



## Benefits of Trees

- Shade and beauty
- Air quality
  - Reduction of CO
  - Production of O<sub>2</sub>
  - Removal of particulate matter



## Benefits of Trees

- Climate
  - Moderate temperature extremes
  - Cool through evapotranspiration
  - Provide windbreaks
  - Reduce energy usage



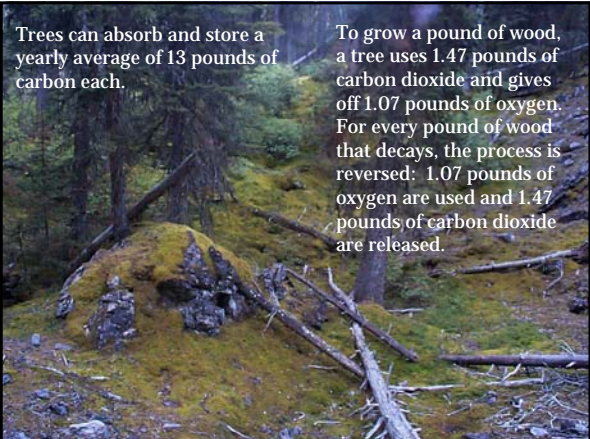
## Benefits of Trees

- Psycho-Social
  - physical health/exercise environment
  - relaxation
- Economic



## Trees improve air quality...

- A large healthy tree can produce enough oxygen each day for 18 people.
- Trees reduce pollution and absorb carbon monoxide, sulfur dioxide, and nitrogen dioxide.
- Deciduous trees remove up to 9% of particulates and evergreen trees remove up to 13% of airborne particulates.



Trees can absorb and store a yearly average of 13 pounds of carbon each.

To grow a pound of wood, a tree uses 1.47 pounds of carbon dioxide and gives off 1.07 pounds of oxygen. For every pound of wood that decays, the process is reversed: 1.07 pounds of oxygen are used and 1.47 pounds of carbon dioxide are released.

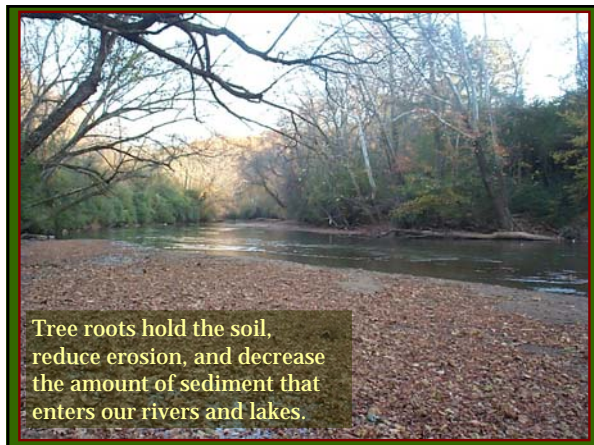
In the sun and heat, parked cars release significant amounts of volatile organic compounds (VOC's), which add to global warming.

By providing a cool, shady spot for us to park our cars, trees reduce the amount of VOC's that are released into the atmosphere.



### Trees improve water quality...

- Tree leaves, branches, and trunk intercept 7% to 22% of rainfall and release it slowly, substantially reducing stormwater runoff and non-point source pollution.
- The result is a reduction in construction and material costs for storm water control structures and systems.



Tree roots hold the soil, reduce erosion, and decrease the amount of sediment that enters our rivers and lakes.

### Trees save energy...

- Trees, if properly placed, can provide a 17% to 75% decrease in summer cooling costs.
- The 200,000 leaves on a healthy 100-foot tree can take 11,000 gallons of water from the soil and "breathe" it into the air in a single growing season, a cooling effect equivalent to air conditioning for 12 rooms.



### Research has shown that...

After a green moment, in a "green building" (surrounded by trees), or green vacation, people have a sense of renewal, which results in better concentration, more effective life functioning, more patience on performance measures for delayed gratification, better impulse control, more self-discipline, less violent, less aggressive, reduced ADHD symptoms, more effective life course, greater well-being and life satisfaction.

