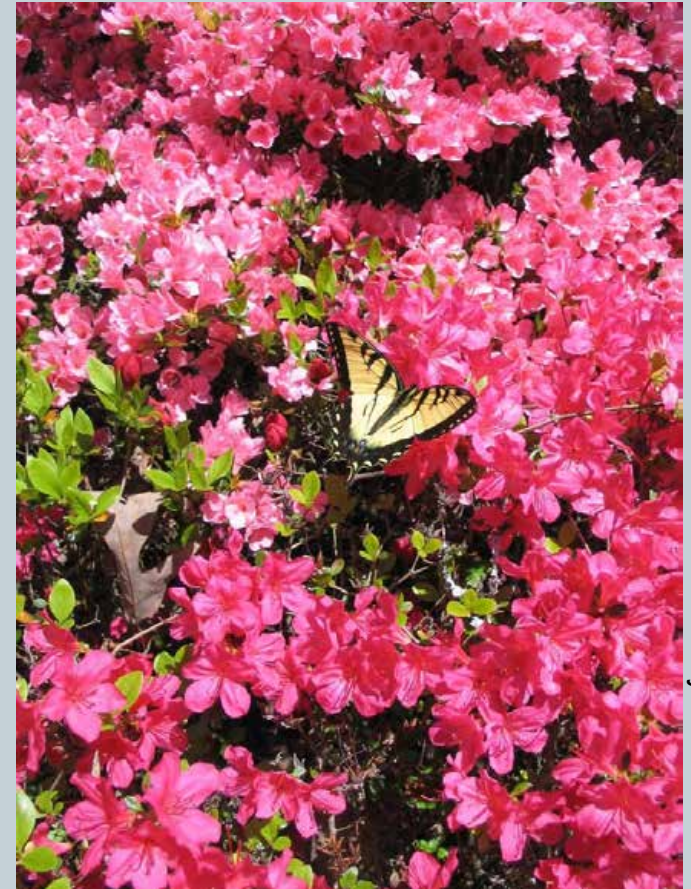


Photo by Ellen Vincent

# Sustainable plant selection



## *Right plant right place*

- Objective is to create or preserve a **plant community** that needs minimal inputs of:
  1. water
  2. fertilizer
  3. pesticides
  4. maintenance as plants mature (becomes established)  
(p. 19).

# Sustainable plants



- Identify and plan for what is already there. Enrich and enhance.
- Restore existing habitats that will be damaged during construction.
- Create new habitats where possible and provide **linkages** between new and existing habitats-both on site and with surrounding areas (p. 19).



# Native plant species ecosystem benefits



## ***Cercis canadensis* Redbud**

- Zones: 5-9, native to US, SC
- Pink flowers before leaves in spring along branches and stems
- 15-30' h x 15-20' w
- Heart shaped leaves
- Single or multi-stemmed deciduous tree
- Part shade, shade
- Soils moist, fertile, well-drained
- Border, specimen, understory
- Nesting material and structure for native bees, attracts birds, moderate deer resistance

