CALIFORNIA TREE ACADEMY

STAFF & CORPS MEMBER TRAINING

1

CTA Training – Module 3 – Tree Selection, Nursery Standards, Tree Pruning

- Part 1 - Right Tree Right Place
- Part 2 - It Starts at the Nursery
- Part 3 - Young Tree Training Pruning

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CTA Training – Module 3 – Part 1 - Key Concepts

Tree Selection

1. What are the 2 "R's" of tree selection?
2. Tree Selection Criteria – Be able to name and understand at least 5 of the following Criteria:
   a. Where are you planting trees?
   b. Growing Space
   c. Other Infrastructure
   d. Safety, Wind, Fire
   e. Climate Zone
   f. Invasive tree species
   g. Species Diversity
   h. Pest and Disease Issues
   i. Availability at nurseries
   j. Water Needs
   k. Tree Function
   l. Deciduous vs. Evergreen
   m. Leaf, Seed, & Fruit Drop
   n. Beautification
   o. Tree Form

3

CTA Training – Module 3 – Part 2 - Key Concepts

"It Starts at the Nursery" – What does this mean?

1. Be able to define the following terms:
   - Co-dominant leader
   - Girdling root
   - Included bark
   - Kinked root
   - Central leader
   - Photosynthate
   - Root collar
   - Scaffold branches
   - Shall
   - Should
   - Temporary branch
   - Trunk

4

CTA Training – Module 3 – Part 2 - Key Concepts

"It Starts at the Nursery" - continued

2. Does the presence of temporary scaffold branches help a tree form a better trunk taper or prevent a tree from forming better trunk taper?
3. Why is trunk taper development important in young trees?

5

CTA Training – Module 3 - Part 3 - Key Concepts

Tree Pruning

1. What is meristematic tissue?
2. What plant parts can be contained inside a bud?
3. Know where you prune along a branch relative to buds and other branches and "nodes"
4. Be able to define and draw an "excurrent" tree form and "decurrrent" tree form
5. When is generally the best time to prune deciduous and broadleaf evergreen trees?
6. Why is that the preferred time to prune these trees?
7. Know the first "general rule" about how much to prune out of a tree in a single year

6

CTA Training – Module 3 - Part 3 - Key Concepts

Tree Pruning - continued

8. What is the first reason to prune a mature tree?
9. Be able to describe "crown thinning". Know when crown thinning would be appropriate
10. Is "crown reduction" tree topping?
11. Know the best way to make a pruning cut on a tree is a (know which one) and be able to draw any of the following types of cuts:
    a. Flush cut?
    b. Stub cut?
    c. Cut at branch collar?

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CTA Training – Module 3 - Part 3 - Key Concepts

Tree Pruning – continued

12. Be able to draw co-dominant leaders & how you should prune one of the leaders
13. Name at least 3 reasons why it is bad to top trees
14. Why is it bad to cut all of the foliage off of a tree during the growing season (besides the fact that it looks bad)?
15. Know the 5 step process for pruning young trees and be able to draw a young tree and label the 5 steps on the drawing

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PART 1 – TREE SELECTION = RIGHT TREE RIGHT PLACE

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"Right Tree Right Place" – What Does this Mean?

- **It means:**
  - Selecting Small Stature, Medium Stature and Large Stature trees to plant in places suitable for their optimum growth
    - Selecting trees that are suitable for the climate zone in which your project is located
    - Not selecting large or medium stature trees to plant under power lines
    - Selecting trees to plant in tree wells or narrow parkways that will not damage adjacent infrastructure
  - Selecting trees that people want

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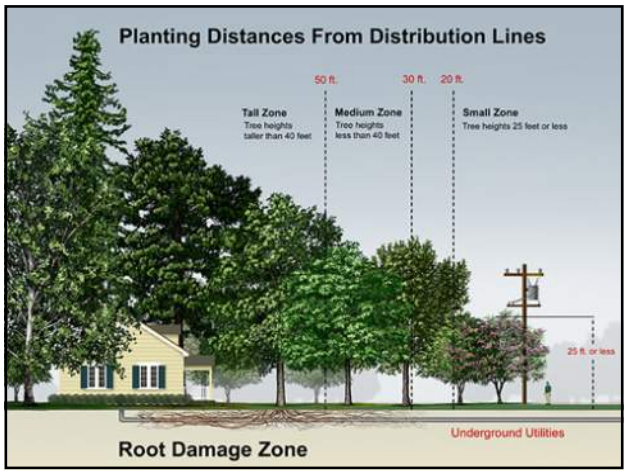

