Pruning—Understanding plant responses to an important management tool

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Pruning Practices

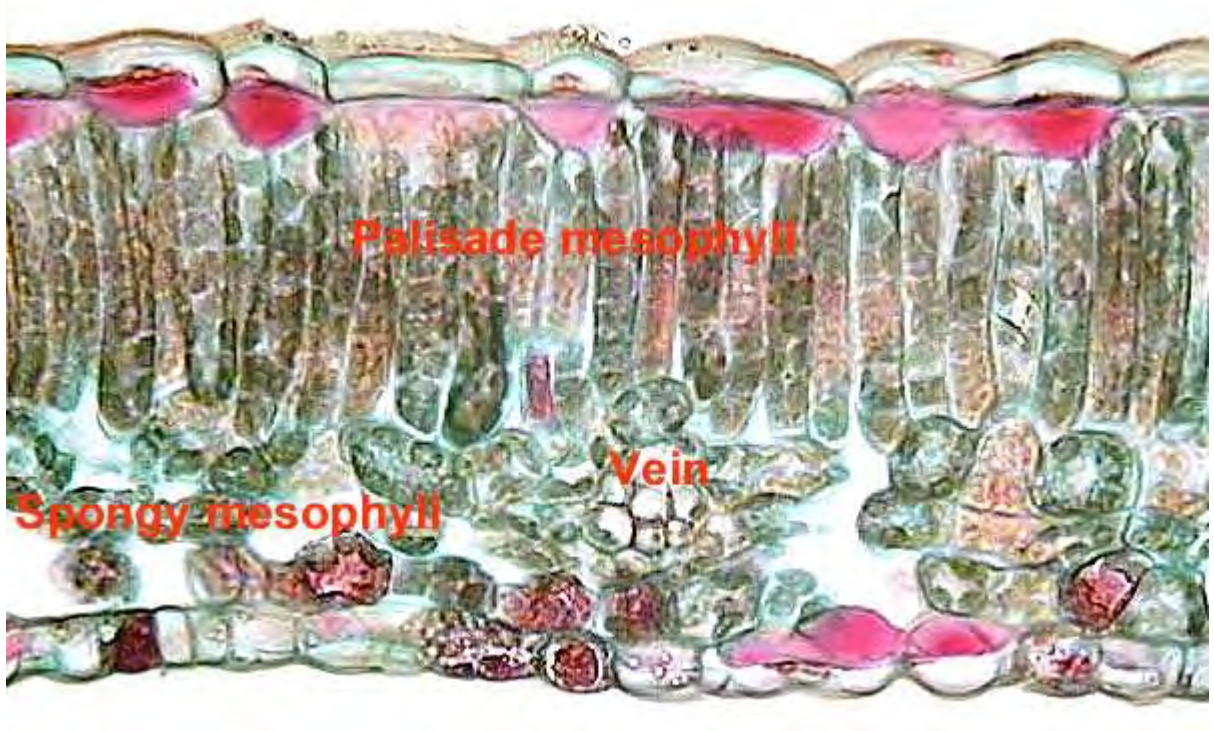
- Create wounds both on branches and stems
- Allow for an “infection court” or opening for disease causing organisms to enter
- Wound dressings so far are not very effective barriers to fungal ingress.
- Allow fungi to bypass the normal compartmentalization defenses that trees use to resist decay
- Take away the ability of trees to make and store carbohydrates

Pruning

- Removing stems removes stored energy
- Pruning is wounding
  - Wounds are infection courts
- Pruning redirects the allocation of energy and tree hormones.

Pruning

- Removing leaves removes energy producing cells



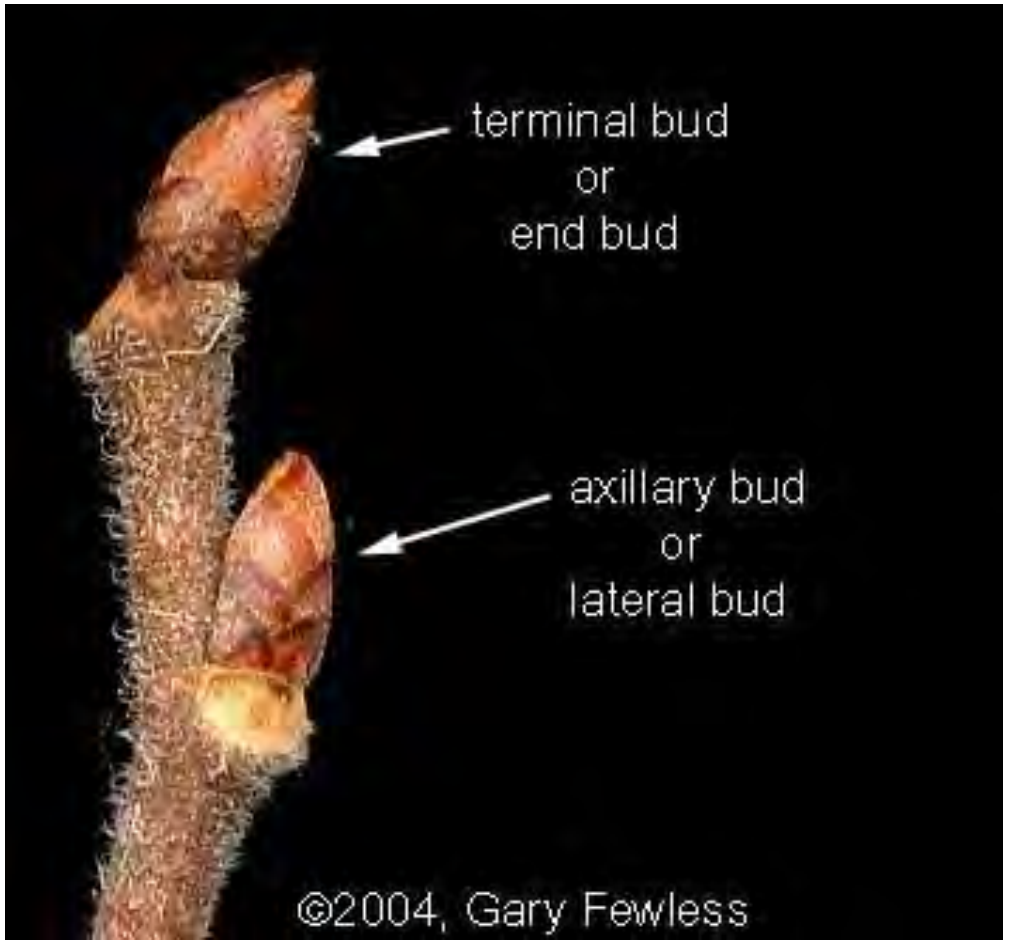
The more photosynthetic capacity removed, the less that part of the tree or the entire tree will grow.

