Fruit Trees Pruning and Training

Reasons for Pruning

Tree Structure

Forest grown tree

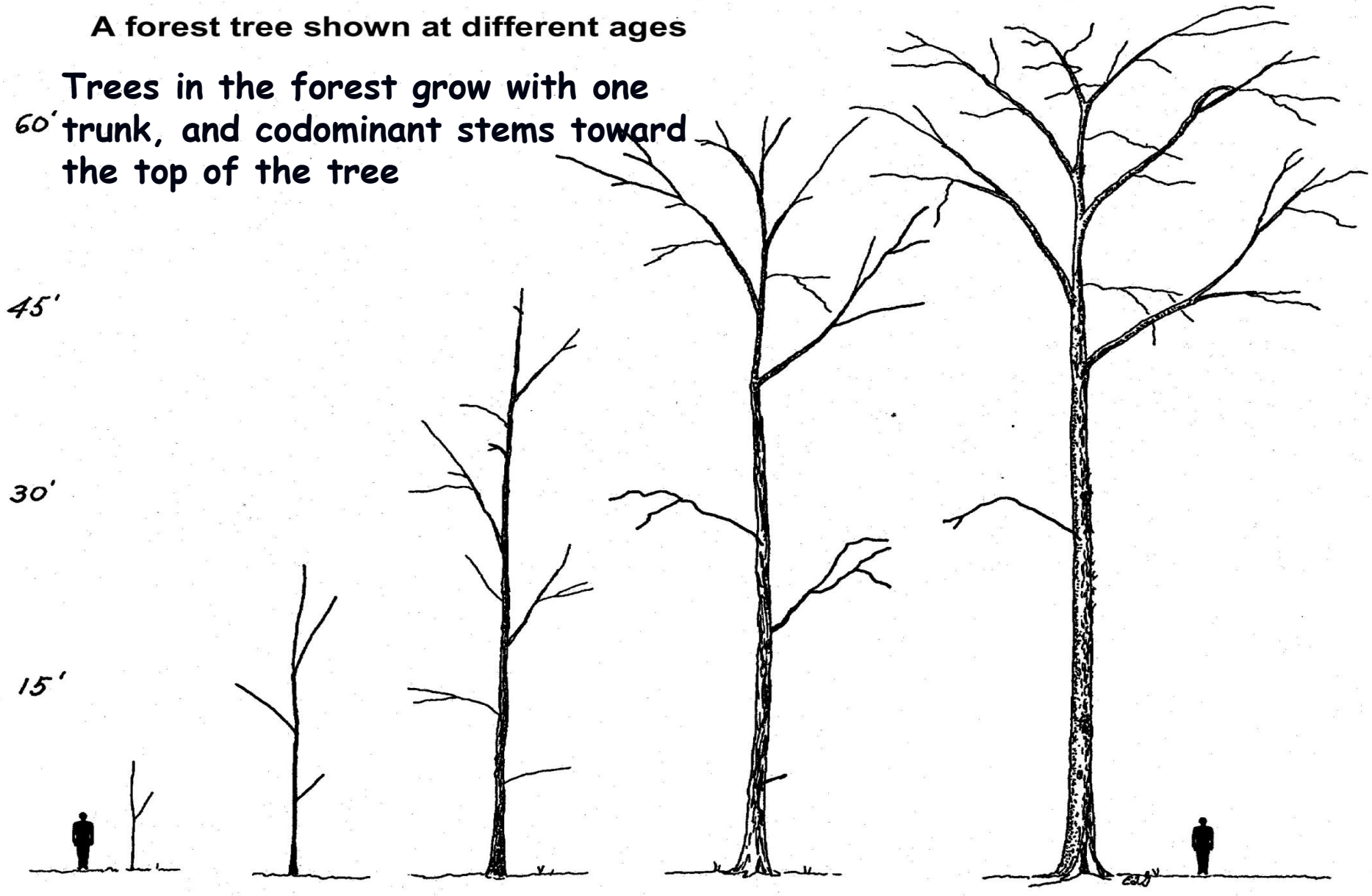
vs.

Open grown tree

- How do they develop on their own?

A forest tree shown at different ages

Trees in the forest grow with one trunk, and codominant stems toward the top of the tree



Trees in the forest have to compete with their neighbors for light. As the forest trees grow, lower branches get shaded out, die, and are eventually shed from the tree leaving a clear trunk (no branches).

Codominant stems form far up into the canopy on most forest trees

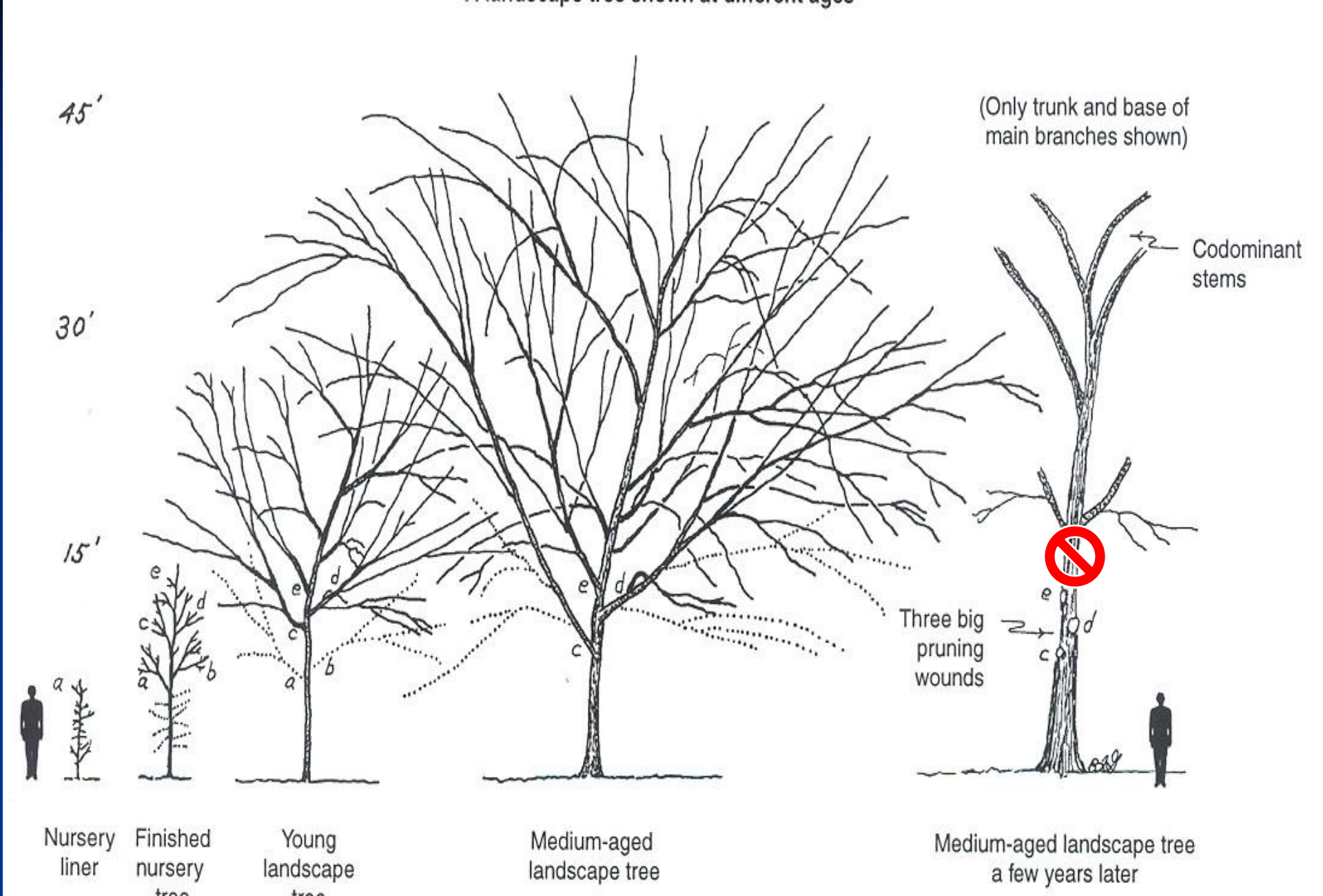
Notice on these tuliptrees (*Liriodendron* sp) how the lower trunks are clear while further up in the tree, there are a number of large branches competing for the light. Branches on these trees start at about 80 feet and the trees are about 120 feet tall.

Open grown trees

- Canopy develops low on the trunk
- Canopy spreads wide
- Tree is often wider than tall

Its party time for all

Its all about access to sunlight


A landscape tree shown at different ages
45'
30'
15'
(Only trunk and base of main branches shown)
Codominant stems
Three big pruning wounds
Nursery liner
Finished nursery tree
Young landscape tree
Medium-aged landscape tree
Medium-aged landscape tree a few years later

Reasons for Pruning

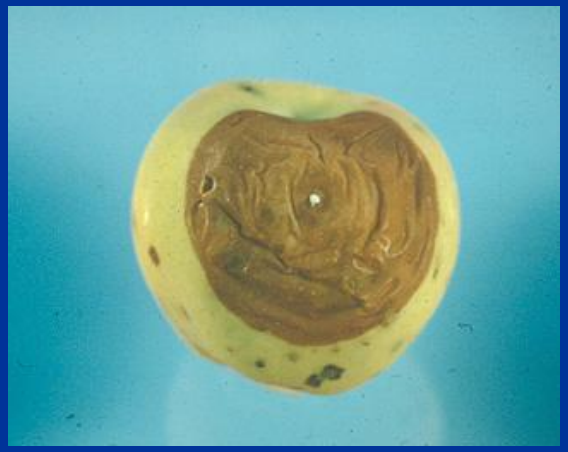
- Reduce tree size
- Control tree shape
- Make trees structurally strong

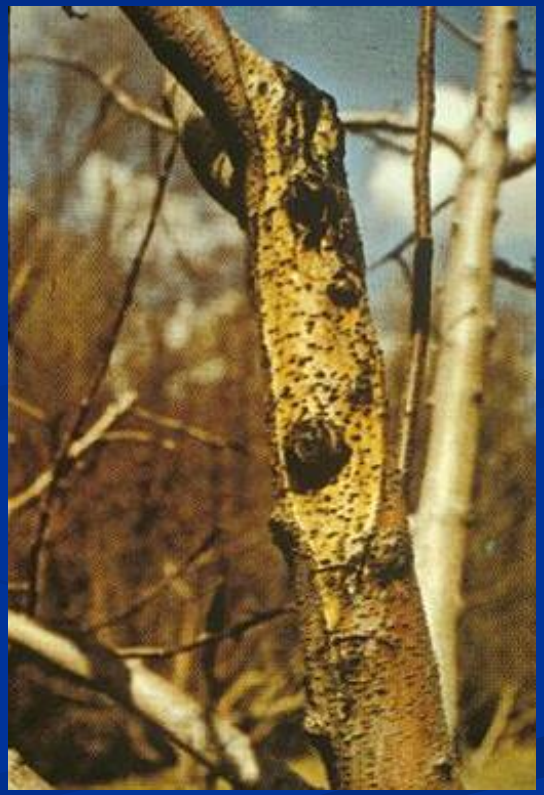
Reasons for Pruning

- Improve light penetration
  - Flower bud initiation
  - Fruit color
  - Pest control

Reasons for Pruning

- Removal of diseased wood
  - Fruit rot control





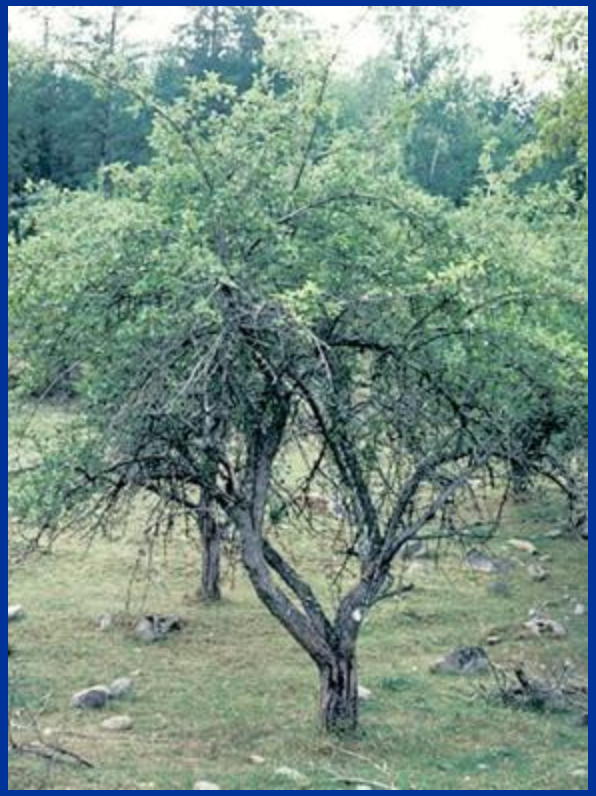
Reasons for Pruning

- Partially reduce crop load

- Facilitate cultural operations

Reasons for Pruning

- Keep the crop close to the ground



What happens if you do not prune?

- *Earlier fruiting*
- *Less light penetration*
- *Poor spray coverage*
- *More difficult to manage*

When to Prune

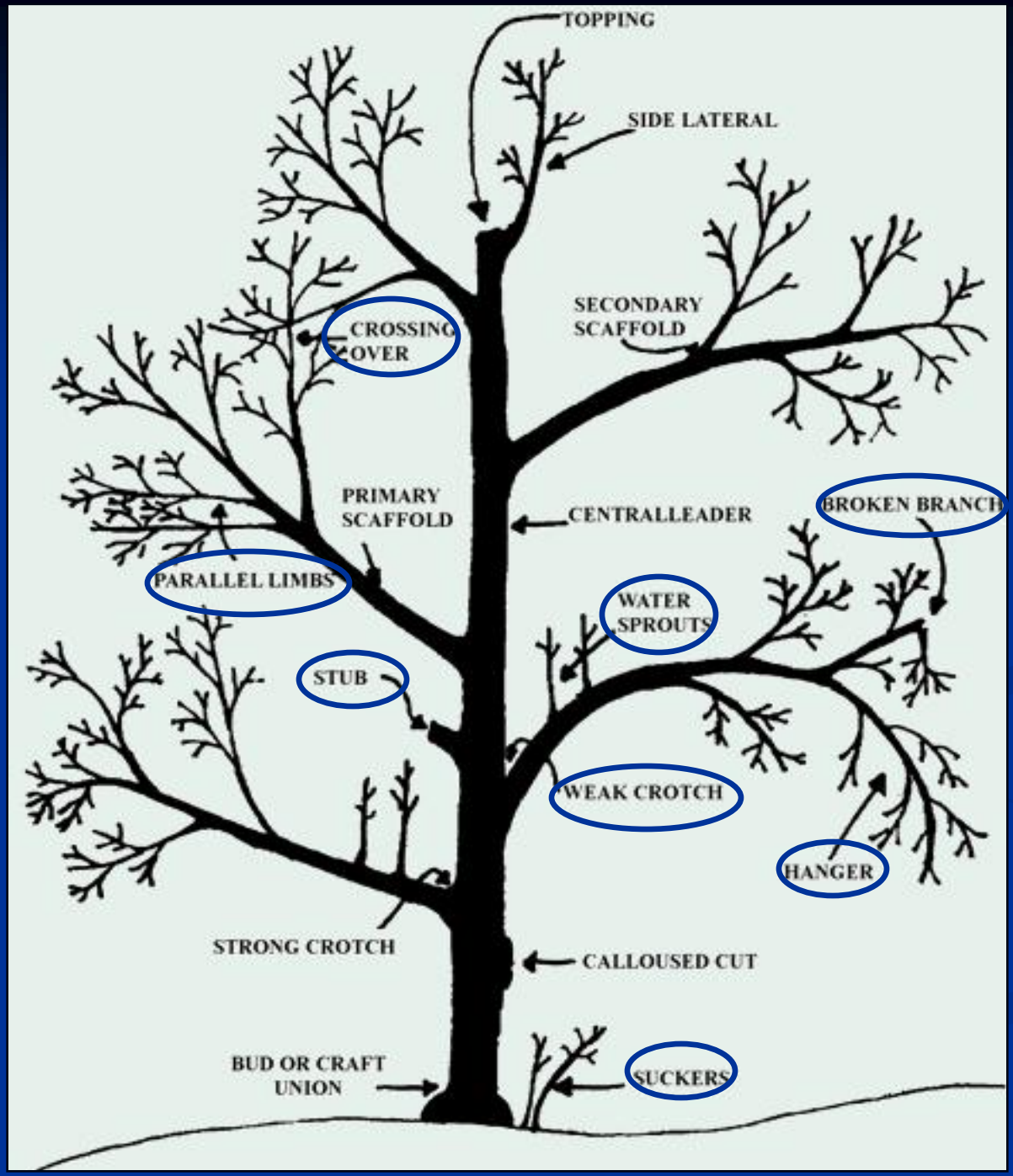
- Dormant season
- Summer pruning

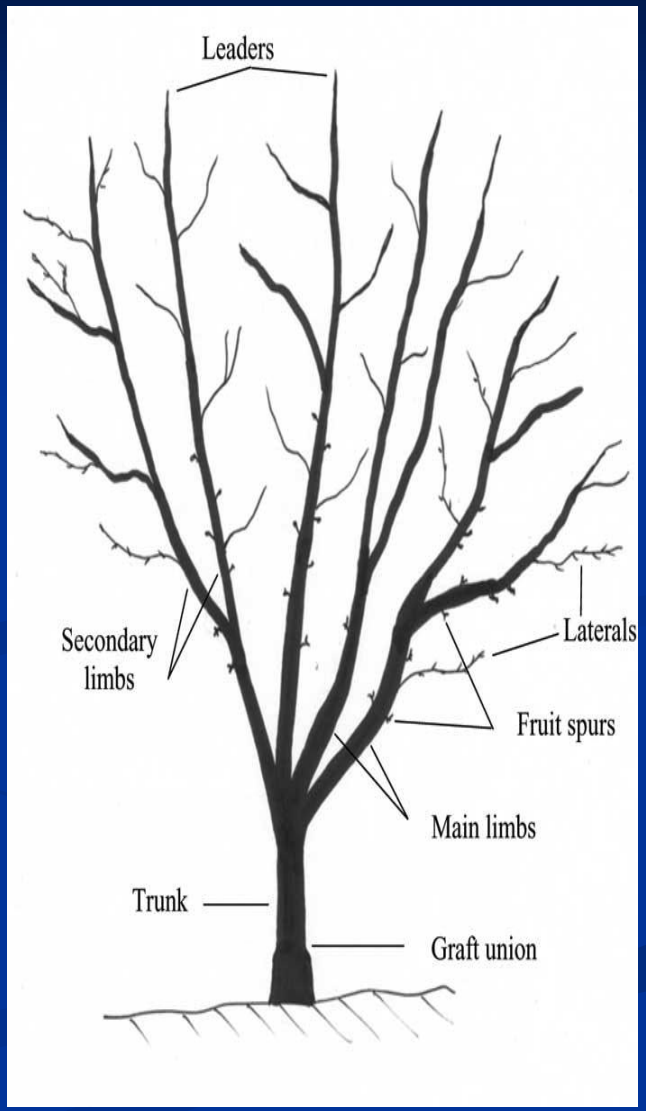
- Pinching competitive laterals in young leader to keep leader growing strong