Trees create healthier, stronger, safer neighborhoods.

### Research has shown that...

There is 2x as much children's play in green spaces vs. barren.

There is 2x as much creative play in green spaces vs. barren.

There is 2x as much supervised children in green vs. barren spaces.

There is 2x as many unsupervised children in barren vs. green spaces. Lack of supervision is the number one cause of delinquency.

In better cared for spaces [with trees], there is less graffiti, vandalism, litter, and less crime (from police crime data).

### Trees attract residents and visitors to a community...

- For a single home, trees can provide an owner with a 4% to 27% increase in property values.
- A single tree can add up to 9% to the value of a residential property.
- One study has shown that one hardwood tree on a site adds \$333 to the property value and each pine adds \$257.
- Trees increase a community's tax and economic base.

### Tree Inventories

- Give you a snapshot of what you have.
- Can be 100%, or a sample.
- Provide information on individual trees as well as the entire community forest.
- Must be kept updated to be effective.



### Tree Inventories

- Common data collected includes:
  - Tree ID Number
  - Location
  - Species
  - Diameter
  - Condition
  - Management Needs
  - Environmental Factors



### How Trees Grow

- Crown - Leaves and Buds
- Trunk - Stem, Scaffold Limbs and Branches
- Roots - Woody and Fibrous



## Cambium Layer

- The cambium is a microscopic layer of meristematic cells that produce wood to the inside and inner bark to the outside.
- The cambium layer is responsible for a tree's increase in trunk and limb diameter.

## Leaves and Buds

- Leaves contain chlorophyll which captures light.
- Through photosynthesis, light and carbon dioxide are used to produce carbohydrates (sugars and starches).
- A branch or twig must make and store all its own food.

## Leaves and Buds

- Leaves form in the growing tip of the shoot; each bud has developing leaves inside.
- Buds are formed in the leaf axils.
- Buds produce hormone signals to communicate with the root system.
- The terminal bud on a branch controls the buds below.



## Trunk, Limbs, and Branches

- The trunk serves as a transport system for moving water and nutrients up through the wood, and food in the inner bark downward to storage in the stem and roots.
- The outer 4 to 20 annual rings are usually "alive" and functioning--this is the sapwood.

## Trunk, Limbs, and Branches

- The trunk, limbs, and branches are covered in bark that insulates and protects the cambium and wood.
- Trees have large branches known as "scaffold" limbs that support the smaller branches, twigs, and leaves.

## Trunk, Limbs, and Branches

- Heartwood is discolored wood found in the center of the trunk and large limbs. It is resistant to decay.



## Roots

- Perennial, woody roots anchor the tree and store carbohydrates.
- Annual, absorbing roots take up water and essential nutrients.

- 12-18 inches deep
- Extend out from the trunk 2 to 5 times the width of the crown
- Multiple fine root fans produce each year



## Site Situations for Trees

- Large Landscape Areas
- Road Frontage Areas
- Parking Lots
- Plazas and Downtown Settings
- Buffers
- Riparian Zones and Drainage Areas
- Utility Corridors



## Tree Species Selection

- Location - Site Situation
- Climate
- Light
- Basic Landscape Functions
- Maintenance

## Selection - Climate

- USDA Plant Hardiness Zone Map = 7b
- Average annual minimum temperature = 5 to 10 degrees F
- Light, temperature, moisture, and soils are a result of climate and location.

## Selection - Light

- Light levels affect temperature.
- Light levels affect growth, survival, and flowering.
- Overstory trees vs. understory trees.
- Early successional stages vs. late successional stages of forest development.



