Apple Tree Pruning Basics

DANIEL BECKER: DBE242@UKY.EDU

SMALL FRUIT AND VEGETABLE EXTENSION ASSOCIATE

DEPARTMENT OF HORTICULTURE, UNIVERSITY OF KENTUCKY

Reasons for Pruning

Reduce tree size

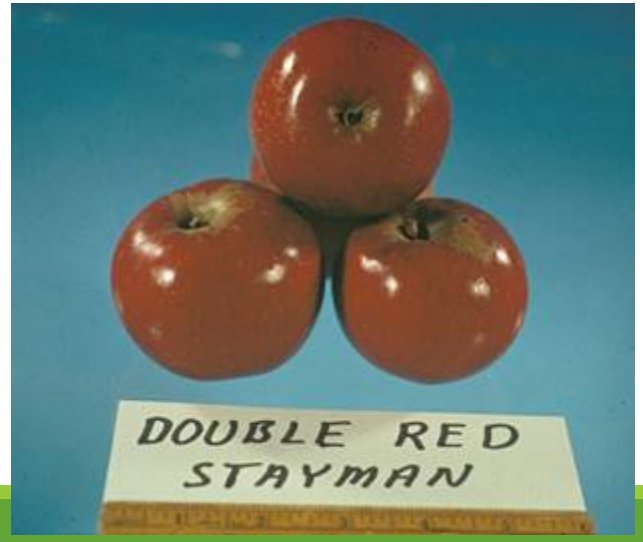
Control tree shape

Make trees structurally strong

Reasons for Pruning

Improve light penetration

- Flower bud initiation
- Fruit color
- Disease/pest control



Reasons for Pruning

- Removal of diseased wood
  - Fruit rot control

Fire blight

Black rot
Bitter rot
White rot

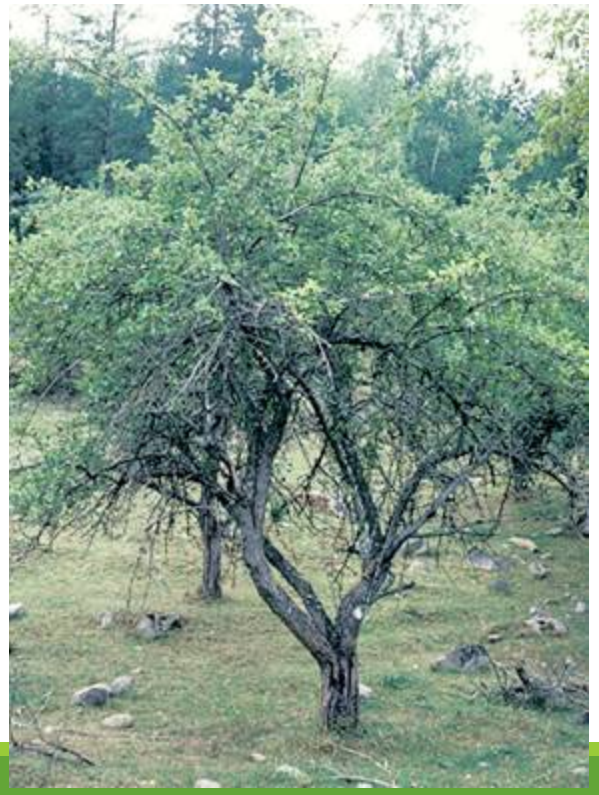
Reasons for Pruning

Partially reduce crop load

Facilitate cultural operations

Reasons for Pruning

Keep the crop close to the ground



Prune when Dormant

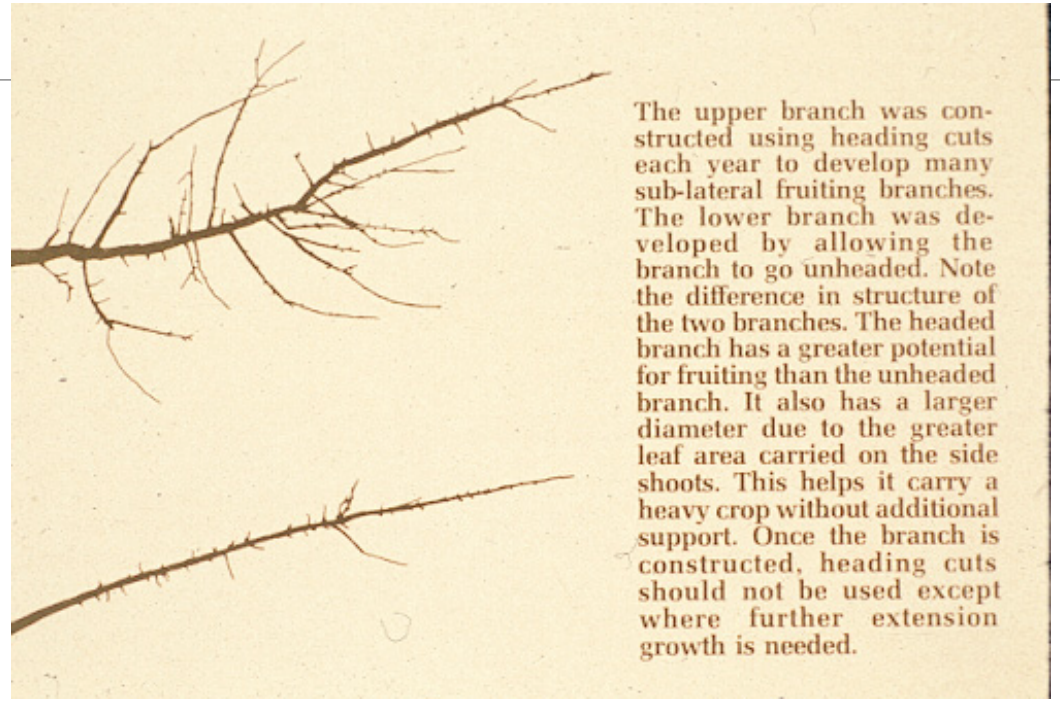
- February to bloom
- Prune from most to least cold hardy
  - Apple, pear
  - European plum
  - Peach, Asian plum, cherry
    - Peach – ok after bloom
- Prune old trees first
- Young trees last

Pruning too early increases possibility of winter injury

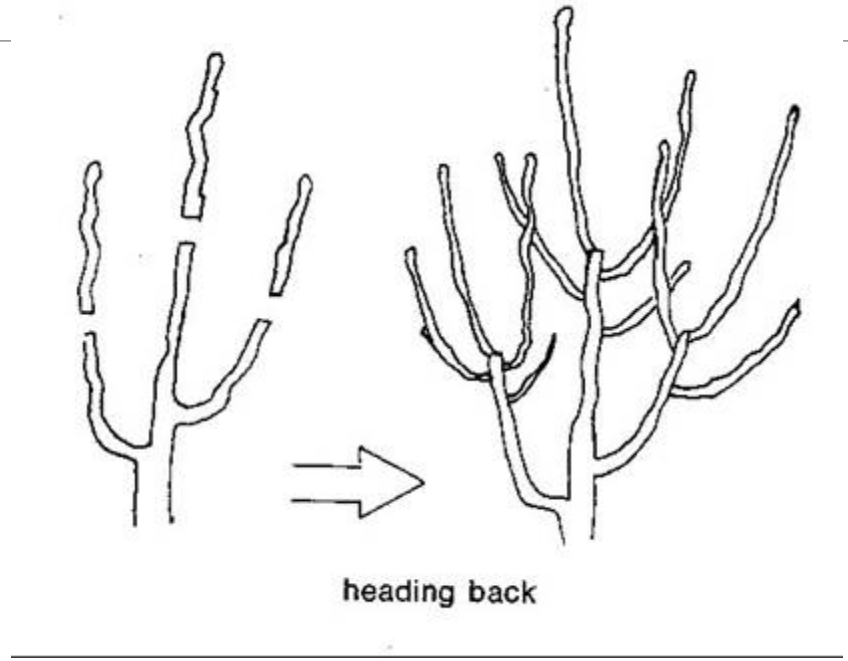
Pruning Equipment
(hand tools most economical for homeowner)