Goal of pruning

- To increase easily harvestable yield
- To limit size of the tree and retard growth
- To maintain health and vigor of the tree and the grove

Responses to Pruning

- The universal response to pruning is growth retardation
- Another important response is bud invigoration
  - Buds are either
    - Preformed (auxiliary buds, terminal buds)
    - Latent, occur everywhere in the stem of an avocado



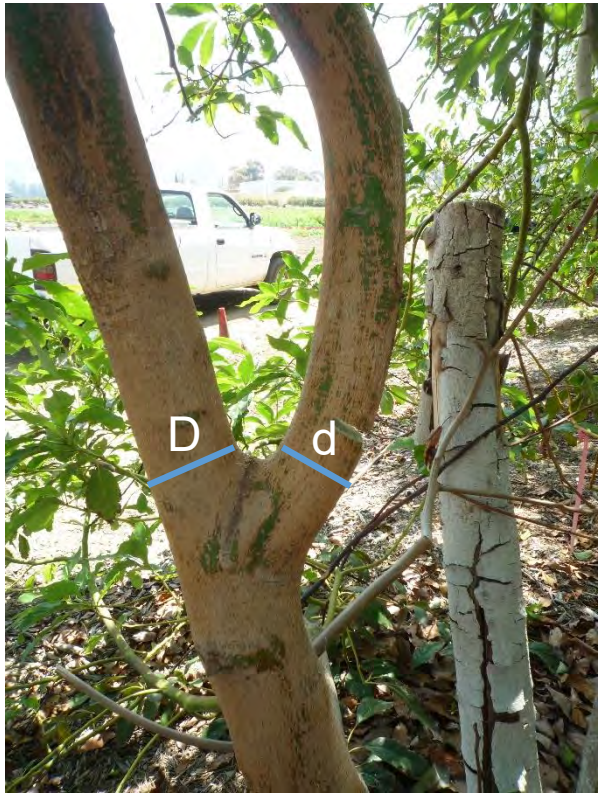
Kinds of cuts

- Heading
- Thinning

Cuts

- Heading cuts terminate leaders in the center of a branch
  - Epicormic growth will form
- Thinning cuts are the complete removal of branches or the removal of a leader back to a branch
  - The real definition of a thinning cut is by the tree itself…If no epicormic growth results from the cut it was a thinning cut.

- 1/3 Rule
  - d=1/3D

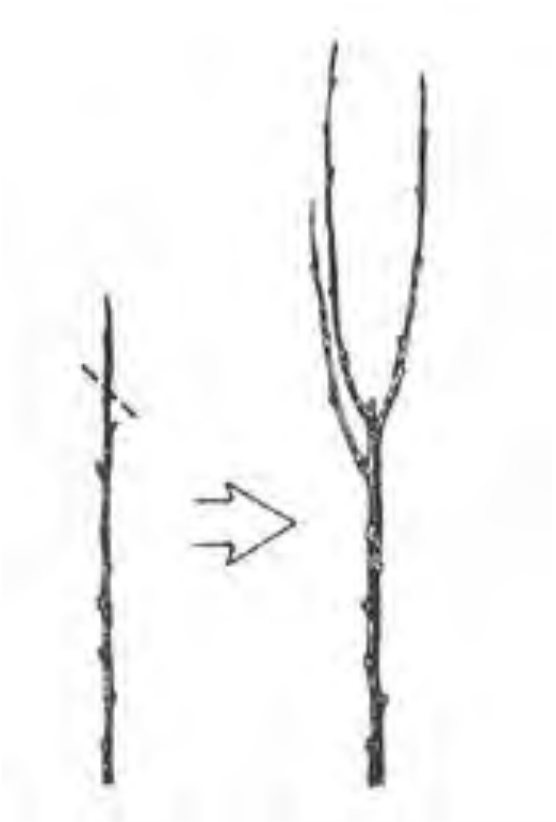


Training Trees

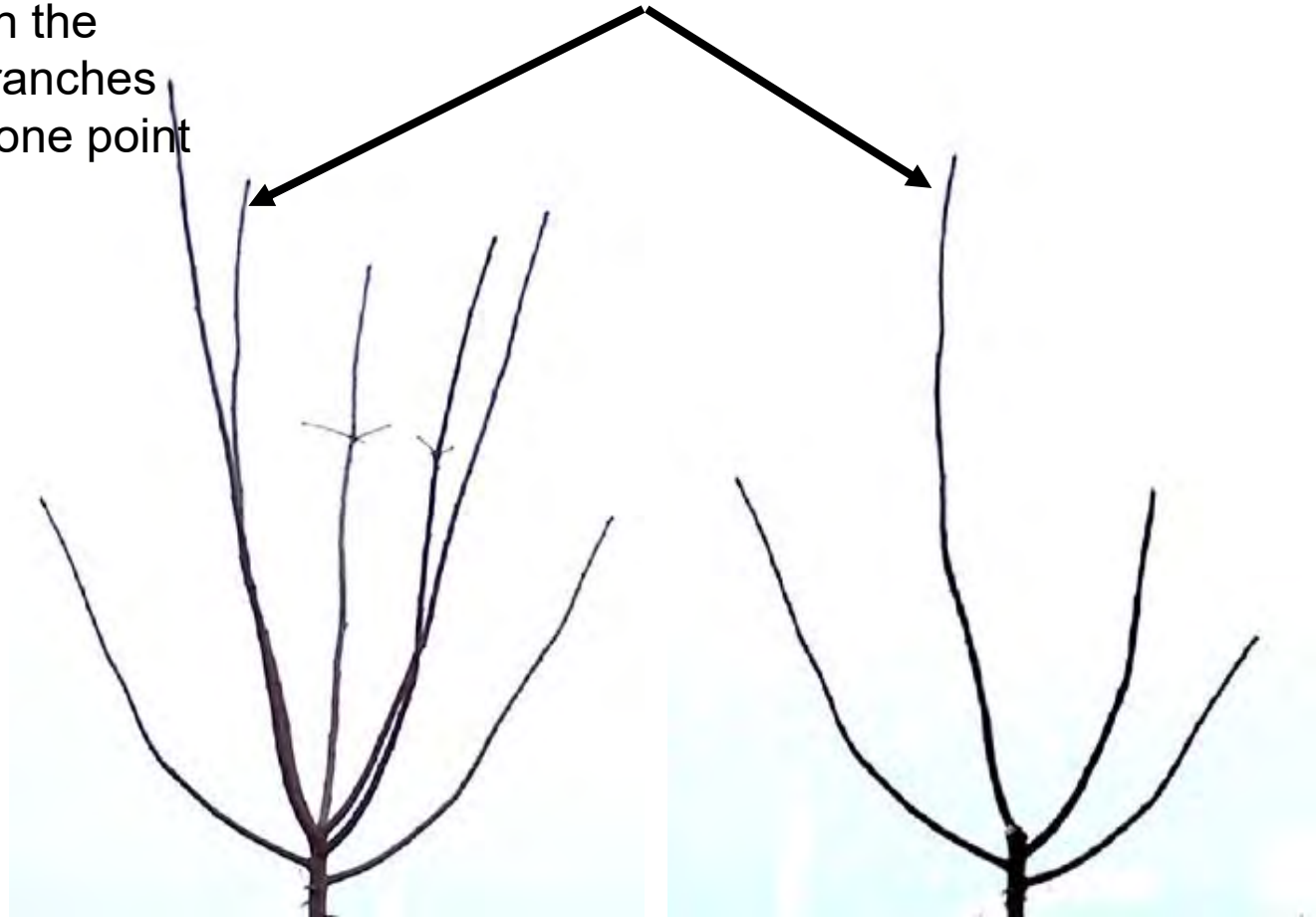
Most systems use a central leader that is headed back to create branches.

