Dr. Ellen Vincent

Why Use Native Trees?

SC Green
Columbia Metropolitan
Convention Center, SC
21Jan2020

Overview

- Sustainability defined (4-13)
  - Historic
  - Contemporary
- Native plants defined (14-30)
- Ecosystems benefits/services (31-68)
  - Linkages/connectivity

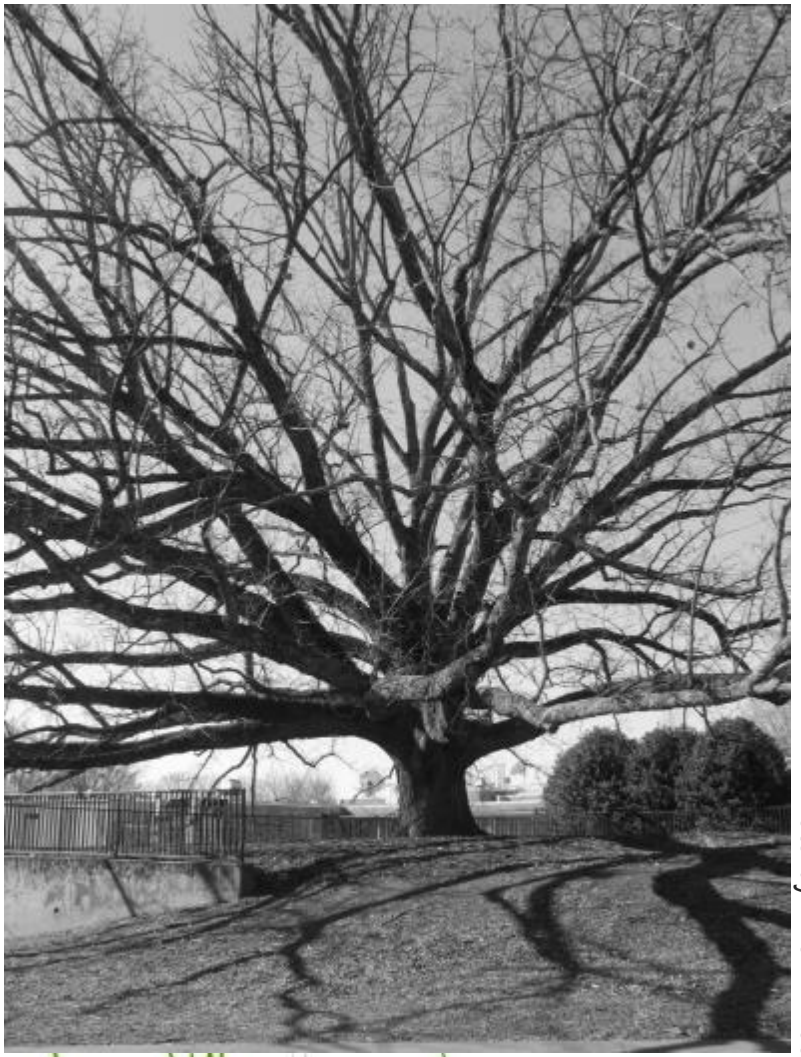


Photo by Ellen Vincent

Centennial Oak *Quercus macrocarpa*, Clemson campus

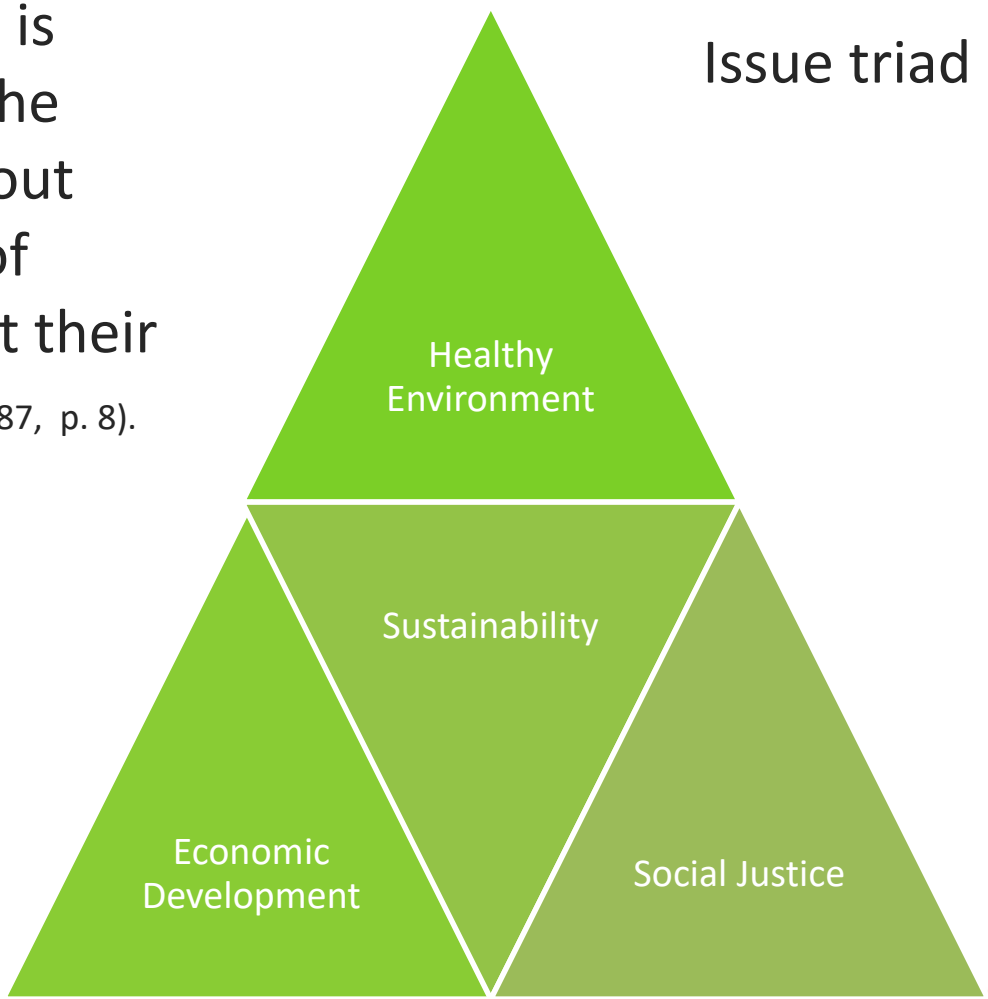
Definitions

1 Sustainability

Sustainability: historic definition 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



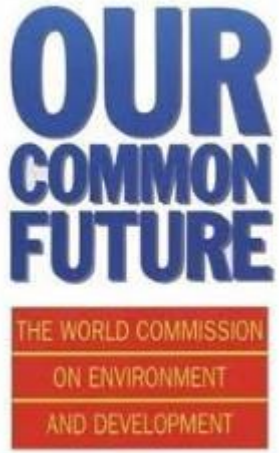
Issue triad pyramid by Ellen Vincent

The World Commission on Environment and Development (1987). *Our common future*.. Oxford: Oxford University Press.

Gro Harlan Brundtland (b. 1939)

- 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



Amazon prices:
$24.95 new
$4.95 used

http://en.wikipedia.org/wiki/Gro_Harlem_Brundtland

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).

