IOWA DEPARTMENT OF NATURAL RESOURCES

SUSTAINABLE URBAN FORESTRY TRAINING AND ASSISTANCE

IN PARTNERSHIP WITH THE USDA FOREST SERVICES

Developing a preventive pruning program in your community:

Young trees

Dr. Ed Gilman and Traci Jo Partin

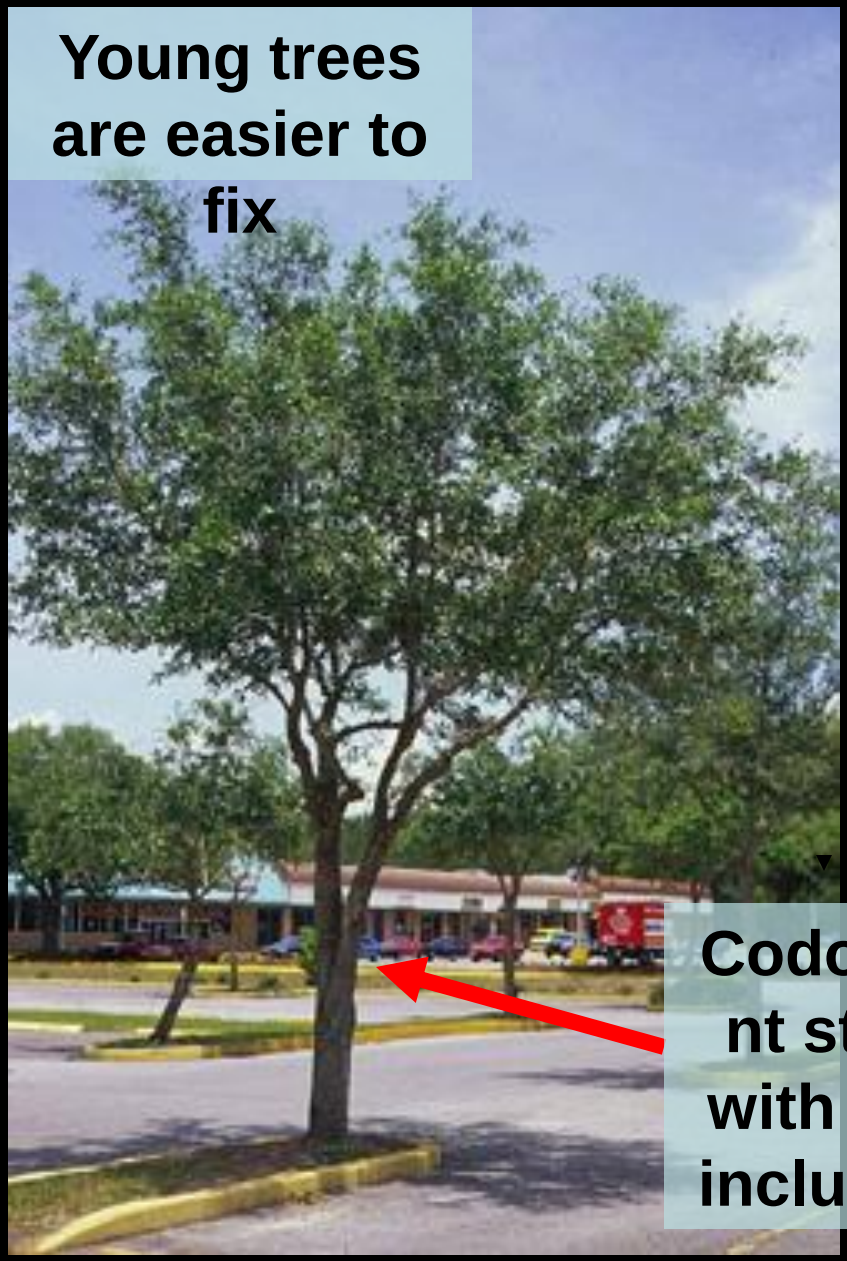
Pruning can reduce damage

Not pruned

A recent study at UF showed that pruning reduces the angle of trunk bend when trees are exposed to high winds.