Scaffold branches are spaced radially and vertically on the stem.

Nursery trees are often top trees to promote branching.



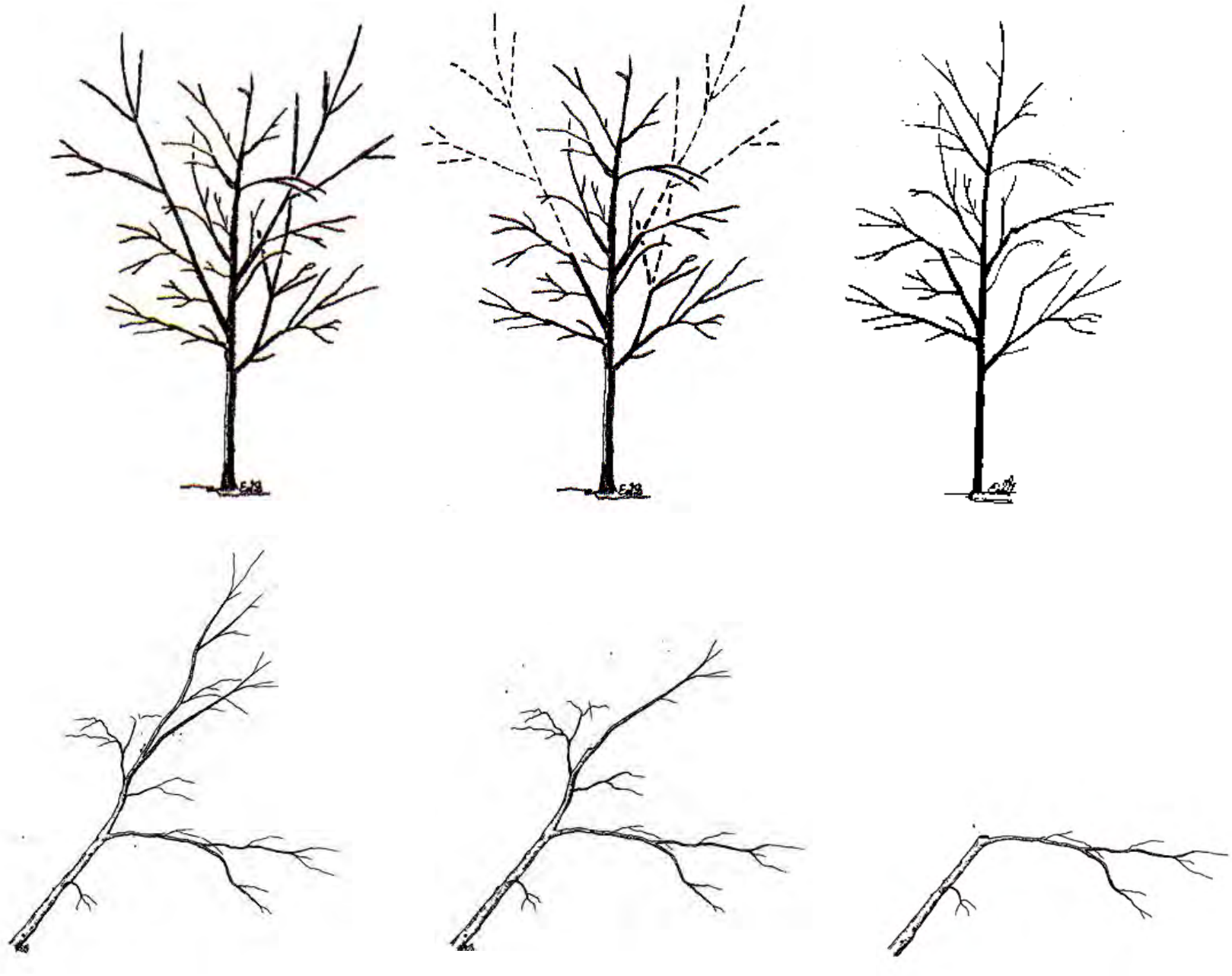
As a consequence of training branches must be thinned to correct a branch fault in the canopy: all branches coming from one point



good

bad

Structurally trees will perform best and resist storm damage best with a strong central leader. This can be corrected by structural pruning