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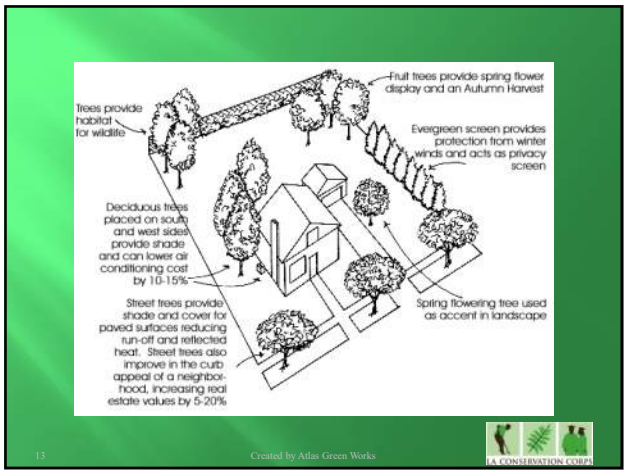

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Tree Selection Criteria List

a. Where are you planting trees?
b. Species Diversity
c. Pest and Disease Issues
d. Availability at nurseries
e. Invasive tree species
f. Water Needs
g. Growing Space
h. Other Infrastructure

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Tree Selection Criteria List - Continued

i. Tree Function
j. Beautification
k. Deciduous vs. Evergreen
l. Leaf Color & Texture
m. Tree Form
n. Leaf, Seed, & Fruit Drop
o. Safety, Wind, Fire

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Tree Selection – Where Are You Planting?

- Private property vs. public property

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Tree Selection – Public Property Design Process

- Master Plan – Urban Design Considerations
- Streets, Transit, Pedestrian Paths
- Parks & Open Space
- Public institutional – e.g. schools

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Tree Selection – Growing Space

- More growing space supports larger trees

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Tree Selection – Other Infrastructure

- **Presence of Other Infrastructure**
  - **Underground**
    - **Pipes, vaults, cables**
  - **Above-ground**
    - **Overhead electric wires, phone & cable, street lights, traffic signals & signage**
  - **At ground level**
    - **Sidewalks, driveways, curbs & gutters, roadways, parking lots, etc.**

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Above-ground Conflicts

OVERHEAD HIGH VOLTAGE

STREET LIGHTING

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Street Tree Selection Criteria

- **Pedestrian clearance**
  - Headroom for **pedestrians**
    - Requires selection of tree species that can be pruned up to **8 feet** or more of head clearance
    - Cannot select fruit bearing trees because of safety (fruit or cones and such falling on people) and nuisance issues (stains on sidewalks and tracking material into stores)

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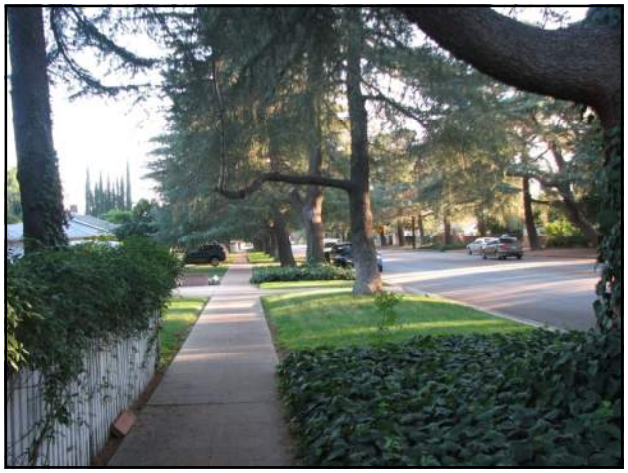

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Street Tree Selection Criteria

- **Vehicular clearance**
  - **Height clearance for trucks**
    - Use trees that can tolerate lowest permanent branch at 14 feet high
    - Plant trees further away from curb whenever possible
    - Use narrow form trees

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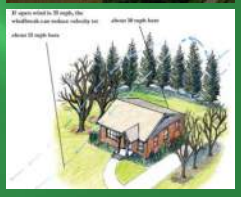
Tree Selection – Safety, Wind, Fire

- **Safety**
  - **Playground & picnic areas**
    - Select trees that can provide shade in hot summer and that have strong branch attachments
- **Wind**
  - To protect from high winds can plant trees suitable as windbreaks
- **Fire**
  - Observe local standards that require trees to be planted further from wood structures in fire prone areas



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Tree Selection – Climate Zone