Reduction pruning

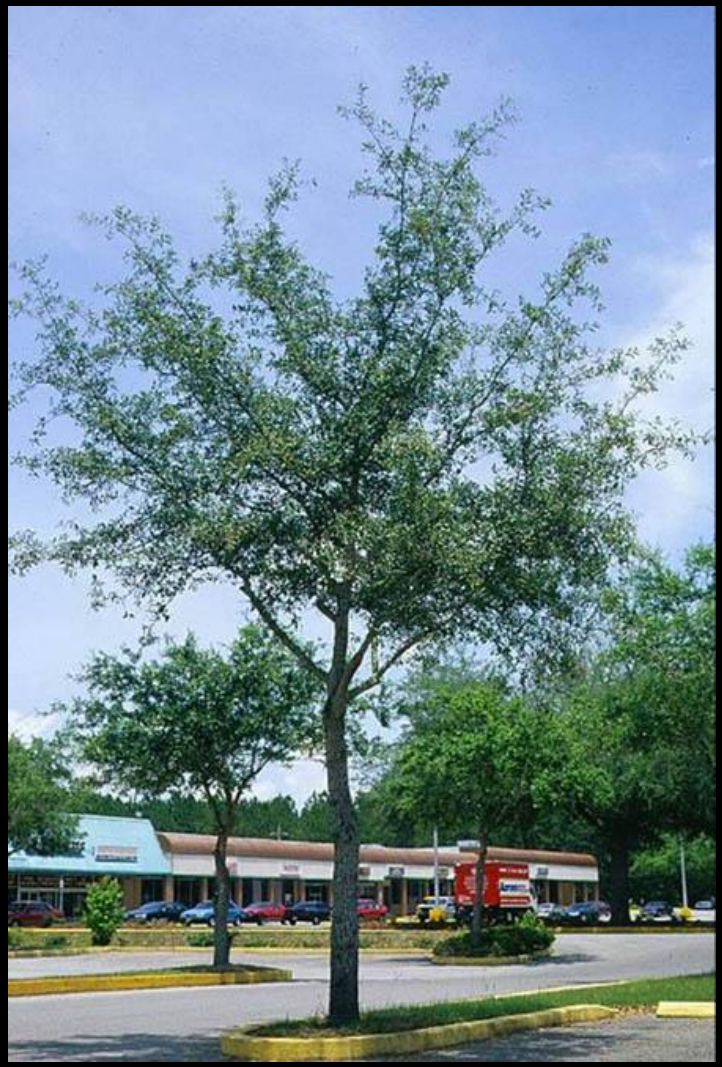
Inaction can cause structural problems

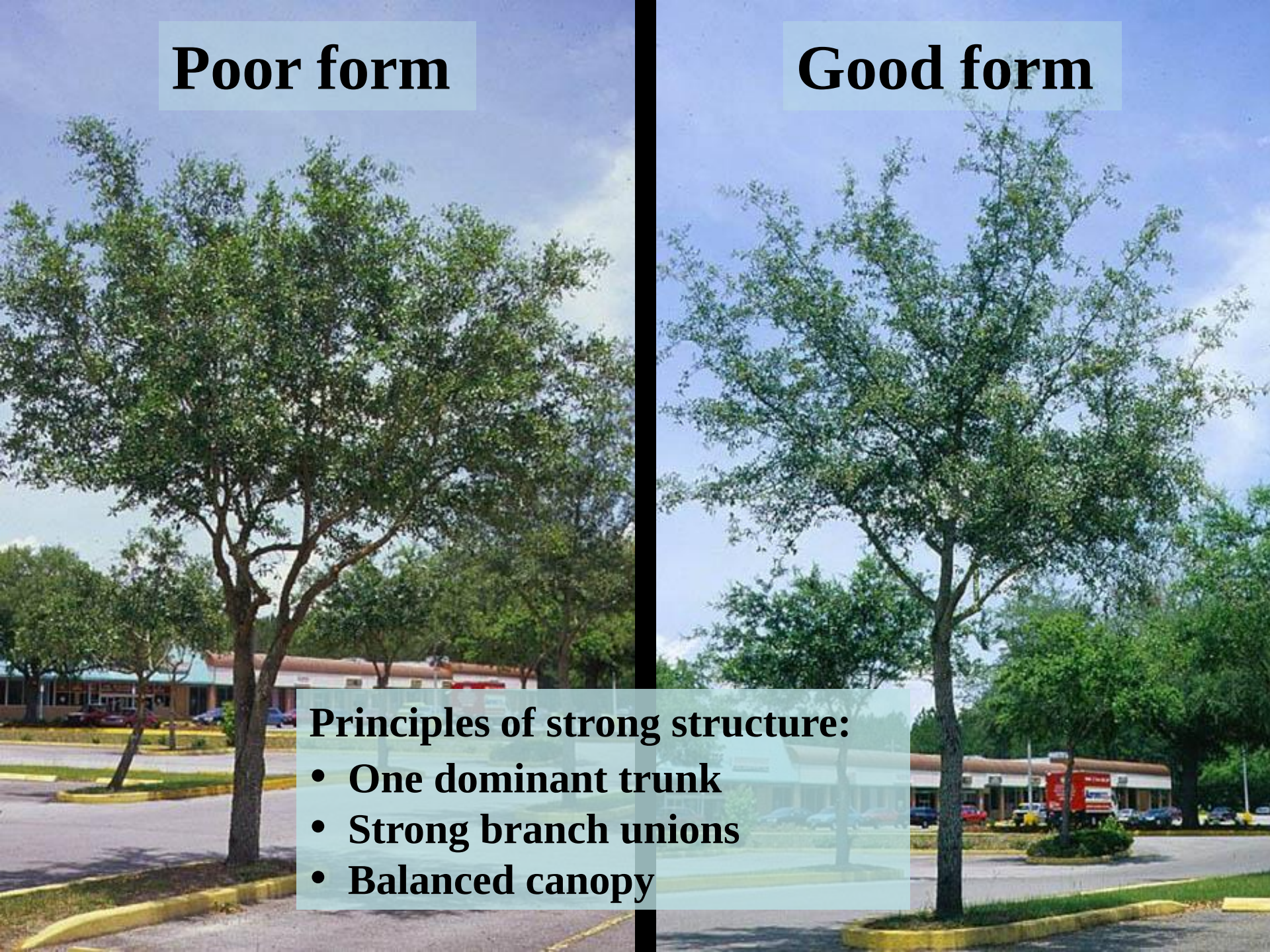


Codominant stems with bark inclusions

Preventive Pruning: young trees

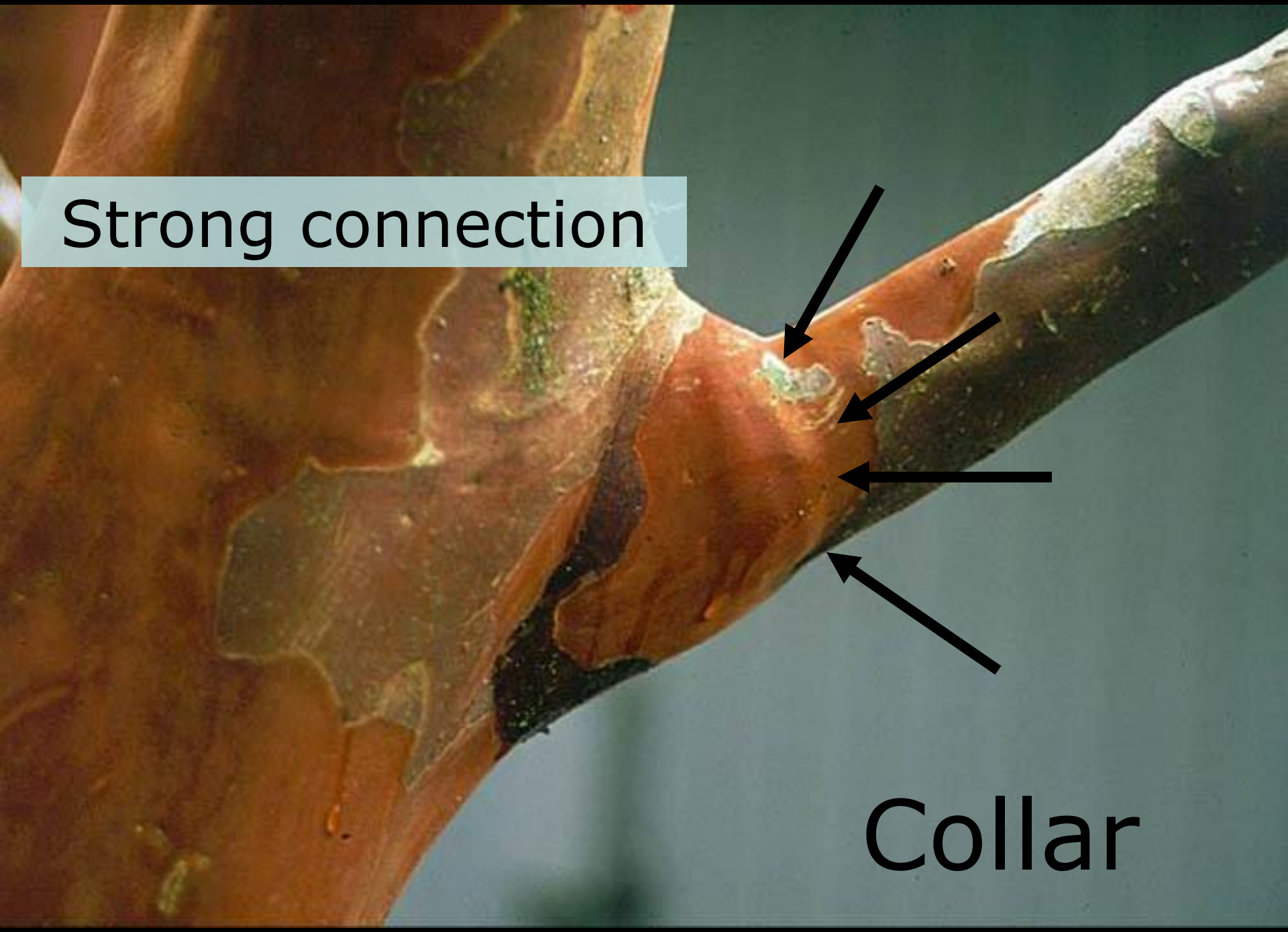
- **Set objectives**
- Determine pruning cycle and dose
- Execute pruning plan
  - make good cuts
  - prioritize trees with structural issues
  - temporary vs. permanent branch management




Poor form
Good form
Principles of strong structure:
• One dominant trunk
• Strong branch unions
• Balanced canopy

Objective: Reduce structural issues that cause tree failure

- **Codominant stems:**
  stems of equal size originating from the same point on the tree
- **Included bark:**
  bark pinched between two stems, indicating a weak union
- **Unbalanced canopy:**
  one side much heavier, or most weight at the tips of branches
- **Large low branches:**


Strong connection
Collar


Weak structure:
codominant stems and
bark inclusions

Codominant stems often cause branch failure in storms

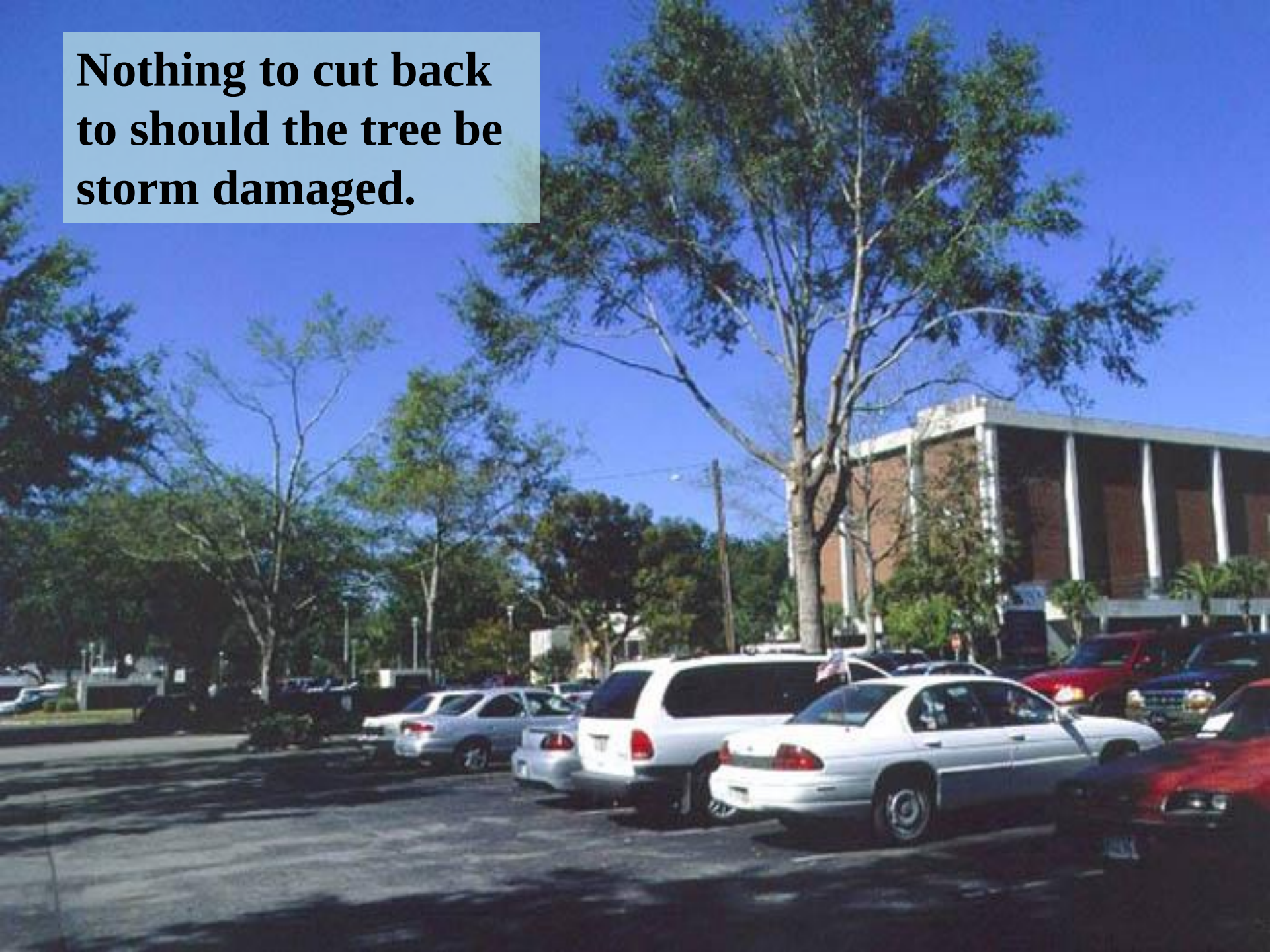
Failure due to bark inclusion

Unbalanced canopy

Lions-tailing: trees with foliage concentrated at the tips of branches because inner branches were removed.

- More susceptible to wind-storm damage
- Difficult to restore

Lions-tailed trees failed


Nothing to cut back
to should the tree be
storm damaged.

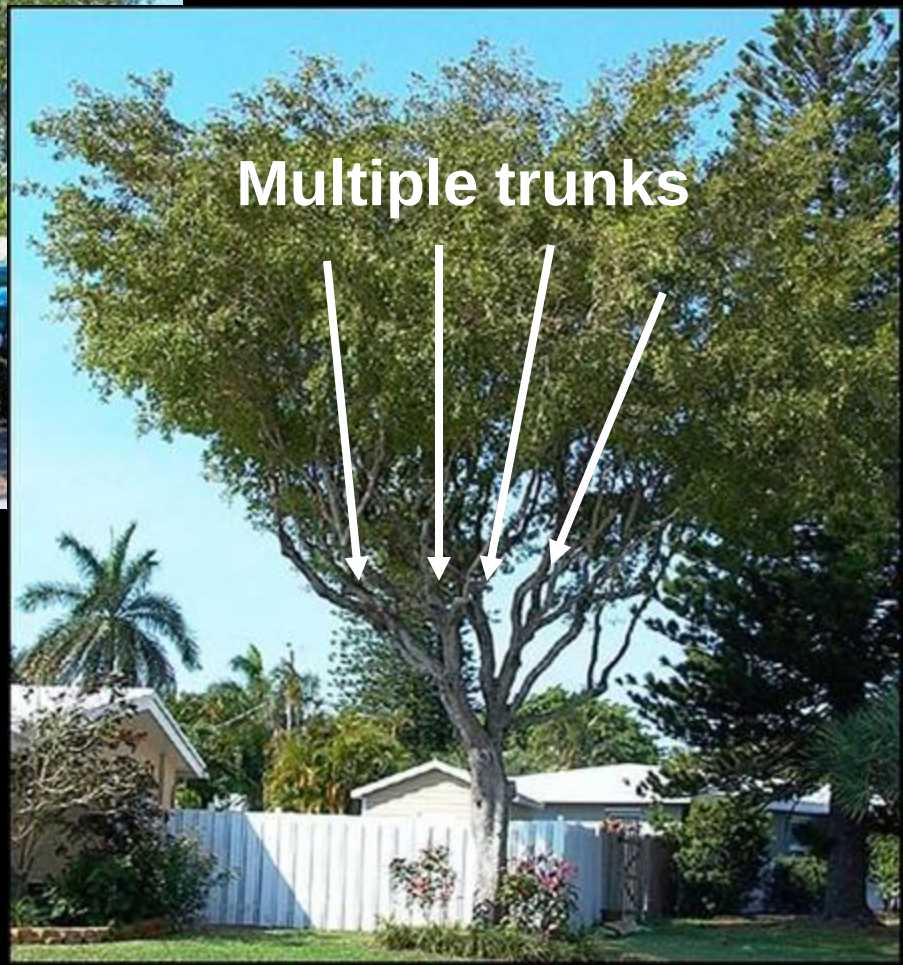

Notice the large limbs located close to the ground – these will eventually have to be removed for clearance.