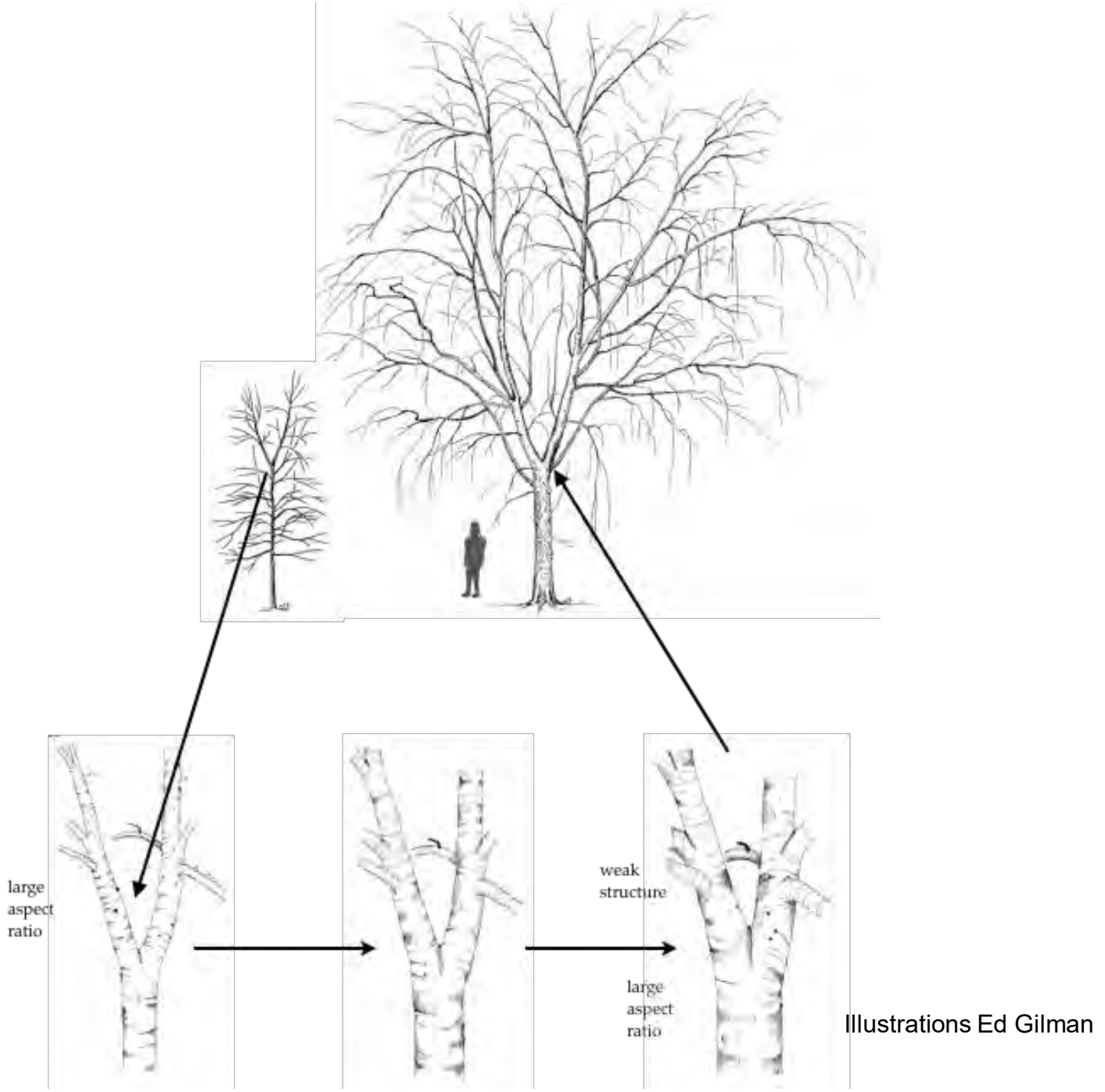
Illustrations Ed Gilman

Branch Faults

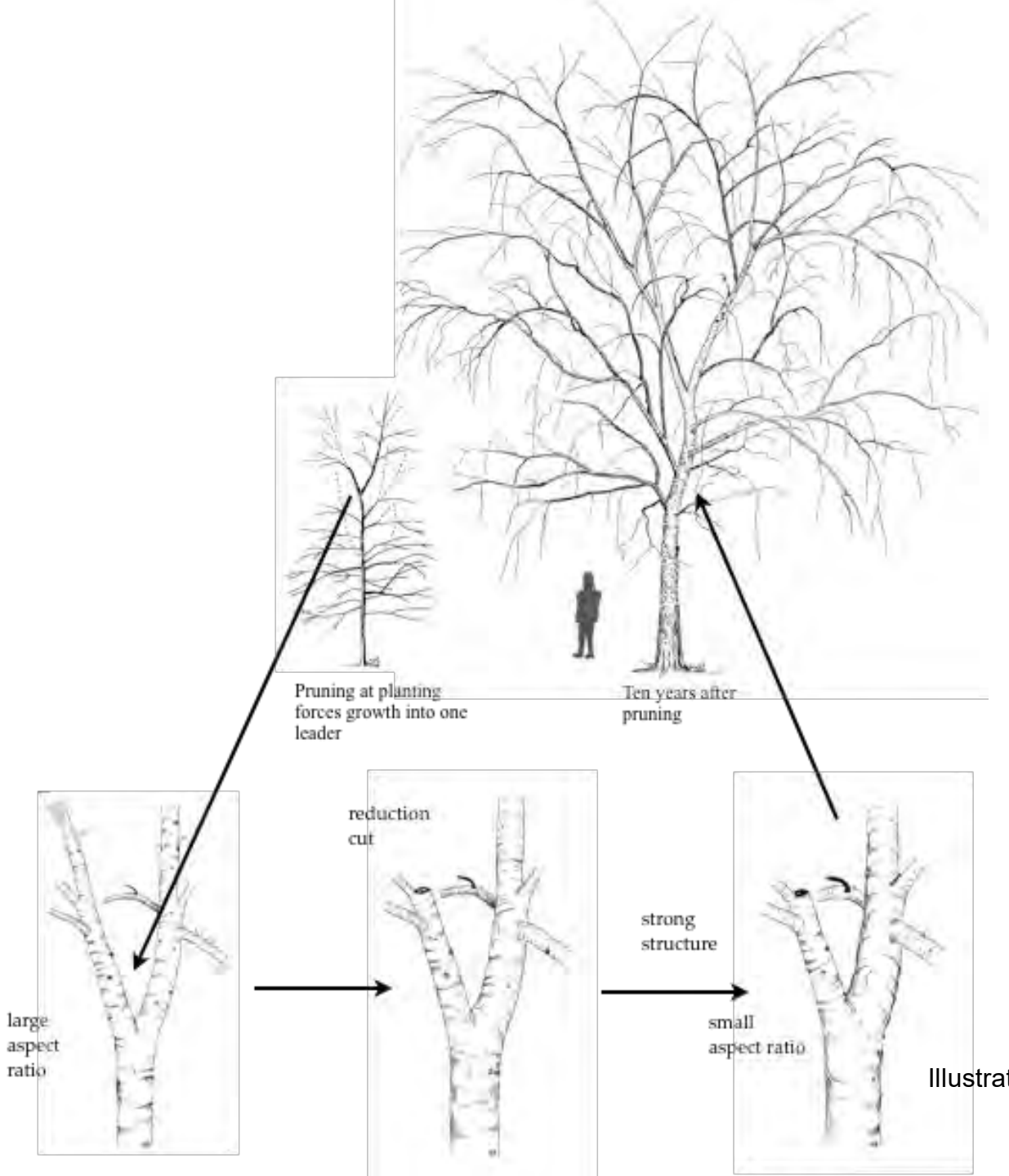
- Codominant Stems
- All Branches coming from the same place
- Branch the same size as the stem its attached to
- Included bark

Structural defects

- Such as included bark are also an infection court and thus an entry point for decay
- Frequent and appropriate structural pruning will limit decay entry from this venue.