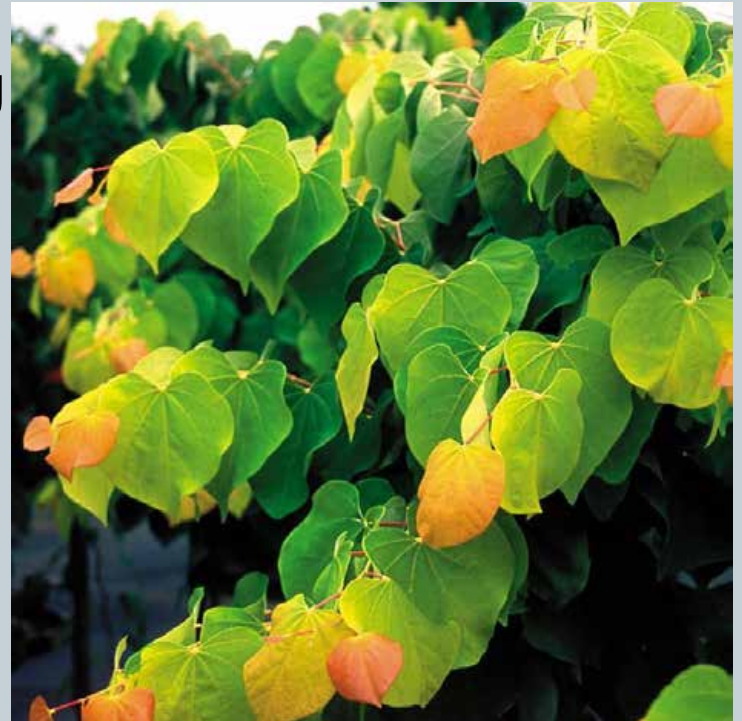


# Native plant cultivar ecosystem benefits

## ***Cercis canadensis* Rising Sun™**

Plant Patent 21,451. Cultivar name: 'JN2'

- Zones: 5-9
- Light purple-rose blooms before leaves in spring along branches and trunk
- 8-12' h x 8' w, compact habit
- Spring foliage is apricot, in summer yellow and mottled lime, in autumn golden yellow
- Fast growing, compact habit
- Full sun, light shade
- Soil loam, clay-sand; dry to moist, well-drained
- Border, specimen
- Reputed disease resistant, heat and humidity tolerant
- Nectar source for butterflies



Introduced by Ray Jackson of Jackson Nursery, TN

# Native plant species ecosystem benefits

## ***Carya ovata* Shagbark Hickory**

### **Benefit**

**Use Ornamental:** Long-living,  
Shade tree, Attractive

**Use Wildlife:** Squirrels and birds relish the  
seeds and catkins. Fruit-birds, Fruit-  
mammals, Nesting site, Cover, Substrate-  
insectivorous birds

**Use Food:** Fruits-nutrition



[http://www.wildflower.org/gallery/result.php?id\\_image=35543](http://www.wildflower.org/gallery/result.php?id_image=35543)

[http://www.wildflower.org/gallery/result.php?id\\_image=35550](http://www.wildflower.org/gallery/result.php?id_image=35550)



# Native plant cultivar ecosystem benefits



## ***Cornus florida* 'Comco No. 1 'Cherokee Brave™ Dogwood**

- Zones: 5-9
- Deep red bracts starred with white appear before leaves in spring
- 15' h x 15-20' w
- Bright red fruit in summer, fall, and winter attracts wildlife
- New foliage tinted maroon turns green in summer and maroon again in autumn
- Slow growing, multi-stemmed, horizontal layered branching
- Full sun, part shade
- Soil loamy, well-drained
- Reputed disease resistant (powdery mildew)
- heat tolerant, humidity tolerant



**More drought resistant and vigorous than most other American Dogwoods**

# Native plant cultivar ecosystem benefits

***Cornus florida* 'Appalachian Spring' Dogwood** University of Tennessee Breeding Program

- Zones: 5-9
- White bracts mid spring
- 20' h x 20' w
- Spring blooms draw butterflies
- Bright red fruit in spring attracts birds
- Apple green foliage turns “searing red” in fall
- Fast growing, upright, symmetrical
- Full sun, part shade
- Soil loamy, well-drained, moist
- Border, specimen, understory tree
- Reputed disease resistant (anthracnose, powdery mildew), heat tolerant, humidity tolerant



# Non-native plant – endangered s



***Metasequoia glyptostoboides* Dawn redwood** Endangered species reintroduced from seed discovered in China in 1943 and distributed by Harvard's Arnold Arboretum

- Zones: 4-8
- Fast growing, wet soil tolerant
- 70-100' h x 15-25' w
- Deciduous conifer with deep orange brown colored needles that drop in fall, small cones in hot summer
- Upright habit, buttressed roots
- Full sun
- Soil wet, loamy, not drought tolerant
- Specimen
- Endangered species, heirloom plant, reputed urban pollution tolerant