Big cuts can result in decay and cracks.

Your goal

Better management

Poor management



Low and big cuts can be avoided with early pruning.

Objective: Prune to promote strong structure

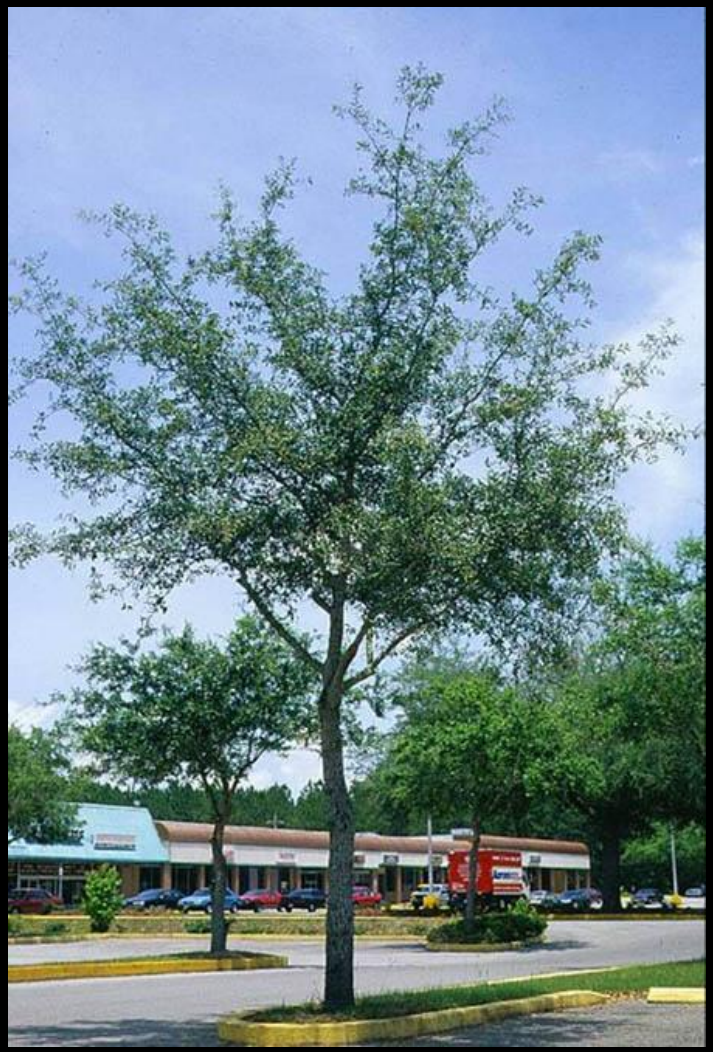
Trees require about 25 years of training to develop strong structure.

Structural Pruning Strategies:

1. Develop or maintain a dominant leader
2. Identify lowest branch in the permanent canopy
3. Prevent branches below the permanent canopy from growing too large
4. Space main branches along dominant trunk
5. Keep all branches less than ½ the trunk diameter
6. Suppress growth on branches with included bark

Preventive Pruning: young trees

- Set objectives
- **Determine pruning cycle and dose**
- Execute pruning plan
  - make good cuts
  - prioritize trees with structural issues
  - temporary vs. permanent branch management



Pruning cycle: the interval or time between each pruning event

- Depends on quality of nursery stock, growth rate, climate, and species.
- Should be shorter in warmer climates where trees grow faster.
- A longer pruning cycle can lead to larger cuts having to be made to correct structural issues.

Determine a pruning cycle

Pruning cycle:

- more than 3-5 years = higher pruning dose
- every 1-2 years = smaller pruning dose

Suggested program:

- At planting
- Year two or three
- Year five or six
- Year ten
- Year fifteen

Pruning dose: the amount of live tissue removed at one pruning

- Depends on customer expectations, the size of the stems, and the pruning cycle.

Low pruning dose (< than 20%)	**Higher pruning dose** (> than 20%)
Mature or recently planted trees	Young, established trees
Cooler climates with short growing season	Warm climates where trees have longer growing season
Decay prone species	Good compartmentalizers

Appropriate Pruning Dose for Specific Applications	
Large Pruning Dose	***Small Pruning Dose***
Municipality	Residences, commercial properties
Long pruning cycle	Short pruning cycle
Aesthetics of less concern	Aesthetics are a concern
Effects on the Tree from Applying Pruning Doses	
Large Pruning Dose	***Small Pruning Dose***
Larger pruning wounds	Smaller pruning wounds
Larger void in canopy	Smaller void in canopy
Greatly encourages growth in unpruned portions of tree	Encourages some growth in unpruned portions of the tree

Impact of pruning dose on co-dominant stem growth

Impact of pruning dose on co-dominant stem growth

Foliage removed for 75% dose


STOP


STOP

Maximum critical diameter: the largest diameter pruning cut you are willing to make on a certain species

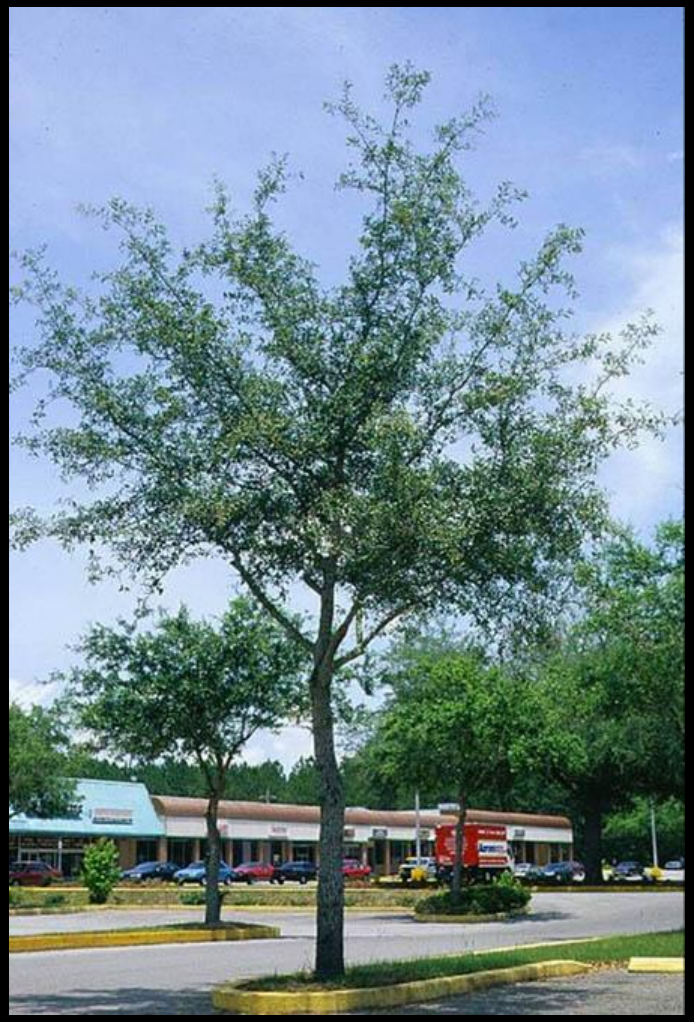
- This limit should be set for both removal and reduction cuts.
- Should be smaller for decay-prone species.
- Is controlled by the pruning cycle

Branch size: - proportion relative to trunk
- actual diameter of stem

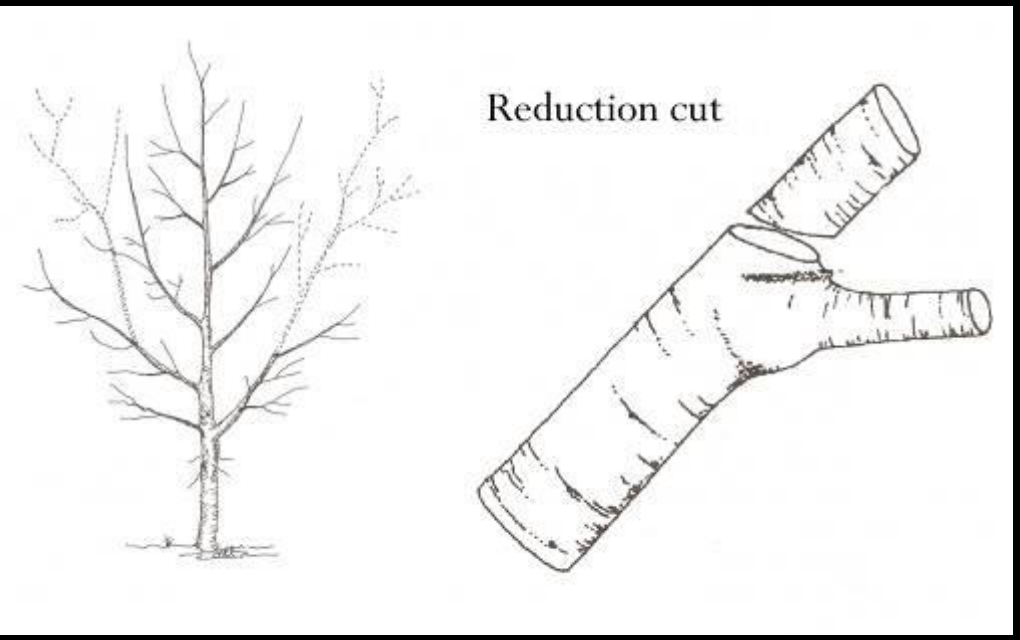
Branch size	Consequences of Removal	Recommended Action
Less than ½ trunk diameter	Few consequences	Remove if needed
1/3 to ½ trunk diameter	Some trunk defects could result	Consider shortening instead
More than ½ trunk diameter	Defects likely	Shorten instead of removing
Large enough to have heartwood	Defects likely	Shorten instead of removing