Summer pruning apples and pears allows sunlight to ripen the fruit and ensures good cropping the following year

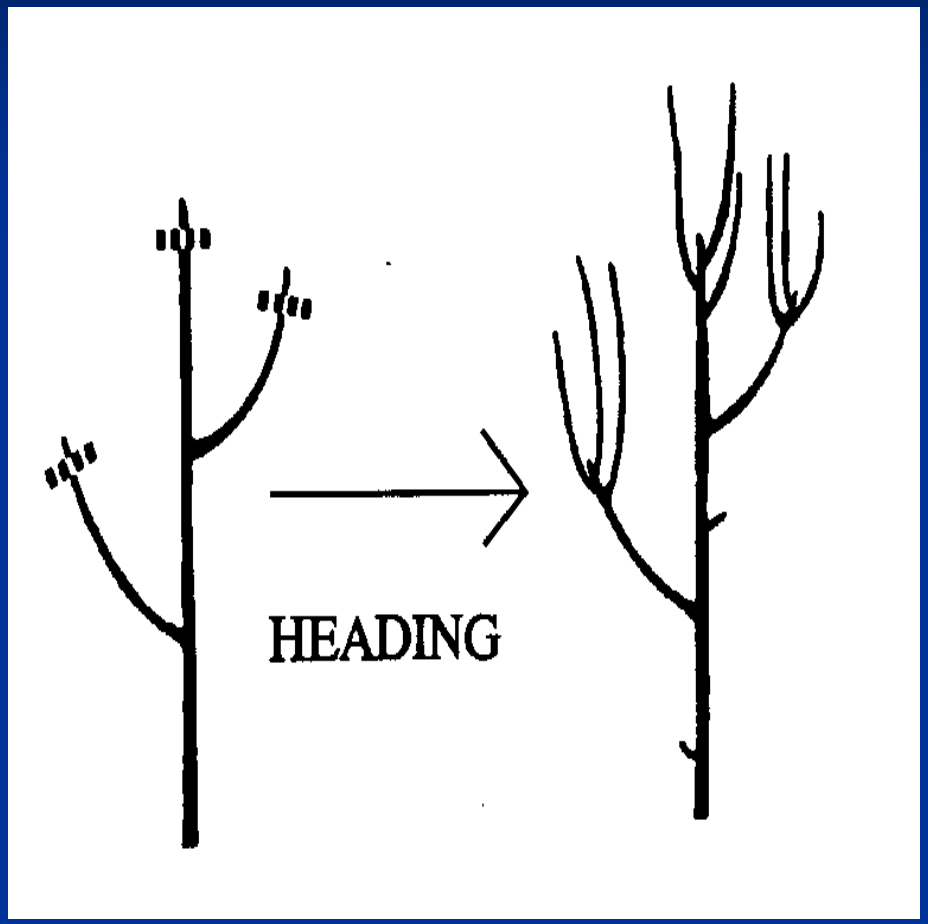
All pruning is dwarfing, but summer pruning reduces growth much more than equivalent pruning during the dormant period

Figure 26. Summer pruning. Top: *section of the top of a typical vigorous tree. Note the upright growth and the shading of the fruits.* Bottom: *proper summer pruning. The vigorous watersprouts have been removed* (a); *the current season's growth has been removed from the upright branches* (b); *the undesirable upright, but fruiting branch has been headed back just above the cluster of fruit* (c) *and will be removed in the dormant pruning; and the upturned branch has been headed back to a weak lateral* (d).


TOPPING
SIDE LATERAL
CROSSING OVER
SECONDARY SCAFFOLD
PRIMARY SCAFFOLD
CENTRALLEADER
BROKEN BRANCH
PARALLEL LIMBS
WATER SPROUTS
STUB
WEAK CROTCH
HANGER
STRONG CROTCH
CALLOUSED CUT
BUD OR CRAFT UNION
SUCKERS

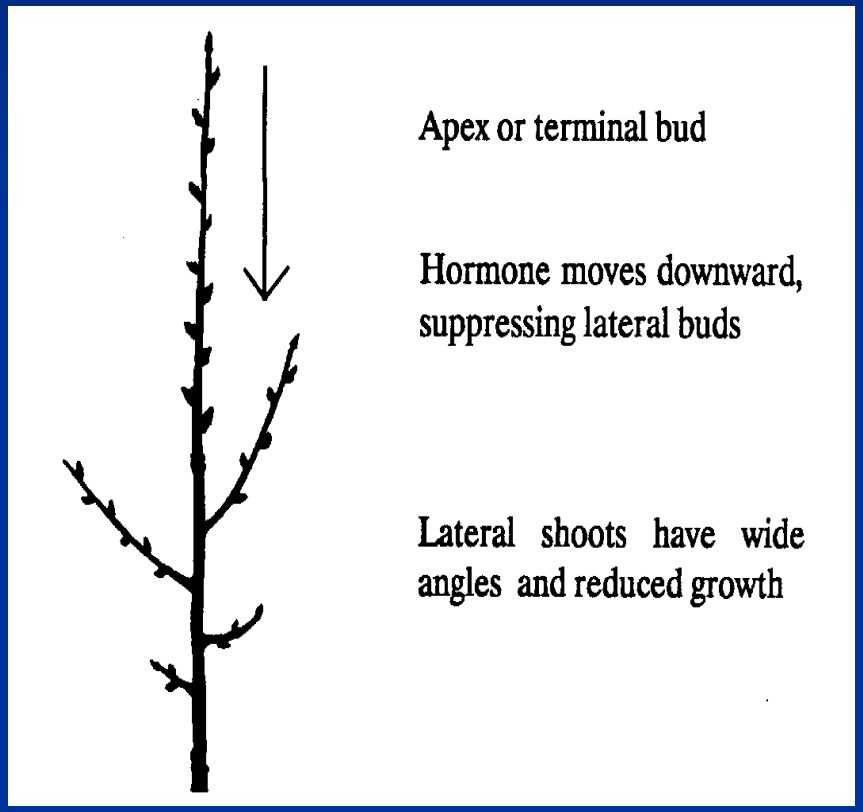

Leaders
Secondary limbs
Laterals
Fruit spurs
Main limbs
Trunk
Graft union

Types of Cuts



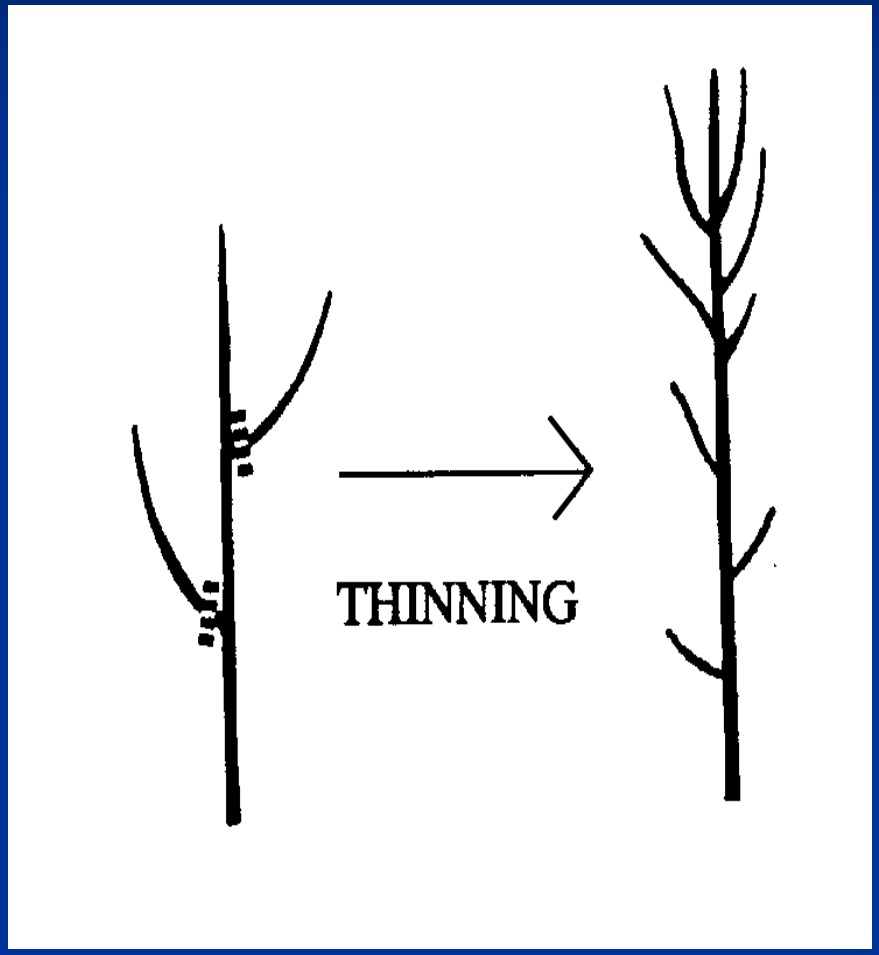
- Heading Cut

  - *Remove part of the branch*
  - *Stimulate bud break near cut*
  - *Stimulate localized branching*



- Inhibits lateral bud break
- Inhibits lateral shoot growth
- Affects branch angle

Types of Cuts

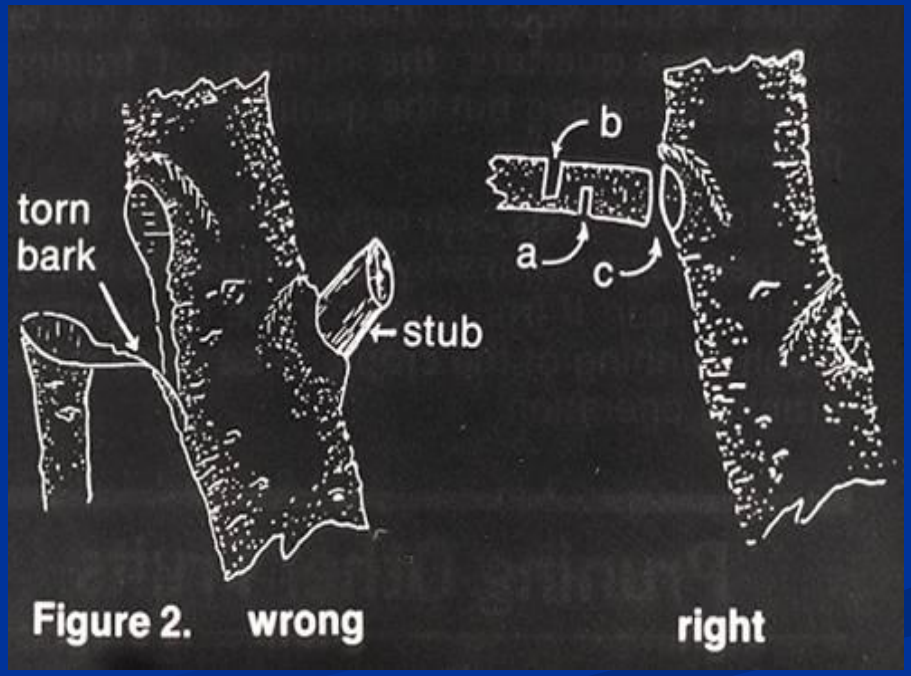


- *Remove branch at point of origin*
- *Least invigorating cut*
- *Promote light penetration into canopy*

Avoid Leaving Branch Stubs

Pruning

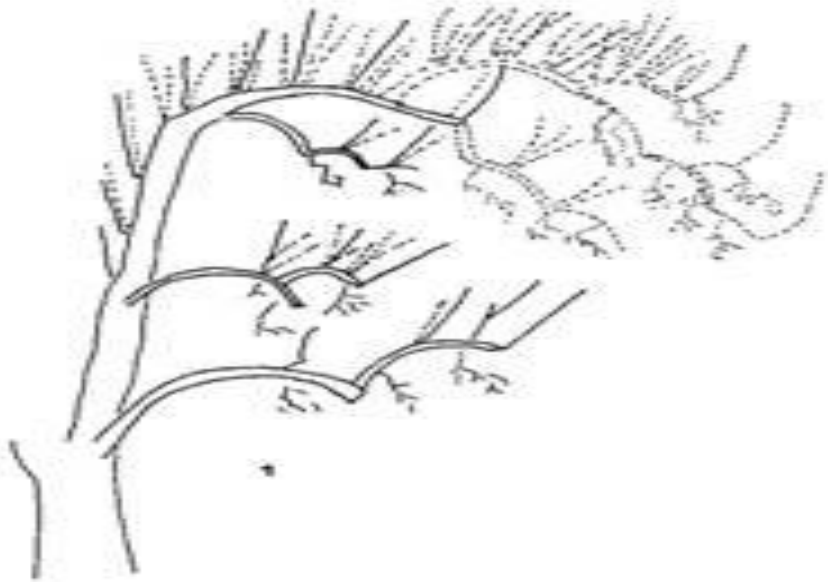
Pruning



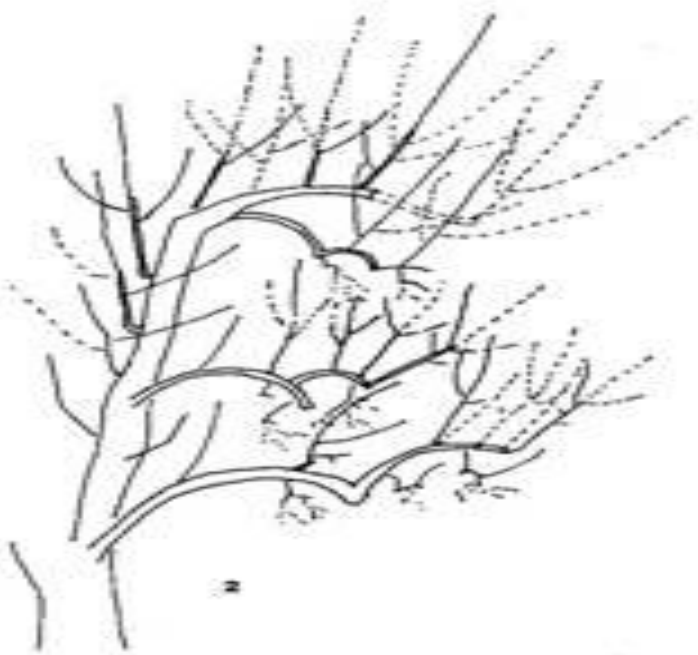
Pruning Neglected Apple Trees

Pruning Neglected Trees

- Remove dead wood
- Reduce tree height
- Cut out 3-4 large branches
- Cut back to outward growing branches

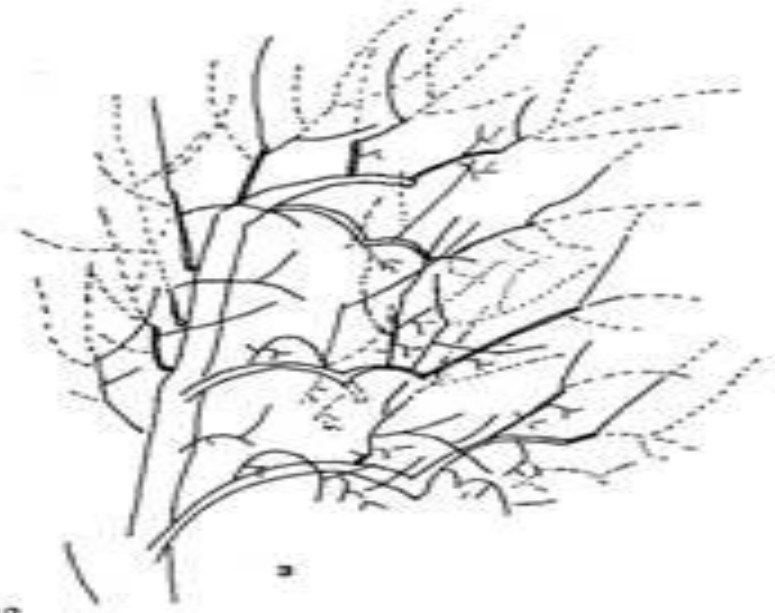


1



2

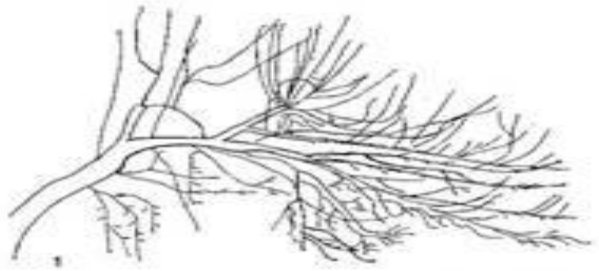
The pruning of "umbrella-shaped trees" can be reversed gradually if they are not too old. Yield will decline temporarily during the conversion.