Plus, steady ladder for pruning larger trees

Heading-Back Cut



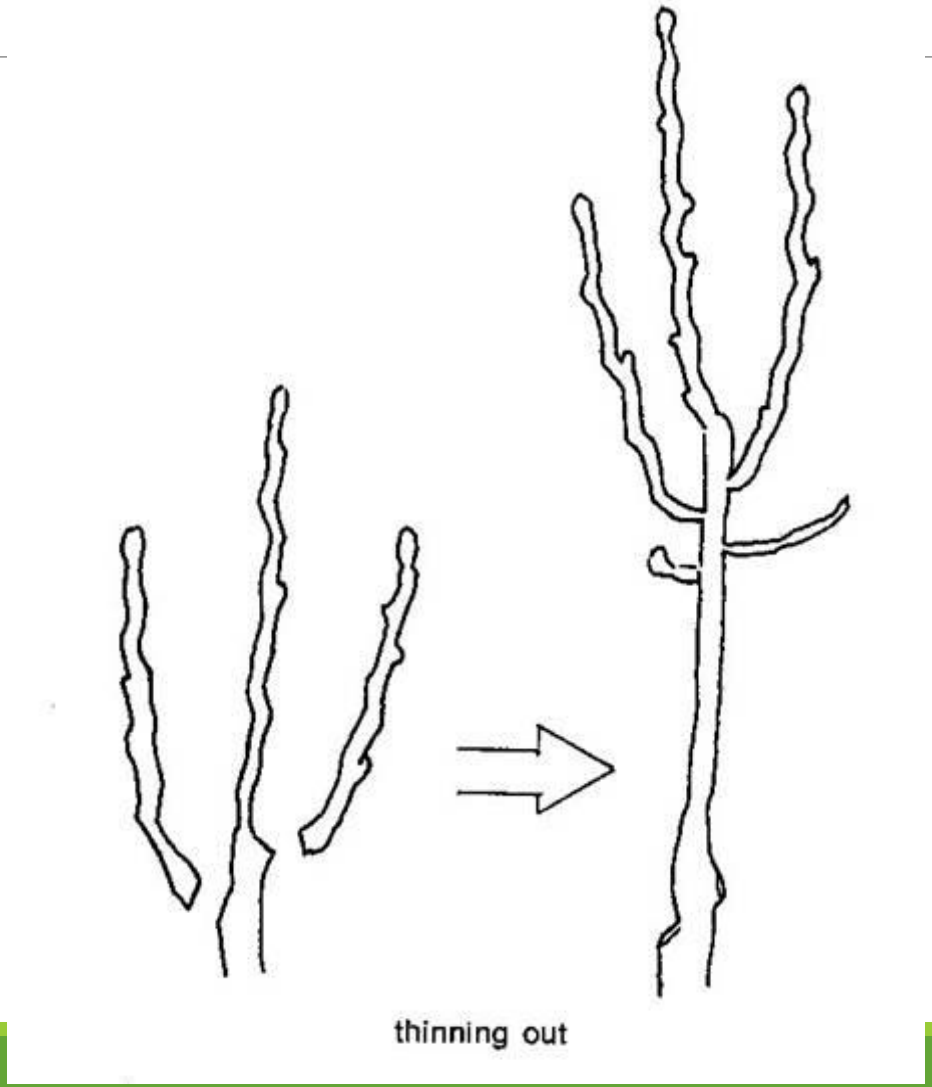
The upper branch was constructed using heading cuts each year to develop many sub-lateral fruiting branches. The lower branch was developed by allowing the branch to go unheaded. Note the difference in structure of the two branches. The headed branch has a greater potential for fruiting than the unheaded branch. It also has a larger diameter due to the greater leaf area carried on the side shoots. This helps it carry a heavy crop without additional support. Once the branch is constructed, heading cuts should not be used except where further extension growth is needed.



Removal of branch or shoot tips

- Stiffens and induces lateral branching
  - Dev. of structure (framework) – fruiting zone
- Change direction of growth by heading to a lateral

Thinning-Out Cut



- Removal of side branches
  - Directs growth to tip of shoot
    - Elongates w/out stiffening
    - Inhibits shoot growth
  - Improves canopy openness and light distribution

Avoid Leaving Branch Stubs

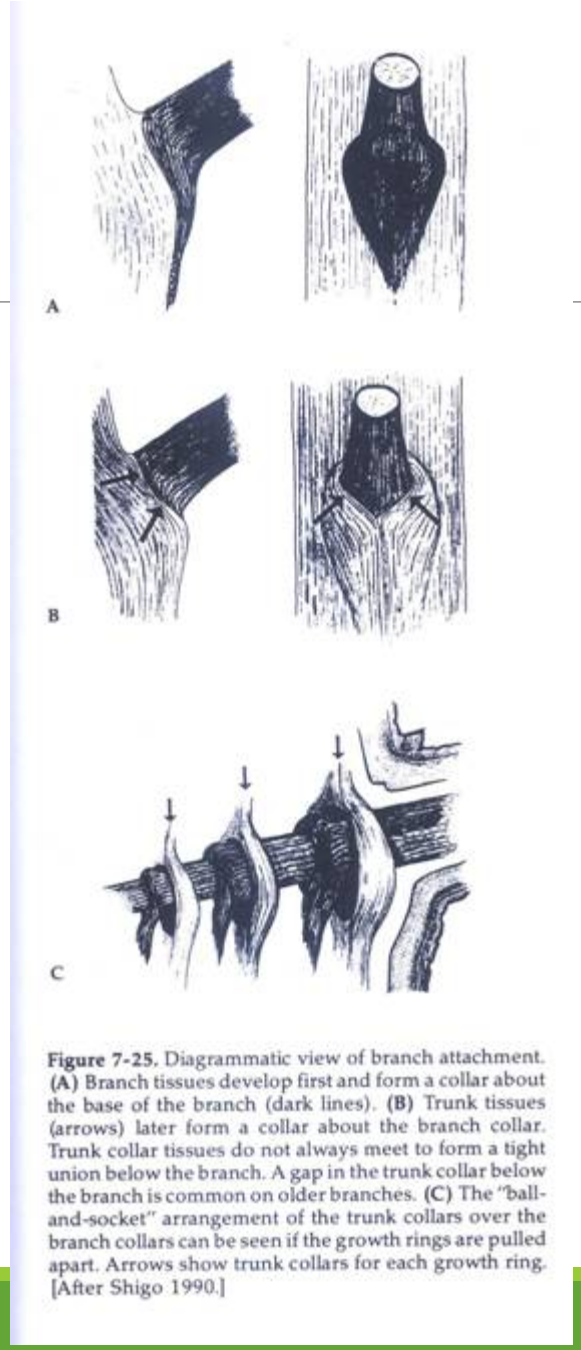


Figure 7-25. Diagrammatic view of branch attachment. **(A)** Branch tissues develop first and form a collar about the base of the branch (dark lines). **(B)** Trunk tissues (arrows) later form a collar about the branch collar. Trunk collar tissues do not always meet to form a tight union below the branch. A gap in the trunk collar below the branch is common on older branches. **(C)** The "ball-and-socket" arrangement of the trunk collars over the branch collars can be seen if the growth rings are pulled apart. Arrows show trunk collars for each growth ring. [After Shigo 1990.]

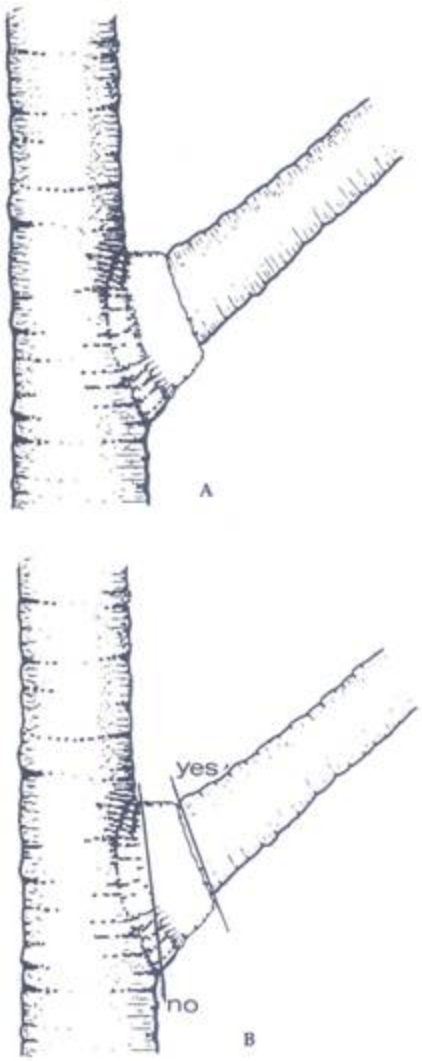


Figure 7-26. (A) Typical trunk-branch system, showing the branch collar superimposed on the trunk collar. **(B)** Proper pruning to retain the protective collar. The proper cut is just outside the branch collar. The improper "flush" cut passes through both the trunk and branch collars. [Redrawn from Stebbins and MacCaskey 1983.]