Preventive Pruning: young trees

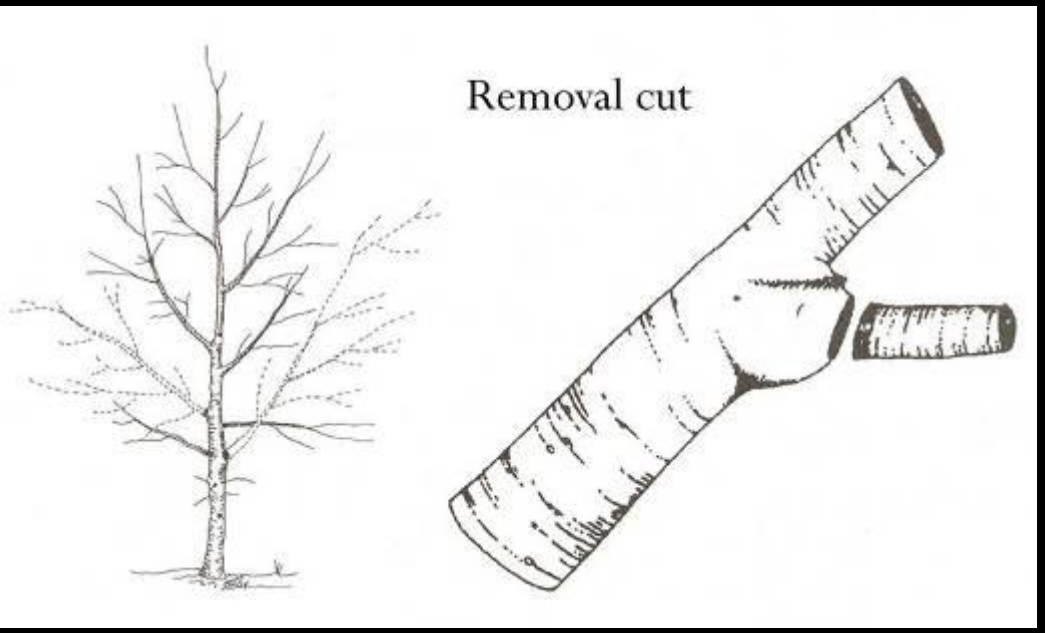
- Set objectives
- Determine pruning cycle and dose
- **Execute pruning plan**
  - make good cuts
  - prioritize trees with structural issues
  - temporary vs. permanent branch management



Types of pruning cuts:

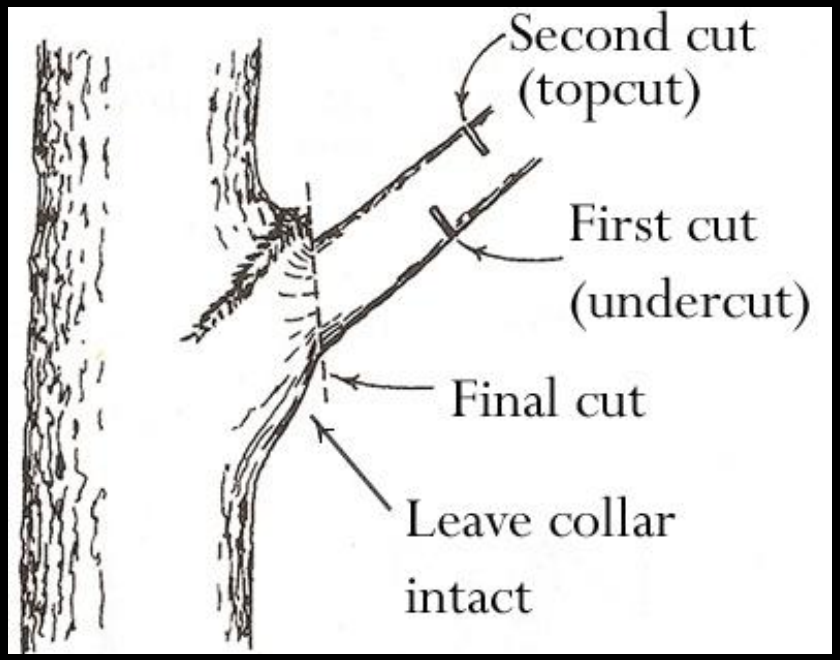


Reduction cut shortens the length of a stem by pruning back to a smaller limb.



Removal cut prunes a branch back to the trunk or parent branch.

Make good pruning cuts



Step 1

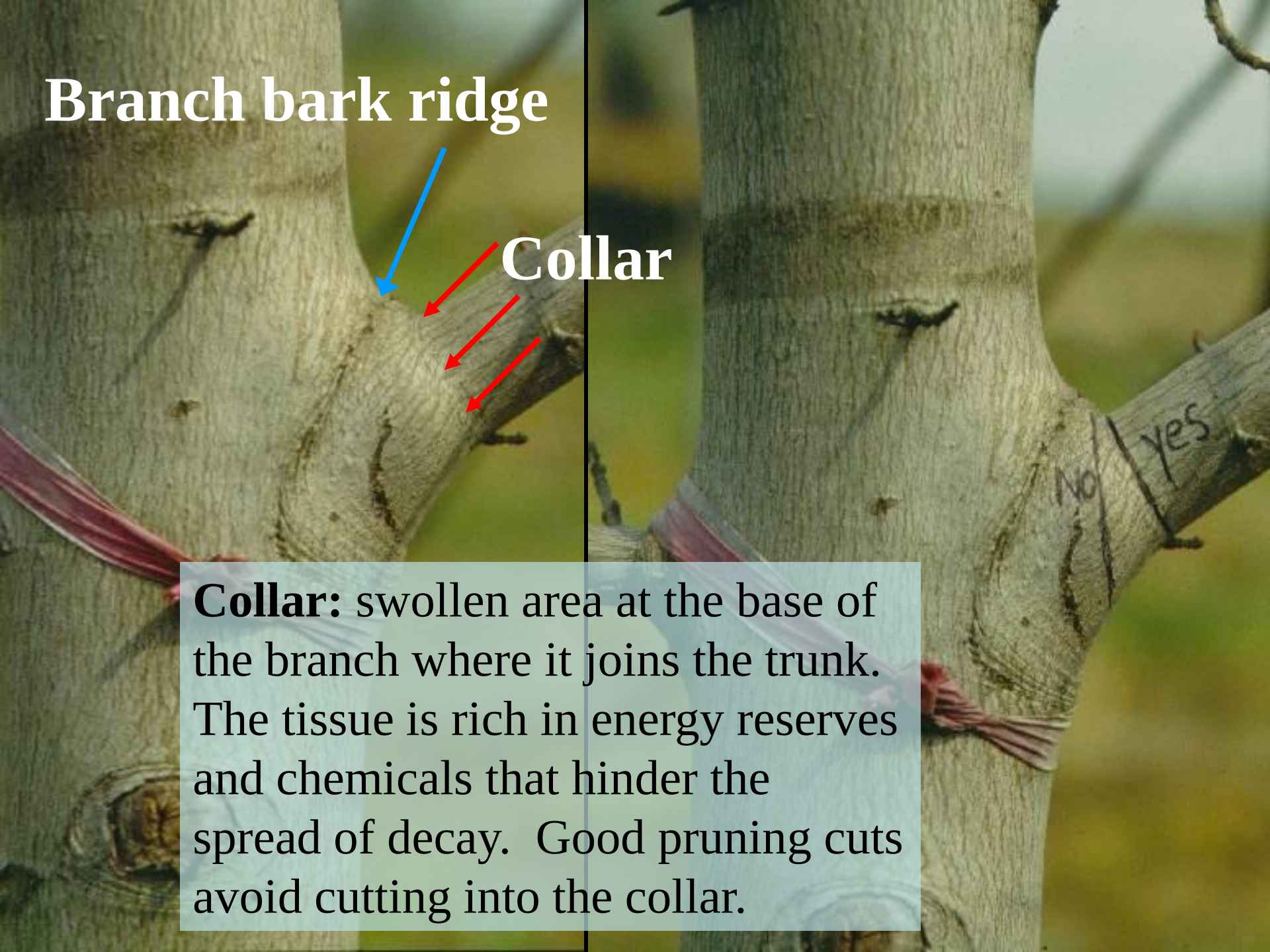
Make an undercut about 12 inches from the trunk.

Step 2

Make a topcut farther out on the limb.

Step 3

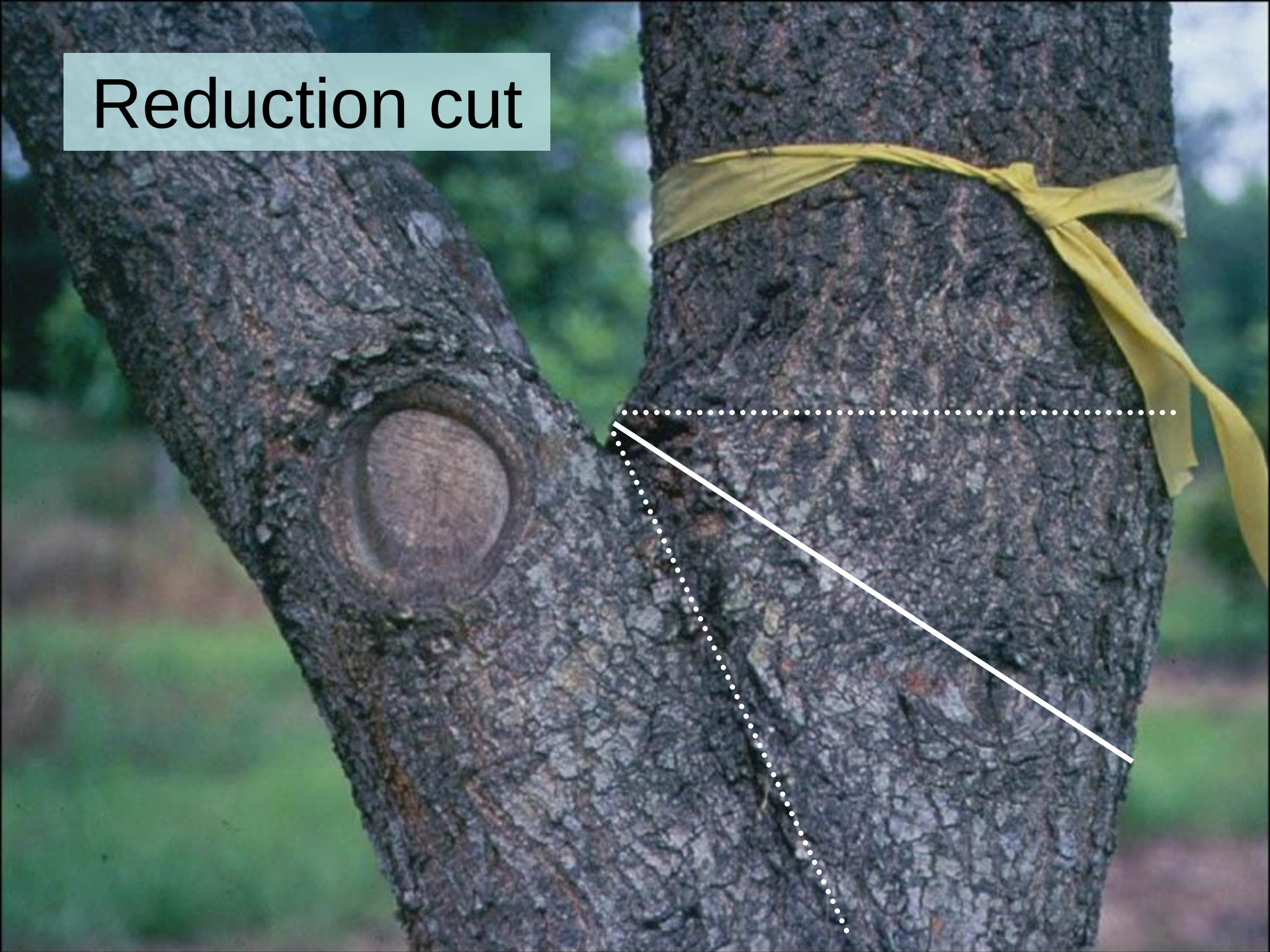
Remove the stub with final cut, being careful not to cut flush against the trunk.
Leave the collar intact.