3

4

Pruning Neglected Trees

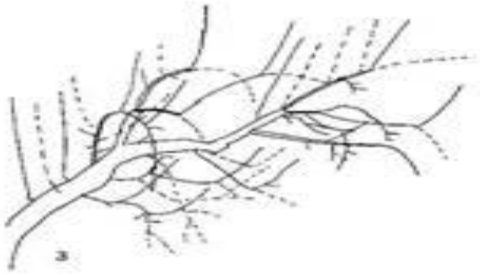


1

The top limbs in an old "umbrella tree" have many suckers that shade the lower portion of the tree.

2

Thin the suckers and do not head those left. Remove most of the downward hanging fruiting wood in order to allow light onto the lower limbs and to prevent further spread.



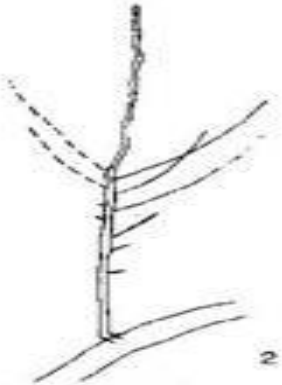
3

The unheaded suckers will fruit and bend over in the third year.

13

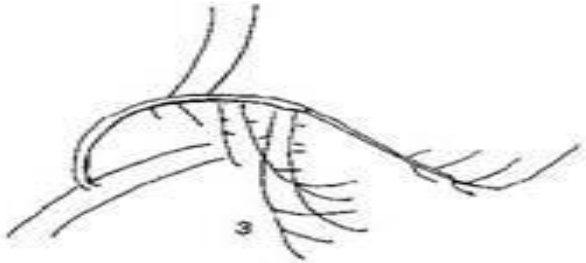
1

One-year apple shoot with no flower buds, left unheaded.



2

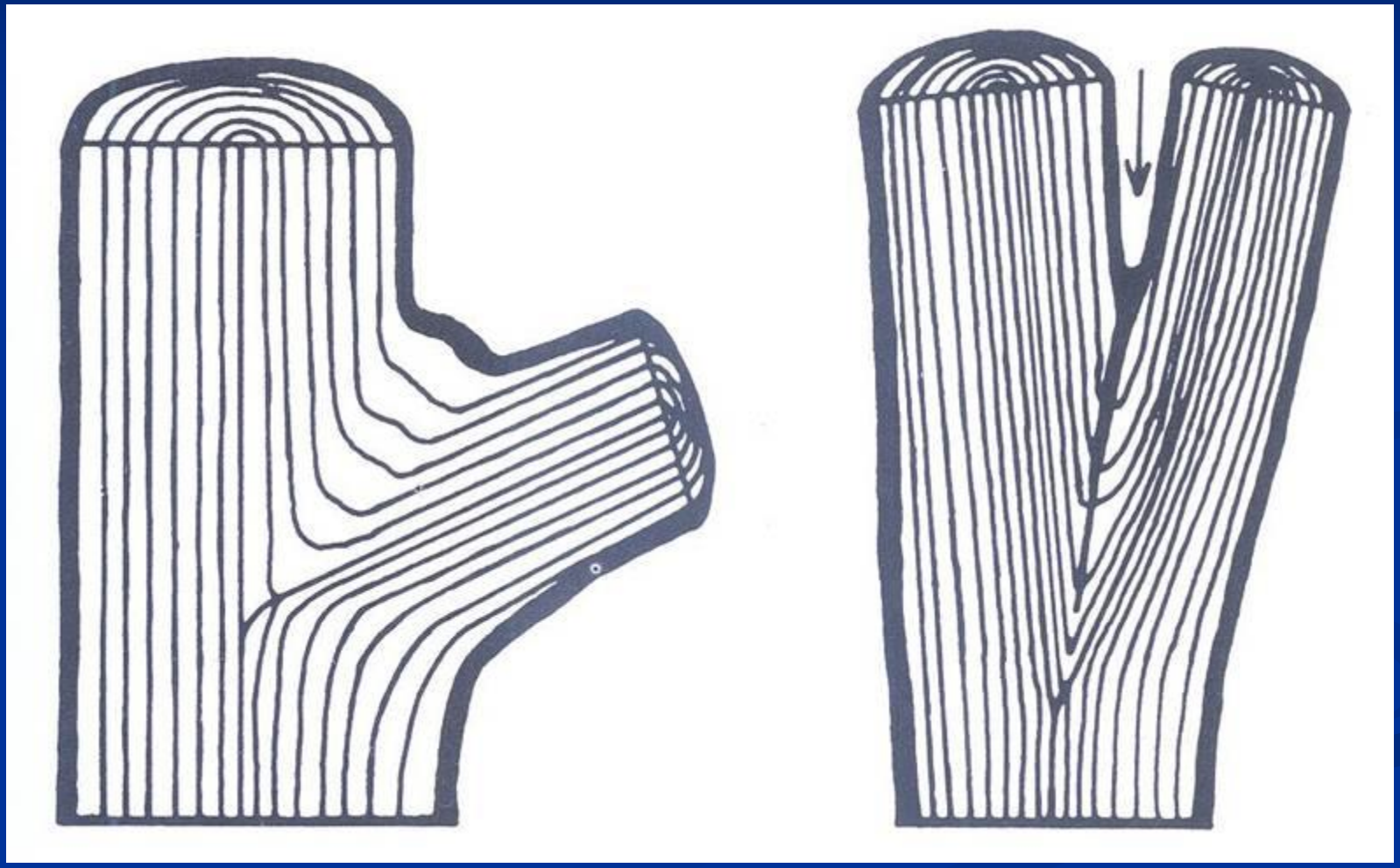
Same shoot after second season, with flower buds.



3

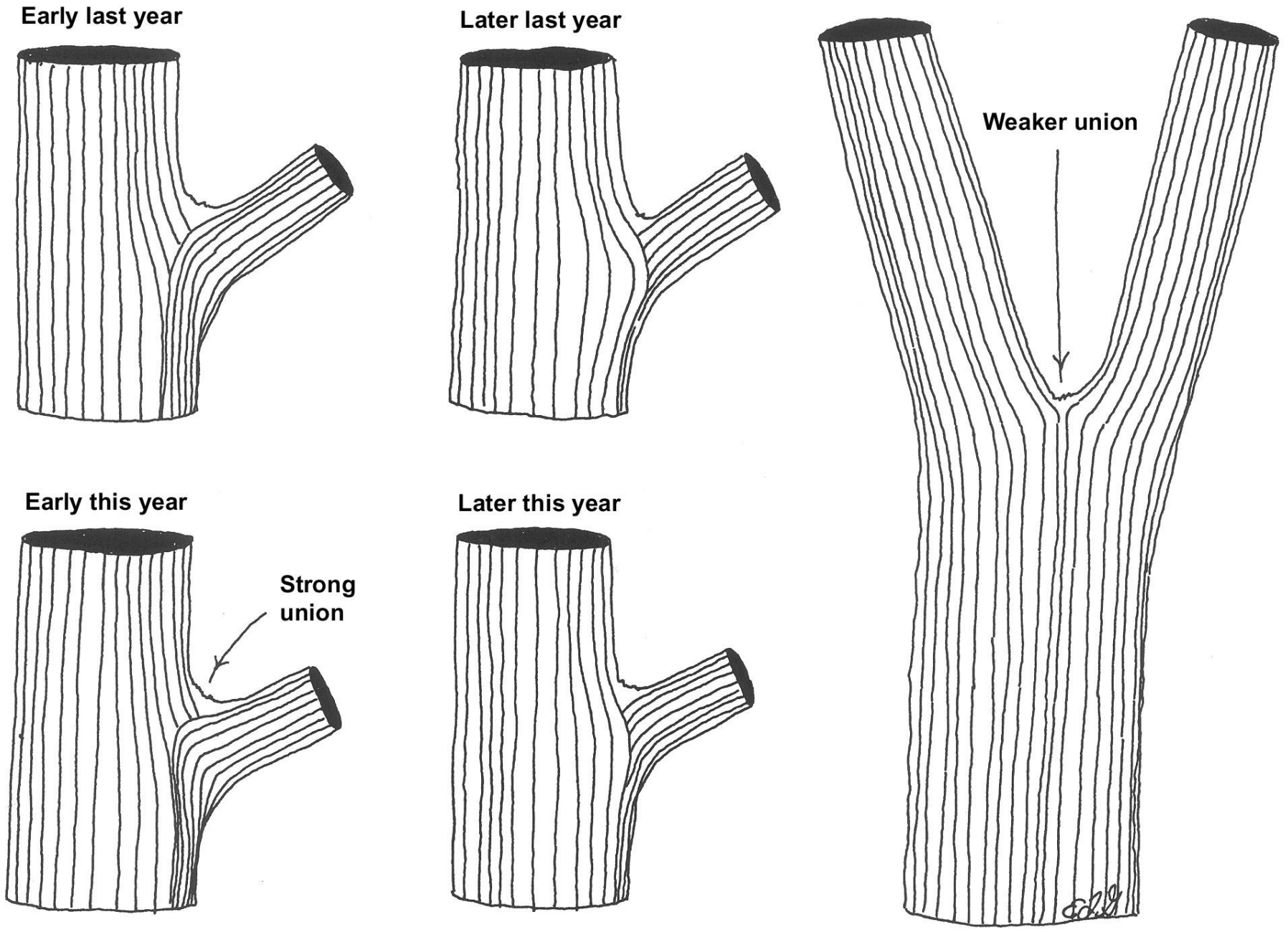
Same after fruiting in third season.

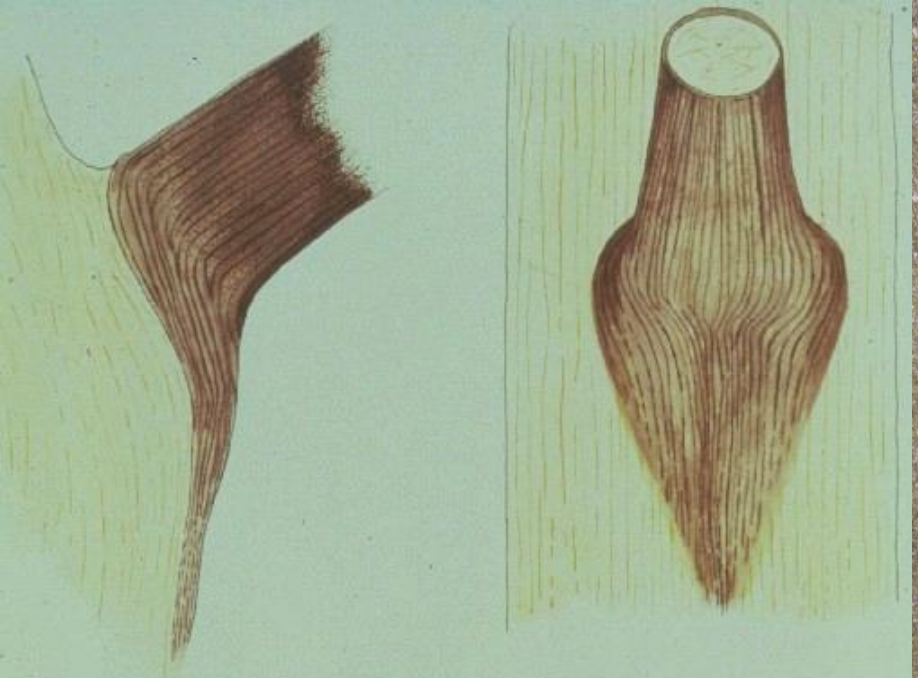
Remove Narrow Branch Angles

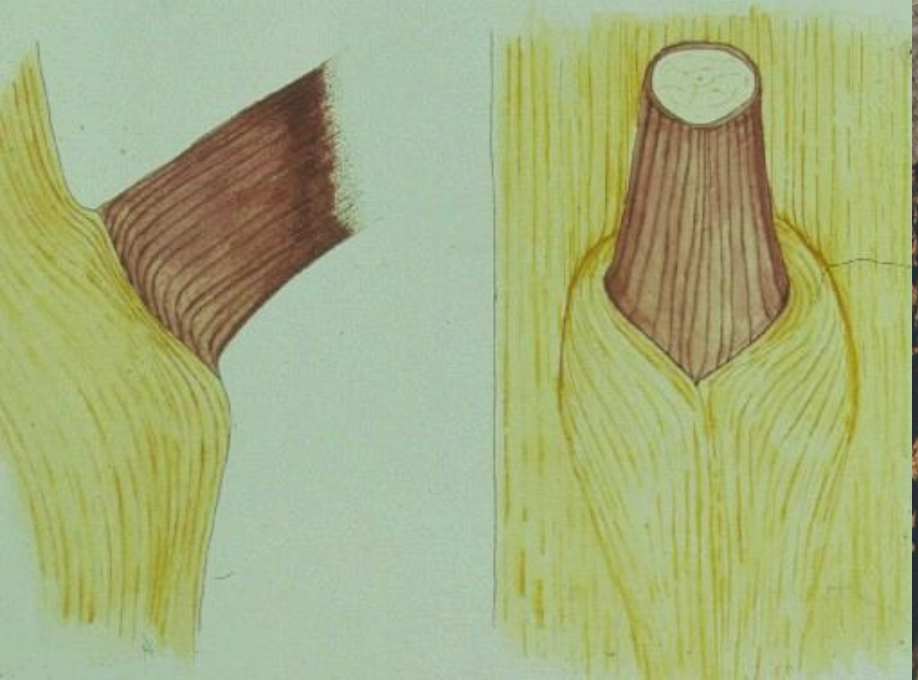


Strong

Weak


Early last year
Later last year
Weaker union
Early this year
Strong union
Later this year
Dominant trunk with one branch
Codominant stems