Best to make cuts as close as possible to the branch collar without leaving a stub

Flush cuts prod. larger wounds (near heart wood) which take longer to heal

Pruning Cuts Heal on Their Own

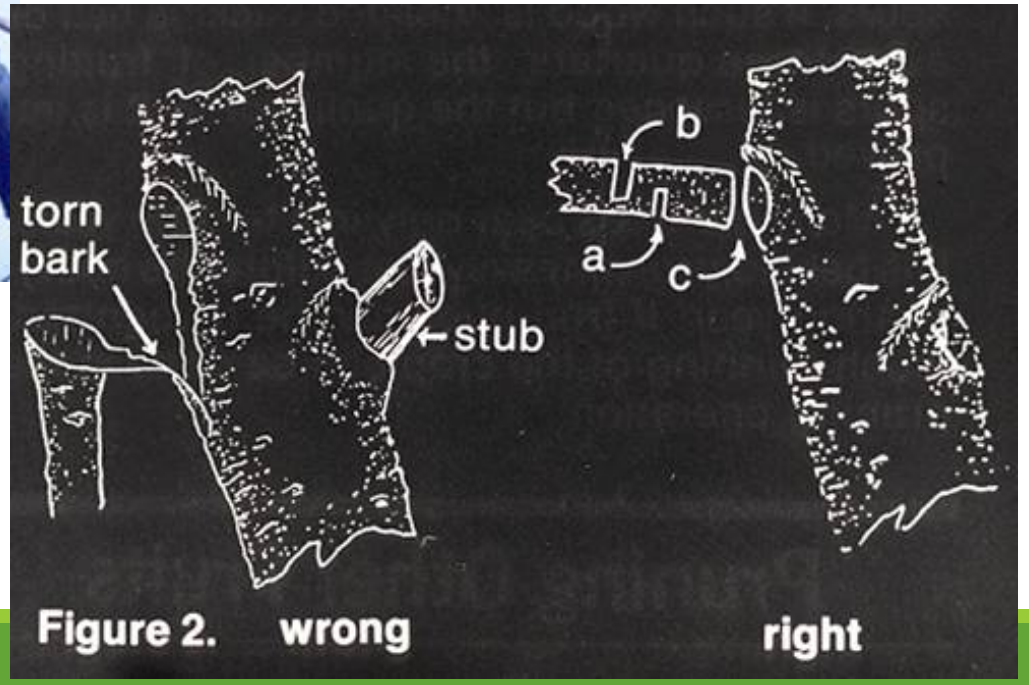
Pruning

When sawing larger limbs (esp. 2”+)

a) Make a short undercut beyond branch collar

b) Cut entirely though branch from above, outside of first cut (removes branch weight)

c) Make final cut, removing stub outside of collar



Pruning Terminology

Central leader: trunk of tree from which main scaffold limbs emerge

Crotch angle: the angle a limb or shoot makes with the trunk or larger limb

Rootstock: section of grafted tree below the graft union

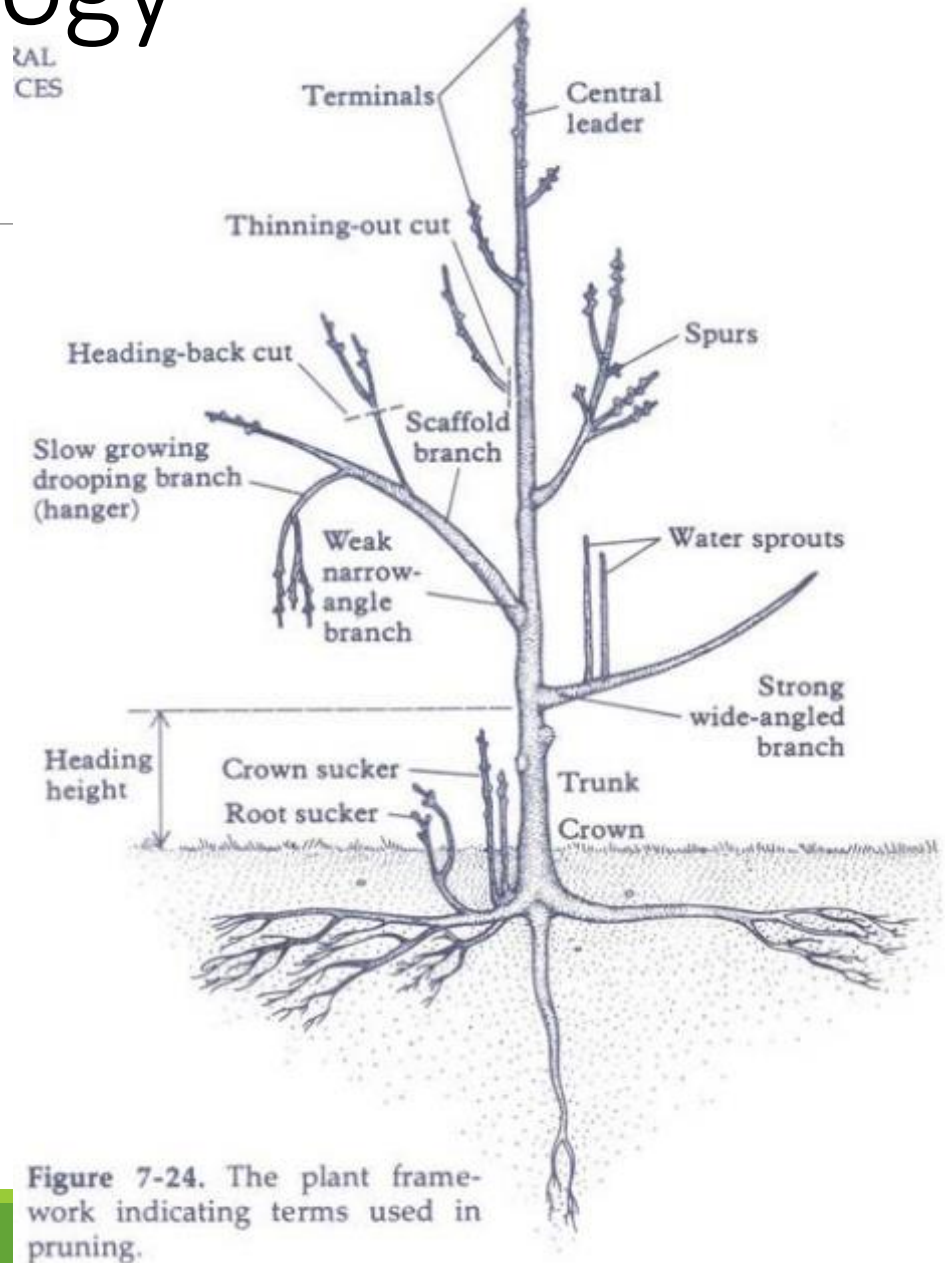


Figure 7-24. The plant framework indicating terms used in pruning.

Pruning Terminology

Scion: section of grafted tree above the graft union

Crown/root sucker: fast growing vertical shoots arising from below ground

Water sprout: fast growing, unproductive vertical shoots arising from branch or scaffold