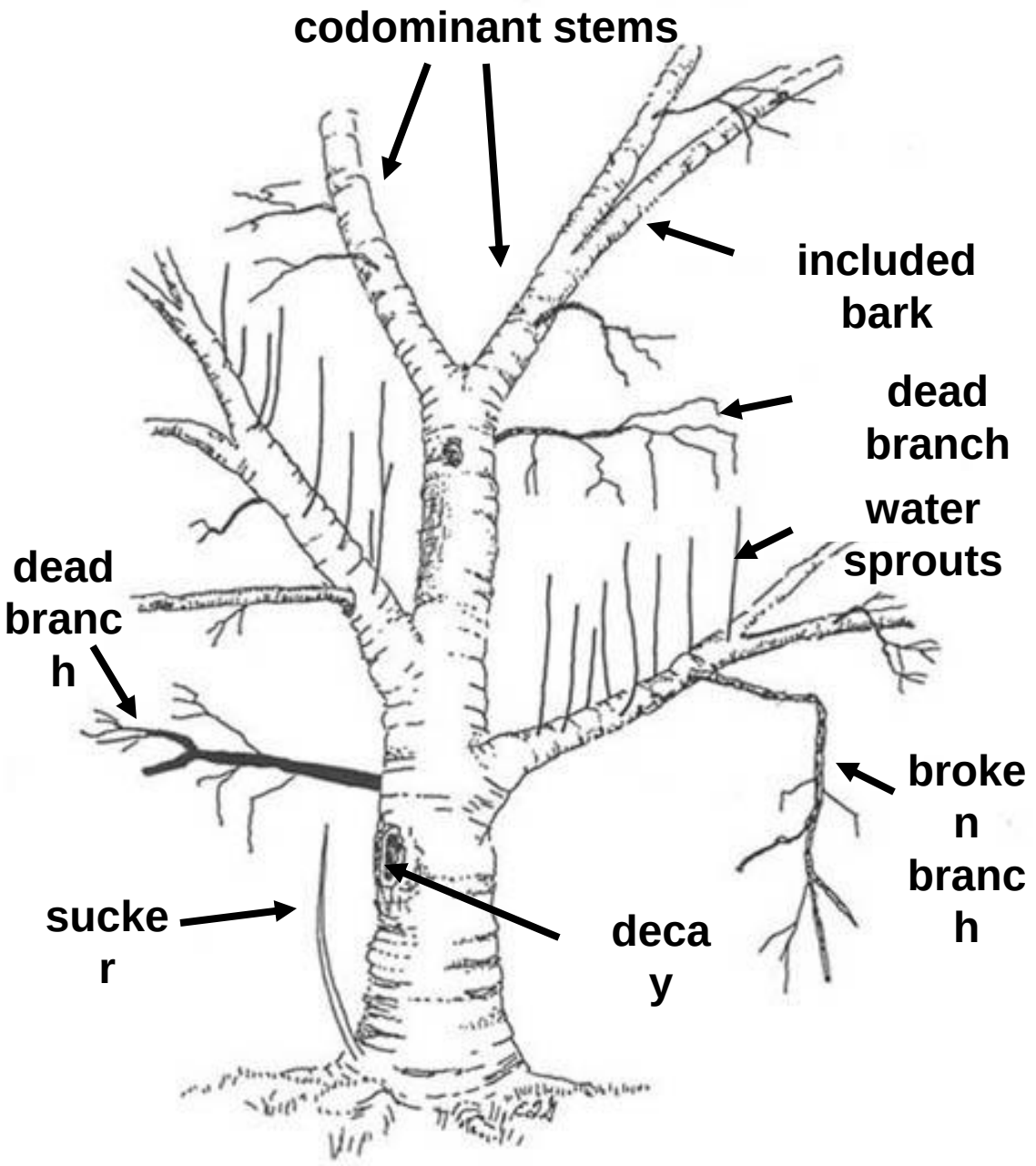


Collar: swollen area at the base of the branch where it joins the trunk. The tissue is rich in energy reserves and chemicals that hinder the spread of decay. Good pruning cuts avoid cutting into the collar.

Bad cut- called a flush cut

Wound wood does not develop evenly.


Reduction cut



Common mature tree problems

Preventive Pruning: mature trees

- **Set objectives**
- Determine pruning cycle and dose
- Execute pruning plan
  - make good cuts
  - prioritize trees with high risk structural issues
  - choose appropriate pruning type

Pruning objectives:

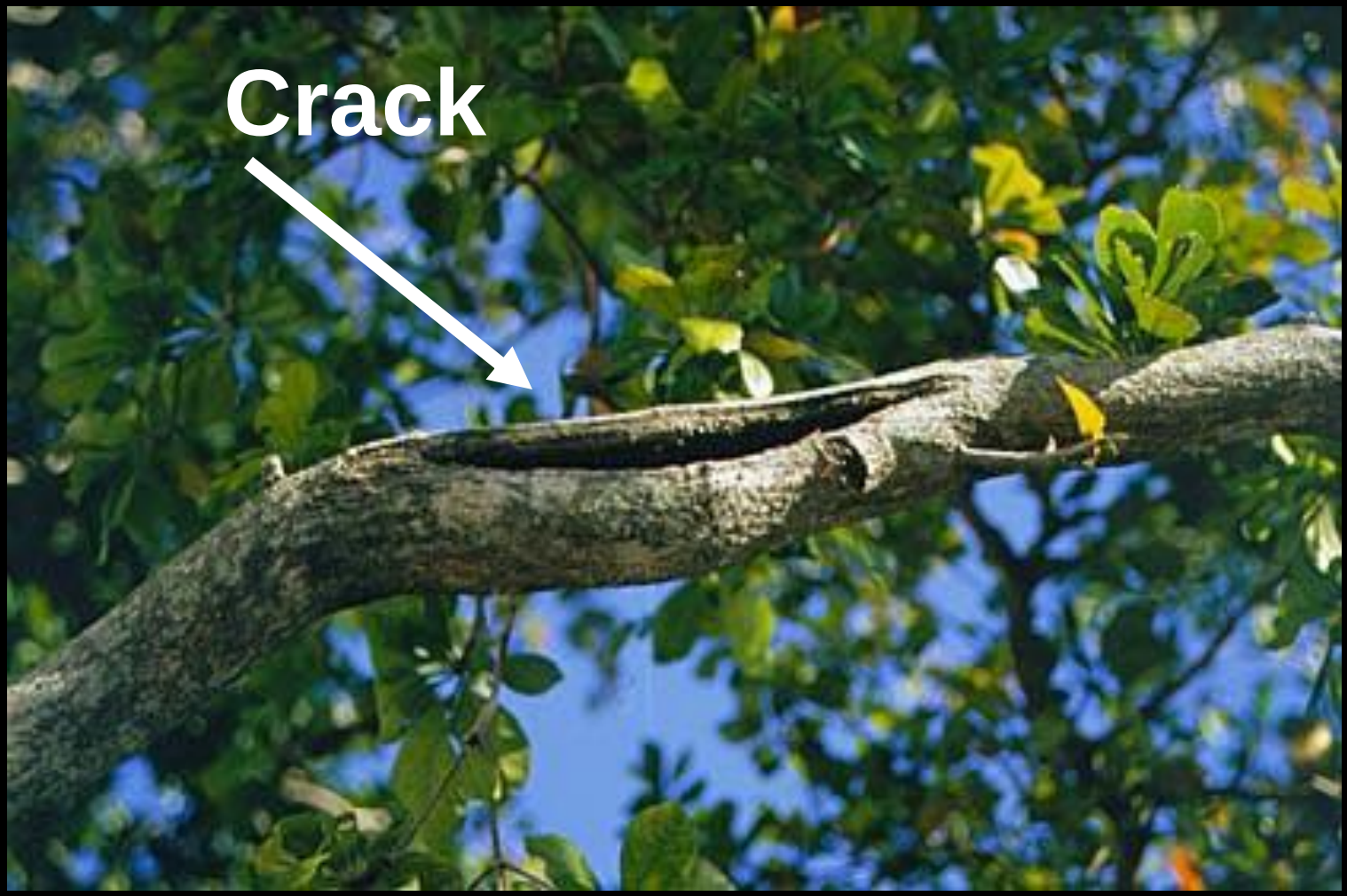
- Reduce risk of failure – minimize storm damage
- Promote human safety
- Allow for safe passage
- Increase sun penetration to the ground
- Maintain health

Objective: Reduce risk of failure

- Identify risks
  - Bark inclusions
  - Cracks
  - Over-extended limbs
  - Leaning trees
  - Root decay
  - Girdling roots
- Reduce conditions that could lead to catastrophic branch or tree loss.