## Site Selection - Desired Functions

- Engineering
  - temperature control
  - wind, noise, light buffers
  - erosion control, stormwater uptake
- Architectural
  - framing views or buildings
  - screening for privacy
  - aesthetics (foliage texture, color, flowering)



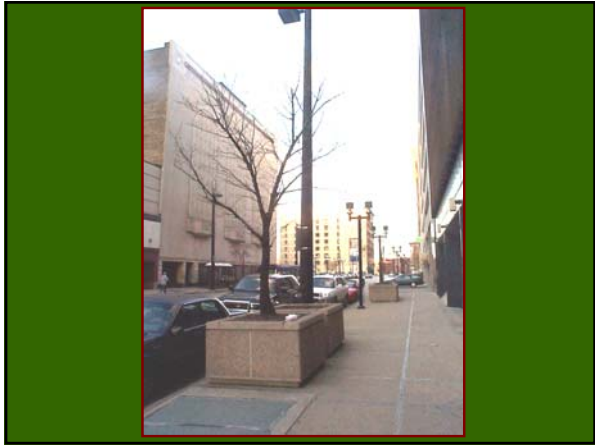
## Site Selection - Maintenance

- Pest susceptibility
- Pruning needs
- Wood strength
- Litter production
- Urban tolerance

## Site Selection - Growing Space

- Soil volume
- Hardscape - sidewalks, streets, walls
- Utility lines - overhead and underground
- Clearance from buildings and over sidewalks and roadways







### Soil

- Physical Characteristics
  - Texture
  - Structure
  - Pore Spaces (moisture and oxygen)
- Chemical Composition
  - Elements
  - pH

### Soil

- Organic Components
  - Leaves and Woody Debris
  - Insects
  - Bacteria
  - Fungi
  - Nematodes



### Tree Species Lists

- Refer to tree species lists for the Piedmont of Georgia for suggestions on which trees to plant, and their characteristics.


 A collage of five small photographs showing different tree species: white flowers, a tree trunk, a tree with white flowers, a tree with green leaves, and a tree with a path.

## Break Time



## Tree Quality



Bare Root



Containerized



Balled & Burlapped

## Tree Quality

- Single leader
- Well pruned
- Well developed root system
- Free from wounds, pests, and broken limbs
- Planted at the proper depth in the container or root ball



## Installation and Establishment

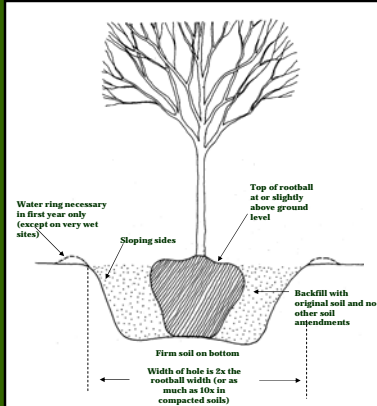
- Handling
- Planting
- Staking and Guying
- After Planting Care
- Establishment Period

## Handling

- Protect from desiccation during transport.
- Do not lift or twist by the stem.



## Planting



## Planting

- To avoid girdling roots make sure that the first order roots are at ground level.

DO NOT PLANT TREES TOO DEEPLY



## Girdling

Girdling is the “strangulation” of a tree-- cutting off it's food supply--

- Wounds
- Roots



## Planting

- Remove all burlap, wire baskets, straps, twine, etc. from the planting hole.
- Do not add soil amendments.
- Do not fertilize.
- Watering in is essential.





## Staking and Guying

- Should only be done if necessary--tree is evergreen and may blow over or lean if not staked, or tree is planted in sandy soils.
- All staking and wires should be removed after one year.
- Trees should still be able to move after staking.
- Should be staked laterally, not from the low to high.

## After Planting Care

- Water in absence of rain, at least 1" per week.
- Mulch annually.
- Do not fertilize until at least 1 year after planting.
- Do not begin training pruning until 1 year after planting.



## Establishment Period

3

Years



## Young Tree Care

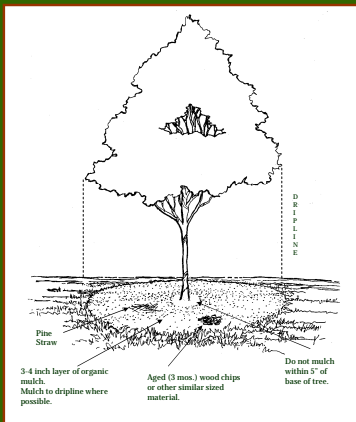
- Training Pruning
- Wrapping/Trunk Protection
- Fertilization
- Mulching
- Irrigation
- Protection



## Mulch

- Increase soil moisture retention.
- Provides nutrients and improves soil texture.
- Moderates soil temperatures.
- Provides weed control.