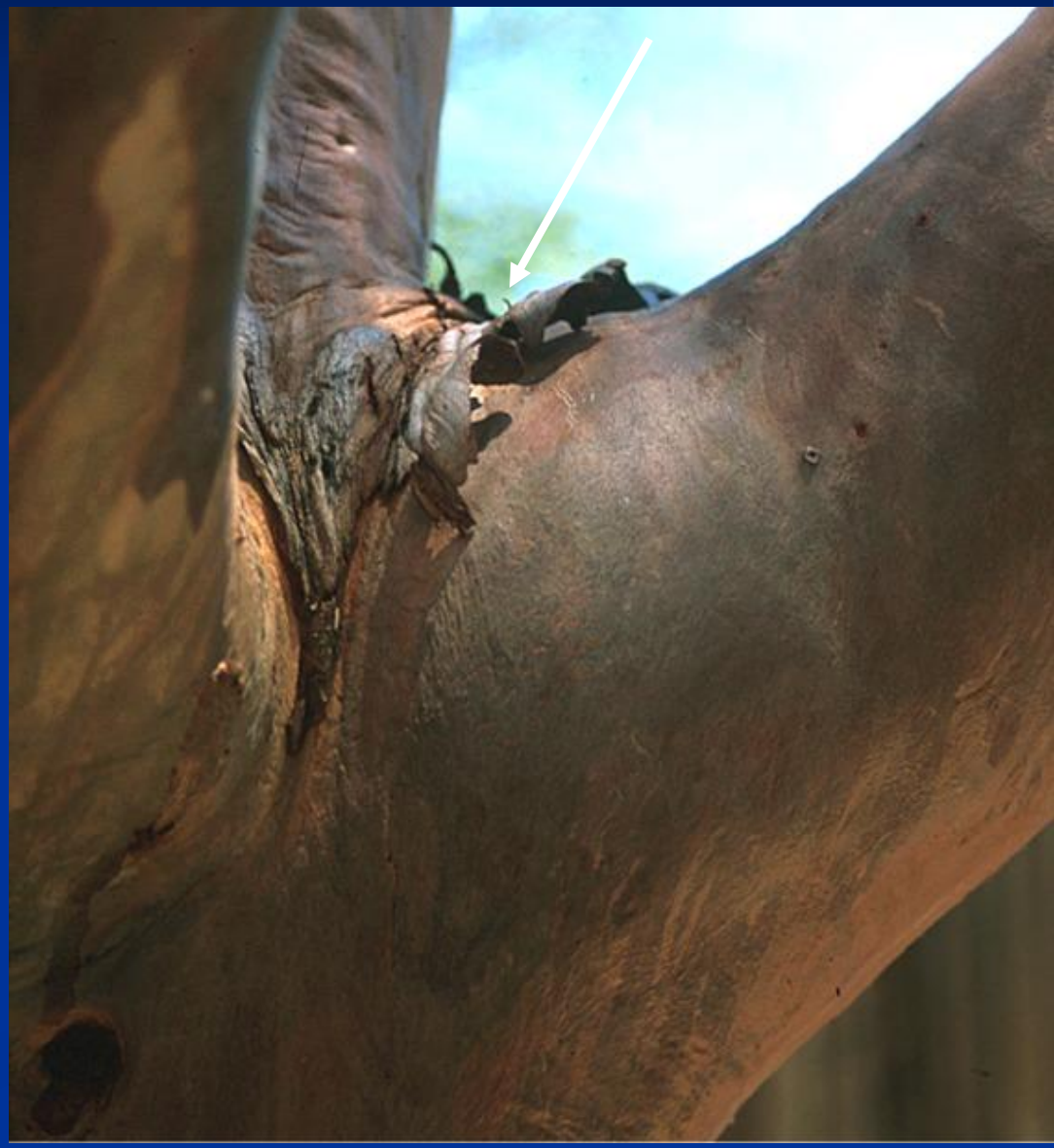


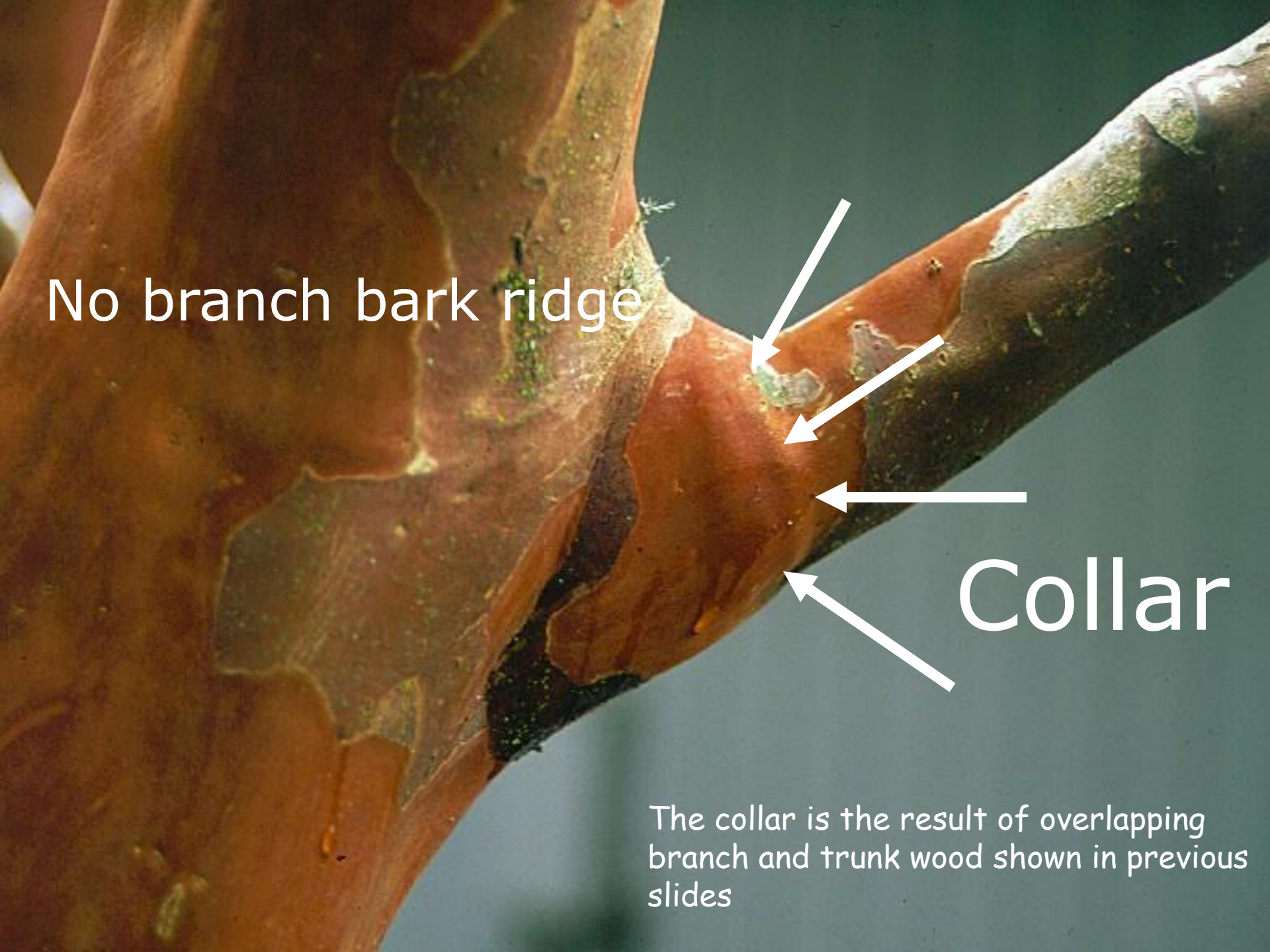


Branch bark ridge present

- Some branch unions have a prominent branch bark ridge

It is different from the formation of elephant ears because the pushing occurs only at the surface so there is always room to the outside. Unlike a bark inclusion, there is no pressure pushing the branch from the trunk.





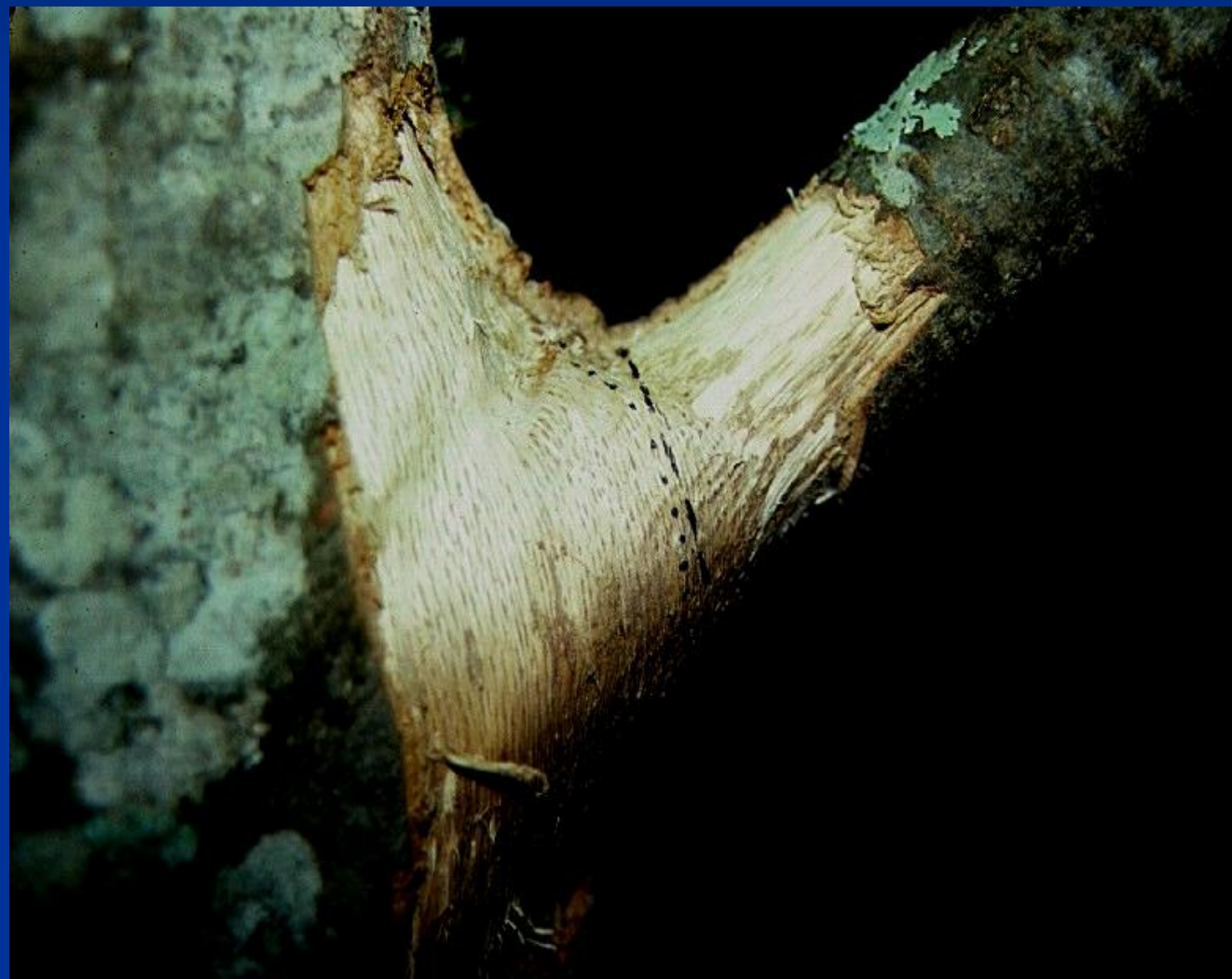
The collar is the result of overlapping branch and trunk wood shown in previous slides

Pine union

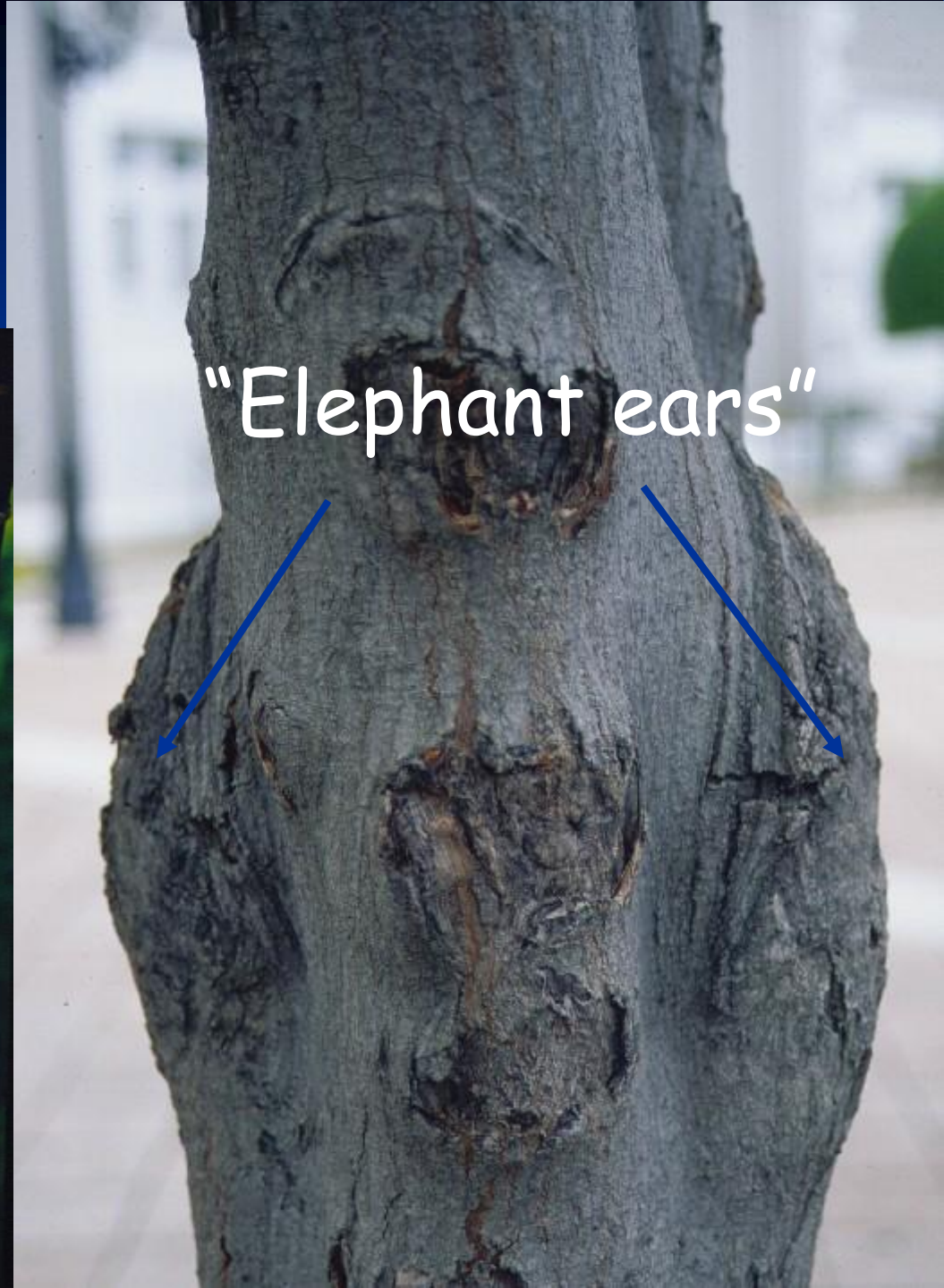
- Collar is visible as a swelling at the base of the branch
- Branch bark ridge (arrows) is visible as a dark, rough bark region on the top and sides of the union

Wood orientation at union

- Peel the bark from the union
- Note how trunk wood grows out onto the base of the branch (dotted line is edge of trunk wood)



These are weak



Bark, that developed when the stems were smaller and had space between them, is now trapped inside the union between the stems. This doesn't happen when the angle between stems is large enough to allow the stems to develop independent of each other.

Included bark beginning to form

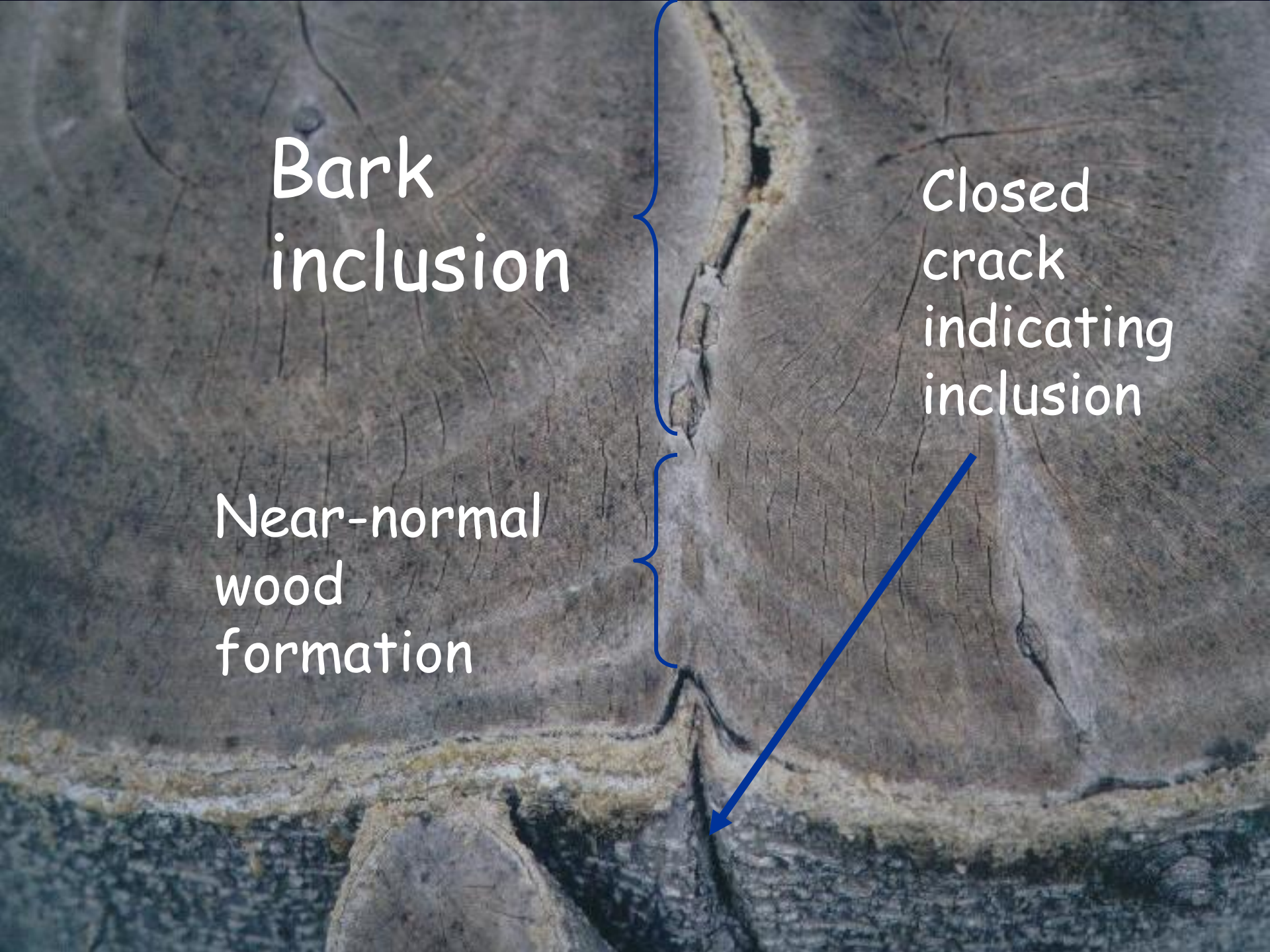
Bark inclusion

Notice the branch angle.