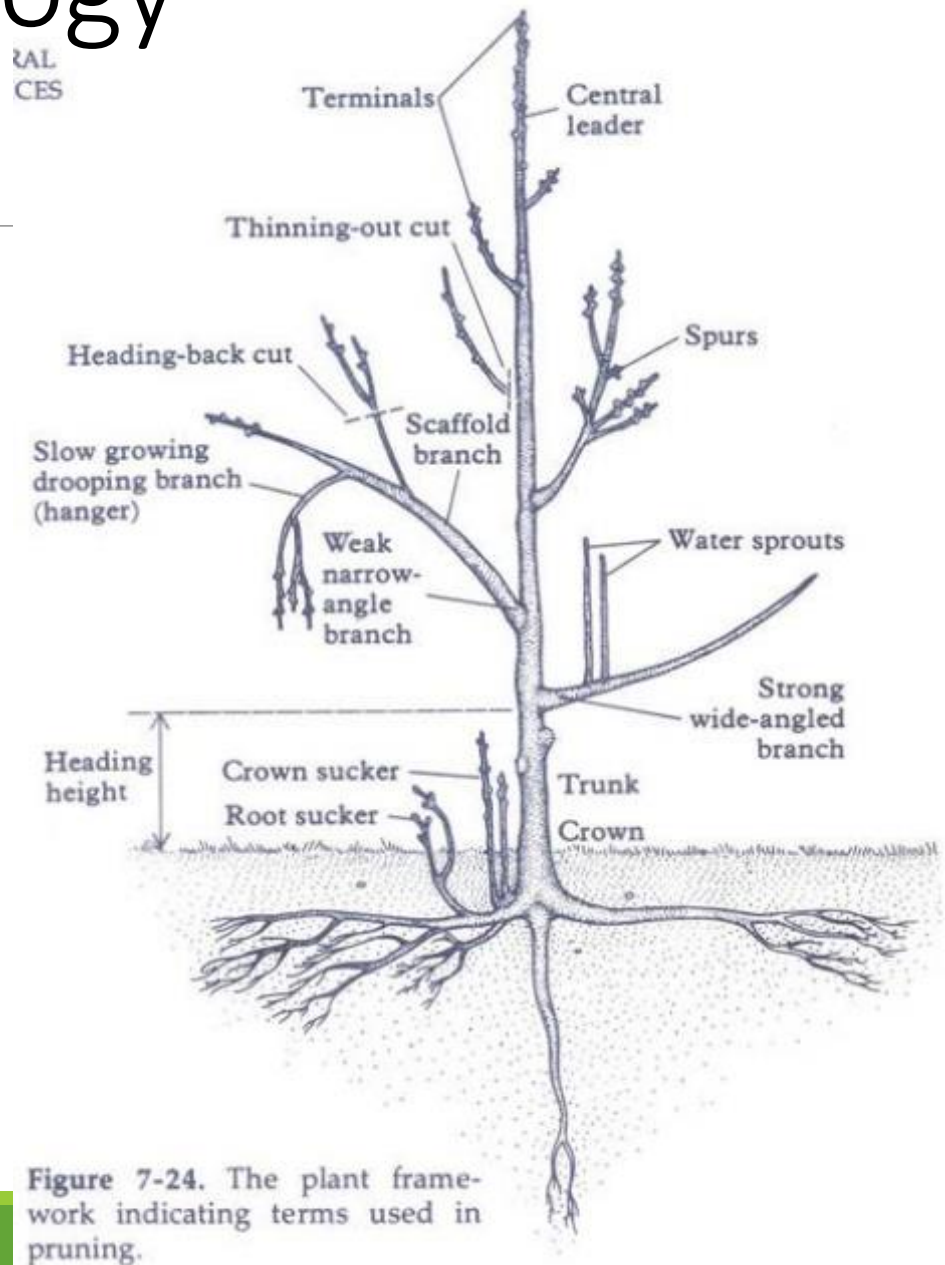


Figure 7-24. The plant framework indicating terms used in pruning.

Pruning Terminology

Scaffold Limb: major limbs attached to the main trunk

Shoot: past or current seasons annual growth

Spur: a short shoot that often terminates in a flower bud (usually 2-5+ years old)

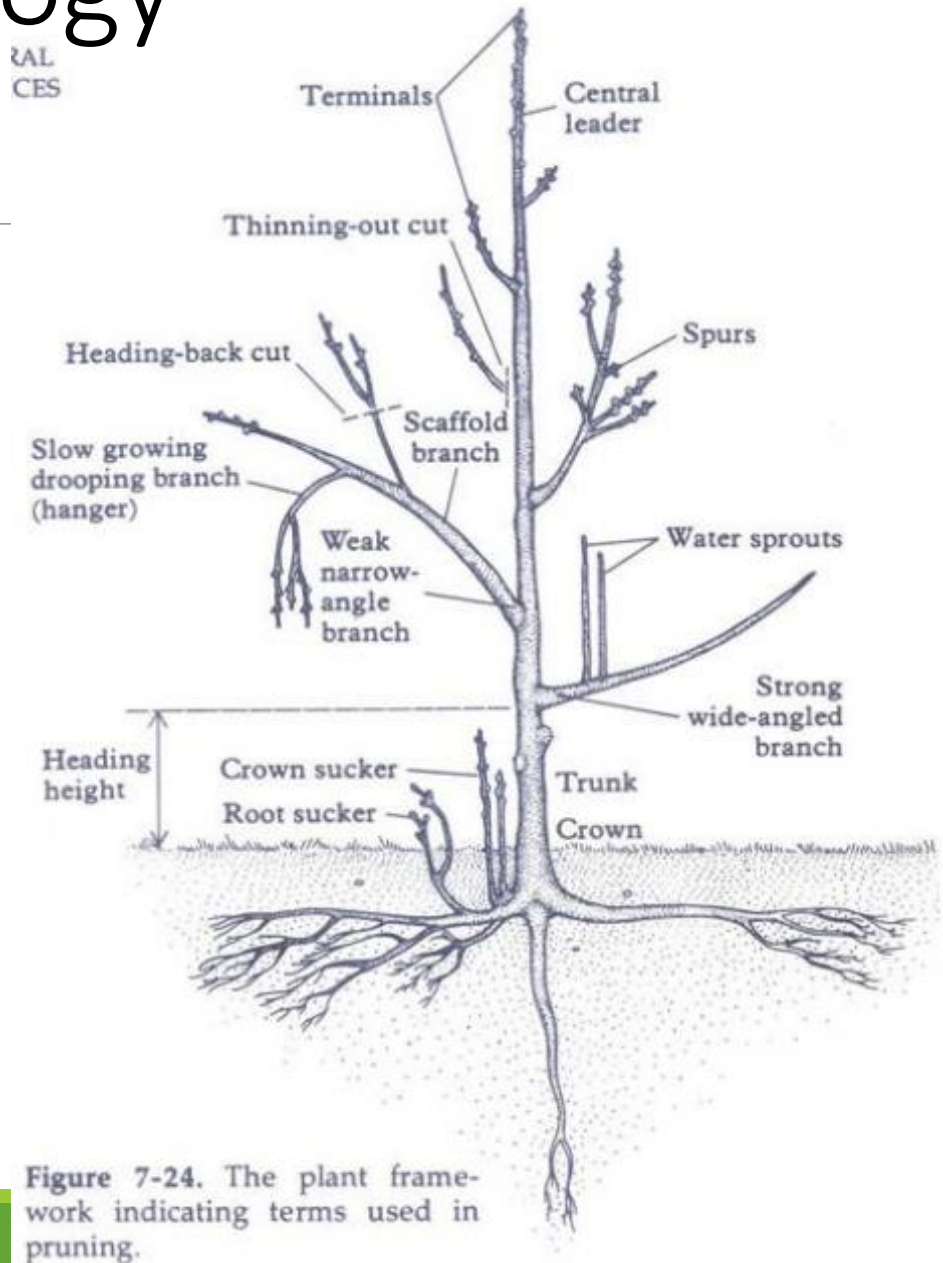
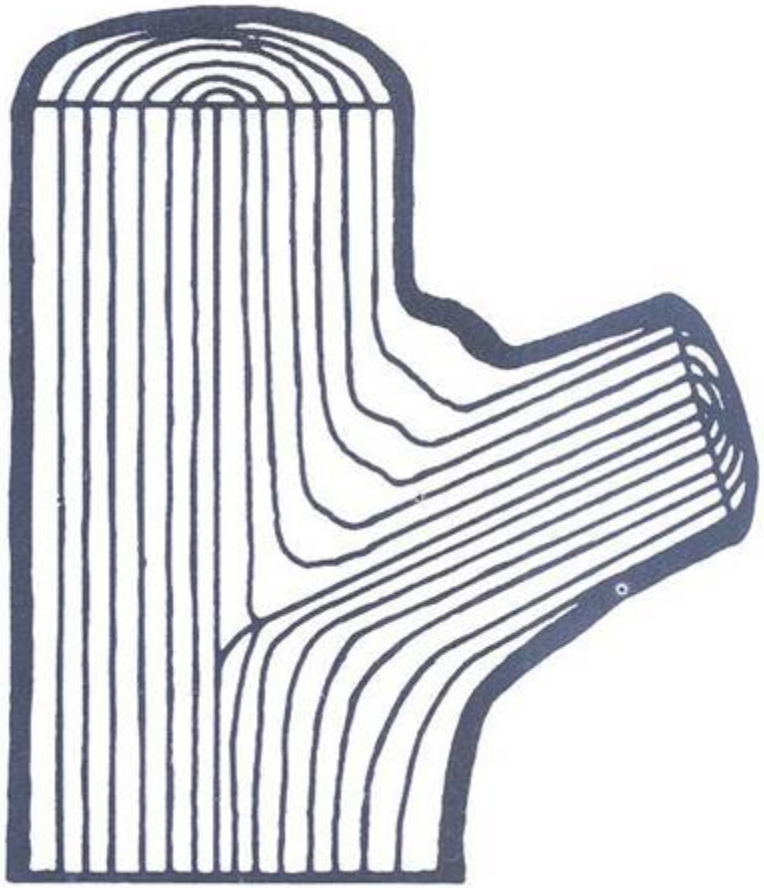


Figure 7-24. The plant framework indicating terms used in pruning.