Illustrations Ed Gilman



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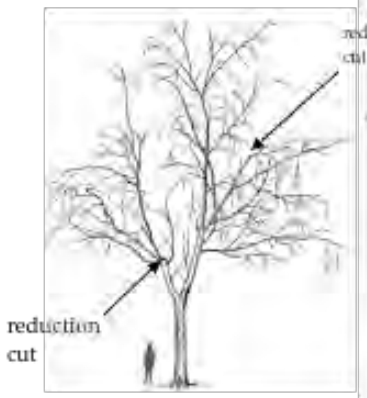

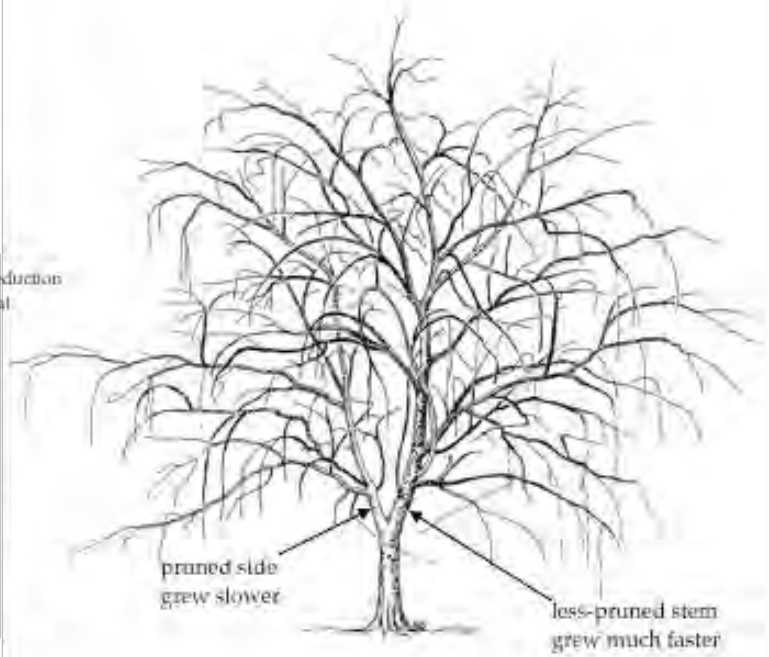

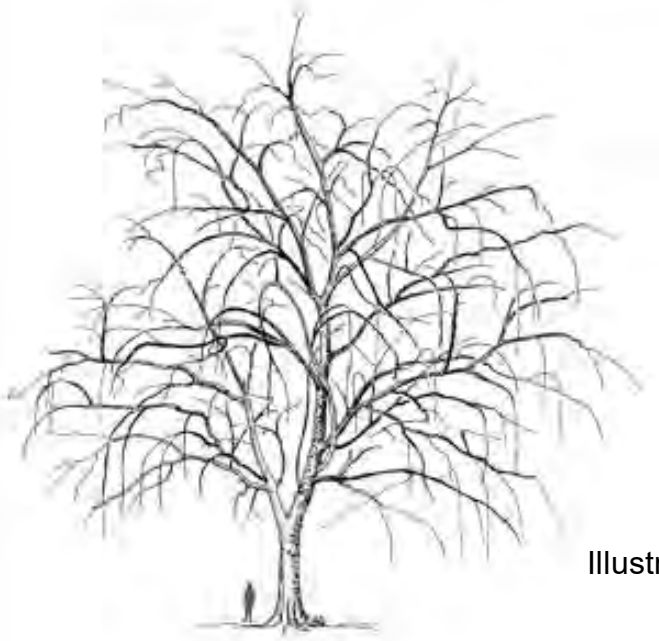

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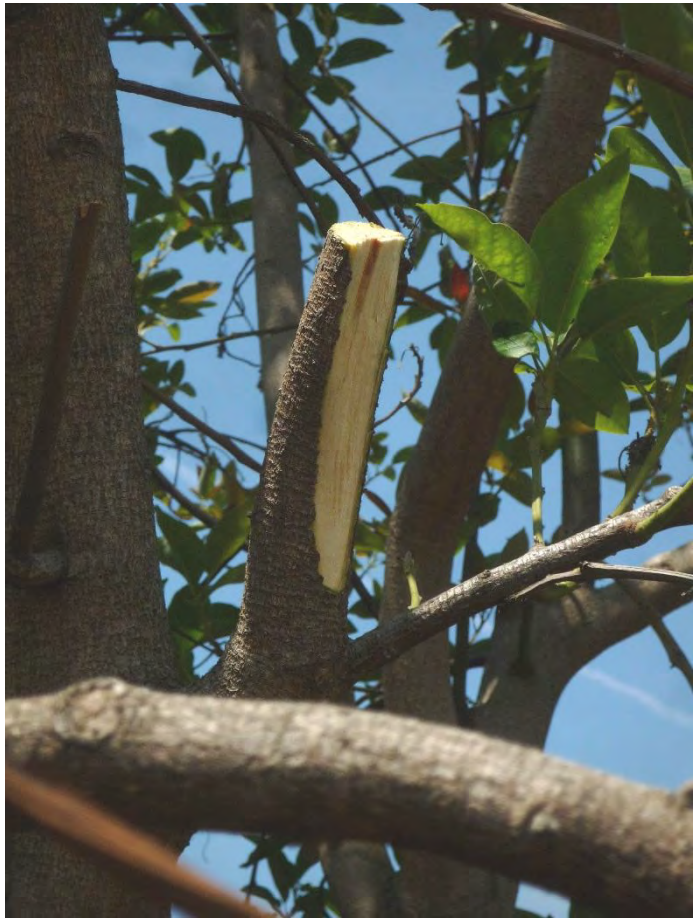
Making a good cut

- Means not destroying your work (i.e. the and its branches)
- The goal is to achieve growth retardation & reduce size w/o introducing excessive amounts of decay.