## Mulching



## Irrigation

- Amount of water a tree requires is dependent upon--
  - climate and weather
  - soils
  - tree species
  - tree condition

## Irrigation

- Irrigation is especially important to a tree during the establishment period, the first three years in the ground.
- Irrigation is important for valuable trees, during drought conditions, and before, during, and after construction.
- Trees should be watered less often and deeper than other vegetation--1"/week.

## Pruning

- Branch Collar
- Branch Bark Ridge
- Wound Paints

## Reasons for Pruning

- Clearance - building, pedestrian, vehicle, utility
- Crown cleaning - broken, dead, diseased, dying, crossed or rubbing
- Young tree training
- Hazard reduction





### 3-Cut Pruning Method

### Topping

- TOPPING IS A HARMFUL PRACTICE AND SHOULD NEVER BE DONE
- Topping is done for a variety of reasons, including:
  - “my tree is getting too big”
  - “I want to encourage flowering”
  - “I want to invigorate my tree”
  - “my neighbor does it”

- “Starves” the tree
- Causes early decline and mortality
- UGLY!

### Topping

### Mature Tree Care

- Fertilization
- Protection - The Critical Root Zone
- CODIT - Wounds, Cavities, Decay
- Tree Wells
- Hazardous Trees
- Signs of Decline

## Fertilization

- 16 Essential Elements - 3 from the air and 13 from the soil.
  - Macronutrients
  - Micronutrients
- Deficiency of any one element will reduce tree growth.

## Determining Element Levels

- Soil analysis
- Foliar (tissue) analysis
- Always take a soil sample and do a soil analysis before fertilizing--know why you are fertilizing.

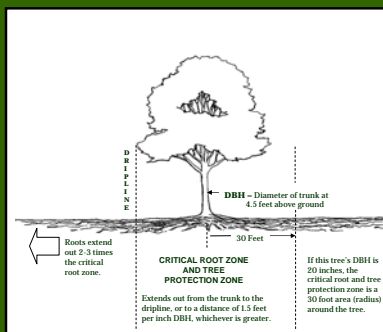
## Availability and Function

- Depends upon the pH level.
- Nitrogen is commonly deficient.
- Organic, slow release fertilizers are recommended for trees.
- Phosphorus and potassium generally occur in adequate quantities in most soils.
- Standards recommend 2-4 lbs. actual N per 1000 sq. ft.

## Application Methods

- Broadcast
- Soil injection
- Foliar sprays
- Tree injection
- Apply mid-spring to mid-summer
- Provide plenty of water

## Protection






## CODIT

- Compartmentalization Of Decay In Trees
- Trees set up boundary walls to isolate damaged areas and decay.





- Signs of Decline
  - crown dieback
  - trunk and limb decay
  - fruiting bodies on roots, trunk, and limbs
  - short shoot extension
  - yellowing foliage
  - excessive sprouting




### Selecting a Tree Care Professional

- Arborist
- Urban Forester
- Tree Worker
- Other Allied Professionals
  - Forester
  - Landscape Architect
  - Horticulturist

### Selecting a Tree Care Professional

- Reputation and References
- General Liability Insurance
- Service Contracts
- Education and Experience
- Certification through International Society of Arboriculture ([www.isa-arbor.com](http://www.isa-arbor.com))
- Bid Procedures

- Equipment
- Climbing spurs or spikes should never be used for pruning or other maintenance of live trees.



**THANK YOU!**  
**Andrew Saunders**  
**Community Forester**

**Athens-Clarke County**  
**forester@co.clarke.ga.us**  
**(706)613-3561**