[https://www.google.com/search?hl=en&q=metasequoia+glyptostroboides&av=on.2.or.r.gc.r.\\_pw.r.\\_qf.&btn=bv:41524429,d:h2l&biw=1008&bih=638&wrrpid=hl135930761704310&mm=1&ie=UTF-8&btn=isck&source=og&sq=N&tab=wi&ei=a2MFUbjQ1o75qAHFsoGIDg](https://www.google.com/search?hl=en&q=metasequoia+glyptostroboides&av=on.2.or.r.gc.r._pw.r._qf.&btn=bv:41524429,d:h2l&biw=1008&bih=638&wrrpid=hl135930761704310&mm=1&ie=UTF-8&btn=isck&source=og&sq=N&tab=wi&ei=a2MFUbjQ1o75qAHFsoGIDg)



# Native plant species ecosystem benefits

## *Nyssa sylvatica* Blackgum

- Native US, SC
- Blue berries attract wildlife (birds and mammals)
- 30-60' h x 20-30' w
- Glossy green foliage turns yellow, orange, scarlet and purple in fall
- Upright habit, horizontal branching
- attractive furrowed gray bark
- Full sun, part shade, shade
- Moist acid soils, sandy or clay loam
- Slow grower, transplant while young-tap root, disease susceptible
- Shade tree, bog or pond garden, ornamental
- Benefits honey bees, attracts birds



# Native plant cultivar ecosystem benefits



## ***Nyssa sylvatica* 'Wildfire'**

- Zones: 4-9
- 30-50' h x 20-30' w
- Foliage emerges red turns dark green, fiery red in fall.
- Upright habit, attractive furrowed gray bark
- Full sun
- Soil loamy, well-drained
- Specimen
- Reputed disease resistance; including bacterial leaf spot
- Black berries attract wildlife



# Native plant species ecosystem benefits

## *Taxodium distichum* Bald cypress

- Zones 4-11, Native to US, SC
- Sun to part shade
- 60-80' h x 25-30' w
- Feathery foliage bronze in autumn
- Deciduous conifer
- Fast grower
- Drought & wet tolerant; forms 'knees'; soil tolerant
- Tolerates compaction
- Provides wildlife cover and nesting; seeds feed birds; larval and/or nectar host for baldcypress sphinx (*Isoparce cupressi*)





# Design for cost effectiveness

- **Short-term cost effectiveness**

- Use existing plants (p, 32).
- The oldest trees may not be able to withstand construction impacts while **younger trees have more recuperative power.**
- Protection must be mandated for existing plant material. (p. 32)



Photo by Ellen Vincent

Seabrook Island, SC

# Trees of merit are the exception



Angel Oak,  
*Quercus*  
*virginiana*  
John's  
Island, SC



Photo by Ellen Vincent

**Preserving older trees of significance must take priority**



# Design for cost effectiveness



- **Short-Term cost effectiveness**

- Use existing hardscape (p. 32).
- Brick, concrete and stone can be reused for patios, walkways, and driveways.
- Add to existing hardscape (p. 32)
- Avoid transporting debris and depositing to landfill.



Photo by Ellen Vincent

“Detroitter” office used by Stoner Landscape, Greer, SC



# Design for cost effectiveness

- **Long-term cost effectiveness**
- Reduce maintenance costs by reducing areas that require irrigation
- Use drip irrigation with weather-sensitive controller.
- Capture storm water runoff for groundwater recharge



Photo by Ellen Vincent

1-Drip hose (soaker hose) 2-gator bag in Charleston

# Design for cost effectiveness



- **Integrate specialized design approaches for maximum short & long-term sustainability**
- Minimize or eliminate potable (drinking) water for irrigation use (select drought tolerant plant species, use high efficiency and climate controlled irrigation equipment, capture rain water) (p. 33).
- Preserve and restore native wildlife habitat (food, water, habitat, mobility cover) (p. 34-35).
- Promote a sense of place (through plants or historical hardscape) (p. 34).
- Manage water on-site (allow all natural water to infiltrate the soil on site) (p. 36).
- Cleanse water on site (vegetated swales, filter strips, bioretention areas) (p. 37).