Failure due to bark inclusion

Cracks are evident and indicate weakness

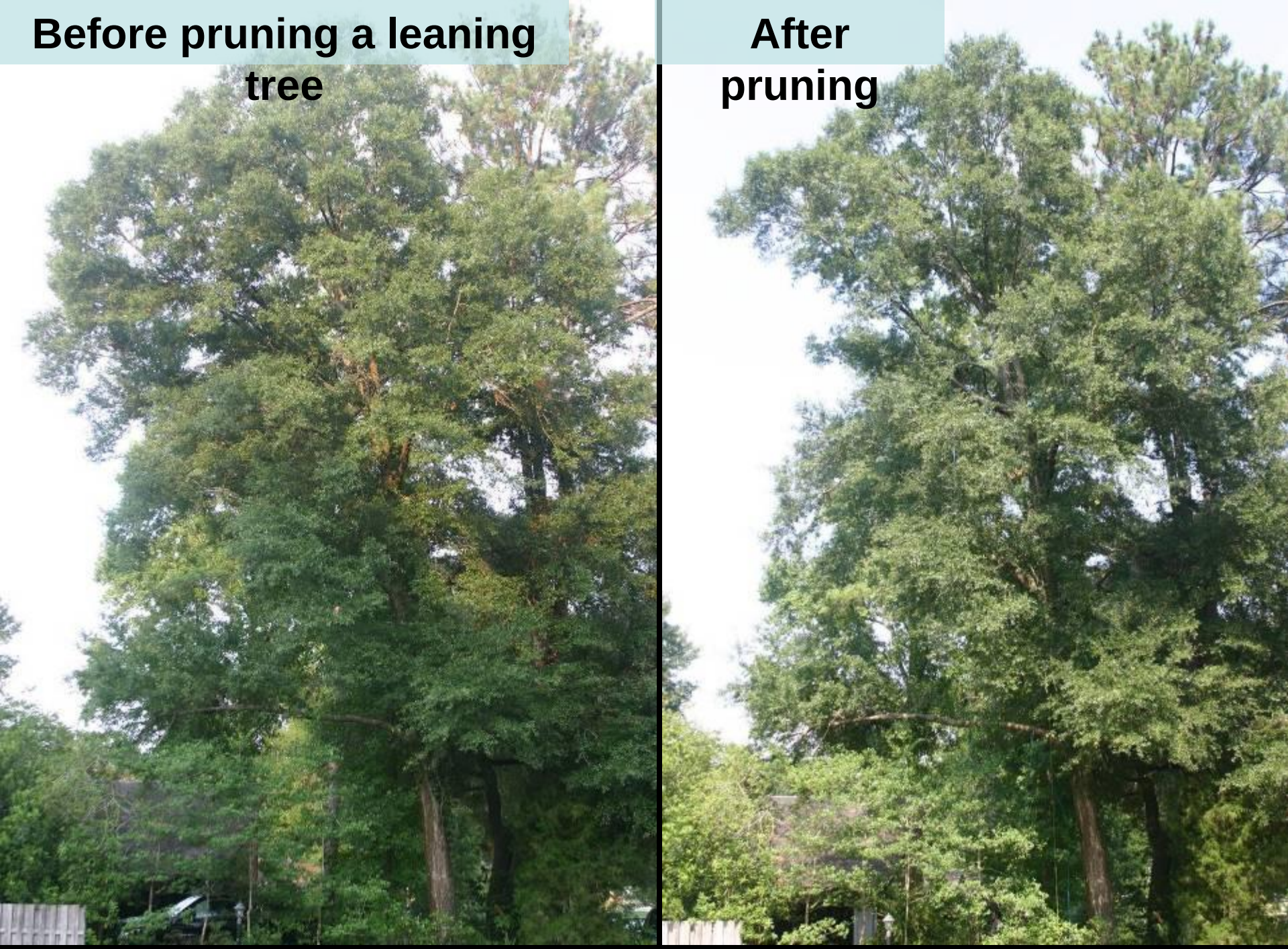


Reduce branch with crack

Horizontal crack

Broken branch

Reduction could have prevented this


Before pruning a leaning tree
After pruning

Severed and decayed root systems

Stem girdling roots may cause trees to topple

Location of girdling roots. Notice that there are few supporting roots on this side of the tree.

Stem girdling roots

- Roots that circle around the base of the trunk

Girdling root


After removing girdling roots

Objective: Promote human safety

- Avoid expensive damage

Pruning strategies

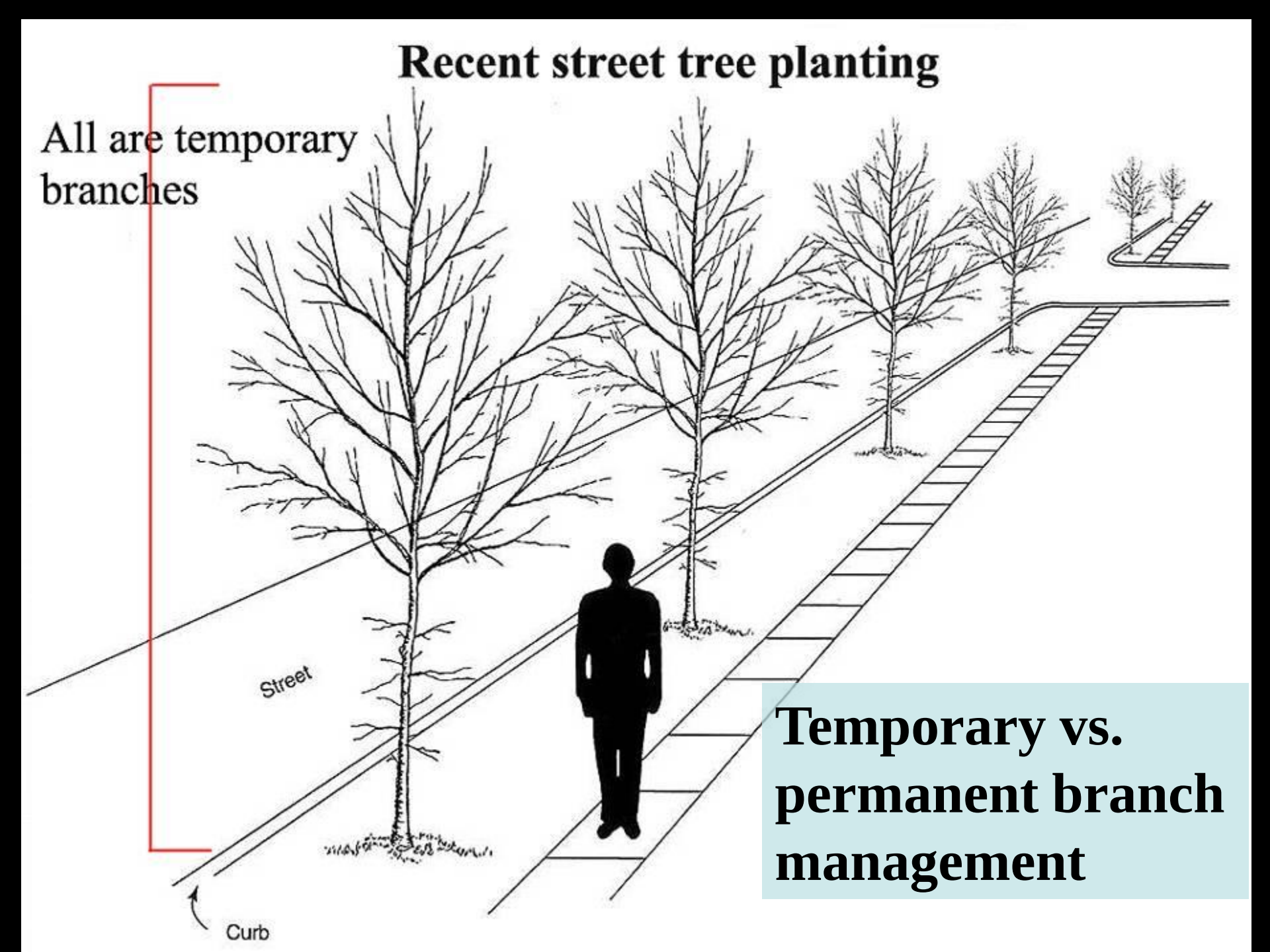
- Execution
  - Prioritize which trees to prune
  - Decide location of lowest permanent limb *temporary branch management vs. permanent branch management*

Prioritize:

Structural pruning not as important on these

Temporary vs. permanent branch management

Keep in mind that all branches will eventually be removed on trees less than 4’’ caliper



Temporary vs. permanent branch management

Pruning Plan: First 5 years

Most branches are temporary.

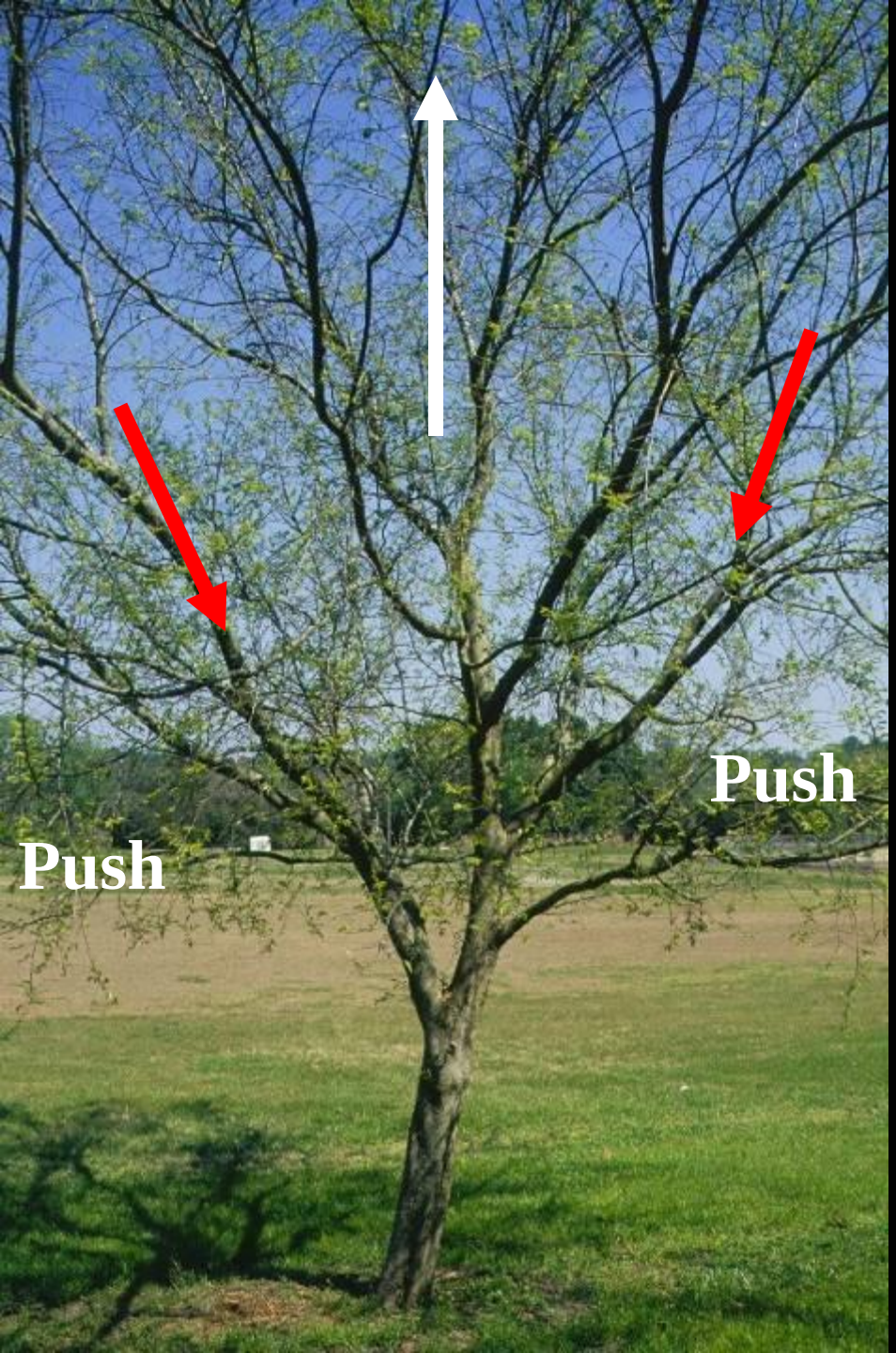
Do not remove more than 35% of live foliage at a pruning visit.