- Select trees that are suitable for your local climate zone
- One of most common climate zone classifications is the "Sunset Western Garden" Climate Zones
- Can use UFEI SelecTree website

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Tree Selection – Climate Zone

- **Factors**
  - Zones determined by 6 important factors:
    1. **Latitude** – length and severity of cold in winters; length of daylight in seasons
    2. **Elevation** – higher = longer & colder winters and lower night temperatures
    3. **Ocean Influence** – keeps temperatures cooler and humidity higher; precipitation more common in winter
    4. **Continental Air Influence** – colder in winter, hotter in summer; precipitation can happen any season
    5. **Mountains & Hills** – determine whether areas dominated by ocean or continental air influence
    6. **Local Terrain** – "aspect" (which way a slope faces) influences amount and timing of solar heat

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Tree Selection – Climate Zones Bay Area

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Tree Selection – Climate Zone 17

- **Marine effects in Southern Oregon, Northern and Central California**
  - Mild, wet, almost frostless winters and cool summers with frequent fog or wind.
  - On most days and in most places, the fog tends to come in high and fast, creating a cooling and humidifying blanket between the sun and the earth, reducing the intensity of the light and sunshine.
  - Some heat-loving plants (citrus, hibiscus, gardenia) don't get enough heat to fruit or flower reliably.
  - Average summer high is 60 to 75°F range.

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Tree Selection – Invasive Species

- **Out compete native tree species & thereby cause harm to protected native habitat areas**
- **They can become a nuisance in disturbed & neglected areas**
- **Removal of these trees can be very difficult & expensive**

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Tree Selection: Know Your Invasive Trees – DON'T USE THIS TREE!

SCHINUS MOLLE – CALIFORNIA PEPPER TREE

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Tree Selection: Know Your Invasive Trees – DON'T USE THIS TREE!

SCHINUS TEREBINTHIFOLIUS – BRAZILIAN PEPPER TREE

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Tree Selection: Know Your Invasive Trees – DON'T USE THIS TREE!

AILANTHUS ALTISSIMA – TREE OF HEAVEN

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Tree Selection - Know Your Invasive Trees – DON'T USE THIS TREE

EUCALYPTUS GLOBULUS – BLUE GUM

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Tree Selection – Species Diversity

Species Distribution for all Documented Street Trees in Urban Honolulu

Species	Count	%	Tree Size*	Approved Street Tree**
Cassia javanica X fistula (RAINBOW SHOWER TREE)	3680	7.2%	Large	Y
Tabebuia pentaphylla (PINK TECOMA TREE)	3239	6.3%	Medium	Y
Cocos nucifera (COCONUT PALM)	2749	5.3%	Large	Y
Veitchia merrillii (CHRISTMAS PALM)	2499	4.9%	Small	Y
Filicium decipiens (FERN TREE)	1859	3.6%	Small	N
Cordia sebestena (KOU HAOLE)	1821	3.5%	Small	N
Tabebuia argentea (SILVER TRUMPET)	1672	3.2%	Small	Y
Lagerstroemia speciosa (QUEEN'S CRAPE MYRTLE)	1658	3.2%	Medium	Y
Samanea saman (MONKEYPOD TREE)	1561	3.0%	Large	Y
Chrysophyllum oliviforme (SATIN LEAF)	1395	2.7%	Small	N
Delonix regia (ROYAL POINCIANA)	1381	2.7%	Medium	N
Cycas revoluta (SAGO PALM)	1320	2.6%	Small	N
Conocarpus erectus argent (SILVER BUTTONWOOD)	1264	2.5%	Medium	Y
Elaeodendron originale (FALSE OLIVE)	1186	2.3%	Small	Y
Melaleuca quinquinervia (CAJEPUT TREE)	1135	2.2%	Medium	Y
Thuja occidentalis (ARBORVITAE)	856	1.7%	Small	N
Cordia subcordata (TRUE KOU)	853	1.7%	Medium	Y
Pimenta dioica (ALLSPICE)	853	1.7%	Small	Y
Plumeria sp. (PLUMERIA)	838	1.6%	Small	N
Ilex paraguayensis (PARAGUAY TEA)	837	1.6%	Small	N
Cifrarcyclum caudatum (FIDDLEWOOD)	788	1.5%	Medium	N
Tabebuia chrysantha (GOLDEN TRUMPET)	677	1.3%	Medium	Y
Calophyllum inophyllum (KAMANI TREE)	637	1.2%	Large	Y
Harpullia pendula (TULIPWOOD)	636	1.2%	Medium	Y
Pittosporum pentandrum (PITTOSPORUM ALII SHORES)	575	1.1%	Small	N
Archontophoenix alexandra (ALEXANDRA PALM)	535	1.0%	Large	N
Clusia rosea (AUTOGRAPH TREE)	495	1.0%	Medium	N
226 Species Found	**51450**			

* Tree size is based on criteria shown in the City and County of Honolulu Official Street Tree List - Small = up to 25' tall, Medium = 26 - 35' tall, Large = over 35' tall

** Indicates whether the tree species is on the City and County of Honolulu Official Street Tree List

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Species Diversity – Why?