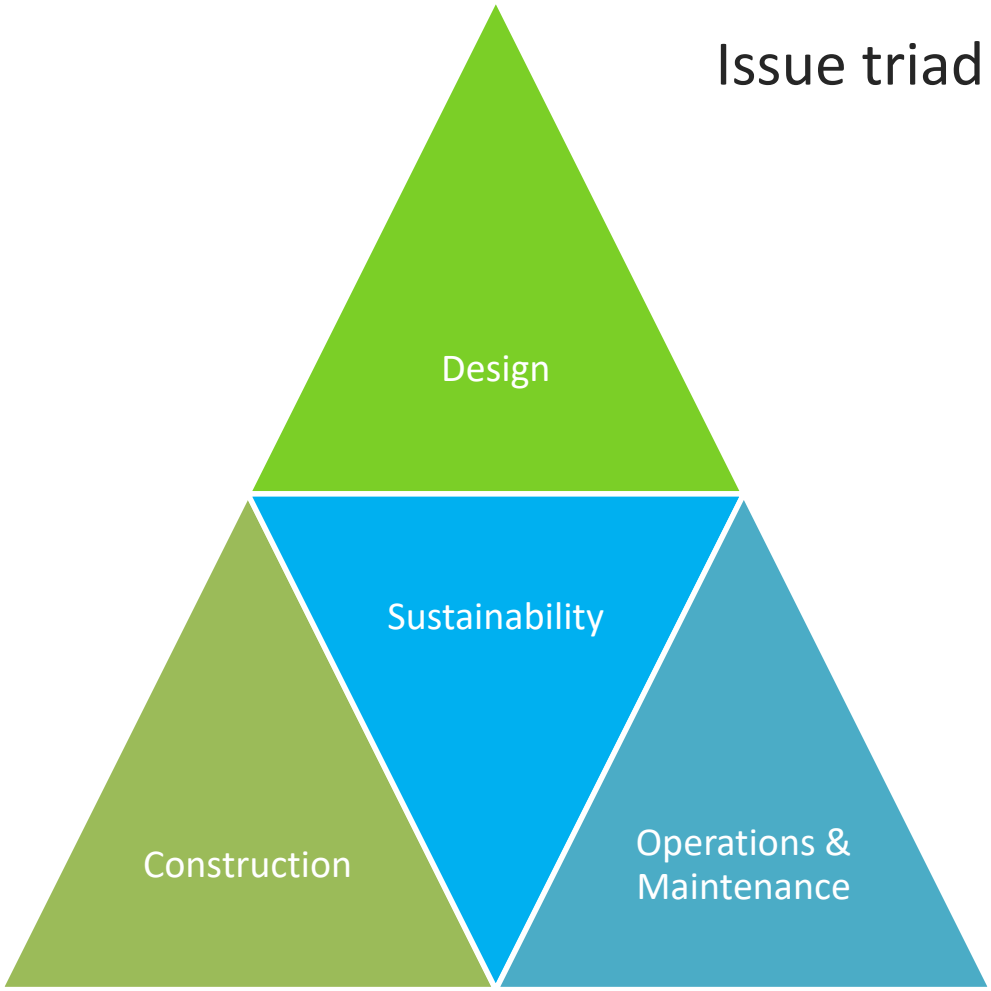
http://en.wikipedia.org/wiki/Gro_Harlem_Brundtland

Sustainability: modern definition 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



Issue triad pyramid by Ellen Vincent

Sustainable Sites Initiative,(2009). *The case for sustainable landscapes.* Retrieved from: http://www.sustainablesites.org/report/The%20Case%20for%20Sustainable%20Landscapes_2009.pdf

Sustainability: Modern definition creators, 2009

THE SUSTAINABLE SITES INITIATIVE™

- www.sustainablesites.org/

AMERICAN SOCIETY OF LANDSCAPE ARCHITECTS
ASLA Library & Education Advocacy Fund

Lady Bird Johnson Wildflower center

UNITED STATES BOTANIC GARDEN

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

http://www.sustainablesites.org/report/Case-for-sustainable-landscapes_thumb.jpg

Sustainable Sites Initiative, 2014

2014-SITES v2 is negotiating with Green Building Council to be part of LEED and receive certification.	**Over 30 Certified Sites.**
Focus is currently on: -**Resiliency** -**Ecosystem services** -**Human health** -Materials -Soil & vegetation -Water	Sustainable SITES Initiative™
2015-Sustainable SITES Initiative SITES® is produced by Green Business Certification Inc. (GBCI)	**Voluntary program designed to evolve over time.**

http://www.sustainablesites.org/certified-sites
http://www.sustainablesites.org/about

Sustainable Sites Initiative-resilient communities

2104: SITES v2 Rating System and Reference Guide

Sustainable landscapes create **ecologically resilient communities** better able to withstand and recover from episodic floods, droughts, wildfires, and other catastrophic events.

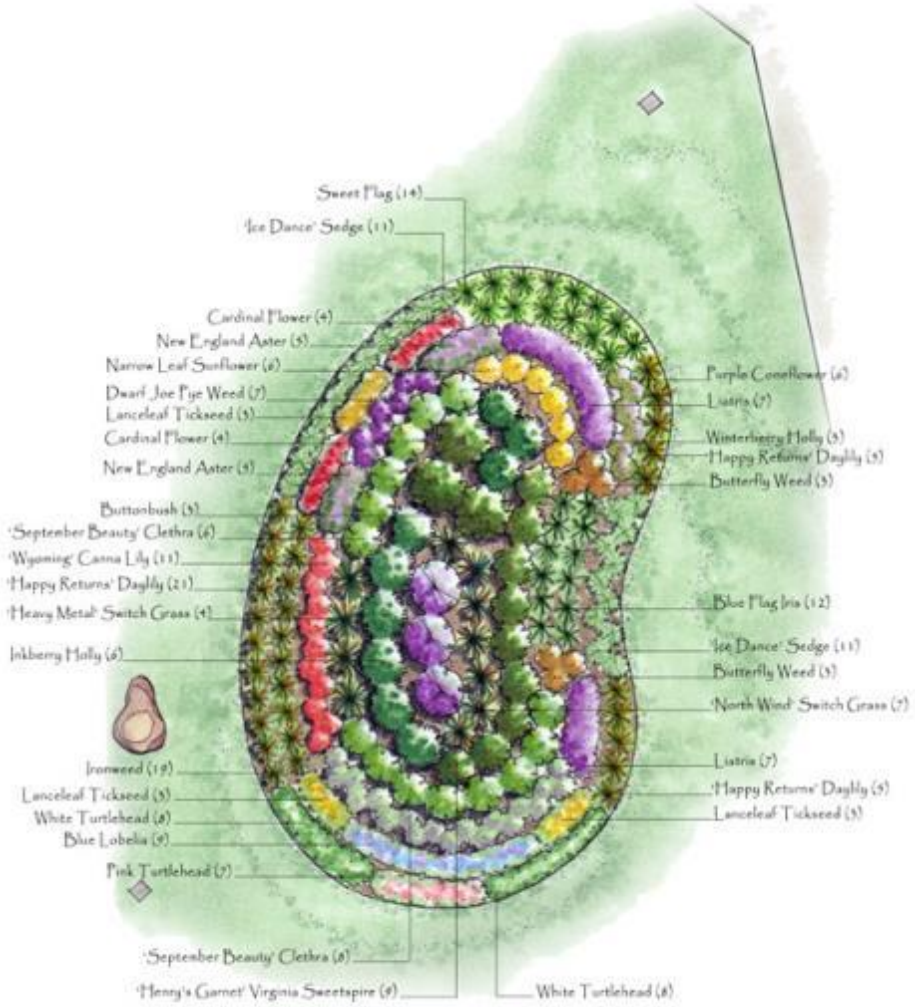
Sustainable SITES Initiative™

http://www.sustainablesites.org/about

"Sustainability" in landscapes

- Is a relative concept.
- Is a shift in thinking and practice.
- Is evolving.

- "They are still artificial landscapes inserted into highly disturbed site environments and maintained to meet the expectations of owners and occupants" (Cook & VanDerZanden, 2011, p. 1).