Poor cuts

- Generally heading cuts
- Large Cuts
- Poorly executed cuts

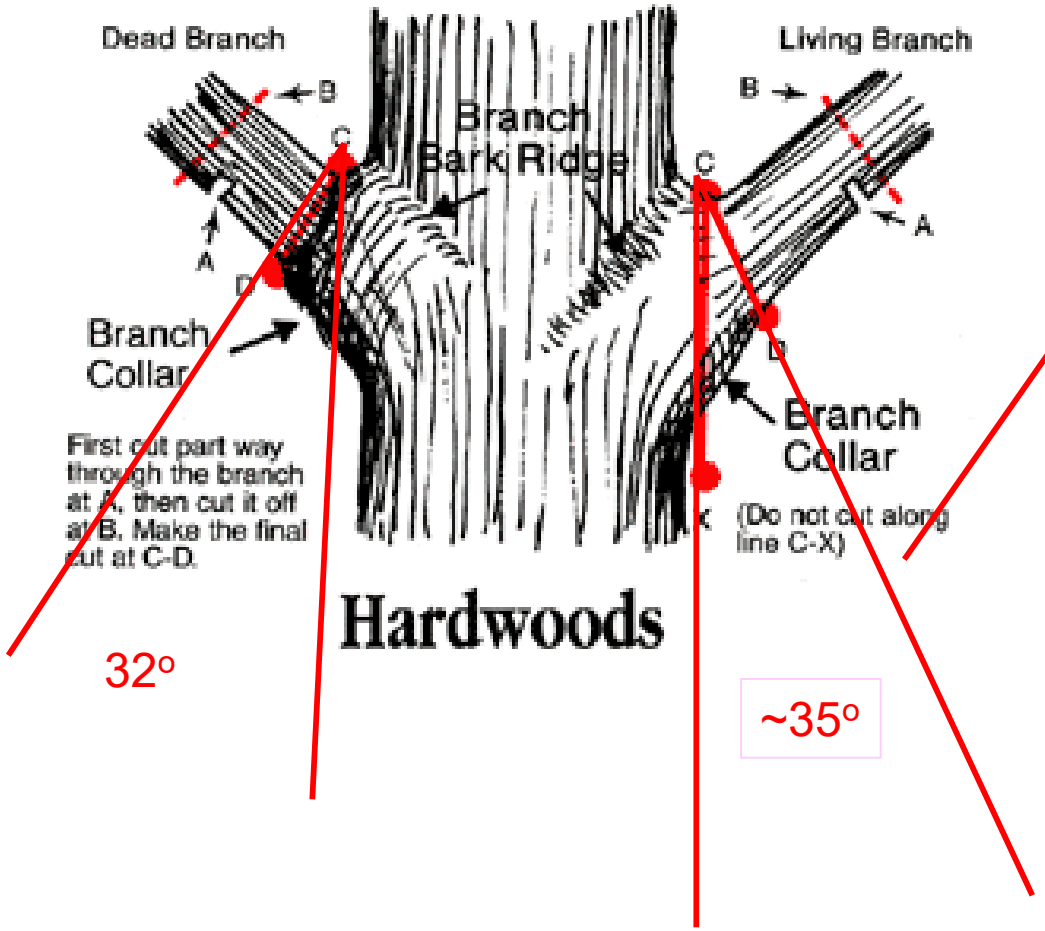
Three part cut

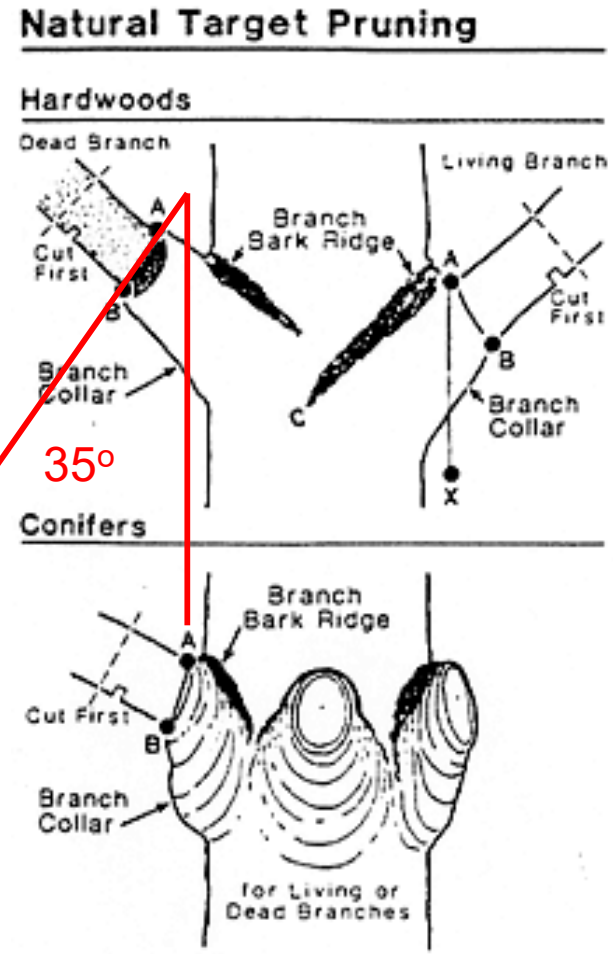
Flush Cuts expose more surface area for decay, they also cut into stem tissue that can not restrict decay through compartmentalization