- **Tree population dominated too heavily by one or a few tree species makes urban forest susceptible to devastation pest or disease specific to a single or few species**
  - **E.g., Chestnut Blight at beginning of 1900's in Eastern U.S.**
  - **E.g., Dutch Elm Disease in mid to late 1900's – wiped out American Elm Trees across U.S.**
  - **E.g., Emerald Ash Borer that is destroying Green Ash trees across U.S. now**

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Species Diversity – National Pest Problems – Dutch Elm Disease

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Species Diversity – National Pest Problems

- Emerald Ash Borer is destroying Green Ash trees across U.S. now
- Has killed over 30 million ash trees
- Estimated impact in U.S. exceeds $20 billion
- Over 7 billion ash trees at risk in eastern U.S.

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Species Diversity – Local Pest Problems

Eucalyptus Species Pests:

- Redgum Lerp Psyllid
- Longhorned Borers
- Tortoise Beetle

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Tree Selection – Pest & Disease Vulnerability

- Don't want to select tree species that have known serious pest and/or disease problems
- Having good species diversity can address potential future pest or disease problems that may arise in future

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Tree Selection – Availability at Nurseries

- Important if:
  - Want to add species to a master plan or official street tree list
  - Specifying tree species for a very large project
  - Utility company recommending trees for long term residential shade tree program
  - Municipality is implementing a long term tree replacement program

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Tree Selection – Water Needs

- Water Requirements
  - Major issue in Southern California
  - Use drought tolerant trees

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Tree Selection – Function Desired

- **Shade**
- Erosion Control
- Fruit Production
- Habitat

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Tree Selection – Deciduous or Evergreen

- **Deciduous**
  - Fall leaf color change
  - Shade in hot summer
  - Sun allowed through in cold winter climates
- **Evergreen**
  - Year round shade
  - No fall leaf color change

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Tree Selection – Leaf, Seed, Fruit Litter

- All trees drop at least some leaves – even evergreen trees like pines
- Some fruit and flower drop can stain pavement
- Some people like a "carpet" of colored leaves in fall

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Tree Selection - Beautification

- **Flower Display** –
  - Season
  - Color
  - Length of flowering period

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Tree Selection – Tree Form

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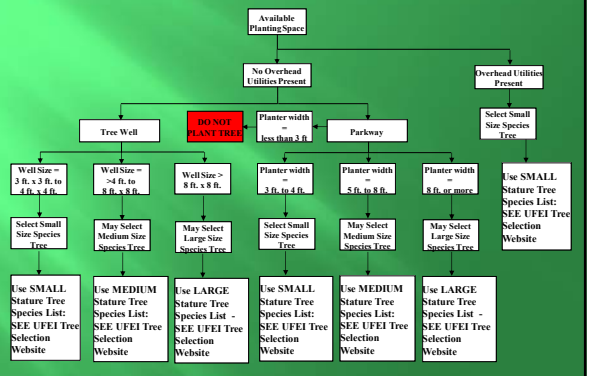
Street Tree Selection Flow Chart



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http://selectree.calpoly.edu/

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PART 2 - "IT STARTS AT THE NURSERY"

Healthy trees with good structure coming out of the nursery have a better chance of becoming high performing mature trees in the future

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CTA Training – Module 3 – Part 2 - Key Concepts

"It Starts at the Nursery" – What does this mean?