Renee Byrd design Byrdlandscapedesign.com

Cook, T. W. & VanDerZanden, A. (2011). *Sustainable landscape management*. Hoboken, NJ: John Wiley & Sons.
http://www.byrdlandscapedesign.com/Landscape-Designs.html

Sustainable landscapes

- Ecologically more stable
- Require less inputs such as water, fertilizers and pesticides

Cook, T. W. & VanDerZanden, A. (2011). *Sustainable landscape management*. Hoboken, NJ: John Wiley & Sons.
http://news.bbcimg.co.uk/media/images/63936000/jpg/_63936019_ash_wildlife_624.jpg

2 Native Plants

A NATIVE Plant:

http://www.wildflower.org/whynatives/

- North American native plants are defined as those that existed here without human introduction.

https://www.wildflower.org/gallery/result.php?id_image=21128

Acer rubrum
Red maple

https://www.wildflower.org/gallery/result.php?id_image=21568

Betula nigra
River birch

https://www.wildflower.org/gallery/result.php?id_image=26678

Callicarpa americana
Beautyberry

A NATIVE Plant:

https://www.nrcs.usda.gov/wps/portal/nrcs/detail/ct/technical/ecoscience/invasive/?cid=nrcs142p2_011124/

- Only **plants** found in this country before European settlement are considered to be **native** to the United States (USDA).

https://www.wildflower.org/gallery/result.php?id_image=2820

Asarum canadense
Wild ginger

https://www.wildflower.org/gallery/result.php?id_image=18989

Ilex verticillata
Winterberry holly

https://www.wildflower.org/gallery/result.php?id_image=7841

Hydrangea quercifolia
Oakleaf Hydrangea

Why plant NATIVE:

- The loss of native plant communities has reduced wildlife habitat and the genetic diversity necessary for **balanced ecosystems**.

- Native plants are disappearing at an alarming rate due to human activities:
  - Urban development
  - Agribusiness
  - Introduction of invasive species

Lady Bird Johnson Wildflower center THE UNIVERSITY OF TEXAS AT AUSTIN

http://www.wildflower.org/whynatives/

Why plant NATIVE:

- -Report by Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services 2019
  - **“Current global response insufficient; ‘Transformative changes’ needed to restore and protect nature; Opposition from vested interests can be overcome for public good”….**

“Through ‘transformative change’, nature can still be conserved, restored and used sustainably – this is also key to meeting most other global goals. By transformative change, we mean a fundamental, system-wide reorganization across technological, economic and social factors, including paradigms, goals and values.”

Science 13 Dec 2019:
Vol. 366, Issue 6471, eaax3100
DOI: 10.1126/science.aax3100

https://www.ipbes.net/news/Media-Release-Global-Assessment

Benefits of native plants

- They are winter hardy and heat tolerant to a given area.
- Provide food and habitat for animals and insects.
- Less susceptible to pest infestations.
- Less likely to become invasive.
- If selected carefully, may not require any soil modification.
- If properly selected require less irrigation, fertilization.
- Source of food and traditional or new medicines.

Challenges of native plants

- Locating reputable sources that grow the plants (not harvest from the wild).
- Changing aesthetic preferences.
- Changing tolerance levels: **Biodiversity** means living with other species.
- Relationships with exotics.

http://bee-pollen-health.com/WaxMothsandHoneyBees_2.jpg

Invasive species

- High reproductive capacity.
- Fast growth rate.
- High dispersal ability.
- Phenotypic plasticity (very adaptable to changing environmental conditions).
- Tolerates wide range of environmental conditions.
- History of invasions (pg. 98).

Cook, T. W. & VanDerZanden, A. (2011). *Sustainable landscape management*. Hoboken, NJ: John Wiley & Sons.

Invasive species

- Not all introduced species are harmful
- Cultivars are not normally invasive
  - Except for Bradford pear (*Pyrus calleryana*) and Norway maple (*Acer platanoides*)-they are exhibiting invasive behaviors in woodland areas (pg. 98).

- Native species can be invasive as well
  - Western juniper (*Juniperus occidentalis*) is spreading beyond its native territory (pg. 98).
  - See page 99 Table 5-5

Cook, T. W. & VanDerZanden, A. (2011). *Sustainable landscape management*. Hoboken, NJ: John Wiley & Sons.

Invasive species web sites

- Must view sites to see if plant is on the invasive list

√___ USDA SC Invasive Plant Species Web site at https://www.invasivespeciesinfo.gov/plants/main.shtml

√___ SC Exotic Plant Pest Council Web site at http://www.se-eppc.org/southcarolina/

Cook, T. W. & VanDerZanden, A. (2011). *Sustainable landscape management*. Hoboken, NJ: John Wiley & Sons.

Recent research

Emerging Urban Forests: Opportunities for Promoting the Wild Side of the Urban Green Infrastructure

Analyzed the species richness of native and alien plants and of invertebrates (carabid beetles, spiders) in emerging forests [Germany] dominated by alien or native trees.

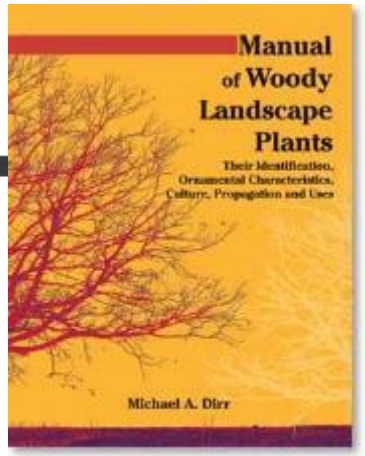
Native and alien plant species richnesses were positively related. Numbers of endangered plants and invertebrates did not differ between native- and alien-dominated forest patches.

Sustainability **2019**, *11*(22), 6318; **https://doi.org/10.3390/su11226318**

file:///C:/Users/ellenav/Desktop/Conferences/SCGIA/2020/Sustainability%20%20Free%20Full-Text%20%20Emerging%20Urban%20Forests%20Opportunities%20for%20Promoting%20the%20Wild%20Side%20of%20the%20Urban%20Green%20Infrastructure%20%20HTML.html

- **AN INTRODUCTION TO NATIVE PLANTS FOR SC LANDSCAPES**
- Factsheet | HGIC 1852 | **Published:** Apr 22, 2015
- https://hgic.clemson.edu/factsheet/an-introduction-to-native-plants-for-sc-landscapes/

Native plant literature



http://www.ffbooks.net/shop_image/product/113.jpg

- ***Armitage's Native Plants for North American Gardens*** **(2006) by Allan M. Armitage**
- ***Native Perennials for the Southeast*** **(2004) by Peter Loewer**
- ***Bringing Nature Home*** **(2011) by Douglas W. Tallamy**
- ***Manual of Woody Landscape Plants*** **(2009) by Michael A. Dirr**

Nativar research

- Mt Cuba Trial Gardens
- https://mtcubacenter.org/research/trial-garden/

MT. CUBA CENTER

***Leucothoe fontanesiana* 'Greensprite'**

https://mtcubacenter.org/plants/greensprite-drooping-leucothoe/

Heuchera

https://mtcubacenter.org/trials/heuchera/

http://1x848d9mftq5g9wx3epiqa1d-wpengine.netdna-ssl.com/wp-content/uploads/2016/12/MtCuba-Plant-Intro-Single-Pages-1.pdf

Nativar research-New plant introduction

MT. CUBA CENTER

- Yellow-stemmed, shrub dogwood originated as a mutation on *Cornus sericea* 'Flaviramea'
- Recommended replacement for variegated forms of *Cornus alba* because it better withstands the hot and humid climate in the mid-Atlantic region.

https://mtcubacenter.org/plants/silver-and-gold-red-osier-dogwood/

Cornus sericea 'Silver and Gold'