Notice that the two stems did not connect with each other as they grew together

Notice that the decay and discoloration are results of the stems pressing and rubbing against each other

Notice that the narrow branch angle is a perfect environment for microorganisms because it is an area that stays moist, warm, and dark.

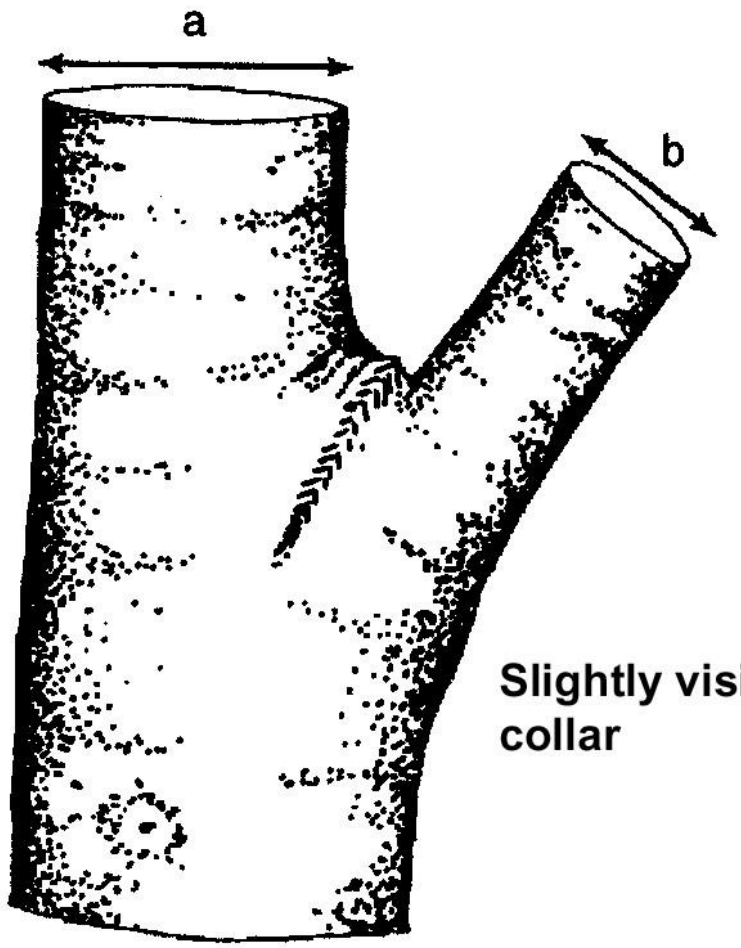

Bark inclusion
Closed crack indicating inclusion
Near-normal wood formation


Bark inclusion
Closure crack indicating inclusion


Bark inclusion
(Not a codominant stem!)

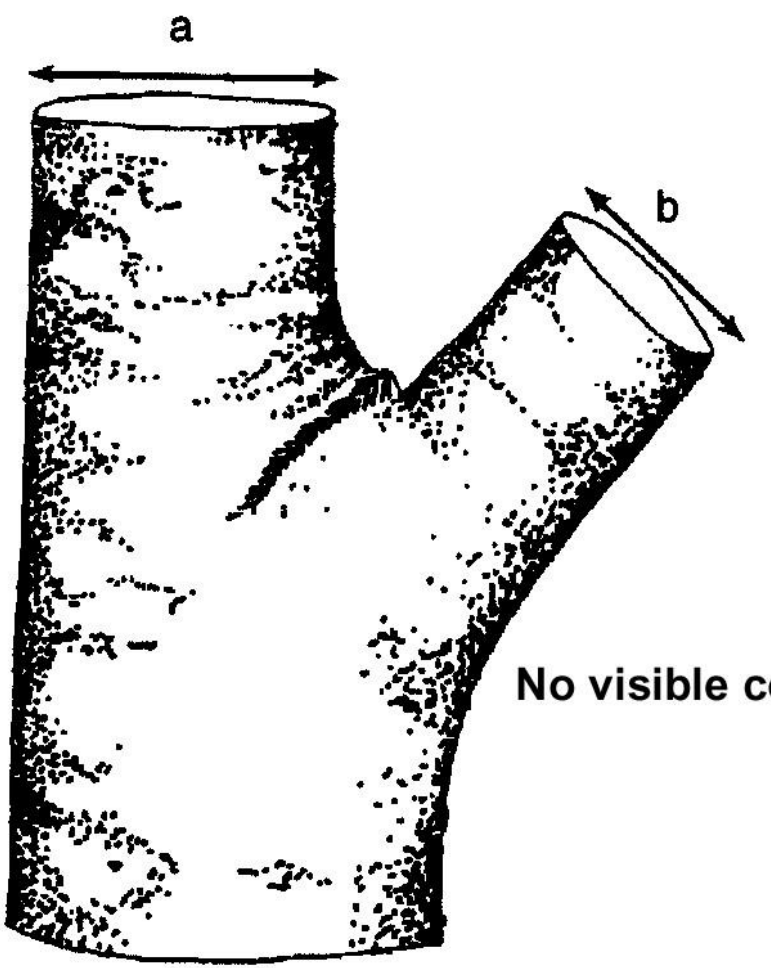

Close-up of closure cr

Desirable branch size



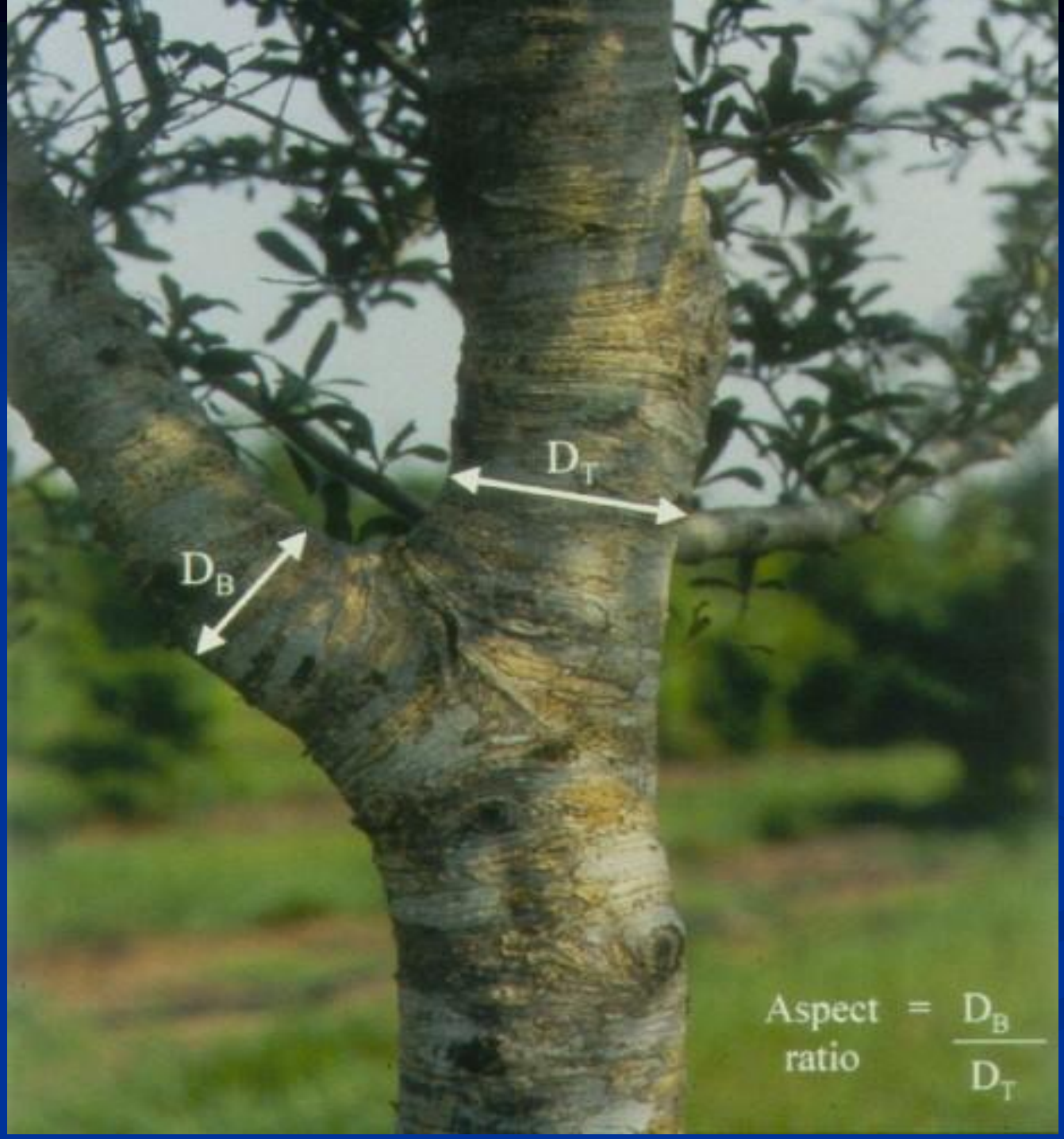
Slightly visible collar

Most preferred branch size:
b < .5a



No visible collar

Preferred branch size:
b = .5 to .75a



The most desirable branch aspect ratio is less than 0.5 as was demonstrated in the previous slide.

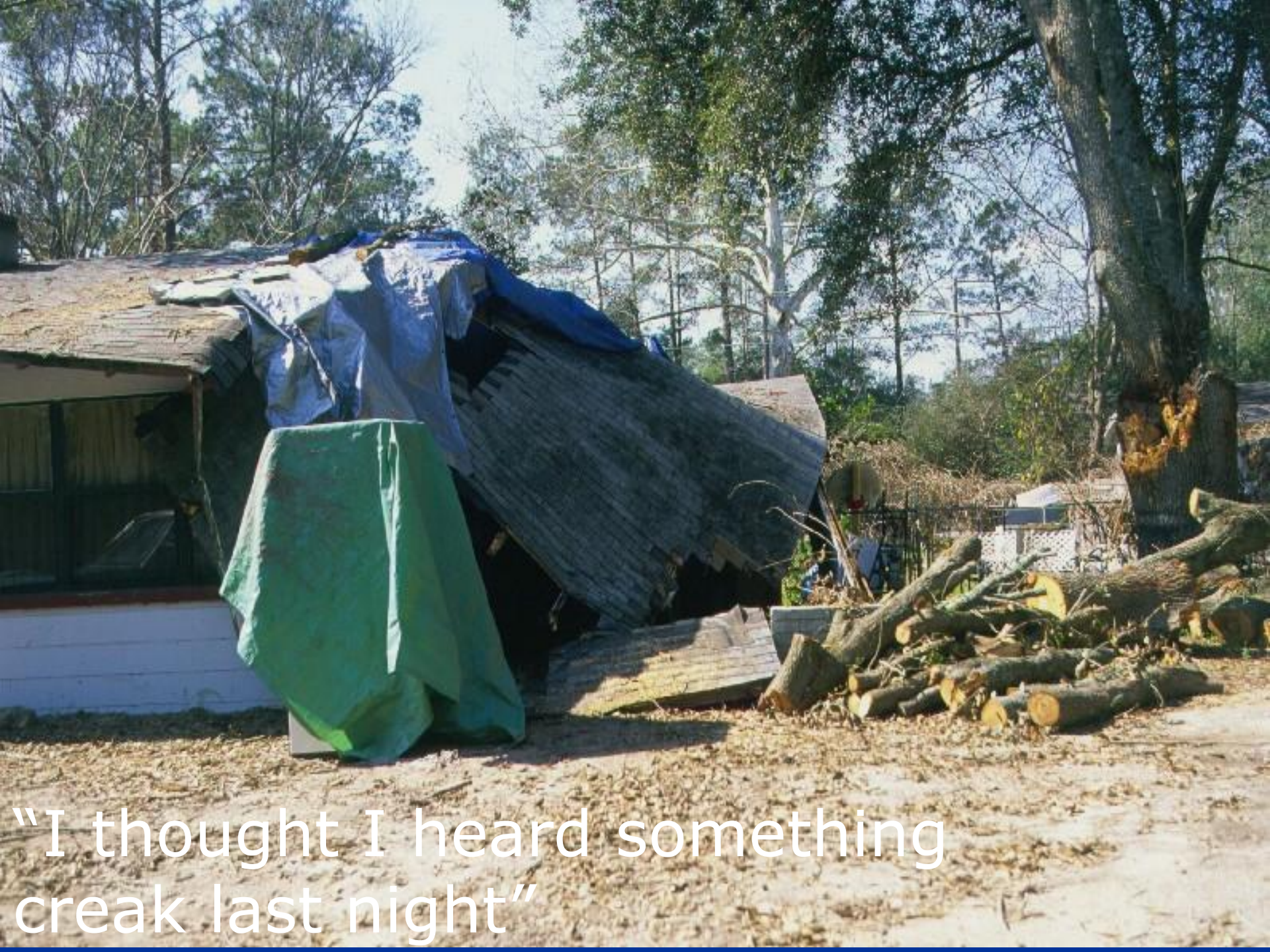

Stron
g
union
Weak
union

Appears to be a nice tree

Close-up of base of tree

Same tree five years later

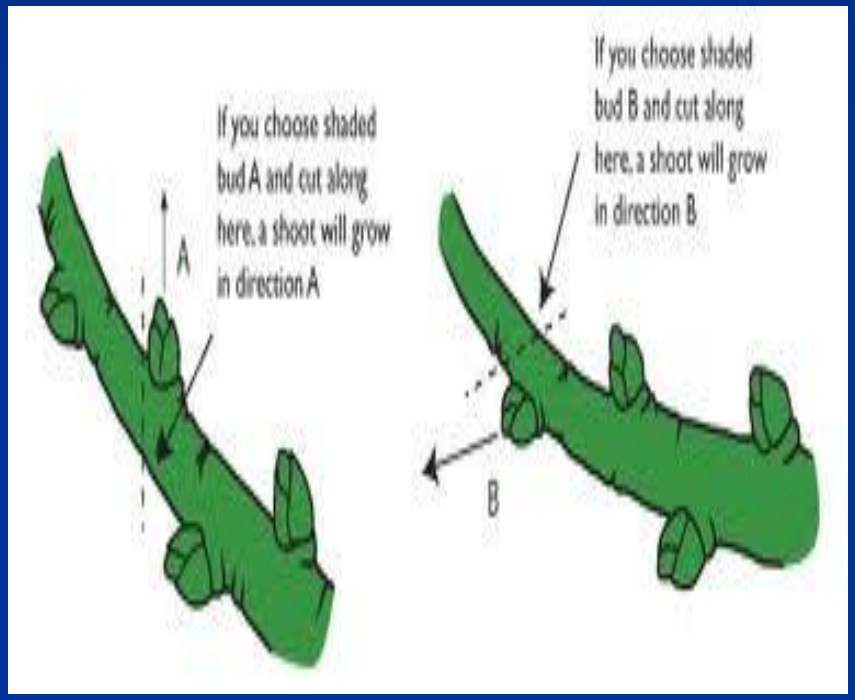

"Fall down go boom tree"
Keep an eye on this side of the tree

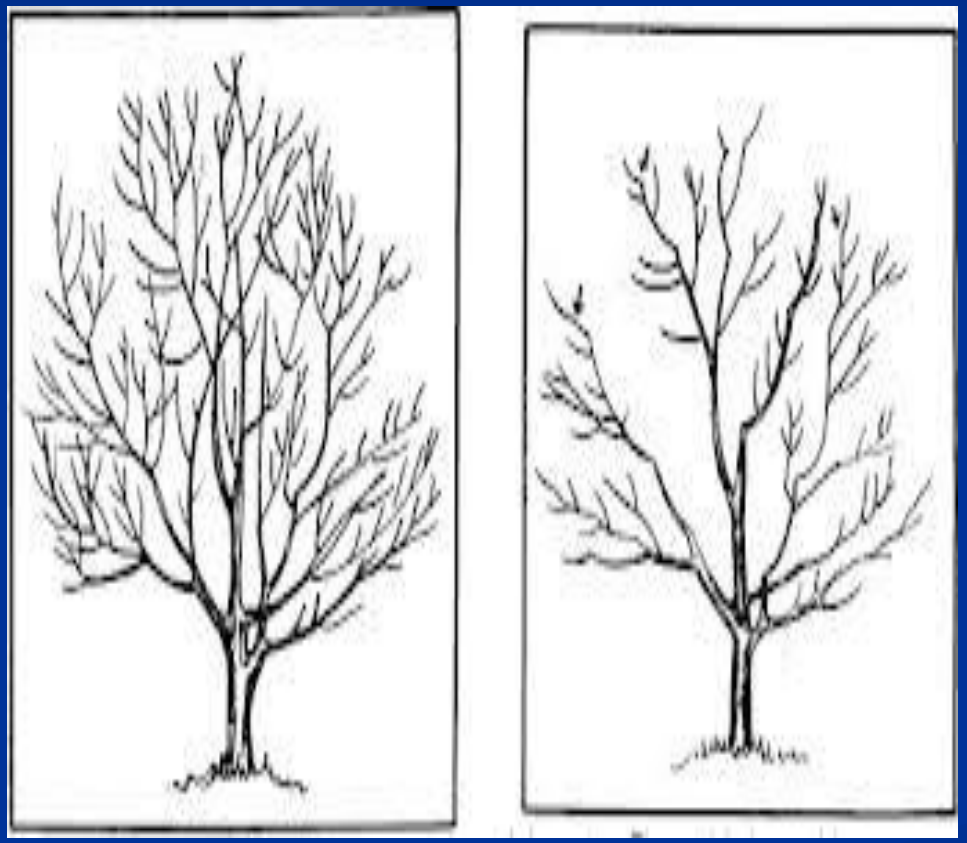

"I thought I heard something
creak last night"