1. **Be able to define the following terms:**
   - Co-dominant leader
   - Girdling root
   - Included bark
   - Kinked root
   - Central leader
   - Photosynthate
   - Root collar
   - Scaffold branches
   - Shall
   - Should
   - Temporary branch
   - Trunk

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CTA Training – Module 3 – Part 2 - Key Concepts

"It Starts at the Nursery" - continued

2. **Does the presence of temporary scaffold branches help a tree form a better trunk taper or prevent a tree from forming better trunk taper?**
3. **Why is trunk taper development important in young trees?**

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Central Leader

MAINTAINING A STRONG CENTRAL LEADER IS PREFERABLE

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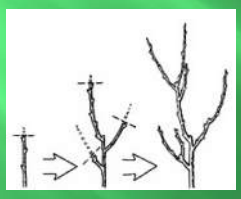
Central Leader

HEADING AND RETAINING A LEADER IS ACCEPTABLE



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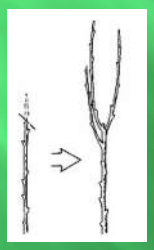
Central Leader

HEADING WITHOUT RETAINING A LEADER IS UNACCEPTABLE



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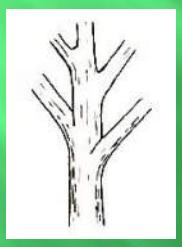
Main Branches

PREFERABLE ANGLE OF ATTACHMENT = 45 DEGREE



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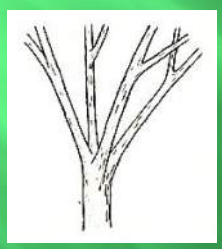
Main Branches

UNACCEPTABLE ANGLE OF ATTACHMENT > 60 DEGREE



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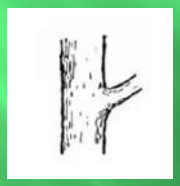
Main Branches

PREFERABLE BRANCH WIDTH RELATIVE TO TRUNK =
½ OR LESS OF TRUNK DIAMETER



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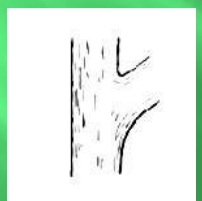
Main Branches

UNACCEPTABLE BRANCH WIDTH RELATIVE TO TRUNK



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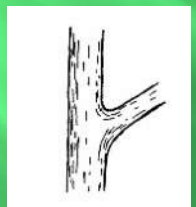
Main Branches

[NOT] INCLUDED BARK – PREFERABLE ATTACHMENT



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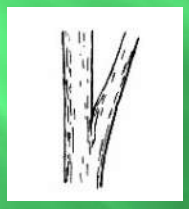
Main Branches

INCLUDED BARK – UNACCEPTABLE ATTACHMENT



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Temporary Branches

GOOD DISTRIBUTION ALONG TRUNK

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Temporary Branches

POOR DISTRIBUTION ALONG TRUNK

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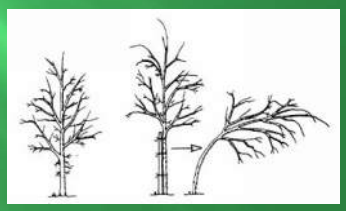
Tree Trunk – Example of Poor Taper

- Trunk diameter and taper shall be sufficient so that the tree will remain vertical without the support of a nursery stake.



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Roots – Good Structure

ROOT STRUCTURE - PREFERABLE

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Roots – Poor Structure

ROOT STRUCTURE – KINKED OR GIRDLED & UNACCEPTABLE

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Roots – Rootball

PREFERABLE UNACCEPTABLE

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Roots – Circling & Matted Roots

PREFERABLE UNACCEPTABLE

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CTA Training – Module 3 - Part 3 - Key Concepts

Tree Pruning

1. What is meristematic tissue?
2. What plant parts can be contained inside a bud?
3. Do you prune right above a bud or right below a bud?
4. Be able to define "excurrent" tree form and "decurrrent" tree form
5. When is generally the best time to prune deciduous and broadleaf evergreen trees?
6. Why is that the preferred time to prune these trees?

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CTA Training – Module 3 - Part 3 - Key Concepts

Tree Pruning - continued

7. Name at least 3 reasons why it is bad to top trees
8. Is "crown reduction" tree topping?
9. The best way to make a pruning cut on a tree is a (know which one):
   a. Flush cut?
   b. Stub cut?
   c. Cut at branch collar?
10. What is the first reason to prune a mature tree?
11. Why is it bad to cut all of the foliage off of a tree during the growing season (besides the fact that it looks bad)?
12. Know the 5 step process for pruning young trees

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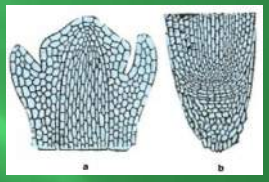
Tree Biology – Meristematic Tissue

- Undifferentiated plant tissue from which new cells are formed, as that at the tip of a stem or root.