Silver and Gold redosier dogwood

Pennsylvania Horticultural Society's Styer Award of Garden Merit 1990

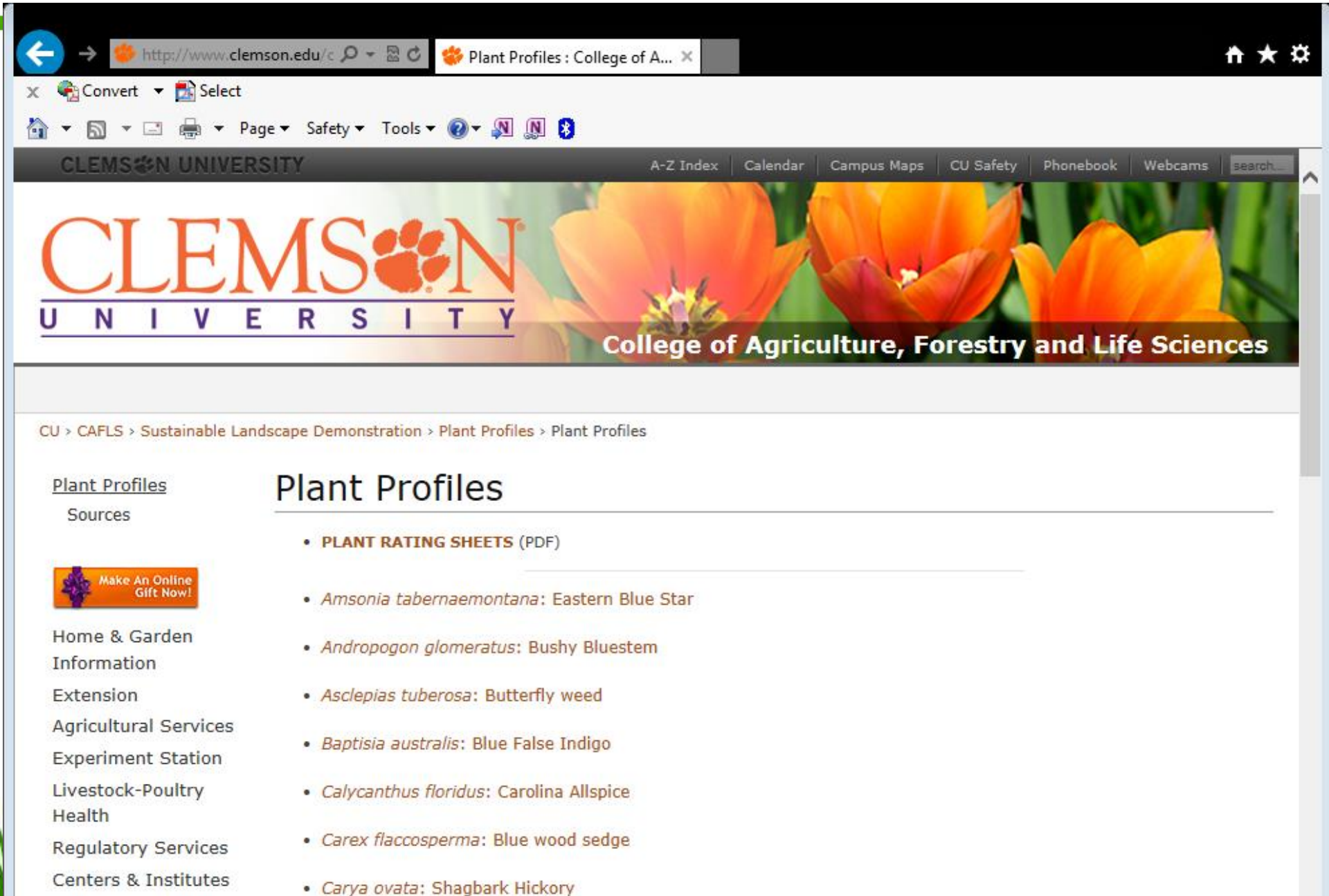
http://1x848d9mftq5g9wx3epiqa1d-wpengine.netdna-ssl.com/wp-content/uploads/2016/12/MtCuba-Plant-Intro-Single-Pages-1.pdf

SC Native Plant Society https://scnps.org/

5 South Carolina Native Plant Society Chapters

-Lowcountry –Midlands –Piedmont – South coast – Upstate

Sustainable Landscape Demonstration Site



3 Ecosystem Services

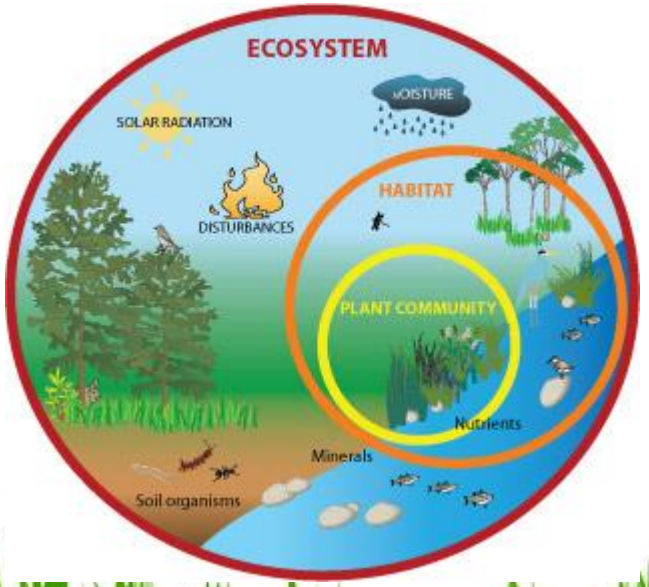
Ecosystem defined

- Ecosystem is a complex set or relationships among:

  Living resources + habitats + residents (p. 81)

- Living resources = plants + animals
- Environmental elements = water + soil
- Residents = people

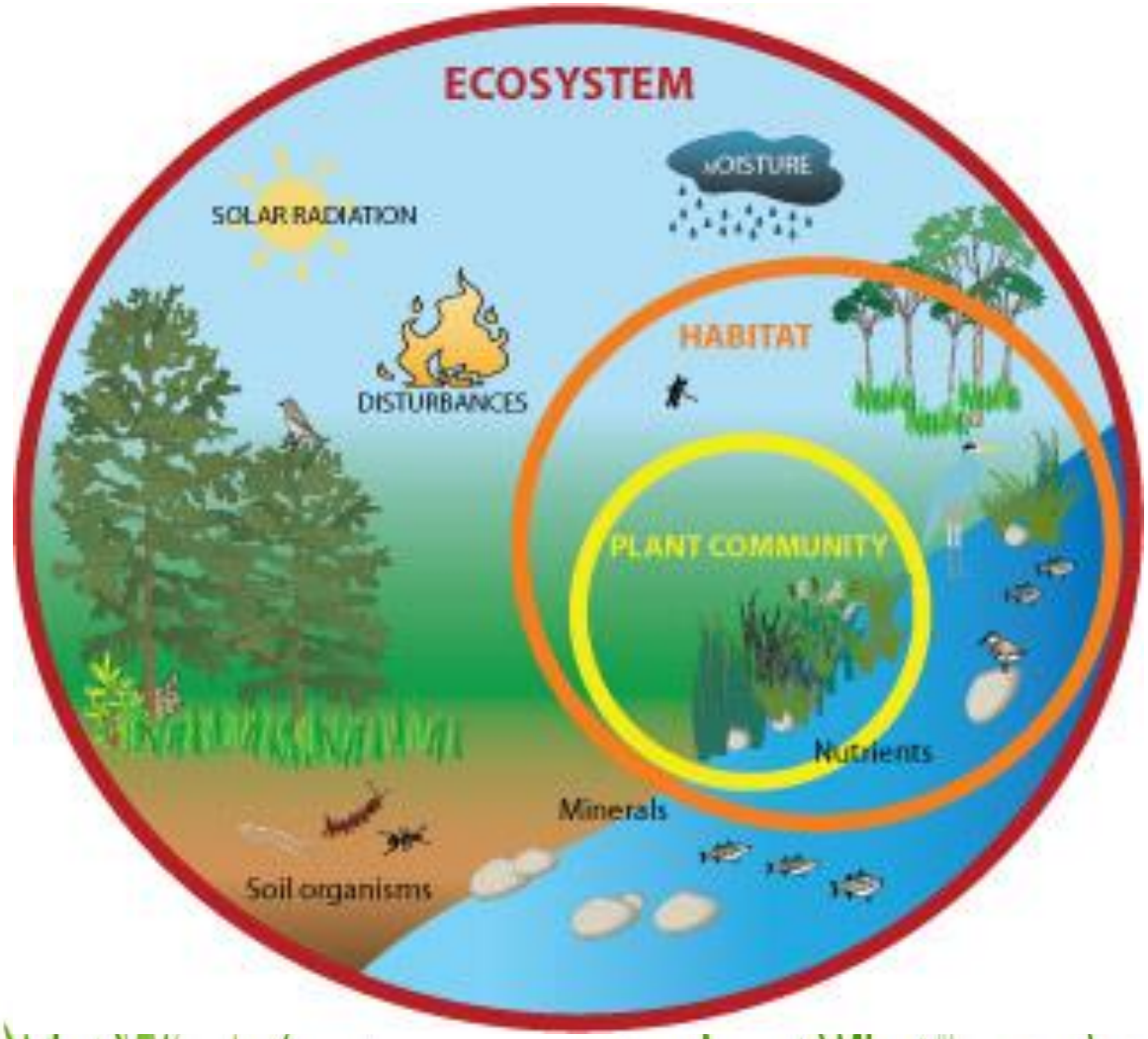
- ***Each area has significant impact upon the others*** *(p. 81).*