Remove Narrow Branch Angles

(narrow branches create bark inclusions prone to splitting)



Strong

Weak

Remove Fire Blight

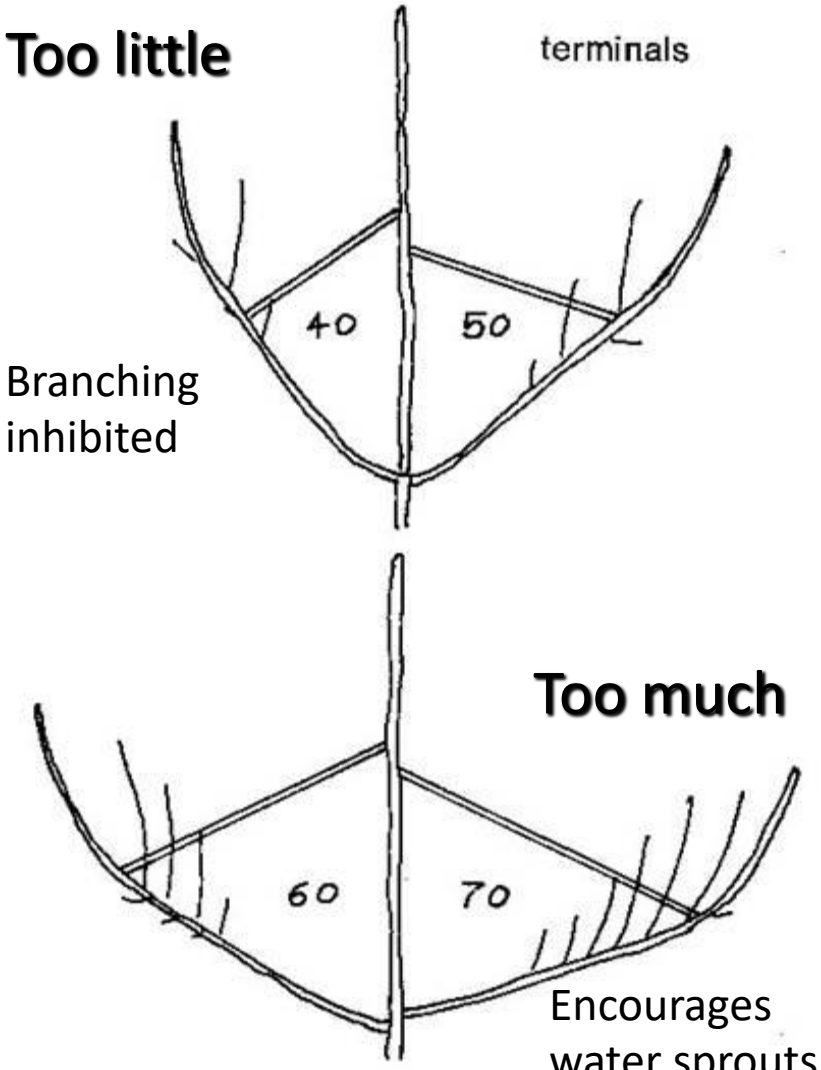
When pruning, cut 6-12” past canker

- Blighted shoots: blackened, retain dead leaves into winter
- Older cankers: dark, cracked, sunken appearance
- Spreads from old sites to new during flowering
  - Oozing → rain splash

Not transferred on pruners (in winter)

Autumn
Gala, M.7
EMLA

Branch Spreading



Encourages flowering, earlier fruit production

Opens tree up for sunlight and spray penetration

Reduces shoot and limb vigor

Branch angles bet. 45-65° from vertical optimal

Spreaders

Used w/all fruits

- Esp.: apples, pears, cherries

Made of plastic, metal, or wood

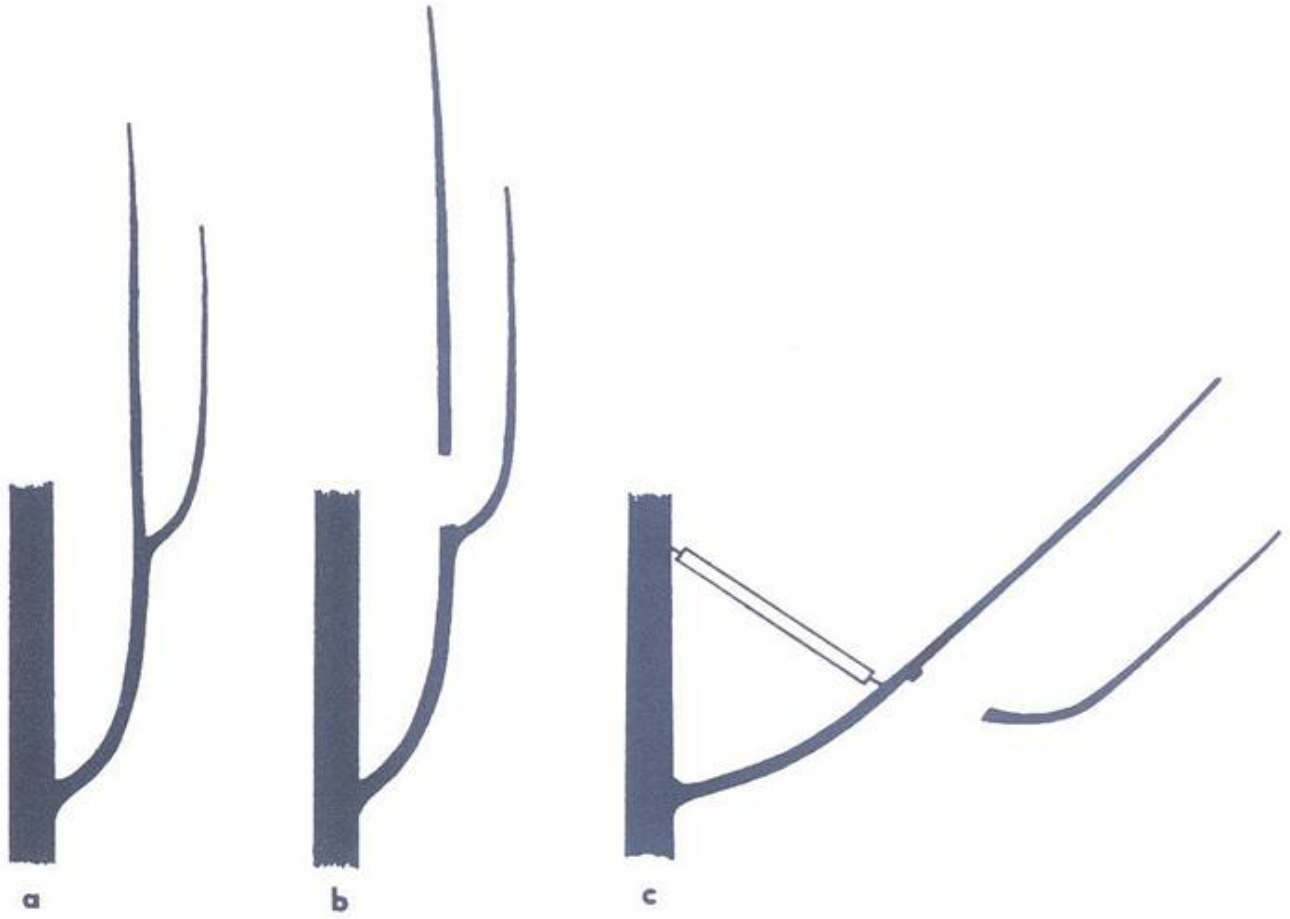
- Start early: toothpicks, clothespins

Make larger ones at home

- By notching ends of boards (1”x2”s)
- Nail ends of 1”x1”s, cut heads at angle

Removed after 1-2 months growth

Branch Spreading



Incorrect

Preferred method

b. Does not improve the branch angle, cut will result in vigorous vegetative growth

General Rules for Pruning Young Trees

Prune lightly

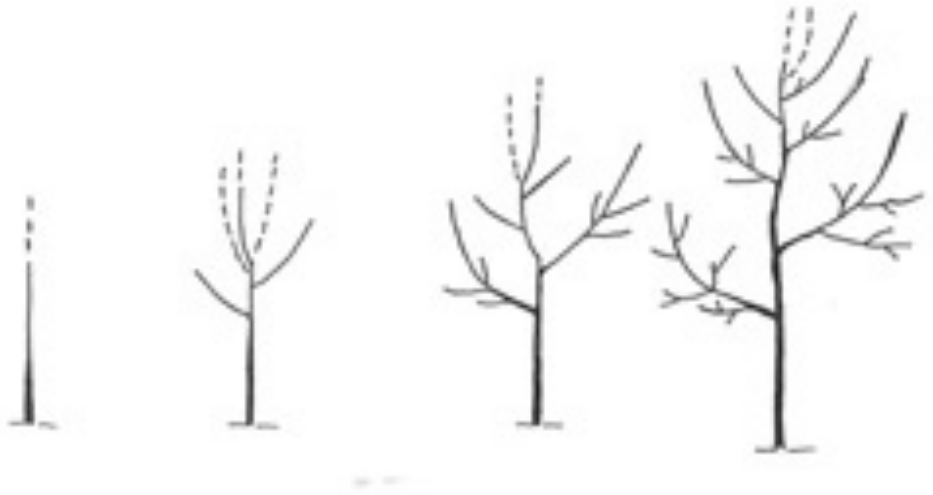
- Heavy pruning delays prod. (↓ yields in early years)

Prune only to:

- Prev. shoot crowding, shading (thinning out cuts)
- Promote branching (heading back cuts)
- Remove broken limbs
- Preserve desired shape

Proper pruning and training of young trees will help avoid the need for corrective pruning later

Vs.