This cuts just the branch

This cuts branch and stem tissue

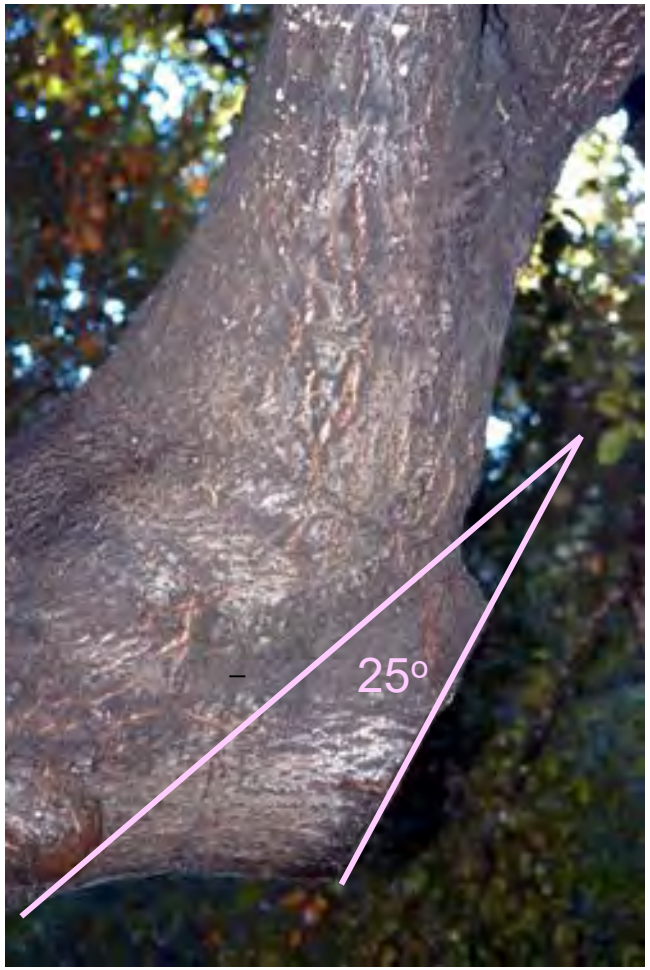
Natural Target Pruning



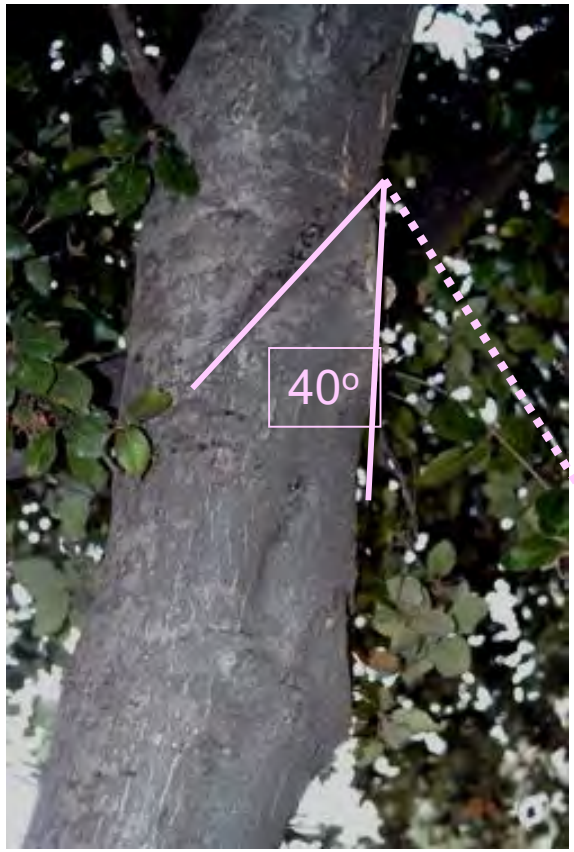


Good Cuts


44°


25°

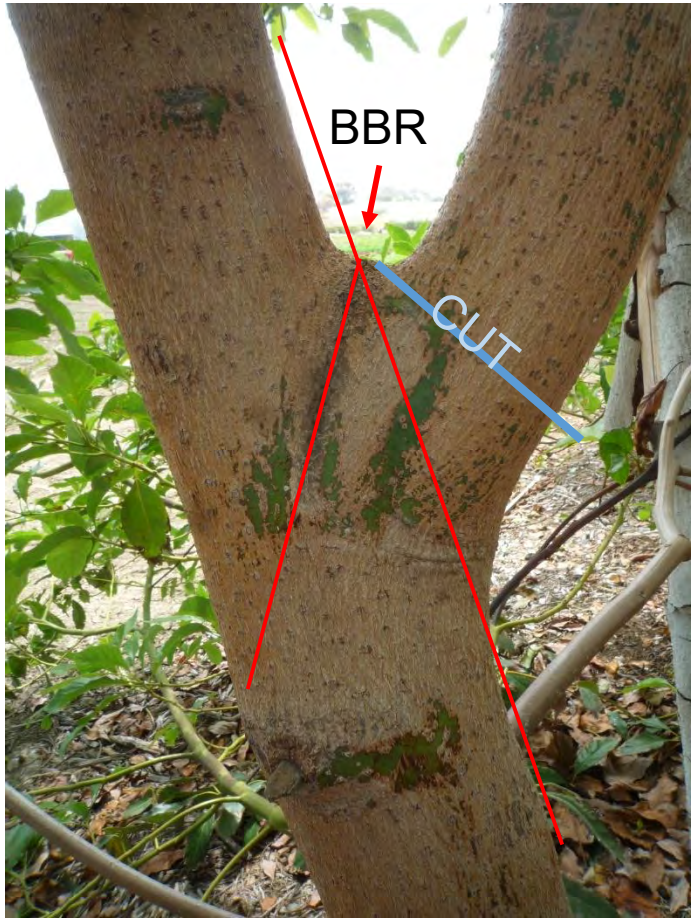
Bad cuts
flush cuts



Branch Biology dictates where to cut

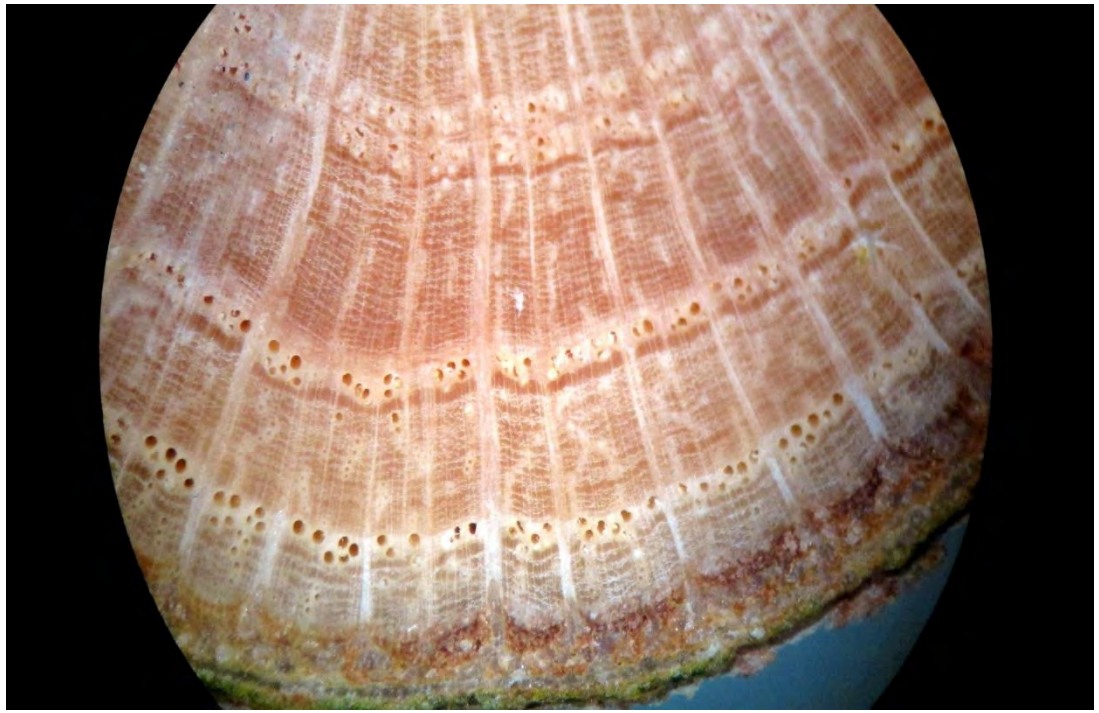
- Branch Bark Ridge (BBR) is visible in Avocado
- Branch collars are largely invisible
- BBR must be used to estimate the angle of cut.