Cook, T. W. & VanDerZanden, A. (2011). *Sustainable landscape management.* Hoboken, NJ: John Wiley & Sons.

http://www.fws.gov/invasives/volunteersTrainingModule/images/invasives/ecosystem.jpg

Ecosystem defined



http://www.fws.gov/invasives/volunteersTrainingModule/images/invasives/ecosystem.jpg

Urban ecosystem

http://ivanredi.com/wp-content/uploads/2013/10/UrbanEcoSystem.jpg

Regenerative urban design by Ivan Redi (Austrian architect)

http://ivanredi.com/architecture-of-networks-experiment-or-reality/

Urban ecosystem-Falls Park on the Reedy, Greenville, SC

http://www.rudybruneraward.org/winners/falls-park/

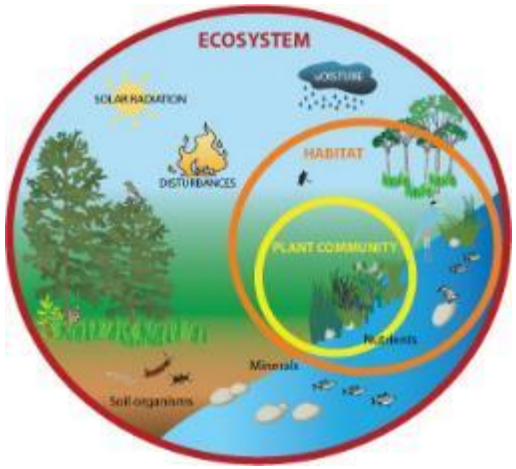
Regenerative urban design by Arbor Engineering (Greenville, SC)

http://www.rudybruneraward.org/winners/falls-park/

Ecosystem defined

- Ecosystem is a **complex set or relationships** among:

  Living resources + habitats + residents (p. 81)



- Living resources = plants + animals
- Environmental elements = water + soil
- Residents = people

- ***If one part of the ecosystem is damaged or disappears, it has an impact on everything else*** *(p.81).*

Cook, T. W. & VanDerZanden, A. (2011). *Sustainable landscape management.* Hoboken, NJ: John Wiley & Sons.

http://www.fws.gov/invasives/volunteersTrainingModule/images/invasives/ecosystem.jpg

Ecosystems

- Healthy ecosystems are in balance
- Sustainable ecosystems contain biodiversity (p. 81)

Biodiversity (def.) "the sum total of the variety of life and its interactions and can be subdivided into (1) genetic diversity; (2) species diversity; and (3) ecological or ecosystem diversity" (p. 81)

-defined by National Biological Information Infrastructure (NBII)

- Ecological landscape design treats landscapes as ecosystems (p. 81).

Cook, T. W. & VanDerZanden, A. (2011). *Sustainable landscape management*. Hoboken, NJ: John Wiley & Sons.

Ecosystems : Biodiversity-plant selection

- An assortment of species from various plant families may thwart mass pest infestations e.g. Dutch elm disease.
  - Bur oak and American beech are from same family so should be separated by another family species.
- Native plants (50% minimum) can support local soil, insect, bird, and mammal organisms.

Photo by Peter Togel

Quercus macrocarpa Fagaceae ↑
Fagus grandifolia Fagaceae ↓

https://i.ytimg.com/vi/Us1j_KWdJXs/hqdefault.jpg

Ecosystem services

- Ecosystem services are goods and services from living and non living elements that directly or indirectly benefit humans (p. 27).
- Natural cycles that protect and sustain:
  - ►The hydrologic cycle
  - ► The carbon cycle
  - ► The nitrogen cycle (p. 28-32)

Photo by E. Vincent

Sustainable Sites Initiative (2009). *The case for sustainable landscapes.*

Ecosystem services

12 ecosystem services identified by Sustainable Sites Initiative (p. 83)		
Global climate regulation	Erosion and sediment control	Waste decomposition and treatment
Local climate regulation	Hazard mitigation	Human health and well being benefits
Air and water cleansing	Pollination	Food and renewable nonfood products
Water supply and regulation	Habitat functions	Cultural benefits

Cook, T. W. & VanDerZanden, A. (2011). *Sustainable landscape management*. Hoboken, NJ: John Wiley & Sons.

Ecosystem services

MACRO	MICRO
Healthy soil	-Organic matter -Beneficial soil organisms -Vegetative mulch
Clean air	-Plants with foliage
Erosion control	-Plants in place -Mulch -Permeable pavement
Pollination	-Insects in flowers
Human health and well-being	-Shade from trees -Benches to sit on -Walkable paths

Photo source: North American Butterfly Association (see notes for Web location

Urban ecosystem: Highline NYC

Photo by Paulina Pena

Urban ecosystem: Highline NYC

Photo by Paulina Pena

Urban ecosystem: Highline NYC

Photo by Paulina Pena

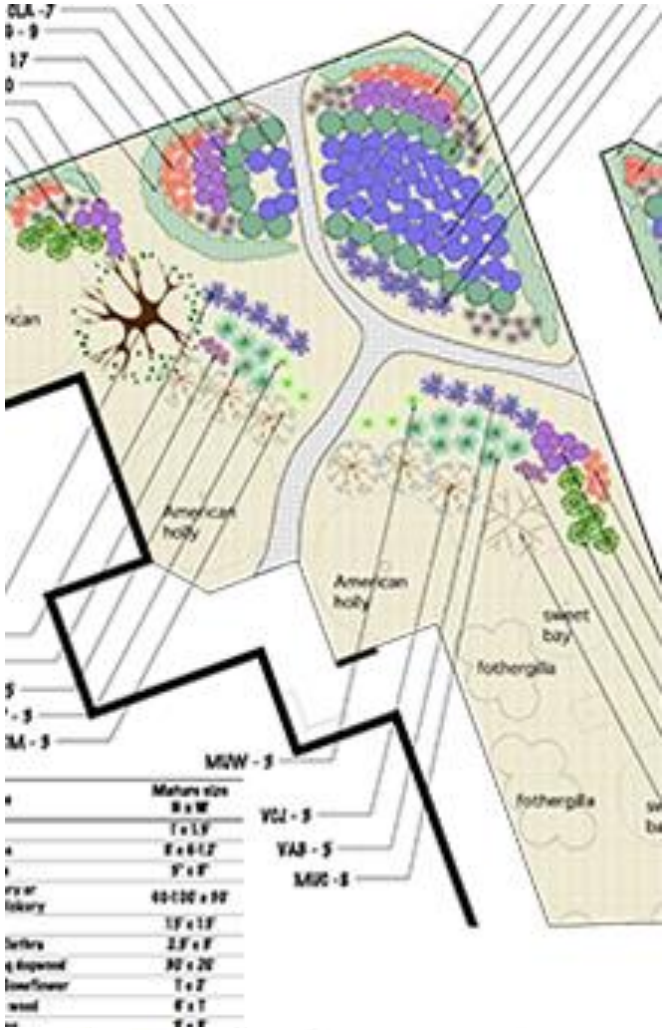
Urban ecosystem: Falls Park Greenville, SC

Photo by Ellen Vincent

3 Ecosystem Benefits

Ecosystem benefits

- Ecosystem benefits are the goods and services provided by healthy ecosystems
- Examples:
  - Plants that promote pollination of crops by bees, bats, or birds
  - Preserving wetlands that provide flood protection
  - Filtration of air and water by vegetation and soils (The Case for Sustainable Landscapes, 2009, p. 6).