# Sense of Place: Location, location, location



Photo by Ellen Vincent

Mount Auburn Cemetery



# SoP: Illumination and reflection



Photo by Ellen Vincent

Museum of Fine Arts, Boston

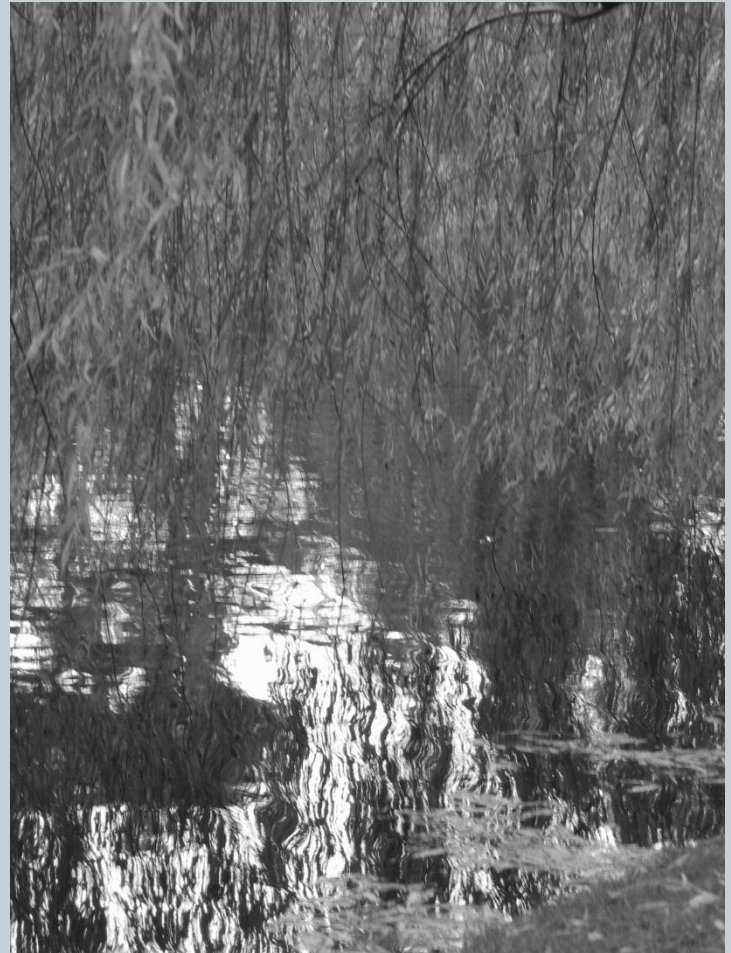


Photo by Ellen Vincent

Mount Auburn Cemetery

# SoP: Trees and stones



Photos by Ellen Vincent





# SoP: Landscape character - very historical



Photos by Ellen Vincent



# SoP: Violence is everywhere



Photo by Ellen Vincent

# SoP: Trees transport us



Photo by Ellen Vincent

Sleepy Hollow Cemetery



# SoP: Boston's gold reserves



Photos by Ellen Vincent





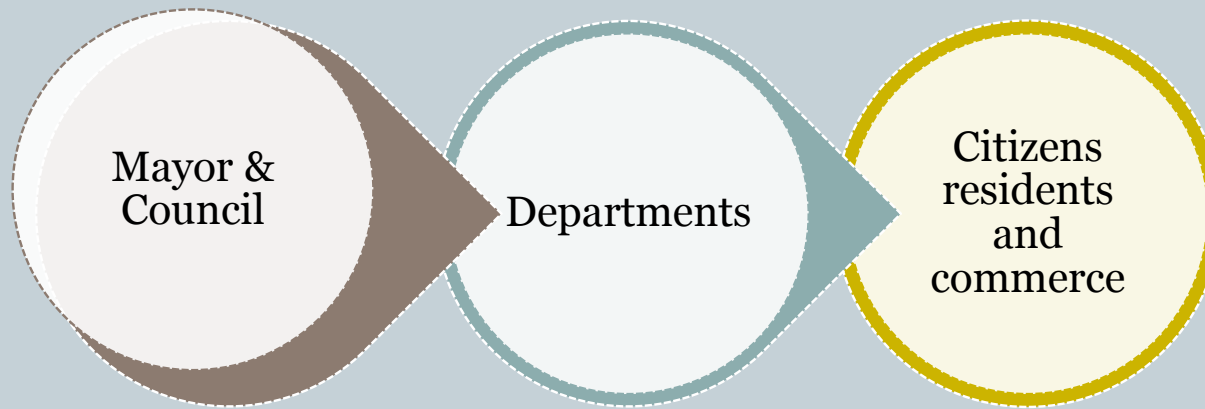
# SoP: Trees are Americana



# Sustainable landscapes parts



- Alignment (**cooperative communication**) is needed between municipal leaders, departments, and citizens (residential and commercial).



# Alignment – cooperative communication



▲ Before



▲ After

Downtown Greenville, SC



# Alignment – cooperative communication



Photos by Ellen Vincent



Falls Park in Greenville, SC hosting all public events in the park.

Too many people caused bed trampling resulting in soil and plant damage. Large events were quickly moved to the streets above.

Falls Park, Greenville, SC

# Alignment – cooperative communication



Photo by Ellen Vincent

Charleston, SC



# Alignment – cooperative communication



Photo by Ellen Vincent

Mature tree view dispute in Charleston, SC



# Alignment – cooperative communication



Photo by Ellen Vincent

Mature tree view in Charleston, SC



# Alignment – cooperative communication



Photo by Ellen Vincent

Mature tree view in Charleston, SC

# Champions of the World



Photo by Ellen Vincent