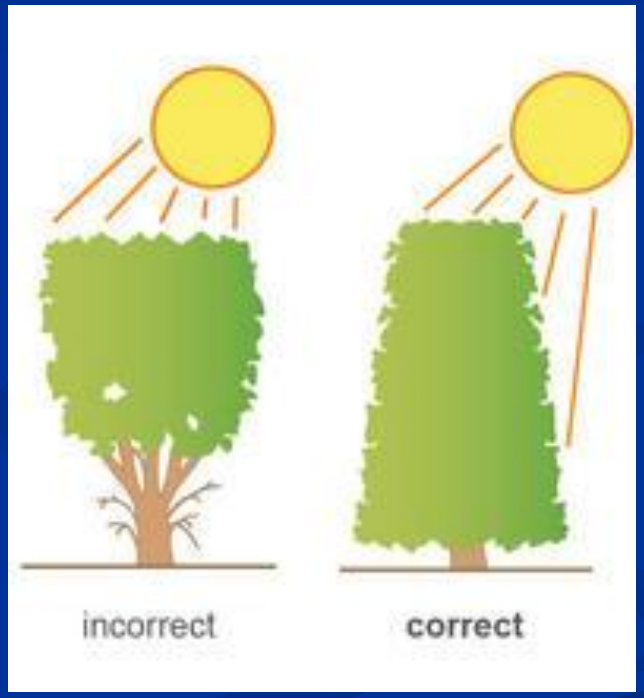
Good structure

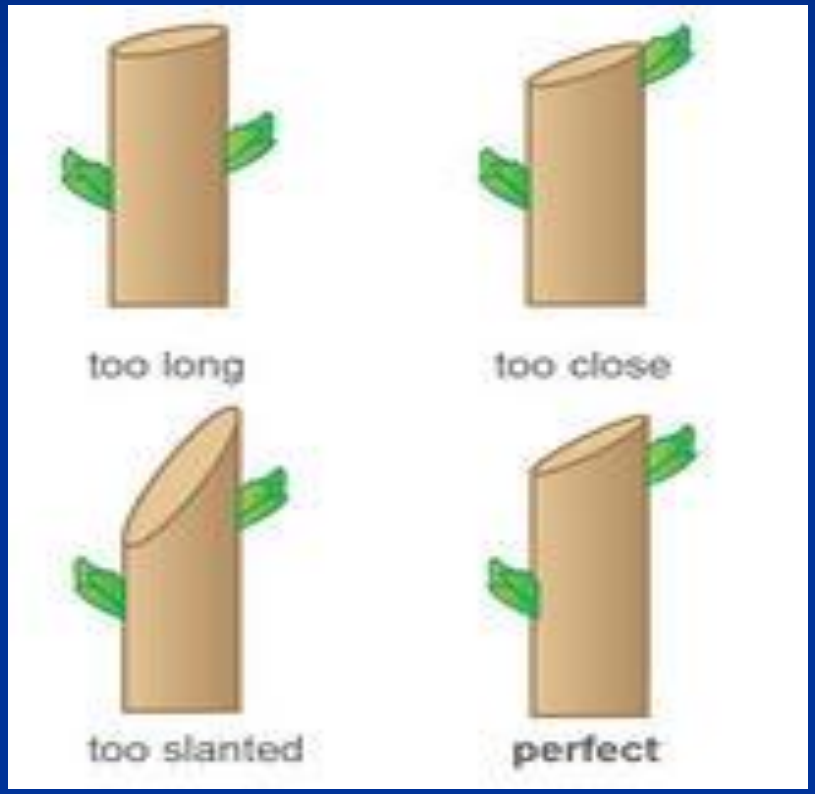
Scaffold branches spaced radially; none directly above another.


Stems too close together
LONG TERM PERMIT PARKING
CITY C PERMIT REQUIRED


If you choose shaded bud A and cut along here, a shoot will grow in direction A
A
If you choose shaded bud B and cut along here, a shoot will grow in direction B
B

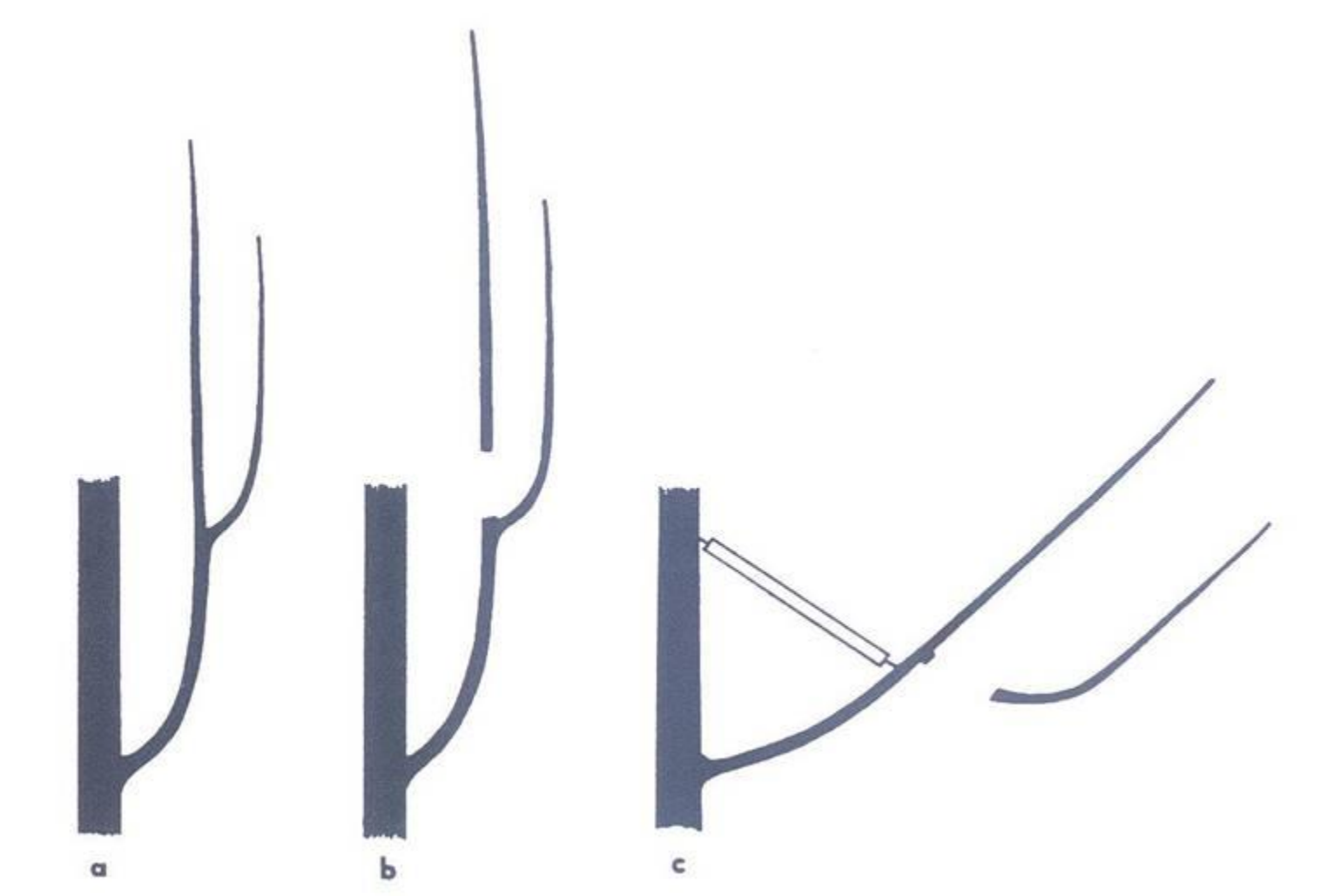



incorrect
correct

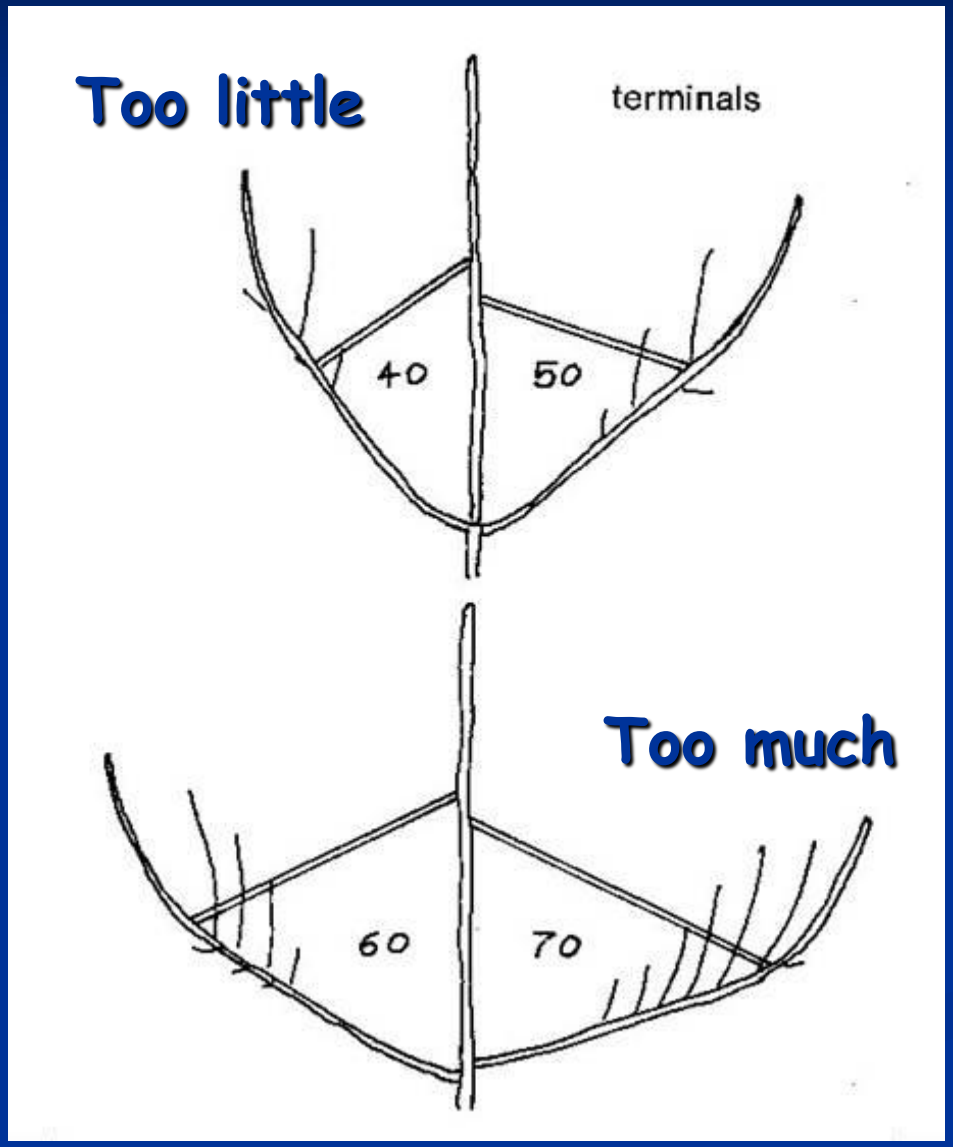

too long
too close
too slanted
perfect


A

Branch Spreading



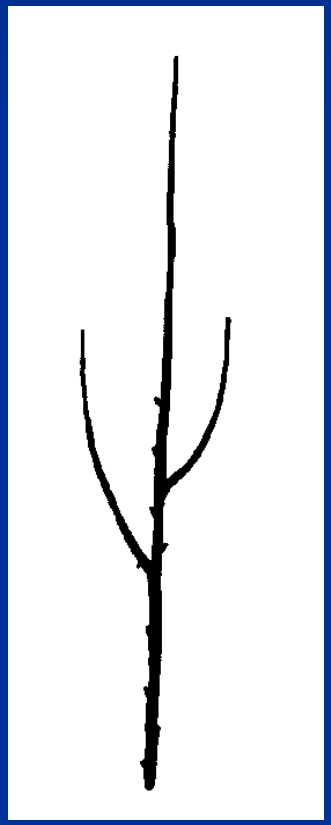
Branch Spreading



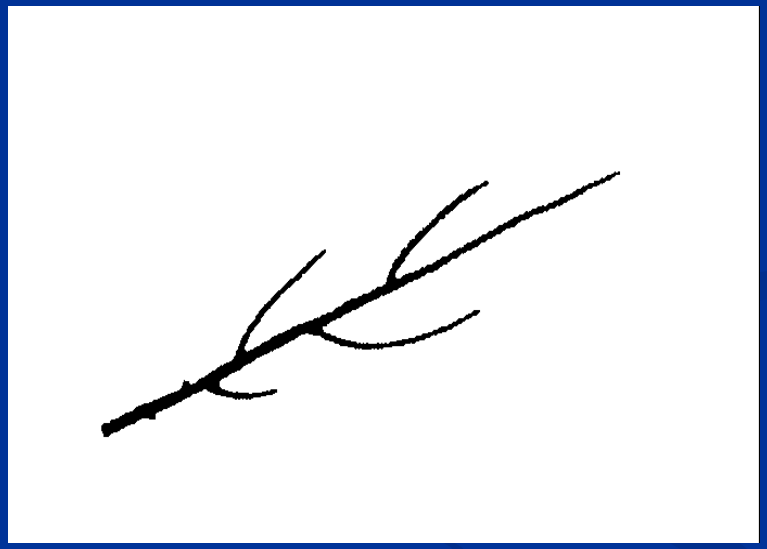
- Opens tree up for sunlight and spray penetration
- Reduces shoot and limb vigor
- Encourages flowering

Bend Branch Towards Horizontal

- Decreases amount of auxin moving from tip



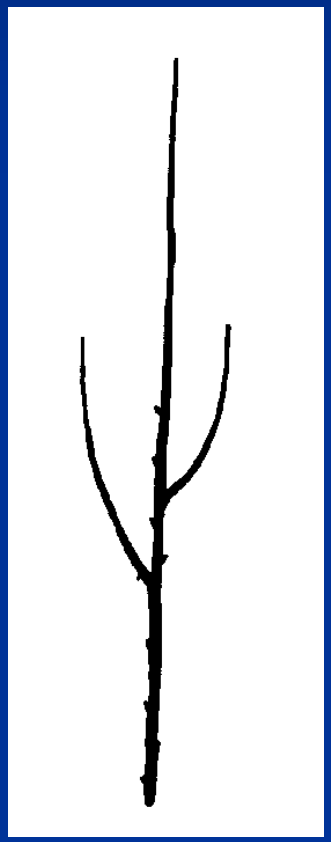
Bend to a 45 to
60 degree angle



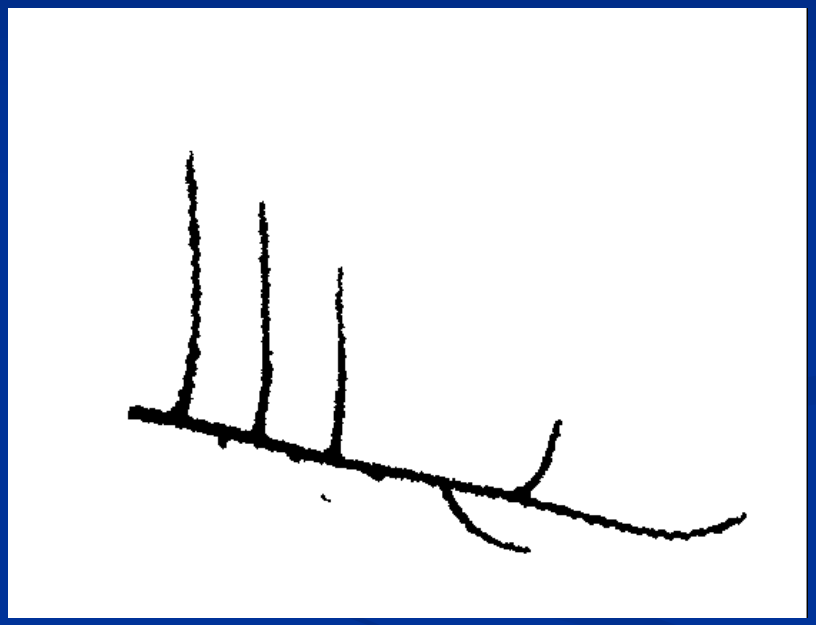
Increase lateral branching
Decrease terminal growth