Apple Bearing Habit Depends on Cultivar

Golden Delicious
Mix of terminal & lateral spurs
(standard-bearer)

Law Red Rome
Terminal spurs
mainly (tip-bearer)

Redchief Red Delicious
Spur type growth
(spur-bearer)

Apple Flower Buds

2 kinds of buds
- Vegetative – shoot/leaves only
- Mixed – inflorescence and basal/lateral vegetative buds

Flower bud usually borne terminally (+ determinate)
- Contains 5-7 flowers in cluster w. leaves
- Spurs – spur bearing
- On shoots – tip-bearing

Standard types usually have a mixture of spur and tip bearing
- Spurs mostly take 2 years to form

Apple Pruning – Central Leader

Minimizes zone of lowest light intensity (↑ bearing surface)

Central Leader – 1st yr.
(At planting)

Goal: develop early tree structure

- Use training more than pruning

For feathered (branched) trees

- Generally, don't head back central leader
- Unless needed – very large un-branched area
  - Cut ¼ of last yrs. new growth
    - Remove 2-3 buds below heading cut
  - Perform notching above selected buds

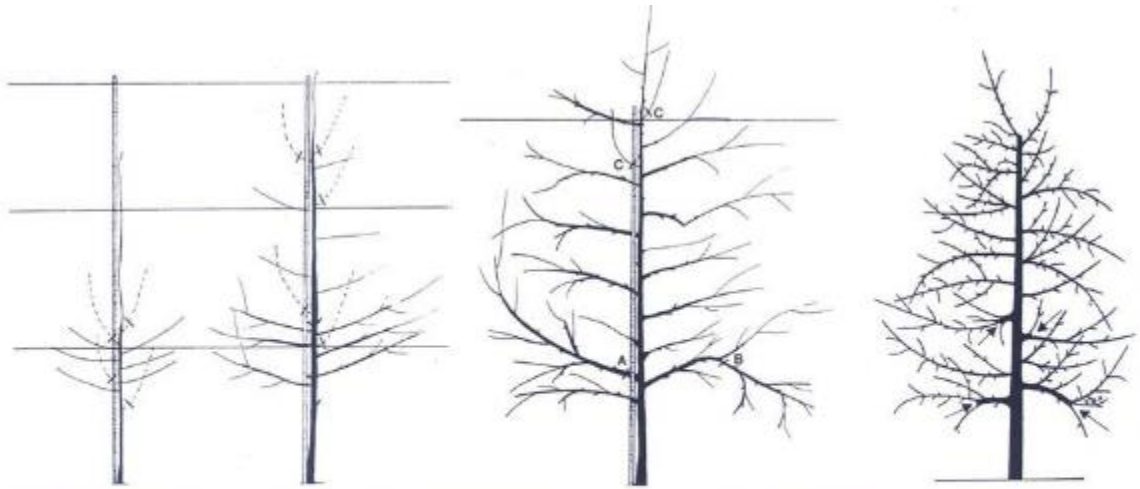


Figure 36. In the vertical-axis trained trees, thinning out cuts (by pinching) are used during the first and second leaf in summer (left). Poorly placed branches and vigorous uprights are removed to aid in training and reduce dormant pruning. (Third tree) Fourth or fifth year vertical-axis trained tree: At "A", this lower fruiting scaffold is too vigorous and has exceeded its allotted space; it is removed during the dormant season. At "B", this lower branch due to fruiting has become pendant; droopy growth is removed back to younger more horizontal branch. At "C", vigorous uprights competing with the leader are removed in summer, preferably when 4 to 6 inches long. Ultimate height of tree is 10 to 14 ft. (Fourth tree at right) Another mature version is shown; arrows indicate branch renewal. (First three trees, courtesy Barritt, 1988; fourth tree, Forshey et al., 1992).

“Notching”

Notching above bud to induce shoot growth around bud break (at silver tip stage or 2 wks. after best)

Central Leader – 1st yr.
(Feathered trees)

Retain 3-4 of the strongest limbs (in each whorl) for scaffolds

- If excess, remove ones w/narrow angles or weak/damaged
- Spaced evenly around center
- Lowest limb ≈ 3’ above ground

Head back competing limbs to below central leader height

- Conical tree shape

To Uniformly Head ("tip") or Not?

Modern variety vs. heritage ("antique")?

- Some older varieties known for difficulty with blind wood

Standard bearer vs. tip or spur types?

Homeowner vs. commercial?

- Is early bearing important?
- High yields?

Central Leader – 1st Year Nursery Whips

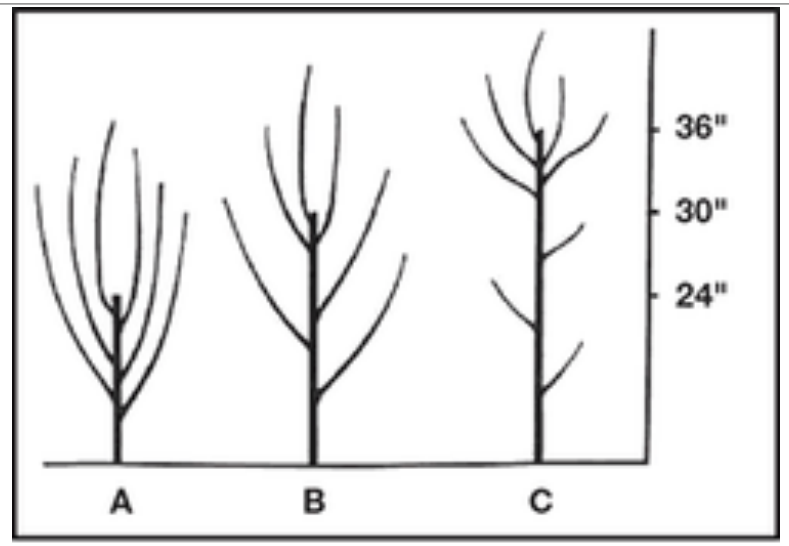


Figure 4.3. Response of trees to different heading heights: (A) the cut is too low; (B) the cut is at the proper height of 30 inches; and (C) the cut is too high.

Photos courtesy: Penn State Extension

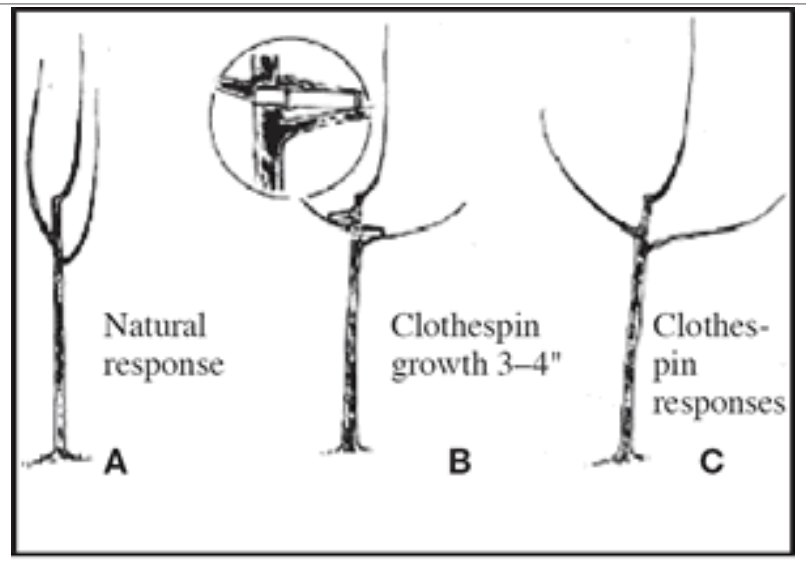


Figure 4.4. Natural tree growth (A); placement of clothespins (B); and tree response at end of the growing season (C).

Head leader to 36-42” (larger whips – use higher)

- Remember to remove 2-3 buds below cut
- Growing season - retain 3-4 of strongest scaffolds

Central Leader – 2nd and 3rd yr.