**Centennial Oak *Quercus macrocarpa*, Clemson campus**



# The Next Generation



**Clemson HORT intern Erik Bruhjell  
with Tree South**



Photos by Ellen Vincent

# The Next Generation



Photo by Ellen Vincent

**Clemson HORT 101 class plants tree under direction of Paul Minerva and  
Clemson arboriculture team-Derek Ham, Steve Gillum, Tyler Jones**



# The Next Generation



Photos by Ellen Vincent

**Clemson HORT 101 class assesses mature tree health using resistograph under direction of Paul Minerva and Clemson arboriculture team-Derek Ham, Steve Gillum, Tyler Jones**



# Global feedback loop



- Human behavior and decisions are part of the global feedback loop.
- What people do affects the health and well-being of the planet;
- Which in turn affects human health and well-being (physical, mental, economic, and social) (The Case for Sustainable Landscapes, 2009, p. 6).



rsd.gsfc.nasa.gov

Earth from GOES-8

# Resources



- Sustainable Sites Initiative [www.sustainablesites.org/](http://www.sustainablesites.org/)
- LadyBird Johnson Wildflower Center <http://www.wildflower.org/>
- Dale Westermeier, Greenville (864-467-4350)
- Danny Burbage, Charleston (843-724-7416) [burbaged@charleston-sc.gov](mailto:burbaged@charleston-sc.gov)
- Ellen Vincent, Clemson University 864-565-1342 [ellenav@clemson.edu](mailto:ellenav@clemson.edu)
- Sustainable Landscape Demonstration Garden:  
<http://www.clemson.edu/cafls/demo/>
- Vincent research, pubs, presentations:  
<http://www.clemson.edu/cafls/research/vincent>

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**Sustainable Landscape Demonstration Garden : <http://www.clemson.edu/cafls/demo/>  
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