Bend Branch Towards Horizontal

- Decreases amount of auxin moving from tip



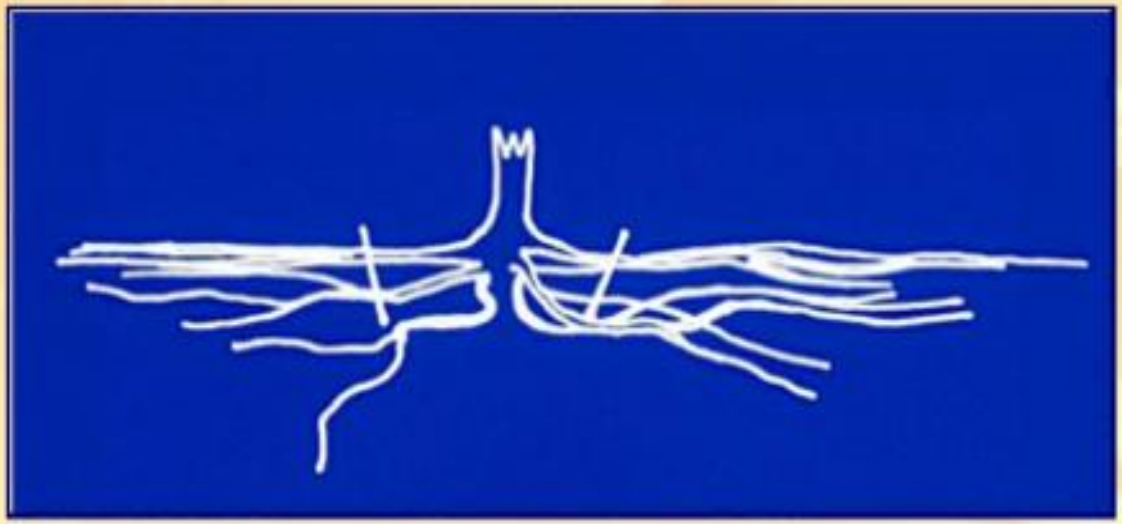
Bend below the horizontal



Increase lateral branching
Buds at highest point break
Decrease terminal growth

Apple Limb Spreading

Root pruning field grown trees



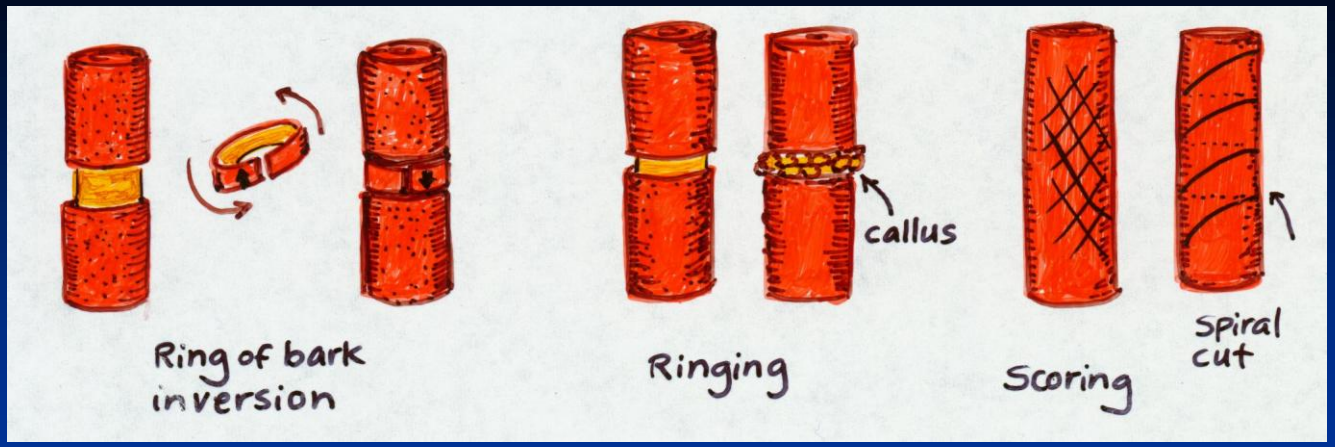
- Root pruning can increase root density in the root ball
- Pruning roots on two sides of the tree as shown above can ensure that the tree will not fall over should a storm strike after pruning

Sample root pruning protocol for nursery production

- Spade root pruning was accomplished by slicing a square tipped balling shovel 36 cm (14 in) long into the soil at an angle similar to that of a mechanical tree spade
- North and South one-eigth circumference segments (12.5 percent of circumference each, totaling 25% circumference) were pruned in April 1999 20 cm (8 in) from the trunk and East and West one-eigth segments were root pruned in May
- Root pruning was repeated in August (NW and SE segments) and September (NE and SW segments) 27 cm (11 in) from the trunk
- The bottom of the hand spade did not reach far enough into the soil to overlap adjacent slices so any roots growing directly down under the trunk were not cut

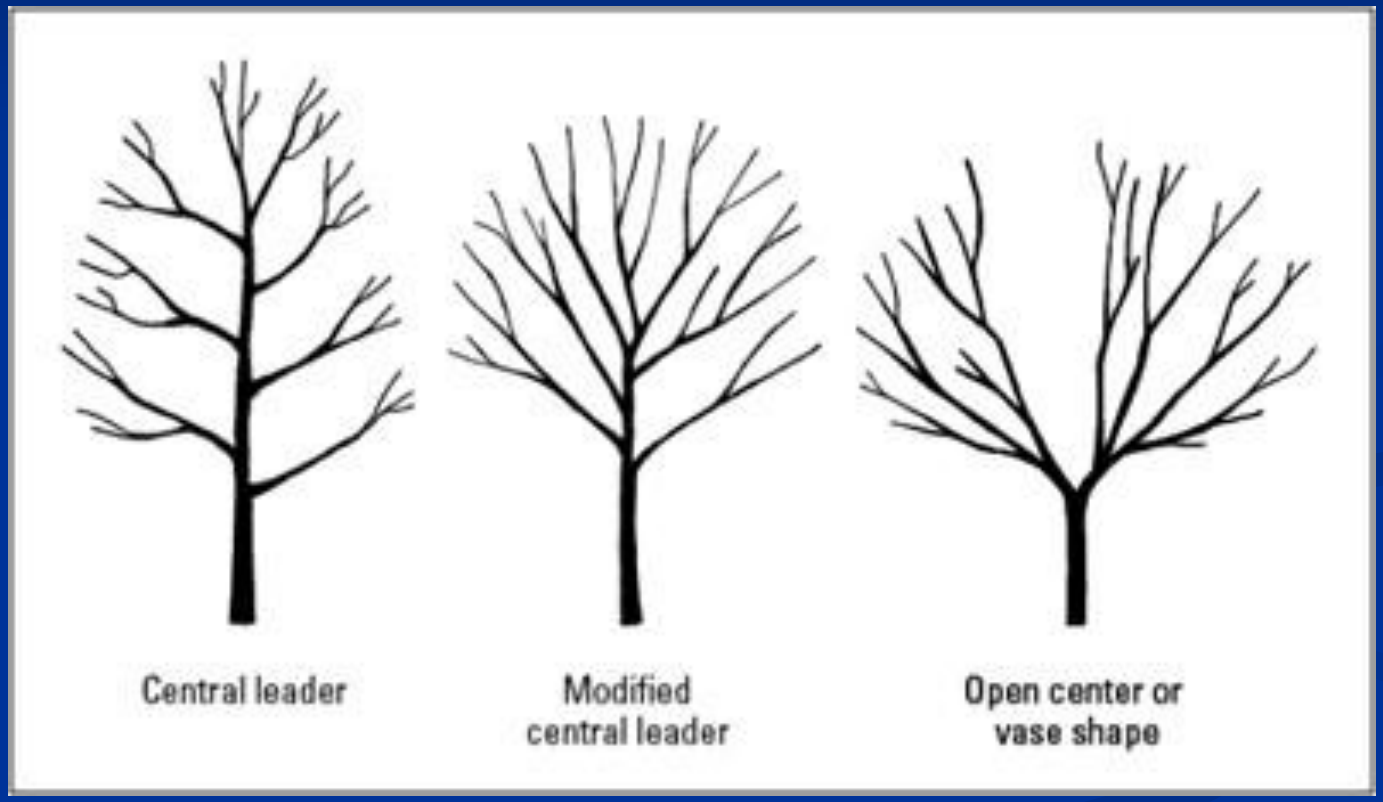
Root pruning increases root density in the root ball

- Root pruning can increase root density in the root ball and can help prepare the tree for survival in the landscape
- More small diameter roots and fewer large diameter roots result from root pruning
- This has been shown (Watson and Gilman) to increase transplant success compared to non-root pruned trees and compared to trees grown in containers



Force bud development. Sweet cherries have a tendency toward long, bare branches, devoid of fruit. Cutting a notch through the bark to the inner hardwood just above a dormant bud often stimulates the bud to grow, a technique that can be used to encourage low, fruitful branching. Eventually these buds along the trunk and branches will die if they aren't stimulated. So it's best to do your notching early on wood no older than two years

Fruit Trees Training



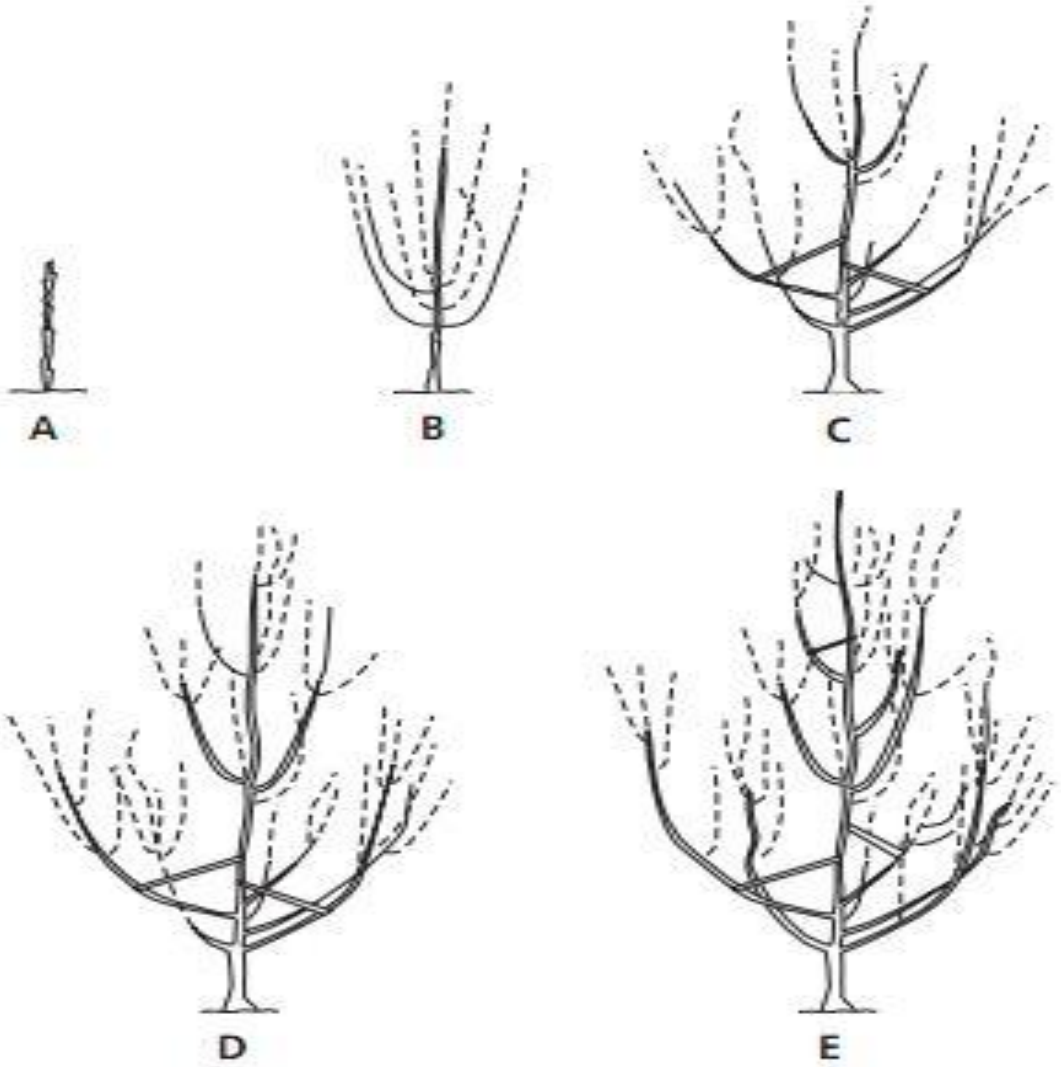
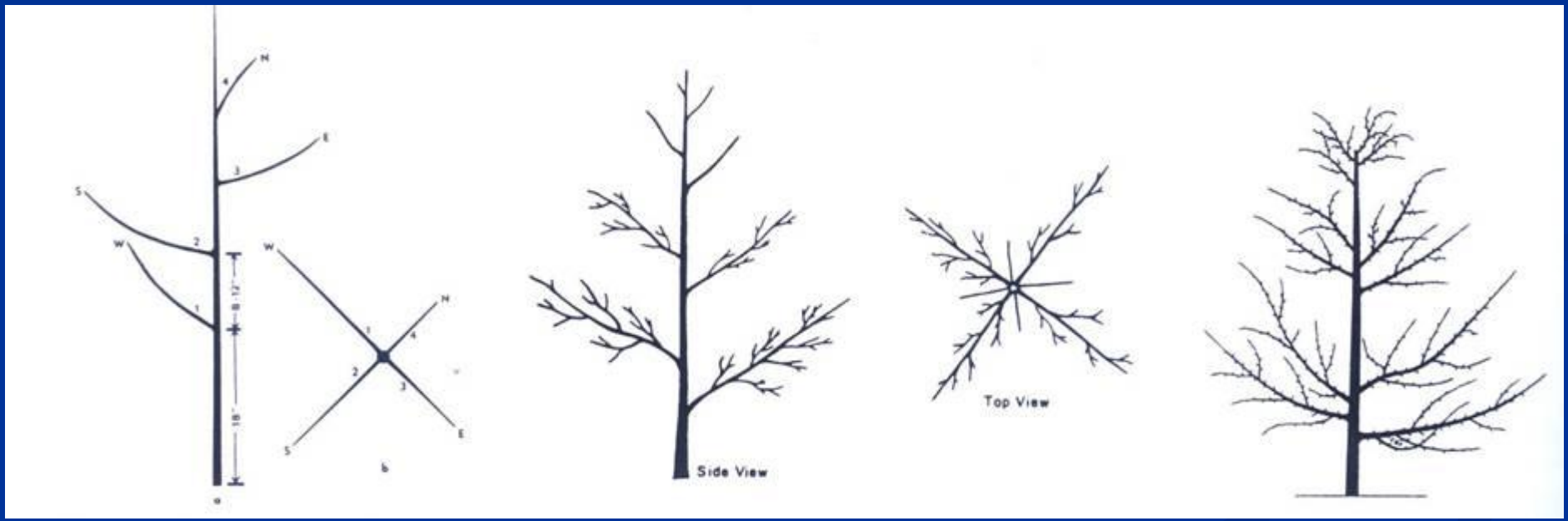
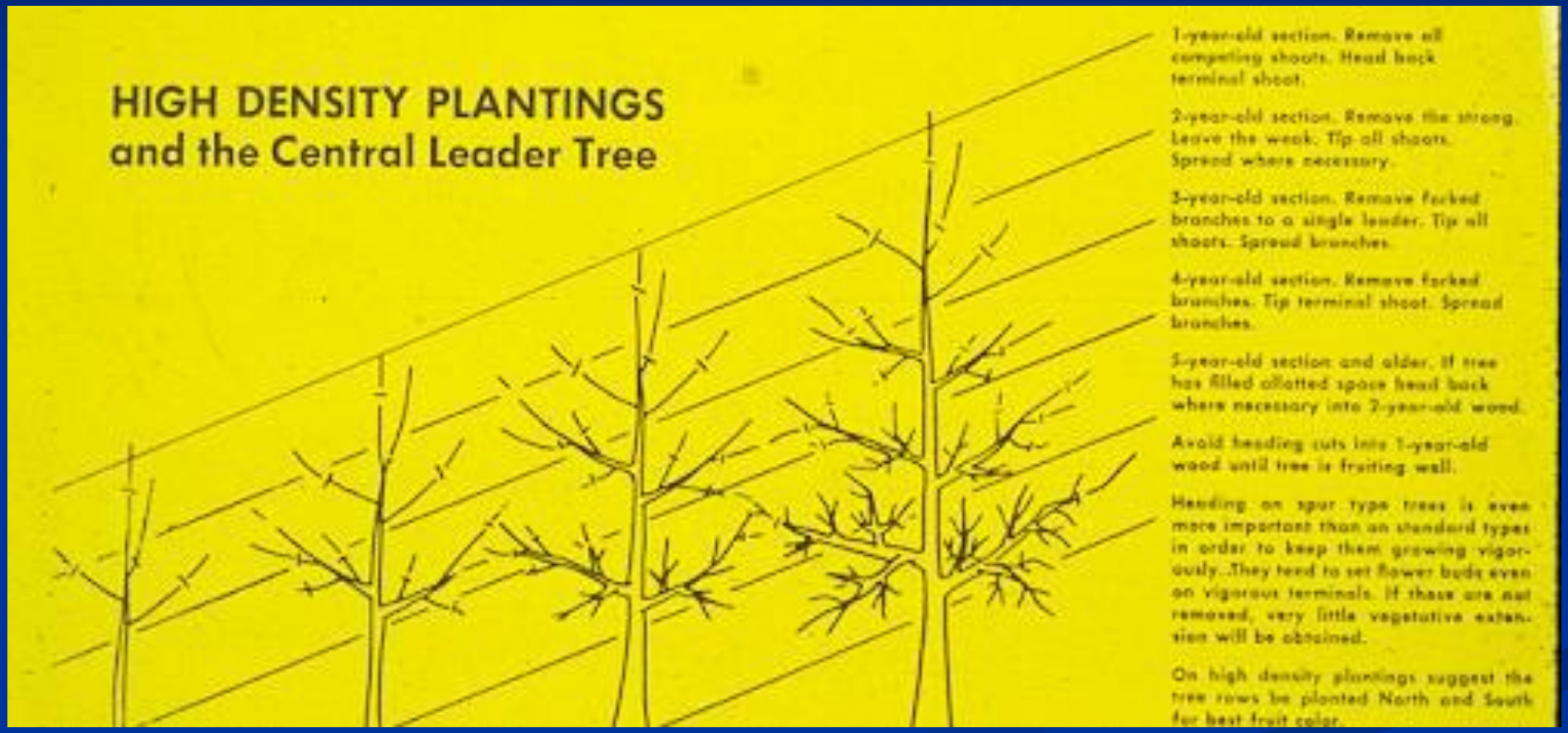


Figure 2. Central leader pruning method. (A) Bare root tree at planting time. (B) First tier of scaffold branches and reestablished central leader. (C) First tier of branches staked into desired position as second tier of branches is established. Branches developed in the third (D) and subsequent (E) years are spaced evenly around and up the central leader. Note the 45° angle of branch attachment formed by using spreading bars.