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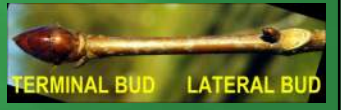
Tree Biology – Bud Types & Nodes

- Terminal bud – located at the tip of a shoot
- Lateral bud – located in the area above where a leaf is attached to the stem
- Node – the joint on a stem where a leaf is or was attached
- Internode – length of stem between nodes



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When to Prune?

1. Both deciduous and broadleaf evergreen trees should be pruned in the winter months when they are dormant
   a. Prune at the earliest after the last leaves have fallen from the tree
   b. Prune at the latest before the buds have begun to swell and new leaves and flowers begin to develop in the spring

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General Rules: How Much to Prune?

1. **No more than 25% of the canopy in any one year**
2. For many trees removing no more than 5% to 10% should be sufficient
3. For slow growing trees or trees growing in poor sites, you should remove <25% in any one year
4. In some cases where there are severe structural defects you may need to remove >25%

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Reasons to Prune Trees

1. **Prune first for structure – GOOD STRUCTURE MAKES TREES SAFER**
2. **Prune next for health –make proper cuts – poor cuts leads to health problems for tree**
3. **Prune last for aesthetics**
4. **Never prune trees near utility lines – call a Certified Arborist**
5. **Avoid pruning trees when you might increase susceptibility to important pests**

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Mature Tree Pruning Guidelines – Crown Thinning

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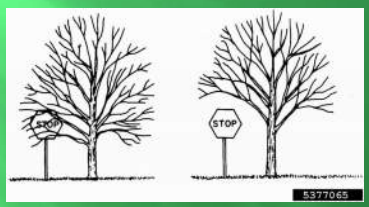
Mature Tree Pruning Guidelines – Crown Raising



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Mature Tree Pruning Guidelines – Crown Reduction

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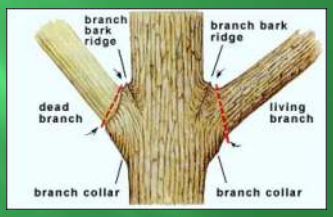
Pruning Techniques Once You Decide to Prune

1. Locate the branch collar
2. Locate the branch bark ridge
3. Make proper pruning cut as shown
4. A proper pruning cut does not damage either the branch bark ridge or the branch collar



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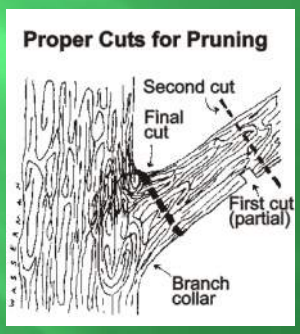
Pruning Techniques – Notch Cuts for Large Branches



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Proper Pruning Cut – Atlas Cedar 1

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Proper Pruning Cut – Atlas Cedar 2

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Co-Dominant Leaders – The Problem

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Co-Dominant Leaders – Branch Failure = Tree Death

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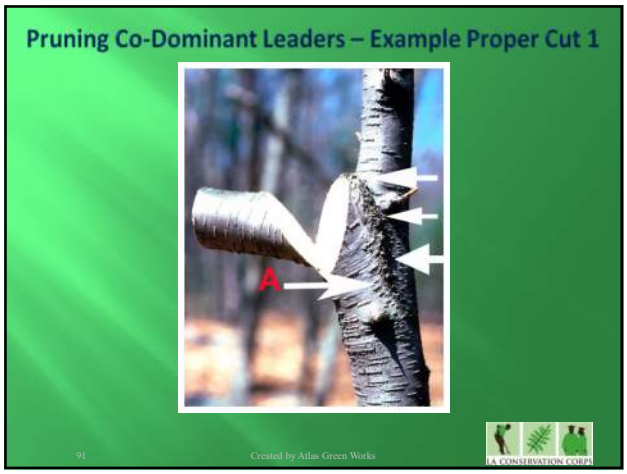

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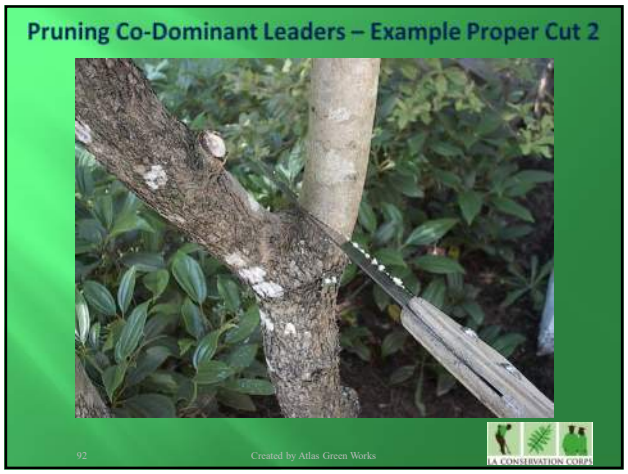