Allison Kelly
Sustainable Landscape Demonstration Garden

Ecosystem benefits-historical work

Rachel Carson, (1907-1964) marine biologist, author	*Silent Spring* (1962) published two years before she died of cancer
	Believed man was assaulting the environment through excessive use of insecticides (DDT) (p. 7).
	"contamination of air, earth, rivers, and sea with dangerous and even lethal materials" –Carson 1962 (p. 6).
	Work spurred **creation of the U.S. Environmental Protection Agency (EPA)**; and spurred the ban on DDT and other insecticides.

http://www.google.com/imgres?q=Rachel+Carson&hl=en&client=firefox-a&sa=G&rls=org.mozilla:en-US:official&biw=1920&bih=1010&gbv=2&tbm=isch&tbnid=5YnjENqAGFTFTM:&imgrefurl=http://www.uncoverage.net/tag/rachel-carson/&docid=dBrEfvzkQRUMlM&w=600&h=460&ei=vDxVTvLXIImDtgf8yICQAg&zoom=1&iact=hc&vpx=1158&vpy=126&dur=11106&hovh=197&hovw=256&tx=93&ty=138&page=1&tbnh=135&tbnw=157&start=0&ndsp=73&ved=1t:429,r:8,s:0

Cook, T. W. & VanDerZanden, A. (2011). *Sustainable landscape management*. Hoboken, NJ: John Wiley & Sons.

Ecosystem benefits-historical work

Rachel Carson, (1907-1964) marine biologist, author

http://www.google.com/imgres?q=Rachel+Carson&hl=en&client=firefox-a&sa=G&rls=org.mozilla:en-US:official&biw=1920&bih=1010&gbv=2&tbm=isch&tbnid=5YnjENqAGFTFTM:&imgrefurl=http://www.uncoverage.net/tag/rachel-carson/&docid=dBrEfvzkQRUMlM&w=600&h=460&ei=vDxVTvLXIImDtgf8yICQAg&zoom=1&iact=hc&vpx=1158&vpy=126&dur=11106&hovh=197&hovw=256&tx=93&ty=138&page=1&tbnh=135&tbnw=157&start=0&ndsp=73&ved=1t:429,r:8,s:0

Ellis Reid, 1st grader in NC

Photo courtesy of Laurie Reid

Ecosystem benefits

- 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 project development.
  - See Biomimicry Institute 'Ask Nature' Web page at http://www.asknature.org/.

Photo by Ellen Vincent

WEB TRAVELS: Biomimicry--Ask Nature

https://pbs.twimg.com/profile_images/2145239931/AskNatureAvatar_2012-01.png
https://biomimicry.org/wp-content/uploads/2016/01/Institute_logo_banner.png

BIOMIMICRY INSTITUTE

Ask Nature .org

Biomimicry Institute 'Ask Nature' Web page at http://www.asknature.org/

Ecosystem benefits-*Cercis canadensis*

BENEFIT

Use Food: Add flowers and flower buds to salads, breads and pancakes. They have a slightly sour taste, high in vitamin C. Young pods may be eaten raw, boiled or sauteed. (Tull)
Use Other: Boiled in water, redbud twigs produce a yellow dye. (Kershaw)
Conspicuous Flowers: Yes
Fragrant Flowers: Yes
Attracts: Birds
Deer Resistant: Moderate

VALUE TO BENEFICIAL INSECTS

Special Value to Native Bees
Special Value to Bumble Bees
Provides Nesting Materials/Structure for Native Bees

This information was provided by the Pollinator Program at **The Xerces Society for Invertebrate Conservation**.

Photo by Ellen Vincent

Cercis canadensis **Eastern redbud**
Gay St. Knoxville, TN

Lady Bird Johnson Wildflower Center Native Plant Database
https://www.wildflower.org/plants/result.php?id_plant=ECPU

Ecosystem benefits-*Magnolia virginiana*

BENEFIT
Use Ornamental: Attractive, aromatic, showy, blooms are ornamental
Use Wildlife: Very low. Nectar-moths, Nectar-beetles
Conspicuous Flowers: Yes
Fragrant Flowers: Yes
Attracts: Birds

BUTTERFLIES AND MOTHS OF NORTH AMERICA (BAMONA)
Sweetbay silkmoth (*Callosamia securifera*)

Laval host

***Magnolia virginiana* Sweetbay magnolia**

https://www.wildflower.org/gallery/result.php?id_image=33544

Lady Bird Johnson Wildflower Center Native Plant Database
https://www.wildflower.org/plants/result.php?id_plant=ECPU

Lady Bird Johnson Wildflower center
THE UNIVERSITY OF TEXAS AT AUSTIN

Ecosystem benefits-*Nyssa sylvatica*

BENEFIT
Use Ornamental: Shade tree, Fall conspicuous, Bog or pond area, Water garden
Use Wildlife: Substrate-insectivorous birds, Fruit-birds, Fruit-mammals, Browse, Nectar-bees
Attracts: Birds

VALUE TO BENEFICIAL INSECTS
Special Value to Honey Bees

This information was provided by the Pollinator Program at **The Xerces Society for Invertebrate Conservation**.

https://www.wildflower.org/gallery/result.php?id_image=35398

Nyssa sylvatica **Blackgum**

N. sylvatica 'Wildfire'

Lady Bird Johnson Wildflower Center
Native Plant Database
https://www.wildflower.org/plants/result.php?id_plant=ECPU

www.saundersbrothers.com/_ccLib/image/plants/DETA-591.jpg

Ecosystem benefits-*Taxodium distichum*

Taxodium distichum

Bald cypress

Photo by E. Vincent

Benefit
Use Ornamental: Fall conspicuous, Long-living, Attractive
Use Wildlife: Cover, Nesting site, Substrate-insectivorous birds, Seeds-granivorous birds, Seeds-Small mammals
Interesting Foliage: Yes
Attracts: Birds
Deer Resistant: Moderate

Tree is a larval host and/or nectar source for:
Baldcypress sphinx (*Isoparce cupressi*)

http://www.silkmoths.bizland.com/IsoparcecupressiJuly18Alabamadb.jpg

Lady Bird Johnson Wildflower center
THE UNIVERSITY OF TEXAS AT AUSTIN

http://www.wildflower.org/plants/result.php?id_plant=TADI2

WEB TRAVELS: Ecosystem benefits of native plants

- **Lady Bird Johnson Wildflower Center Native Plant Database:**
- http://www.wildflower.org/plants/
- Recommended plant species for each state