Reduce all branches greater than ½ trunk diameter.

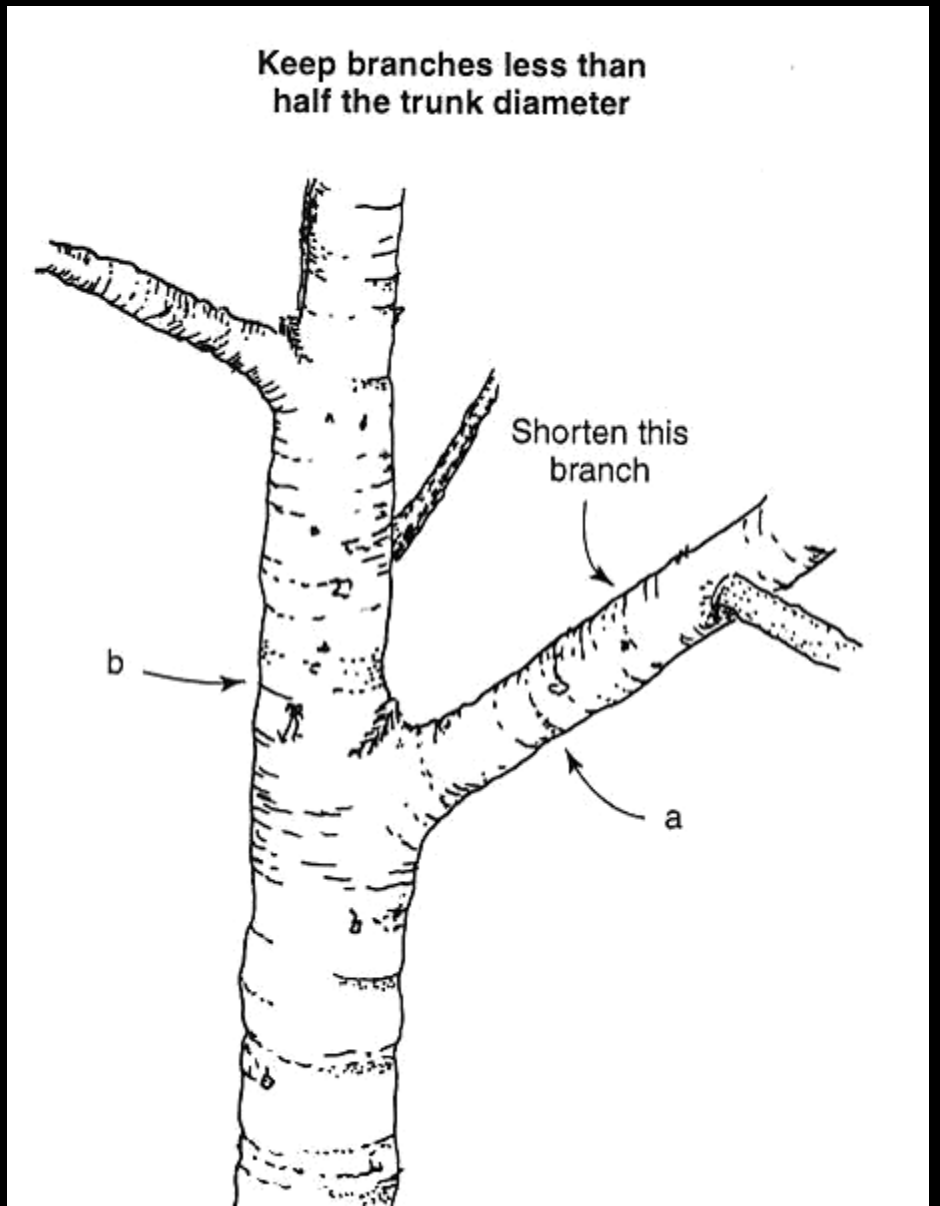
Reduce and/or remove all branches or stems competing with the one selected to be the leader.

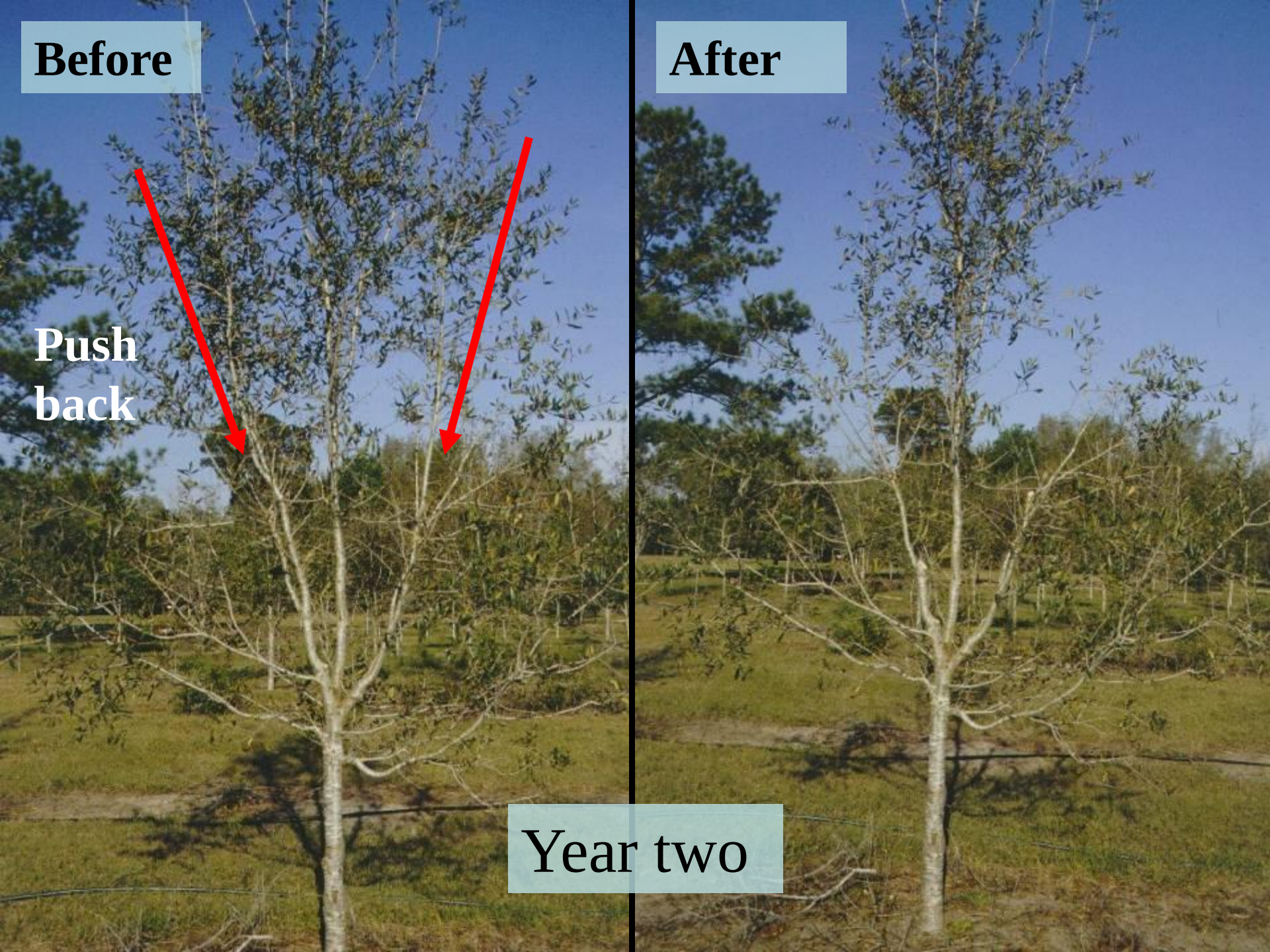
Reduce and/or remove large, low vigorous branches.

Remove broken, cracked or severely damaged branches.



Reduce growth rate of low aggressive branches




Before
Push back
After
Year two

Structural pruning is a three step process:

1. Identify the stem that will make the best leader.
2. Identify which stems are competing with this leader.
3. Decide where to shorten these competing stems.


Before


After

Pruning Plan: 5 – 20 years

Do not remove more than 25-35% of live foliage.

Reduce all branches greater than ½ trunk diameter.