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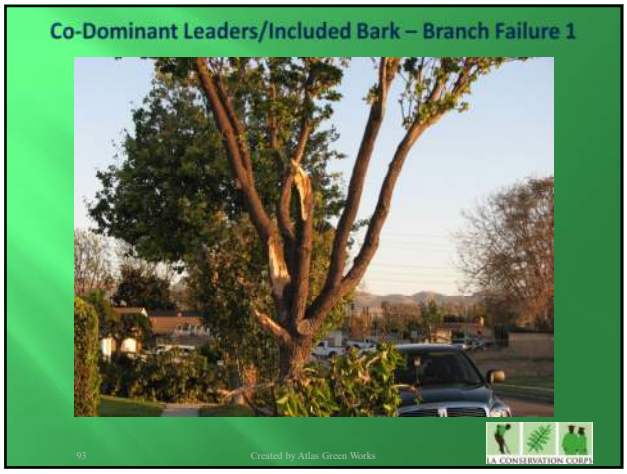

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Co-Dominant Leaders/Included Bark – Branch Failure 5

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THE "DO NOTS" OF PRUNING

98

Pruning Techniques – No Lazy Cuts

- **Bark Ripping** – poor pruning cuts that cause bark ripping

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Pruning Techniques – No Flush Cuts

- **Flush Cuts** - cuts that are flush against the trunk can result in decay
- **Tree cannot grown wound wood over cut**

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Pruning Techniques – No Flush Cuts

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Pruning Techniques – No Stub Cuts

- **Stub Cutting** - pruning cuts made too far outside the branch bark ridge or branch collar
- **Tree cannot grow new wood over the cut**

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Proper vs. Improper Pruning on Fruit Tree

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Result of Improper Pruning on Fruit Tree

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TOPPING Creates More Storm Damage Potential !!!

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TOPPING WASTES $$$$$

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Topping Results in Rot & Decay

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Topping Creates Disease & Pests Problems

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Topping Creates Disease & Pests Problems

- Large stubs of a topped tree have a difficult time forming a callus.
- The terminal location of these cuts, as well as their large diameter, prevent the tree's chemically-based natural defense system from doing its job.
- The stubs are highly vulnerable to insect invasion and the spores of decay fungi.

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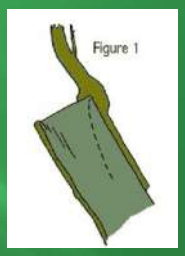
Topping Creates Weak New Growth Attachments

- **New growth is weak – the sprouted branch attachment is weak as it is only growing from the bark tissues.**



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Topping Causes Rapid New Growth

- Resulting sprouts are far more numerous than the normal new growth, and they elongate so rapidly that the tree returns to its original height in a very short time.

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Topping "Starves" the Tree

- Topping removes so much of the crown that it upsets an older tree's well-developed crown to root ratio and temporarily cuts off its food making ability

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Dangerous & Bad Pruning!!!

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Dangerous & Bad Pruning!!!

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Dangerous & Bad Pruning!!!

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Dangerous & Bad Pruning!!!

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Pruning Tools

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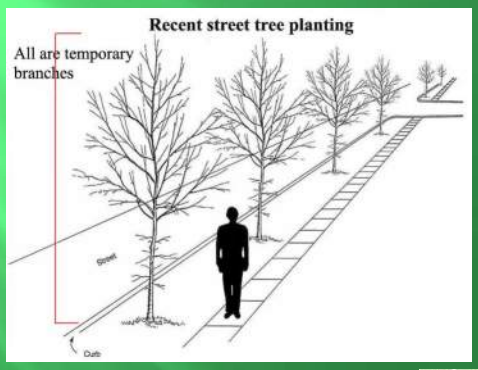
Tree Structure – Young Trees