Apple Central Leader Pruning

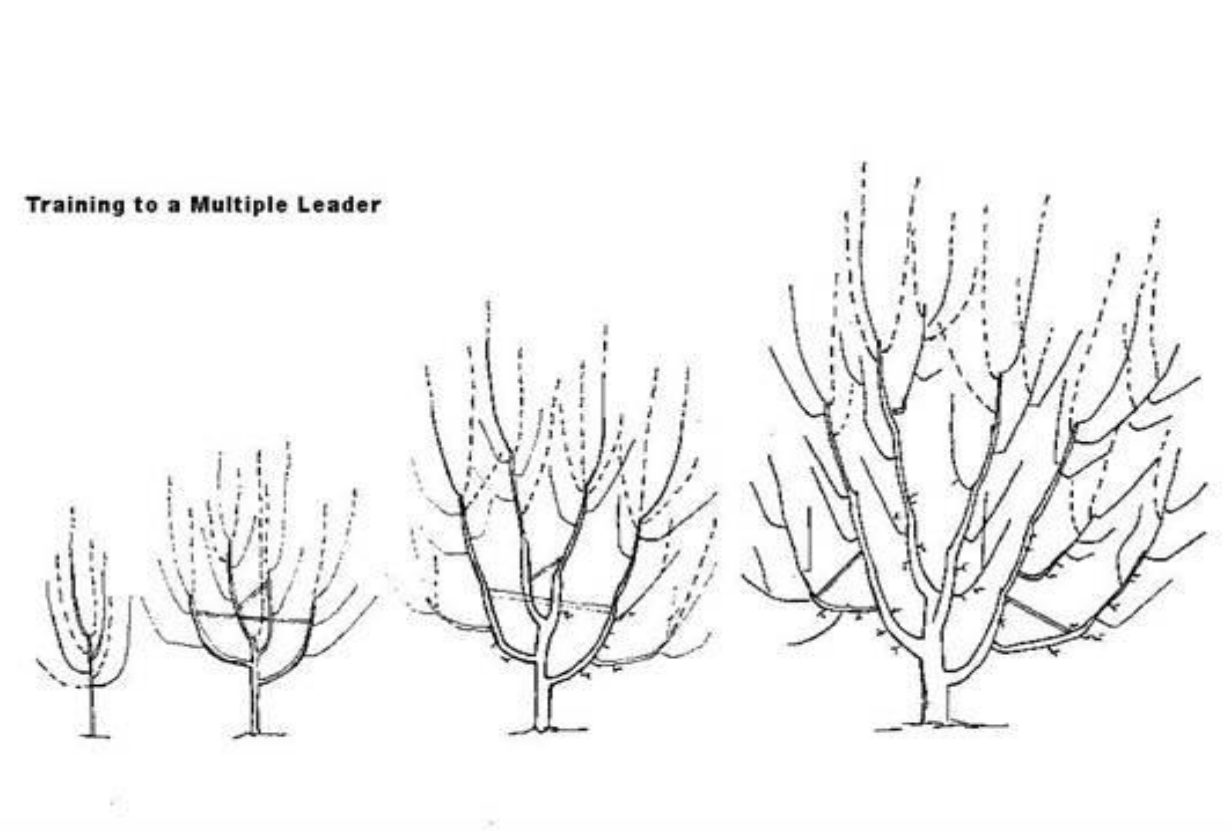


Apple Pruning

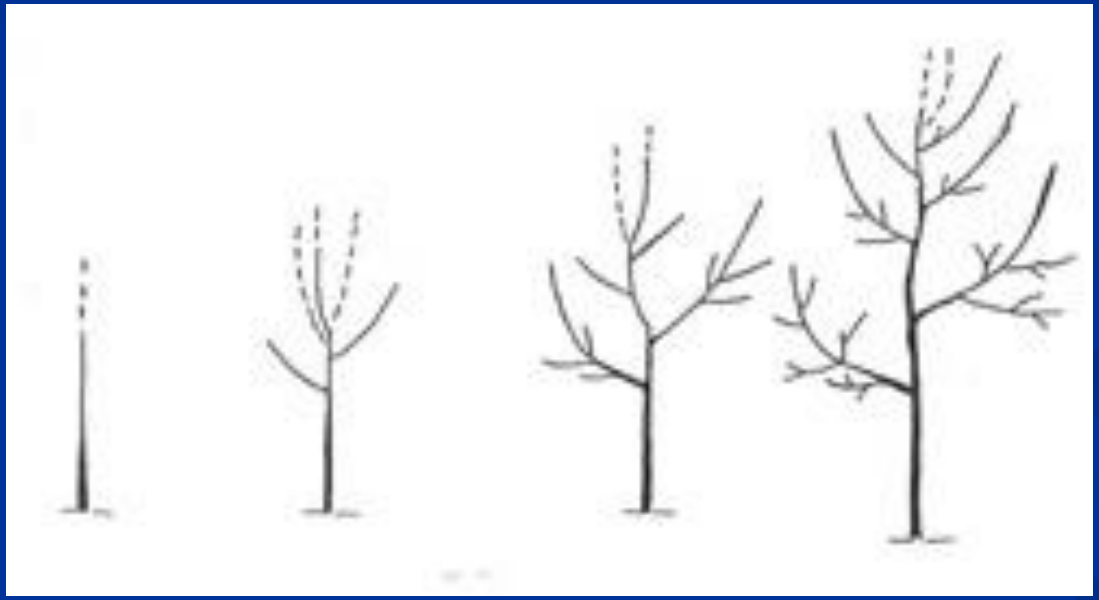


Central Leader Tree

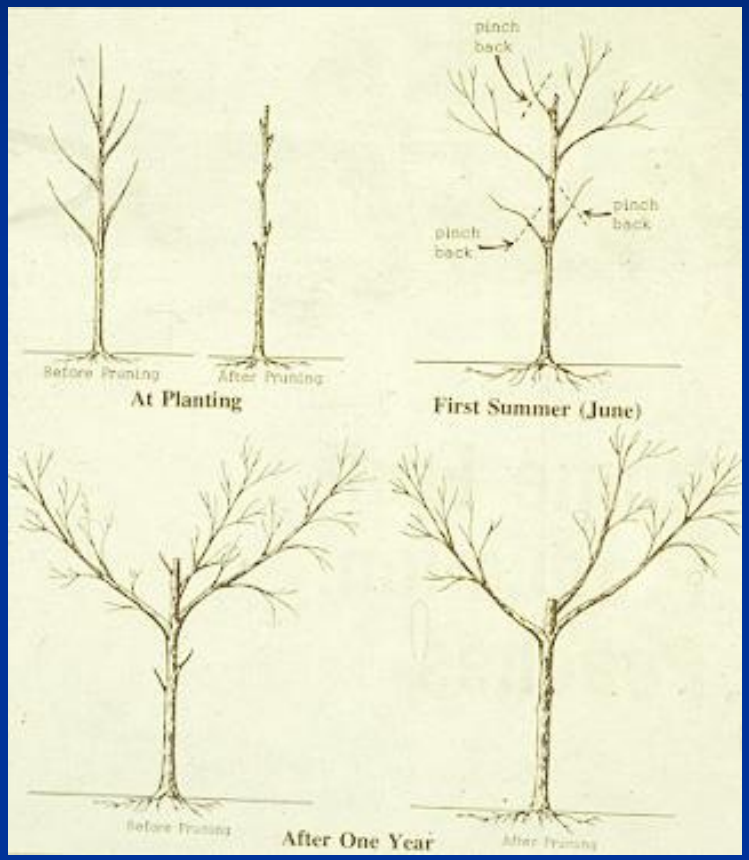
Pear Pruning – Multiple Leader

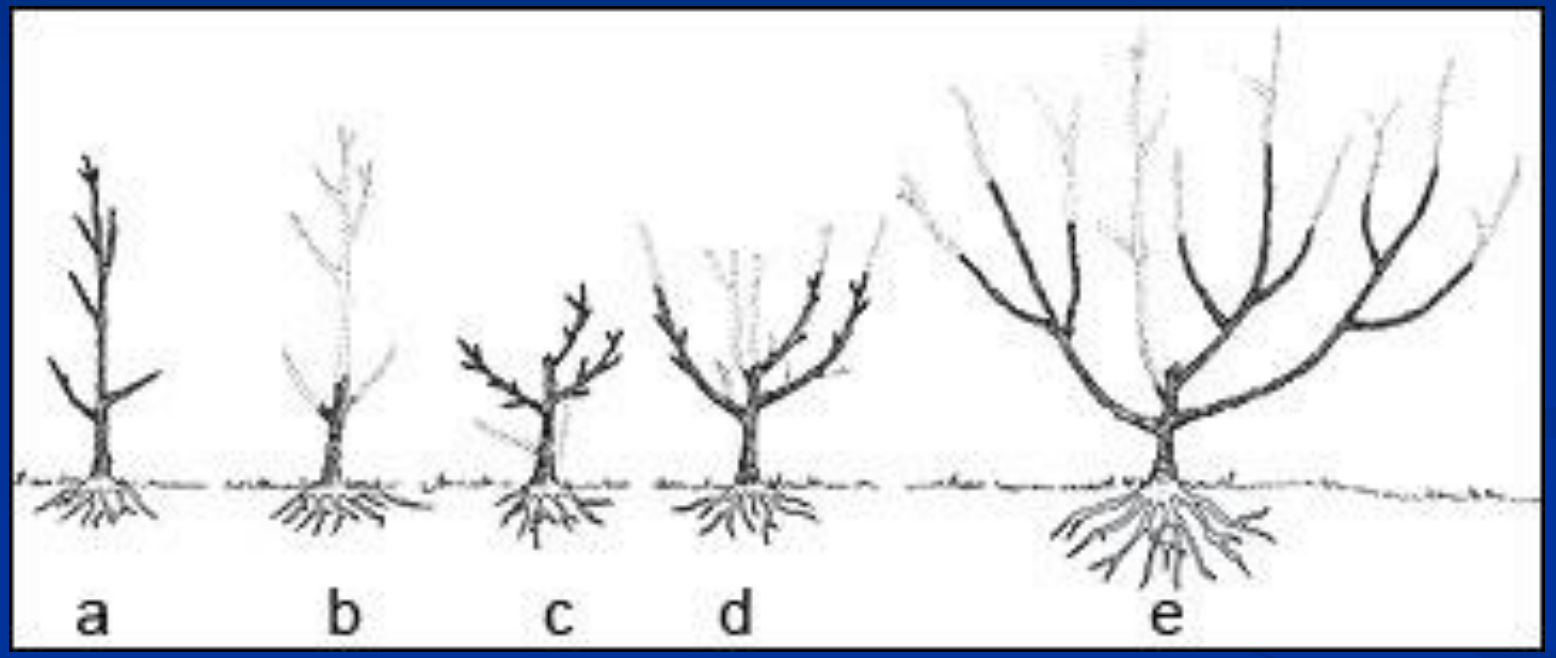


Modified leader

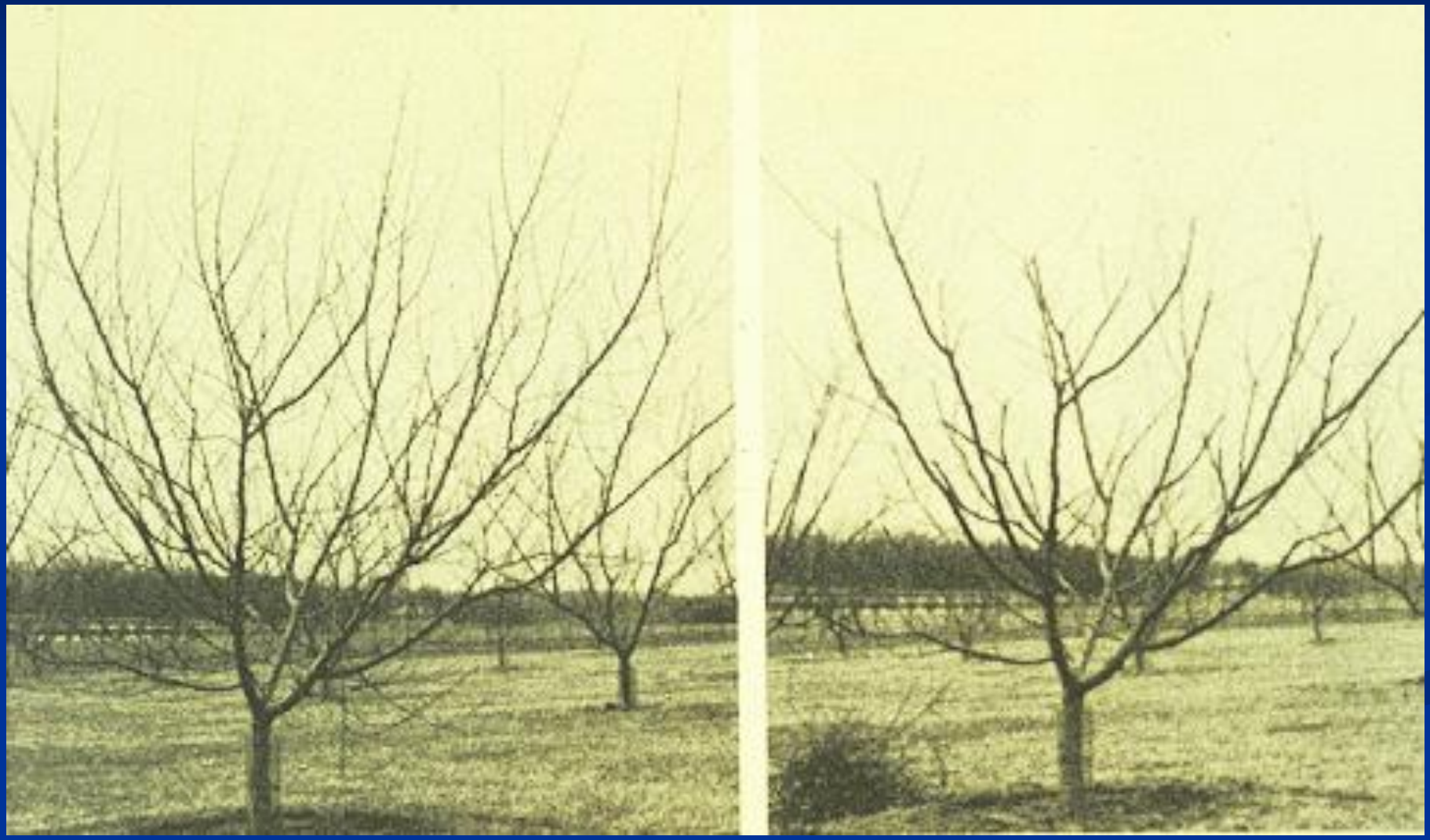


Peach Pruning – Open Center or Vase




a
b
c
d
e

Peach Pruning



Peach Pruning

Peach Pruning

Peach Pruning

Table 1. Fruiting wood characteristics and pruning of fruit trees

Type of tree	Location of fruiting buds				Spur life (years)	Type of training system	Amount of pruning for mature trees
	On long shoots		On short shoot or spurs				
	Laterally	Terminally	Laterally	Terminally			
almond	minor	—	major	—	5	open center	light (thinning)
apple	minor	very minor	—	major	8–10+	central leader, open center, or modified central leader	medium
apricot	minor	—	major	—	3	open center	heavy
cherry, sweet	minor	—	major	—	10–12	open center	light
fig	major	—	—	—	bears on 1-yr and new shoots	open center or modified central leader	various
nectarine	major	—	minor	—	1–2	open center	heavy
peach	major	—	minor	—	1–2	open center	heavy
pear, Asian	minor	very minor	—	major	6–8	central leader or open center	medium to heavy
pear, European	minor	very minor	—	major	8–10	central leader or multiple leader	medium
persimmon	major	minor	—	—	bears on new shoots	modified central leader	light (mainly thinning)
plum, European	very minor	—	major	—	6–8+	open center	medium
plum, Japanese	minor	—	major	—	6–8	open center	heavy
quince	major	minor	—	—	bears on new shoots	central leader or open center	light (mainly thinning)
walnut	minor on young trees	major on young trees	minor on mature trees	major on mature trees	8–10	modified central leader	light (thinning)