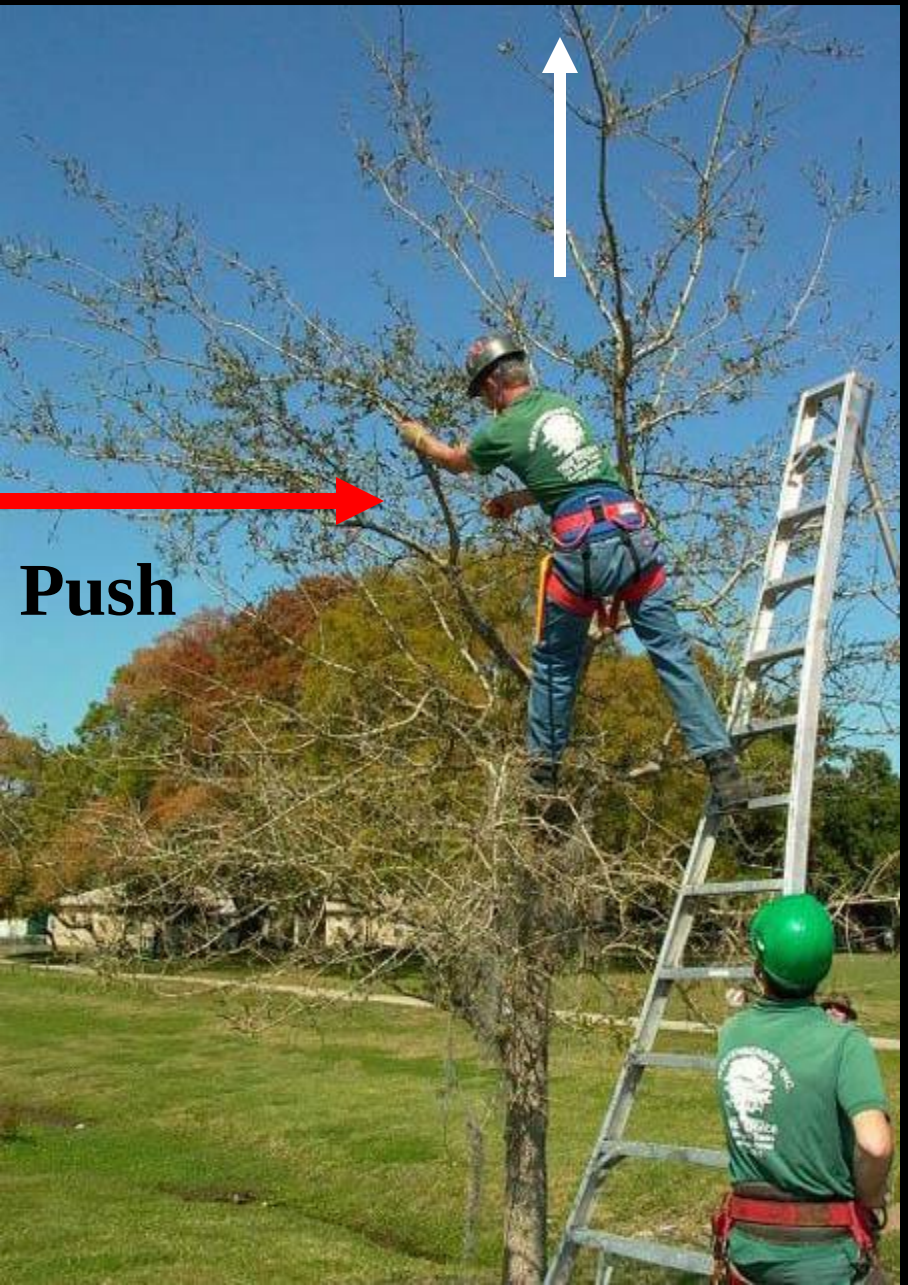
Identify lowest scaffold limbs of the permanent canopy and ***reduce*** all aggressive lower branches.

Reduce branches with included bark.

Reduce or remove competing leaders (if there are more than 3 competing leaders, this can be done in stages).

Reduce branches within 18'' of largest limbs.

Before



After

Two years later


Before


After

Dominant leader structure after two pruning visits

Before pruning

After pruning

Transforming a bush into a tree

Two years later

Pruning Plan: 20 – 30 years

Identify 5 to 10 permanent scaffold limbs and ***reduce*** branches within 18-36’’ to avoid clustered branches.

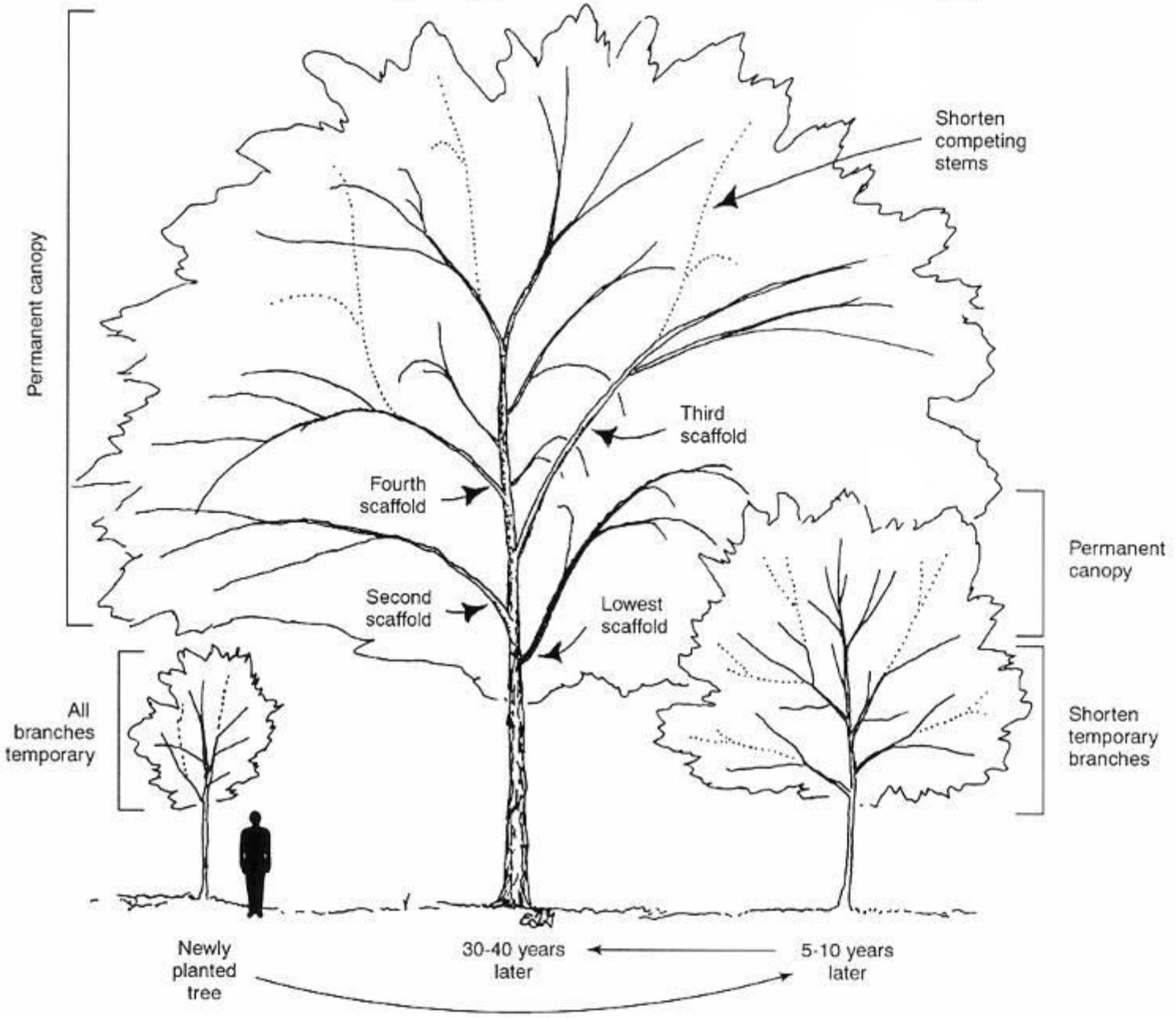
Space permanent scaffold limbs to reduce wind resistance.

Remove many or all of the branches below the first permanent limb.

Reduce branches with included bark.

Reduce and/or remove competing leaders.

Developing the permanent canopy



Reduce growth on branches below permanent canopy

2 years later

After

before

after

Here is a tree that was damaged in a storm. As a result, many stems are growing upright

Remove two upright, interior stems

Before

After removing right codominant stem


Before -
year 8

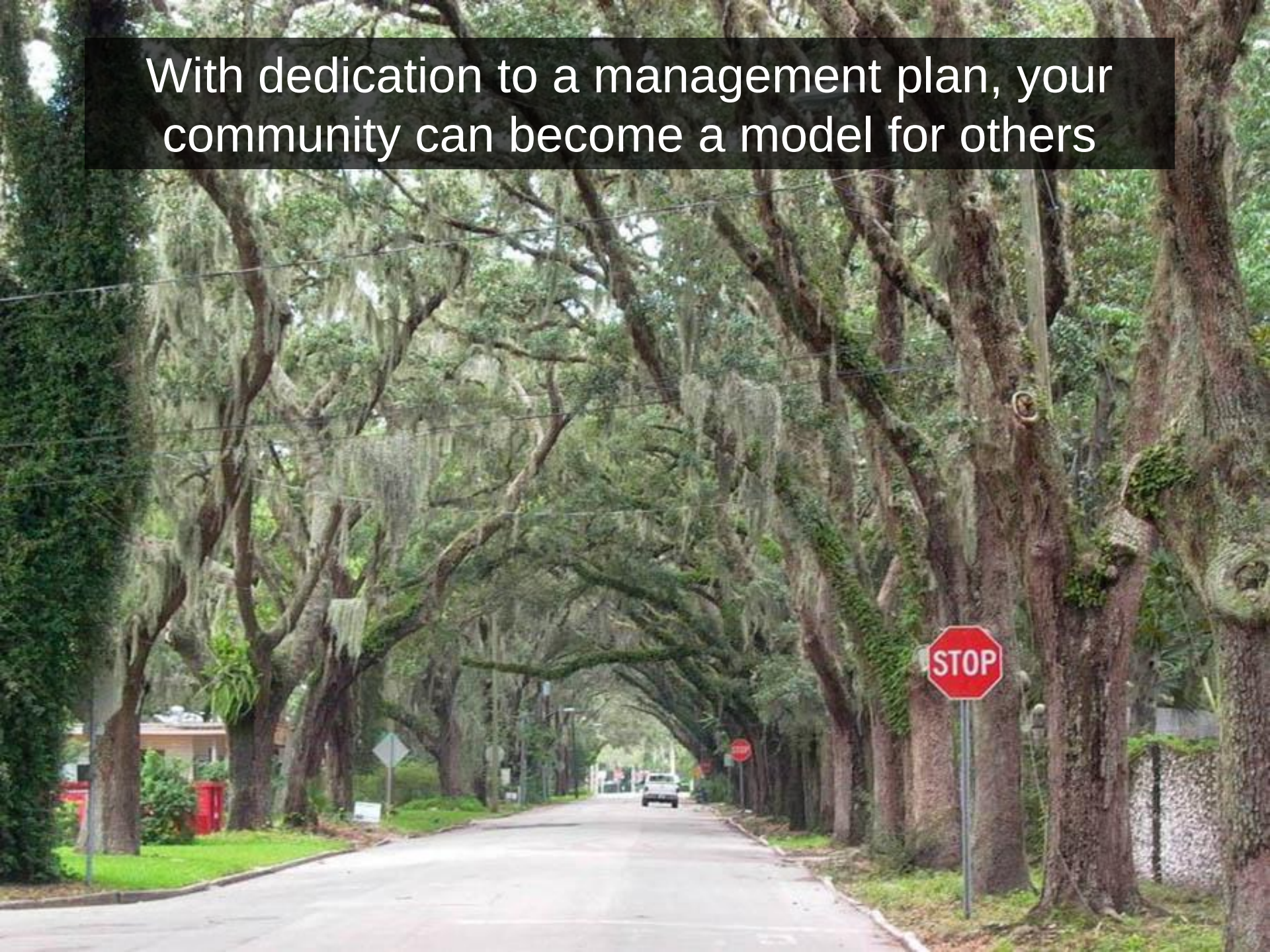

After
Debris


One year after pruning


After
Debris


One year after pruning


18 months after pruning


With dedication to a management plan, your community can become a model for others
STOP