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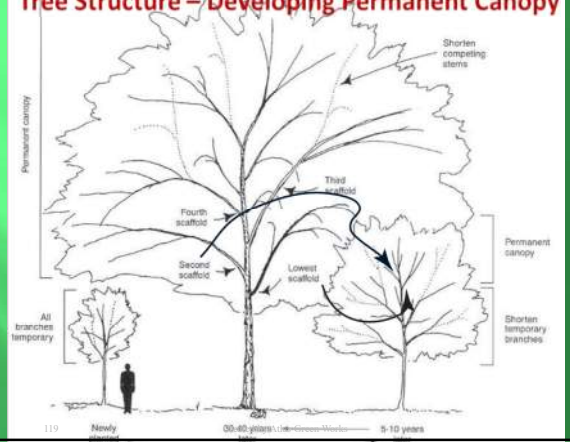
Tree Structure – Developing Permanent Canopy



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5 Step Process for Pruning Young Trees

1. Remove broken, injured, diseased, dying or dead branches
2. Select a leader and remove competing leaders
3. Select and establish the lowest permanent branch
4. Select scaffold branches and cut back or remove competing branches
5. Select temporary branches below the lowest permanent branch

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Training Prune – Remove Dead or Dying Branches

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Training Prune – Select Central Leader

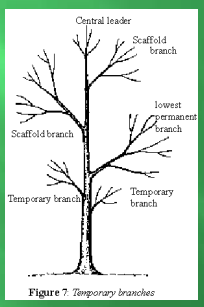

Figure 7. *Temporary branches*

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Training Prune – Lowest Permanent Branch

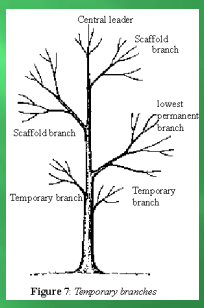

Figure 7. *Temporary branches*

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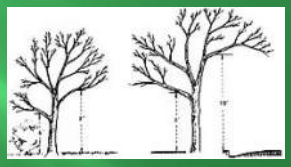
Tree Establishment – Training Prune

- Height of lowest permanent branch to remain depends on tree's use in landscape
  - Street trees usually require 7–8 ft. of clearance or more for pedestrians and more on curbside – as much as 14 ft. depending on roadway use



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Training Prune – Scaffold Branches

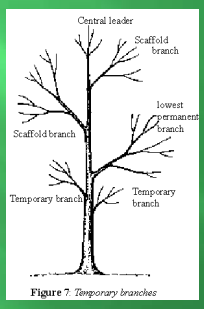

Figure 7. *Temporary branches*

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Training Prune – Temporary Branches

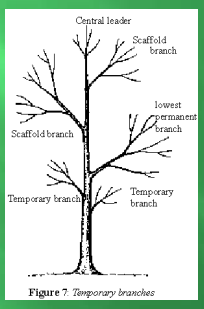

Figure 7. *Temporary branches*

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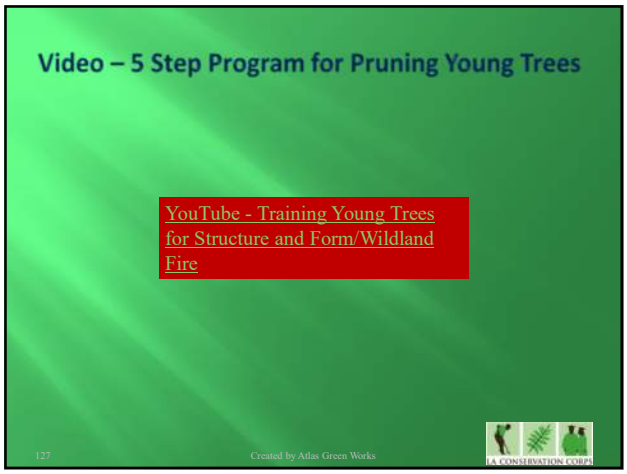

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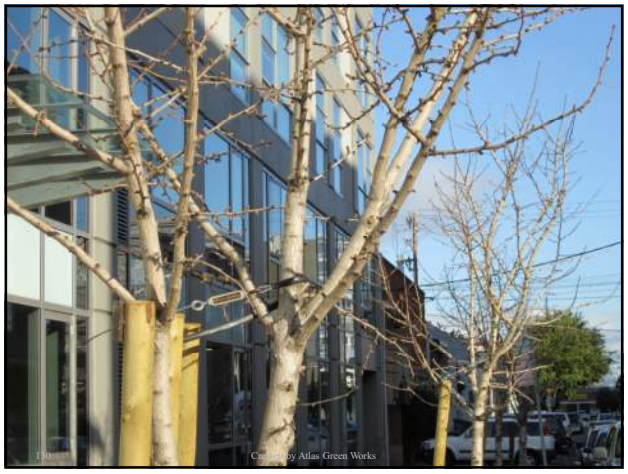

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