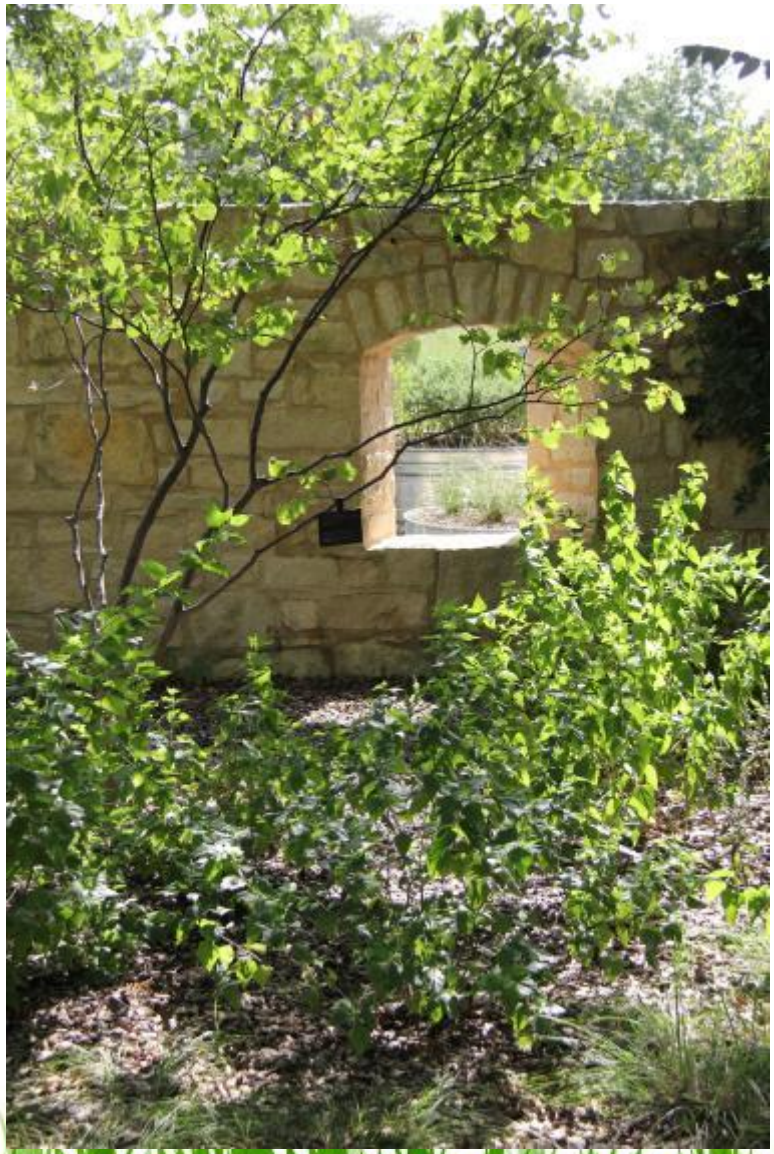


Photo by Ellen Vincent

CLEMSON

College of AGRICULTURE, FORESTRY AND LIFE SCIENCES

Carolina Yards Plant Database

Search the Plant Database	
Region	Soil type
SC Native	Soil pH
Plant type	Soil moisture
Sunlight	Salt tolerance
Wildlife	**Stormwater**

https://www.clemson.edu/extension/carolinayards/plant-database/index.html

Carolina Yards Plant Database

SEARCH

- **REGION** Statewide
- **SC NATIVE** Yes
- **PLANT TYPE** Tree
- **WILDLIFE** Attracts birds

Results yield 40 trees

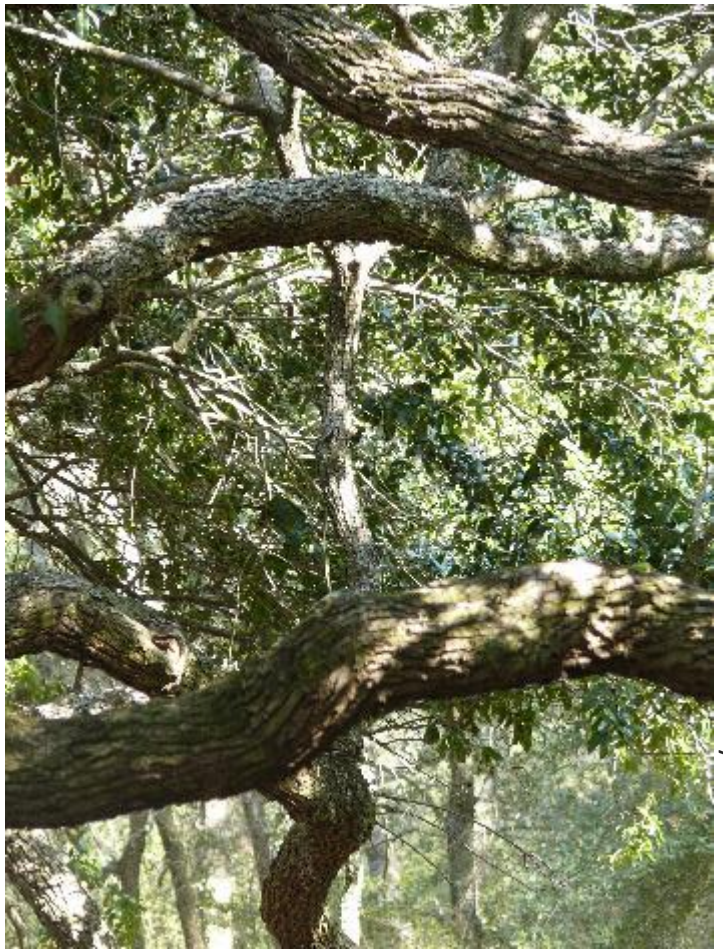


Photo by Ellen Vincent

Angel oak *Quercus virginiana*
Attracts Birds, Deer Resistant

https://www.clemson.edu/extension/carolinayards/plant-database/index.html

Carolina Yards Plant Database

SEARCH

- **REGION** Midlands
- **SC NATIVE** Yes
- **PLANT TYPE** Tree
- **SOIL TYPE** Alkaline
- **WILDLIFE** Attracts birds

Results yield 29 trees

Attracts Butterflies, Attracts Birds, Attracts Hummingbirds

Photo by Ellen Vincent

Southern magnolia
Magnolia grandiflora & cvs

https://www.clemson.edu/extension/carolinayards/plant-database/index.html

Carolina Yards Plant Database

SEARCH

- **REGION** Coast
- **SC NATIVE** Yes
- **PLANT TYPE** Tree
- **SOIL TYPE** Alkaline
- **WILDLIFE** Attracts butterflies

Results yield 10 trees

Photo by Ellen Vincent

Redbud *Cercis canadensis*

Attracts Butterflies, Attracts Birds, Attracts Hummingbirds, Deer Resistant

https://www.clemson.edu/extension/carolinayards/plant-database/index.html

Carolina Yards Plant Database

SEARCH

- **REGION** Statewide
- **SC NATIVE** Yes
- **PLANT TYPE** Tree
- **WILDLIFE** Attracts birds
- **STORMWATER**: Rain garden

Results yield 16 trees

Photohttps://www.etsy.com/listing/729856079/sweetbay-magnolia-flowering-ornamental

Sweetbay magnolia
Magnolia virginiana and cvs

Wildlife: Attracts Butterflies, Attracts Birds, Attracts Hummingbirds
Stormwater: Rain Garden, Constructed Wetland

https://www.clemson.edu/extension/carolinayards/plant-database/index.html

Design linkages for health: Incorporate natives

- **Identify and plan for/with 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).

Cook, T. W. & VanDerZanden, A. (2011). *Sustainable landscape management*. Hoboken, NJ: John Wiley & Sons.

Design linkages: The High Line, NYC

Address: New York, NY (Manhattan)
Size: 395 acres
Desc: 1.45-mile-long New York City linear park built in Manhattan on an elevated section of a disused New York Central Railroad spur. 50% native plants

Photo by Paulina Pena

Design linkages: Atlanta Beltline, GA

Project projections:
22 miles of pedestrian friendly rail transit
33 miles of multi-use trails
1,300 acres of parks
5,600 units of affordable housing
1,100 acres of brownfields remediated
$10-20 billion in economic development
30,000 permanent jobs
48,000 one-year construction jobs
Public art
Historic preservation
Sustainability

http://www.sylvanhillsatlanta.org/wordpress/wp-content/uploads/2010/01/beltline.jpg
http://beltlineorg.wpengine.netdna-cdn.com/wp-content/uploads/2012/05/img-Master-Plan-Subarea-01-Chart.jpg

Certified Sustainable Site: U.S. Courthouse, Albuquerque

Address:
Albuquerque, NM
Project Size:
4.4 acres
Project type:
Government
Site Context:
Urban
Former Land Use:
Greyfield
Terrestrial Biome:
Desert
Budget:
$2,837,131

hhttp://www.sustainablesites.org/pete-v-domenici-us-courthouse-sustainable-landscape-renovation
ttp://www.sustainablesites.org/pete-v-domenici-us-courthouse-sustainable-landscape-renovation