Branch Biology dictates where to cut

- 

Functions of wood

- Support-strength for the architecture of the tree
- Conduction of water, minerals, signaling molecules
- Storage of sugars: energy storage



Stored Starch in *Acacia melanoxylon*

From a healthy branch

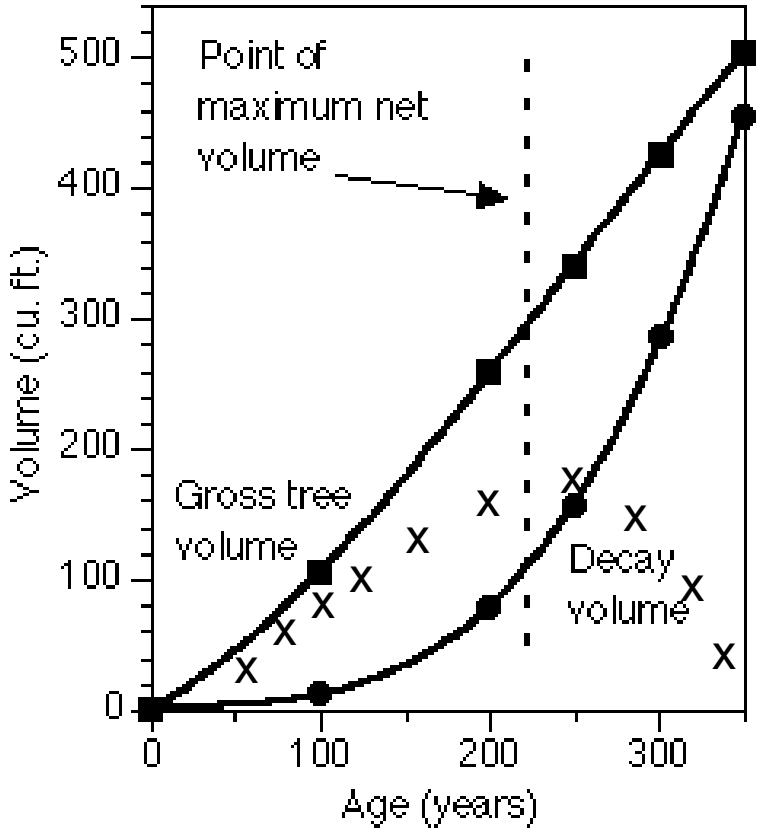
From a declining branch

Decay Depletes stored carbohydrates from living and “dead” wood

- Sapwood is a major storage organ for starch
- Decay fungi consume starch as they rot the wood
- Heart rot and sap rots not only remove wood but remove stored energy from trees

Old Trees Rot!

- Old trees have more decay.
- It is impossible to limit the progress of decay in trees once they have been infected!!
- Decay is best limited by proper management over the course of a tree's lifetime.



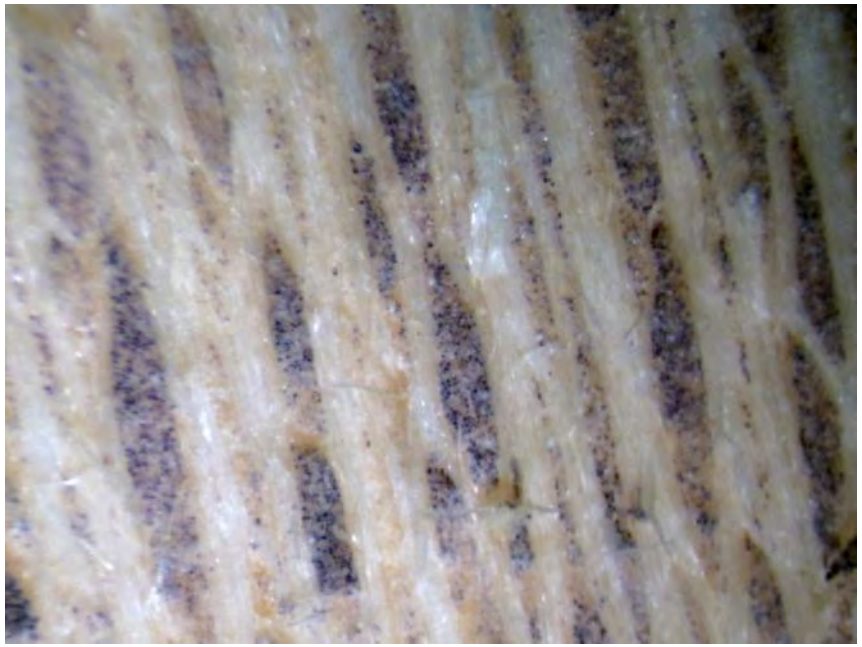
From forest pathology.org
Jim Worrall

Decay fungi require wounds to enter trees

- The size of the cut indicates the size of the decay column that will form in the trunk
- The sum of all the pruning wounds approximates the volume of wood that will eventually be destroyed by these rot fungi

Heart Rot of Trees

- Ganoderma
- Often associated with a decline in vigor.
- Associated with wounds to roots or the main stem
- Wood decay fungi feed on stored sugars in wood and on the wood itself.



Multiseriate rays stained with Potassium iodide to show starch storage in wood (Kevin Smith Seminar, San Marino, CA)

Recommendations

- Avoid This!
- It will cost you more $$
- Epicormic regrowth will require more pruning than thinned and selected branches
- It will shorten the lives of your trees
- There will be less fruit in the short term

Prune:

- With thinning cuts
- More frequently
- Removing less large wood
- Will invigorate buds lower on the tree
- Will save $$ in harvesting
- Will increase yield

Summary: Pruning do and don’t

- **DO**
- Make the smallest wound possible
- Prune Frequently
- Structural pruning
- Pay attention to branch biology
- Conserve healthy canopy foliage

- **Don’t**
- Thin trees just to thin trees
- Remove over 50% of the foliage
- Cover wounds with pruning paints
- Make very large cuts
- Disrespect branch biology
- Make flush cuts