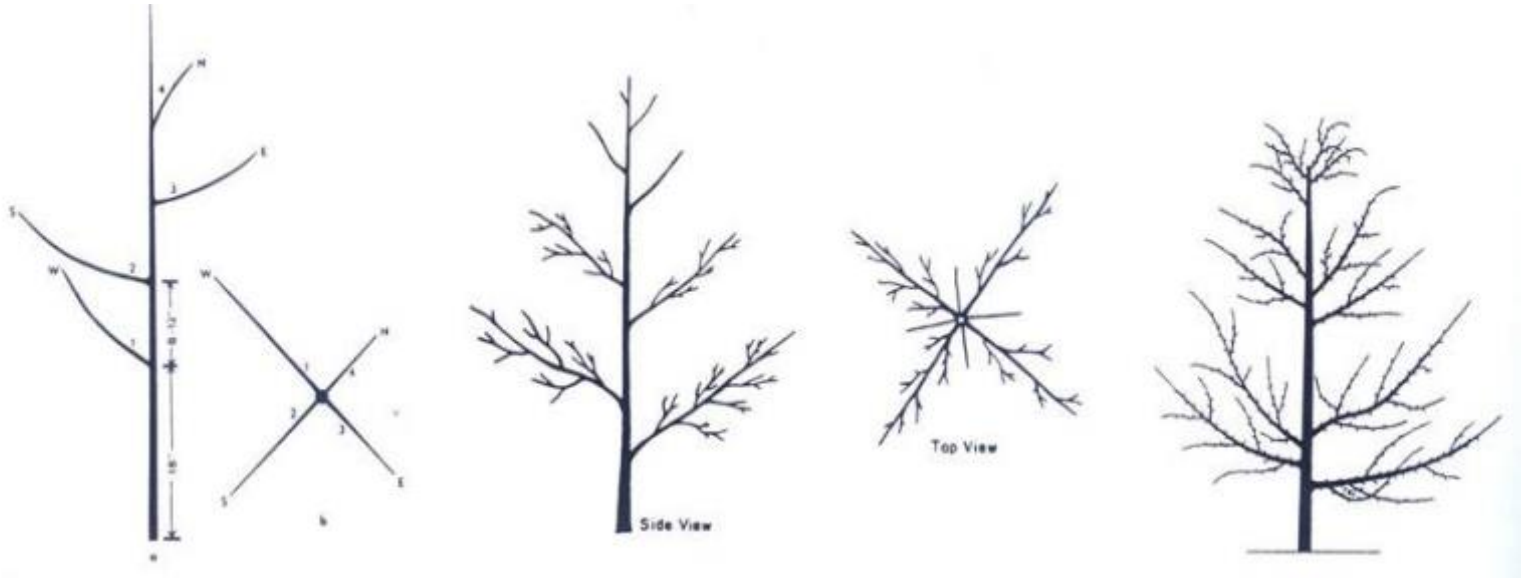
Spread or remove any narrow (≤45°) or improperly positioned scaffold limbs

- Limbs located directly above another should be separated by ≈ 2-3’ vertical distance
- Reduces shading and competition for light

Central Leader – 2nd and 3rd yr.

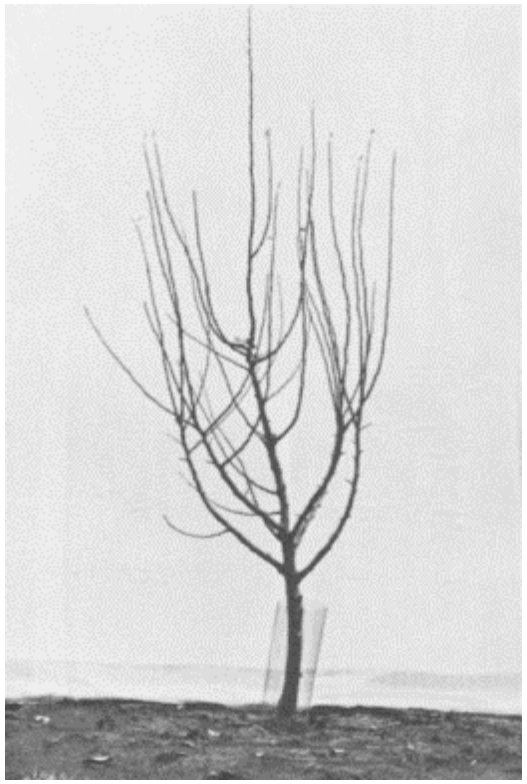
Scaffolds should form distinct whorls (look like wagon wheel from above)

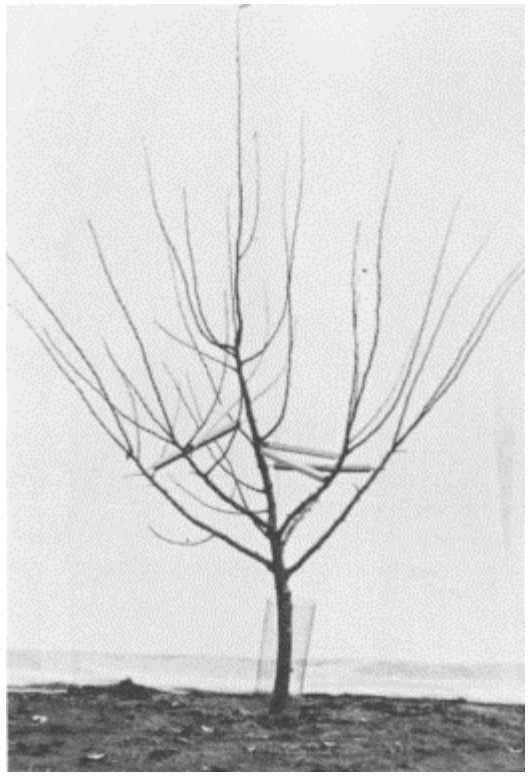
- Each whorl should have 3-4 scaffold limbs
- Avoid “choking”: w/> 4 limbs/whorl
  - May eventually restrict upward growth

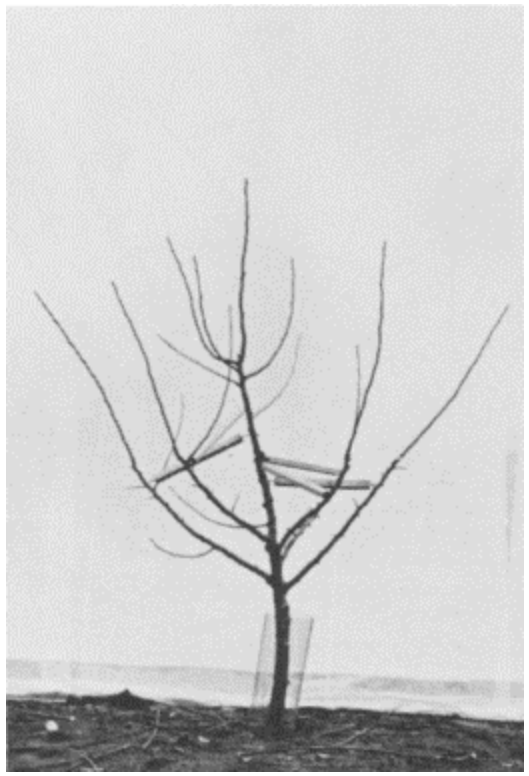


Apple Tree Training

Central Leader System – Second Growing Season

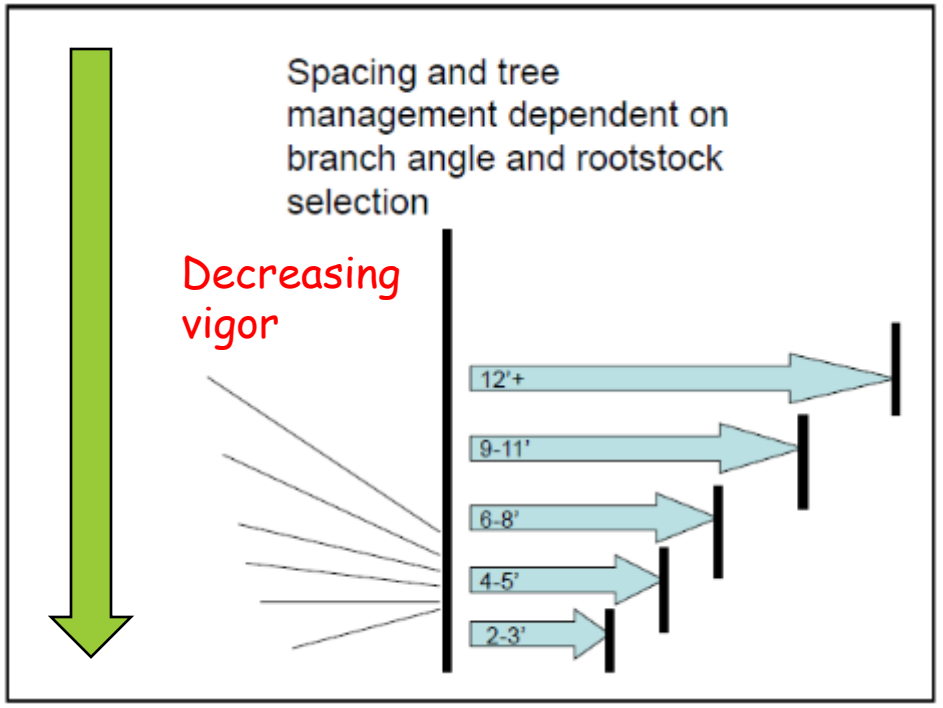






Photos courtesy: Ohio State University

Smaller Trees can have Flatter, Closer Branches



More dwarfing rootstocks

- B. 9, G.41, G. 11, etc.
- 30-50% size class, 8-12’ tall
- Less vigor, greater fruiting pot., prod. fewer water sprouts