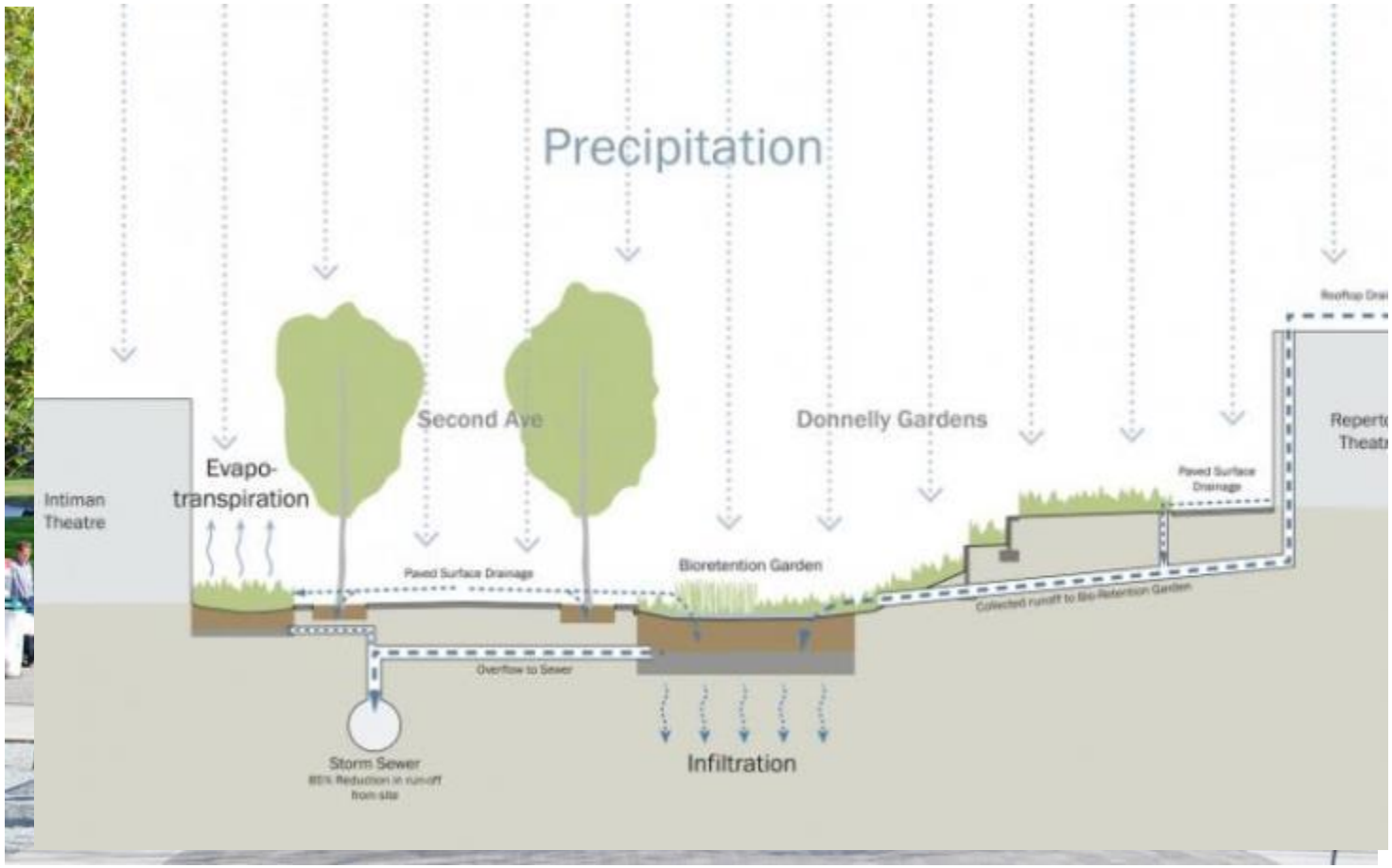
CSS: Square 80 Plaza at the George Washington University

Address:
Washington, DC
Project Size:
0.77 acres
Project type:
Institutional / Educational
Site Context:
Urban
Former Land Use:
Greyfield
Terrestrial Biome:
Temperate Broadleaf & Mixed Forests
Budget:
$2,066,182

http://www.sustainablesites.org/pete-v-domenici-us-courthouse-sustainable-landscape-renovation

SS: Theater Commons and Donnelly Gardens at Seattle Center

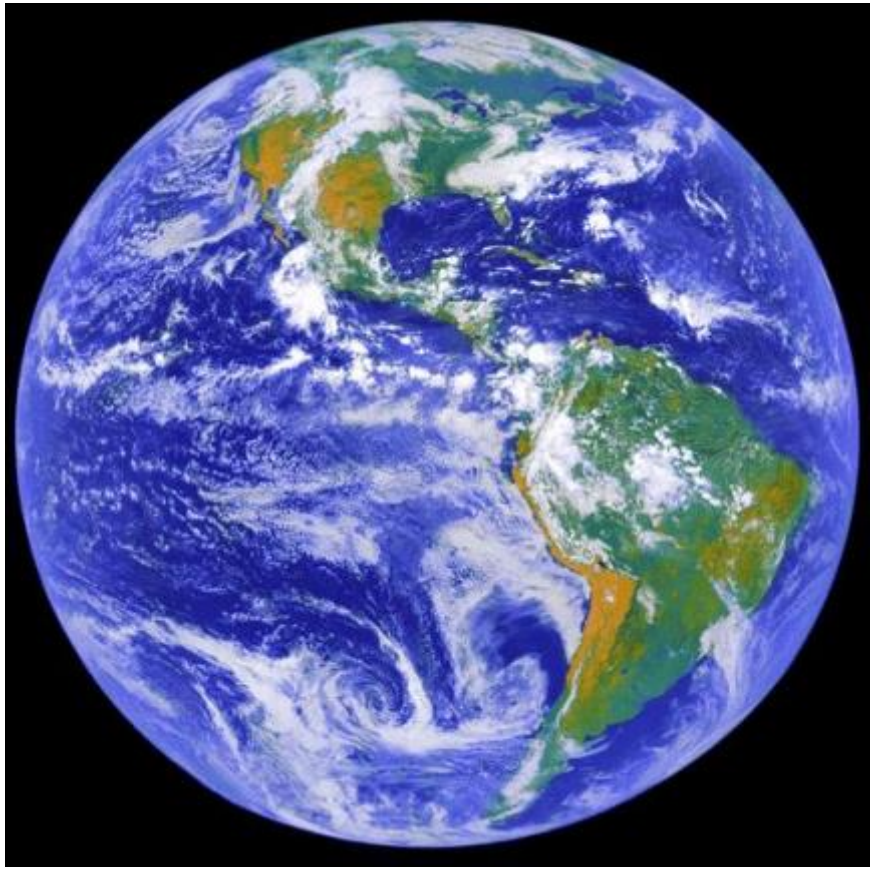
Address:
Seattle, WA
Project Size:
1.6 acres
Project type:
Open space - Park
Site Context:
Urban
Former Land Use:
Greyfield
Terrestrial Biome:
Temperate Broadleaf & Mixed Forests
Budget:
$5,000,000



http://www.sustainablesites.org/theater-commons-and-donnelly-gardens-seattle-center

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

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Photo by Craig Mehaffey

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CAFLS Excellence in Teaching Award 2016
Critical Thinking CT^2 Faculty Scholar 2014-2019
Louis P. Parsons Award for Outstanding Service to Nursery and Landscape Industry 2015

Profile: https://www.clemson.edu/cafls/faculty_staff/profiles/ellenav
Environmental Landscapes: http://www.clemson.edu/cafls/research/vincent/
Sustainable Landscape Garden Demonstration: http://www.clemson.edu/cafls/demo/
Horticulture Internships:
https://www.clemson.edu/cafls/internships/horticulture/index.html