Depending on the training system

- Vertical axis, tall spindle, etc.
- Branch spacings of 6-18” near or below horizontal (≈90°) OK

Cent. Leader – 4th yr. and after

Generally, don't need to head leader

- Encourages narrow angles, reduces fruiting
- Only when tree at desired height, remove leader to a weak (horizontal) branch

≈20% max (total surface area) wood can be removed each season

- 12-15" new growth desired
- Avoids removing too many spurs

Cent. Leader – 4th yr. and after

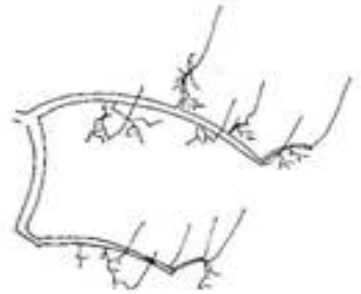
Selective thinning of

- Small branches near center
- Crossed limbs, water sprouts
- Weak hangers

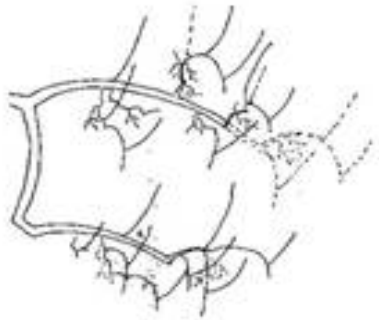
Maintain conical shape

- Prune progressively harder further up
  - Upper should not extend beyond lower
- Limbs ≥ 50% leader diameter removed by “Dutch cut”
  - All, except for 1st scaffold whorl
  - Limit: 2-3 large limbs/season max

1. The weak, pendulant spur systems of "umbrella trees" have little new shoot growth.

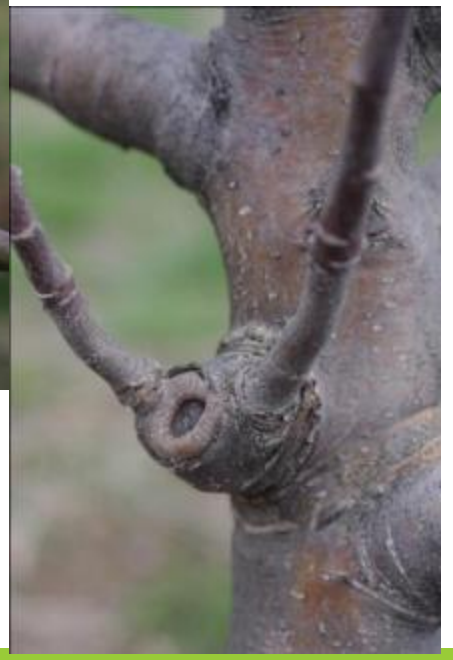


2. Removal of the lowest handing spurs and thinning the others stimulates shoots growth near the spurs.



3. Continue to remove hanging ends of brnahces to promote bearning on stout wood which can hold a heavy load of fruit.

“Dutch Cut”, AKA Bevel Cut



Mature Pruning Example

Unpruned tree

Assess the situation

- Form reasonable goals
- Think about pruning cuts to make
- Rationalize tree response

Focus on one scaffold at a time

Start at bottom or top of tree

- Bottom-up vs. top-down approach
- Depends on perception
- Prune harder going up vs. less going down

Eliminate competing scaffolds

This one is too close

- Shades and droops onto lower one
- Numerous rubbing branches

This branch extends too far out into row

Pruned back to weaker limb

- Oriented outward
- More horizontal

Vigorous limb left as "Kicker"

Fills space

- May develop spurs this year
- Fruit next yr.

Sink for energy

- Divert away from weaker
- Promote more spur prod. and branching

Shoot still hangs out into row

Need to shorten it

How much?

- What is the goal
- Weaker vs. stronger shoot growth
- Spur dev.?

Better leave it longer

Remove only 1/3-1/2 of prev. growth

- Weaker shoot response
- Spurs may still develop lower down

When in doubt

- Don’t head

Eliminate weak spur-bound limbs

As they age:

- Fewer leaves supporting more fruit
- Poor fruit

This one is pointed down near 180°

- Shaded above

Goal: evenly spaced limbs on scaffold

With fewer limbs directly up or down

Almost like a 2 dimensional mini-tree

- On larger 3-dimensional

Eliminate water sprouts

Or spread them

This one had good potential

- Spurs
- But, close to limb below

Eliminate water sprouts

Cut them close

Eliminate basal buds as much as possible

- Reduces regrowth
- But can take a few years to slow down

Move around tree

Locate other competing scaffolds

View from several angles

- Easier to notice
- Time to think

Choose one that is best to remove

Crowding most

Lots of suckers

Few fruit bearing spurs

Too upright angle, etc.

If too large for loppers

Use 3-part cut with hand saw

Does take longer to perform

But better to prev. damage

Finished cut

Make sure that final cut at the wound collar

Nothing else needed

- No paint/tar

Will “heal” on its own

Trim overhanging limbs

Shade lower scaffolds

Outside of desired cone tree shape

A couple of different options

To shorten scaffold

Which one to choose?

- Vigorous uprights vs. weaker, more horizontal

Choose less vigorous one

Weakens regrowth

- Promotes spur development

More vigorous one can be removed later

- As a “kicker”

Mature trees will have weak growth

Downward hanging

- Numerous spurs

Still important for prod.

- If overall # of spurs/tree limited

Trim to outward spur

When not wanting to remove totally

- Growth resp. weaker when cutting into older wood

Some spurs will return to vegetative

Still a # of competing scaffolds

Middle one

- Better angle
- But more water sprouts
- Fewer fruiting spurs
- Pretty close to lower scaffold

Still a # of competing scaffolds

Top one

- Horizontal, but below at end
- More fruiting spurs
- Good places to renew later

I chose to remove the middle one

Will make 3-part cut with hand saw

I chose to remove the middle one

Lots more open and see-through now!

Scaffold has a lot of water sprouts on it

Few spurs

In a good position

Want to keep it

This scaffold has a lot of suckers on it

Remove them as close as possible

Two competing shoots

Keep outward facing one

- Has a spur

Remove the inward one

Scaffold is pretty bare

Few limbs and spurs

Not going to be very productive

But good place for renewal in 1-2 years

Why not remove scaffold end?

Hangs, has # of pot. replacers

I left it because

- Some spurs
- Energy sink
- Gives time for future replacer to dev. spurs, lower vigor

Dutch cut replacement

Wide angled

Good number of spurs

- Especially for 1st year

Fruit will weigh it down

- If not, will use spreader

Keep removing those water sprouts!

No fruit

- Only shade

Spread the ones to keep

Weak hanger limbs can be renewed to an upright

Make sure its one of the smaller ones

This one has some spurs

Example of a strong shoot that was headed back

Lots of water sprouts!

- Few spurs

So stiff that it is diff. to bend

- Will most likely break

Better to just remove it

Shading lower ones anyway

3rd large limb so far on tree

- Will not take any more of that size

Still some spur thinning to do

This one is stronger

I will leave a few more for balance

Still some spur thinning to do

- 3 spurs remain
  - Should carry 3 to 6 fruits aft. crop thinning

I’ve done everything from the ground

Still a lot to do in the top of the tree!

Watch out for large diameter scaffolds

Greater than ½ diam. of leader

- Compete for dominance

Since 3 others removed

- Will leave - is little smaller than 1/2

Cut carefully

Not just because you are on a ladder

But also, be aware of important fruiting wood

- Helps devigorate growth

Eliminate forked scaffolds

Prone to splitting down middle

Choose weaker

More fruiting spurs

Eliminate forked scaffolds

Cut just at the wound collar

But still close enough to reduce water sprouts

Many cuts in treetop will be water sprouts

This is where most growth potential is

- Most apically dominant part of tree

Many cuts in treetop will be water sprouts

Makes a big diff. reducing shading

Can keep weaker ones

- Oriented bet. 60-90°

Continue thinning competing limbs

Spacing can be closer than lower down

- Because, younger and smaller
- Shade less

Continue thinning competing limbs

Still a little bit more to do

- But looks less crowded overall

This tree is tall enough!

Reached its max safe height

Difficult to prune and pick

Spray also

This tree is tall enough!

Has two competing leaders

If shorter might choose one

- Best branches
- Most spurs

This tree is tall enough!

But best to remove both

- Lower overall height
- Minimize dangerous care

In removing leader

Or other vigorous growth in top

- Leave no stubs!
- Magnet for water sprouts

Prune back only to weak, horizontal branches

After

Before

Know when to walk away

Probably several other cuts I could make

But the greater danger is in over pruning