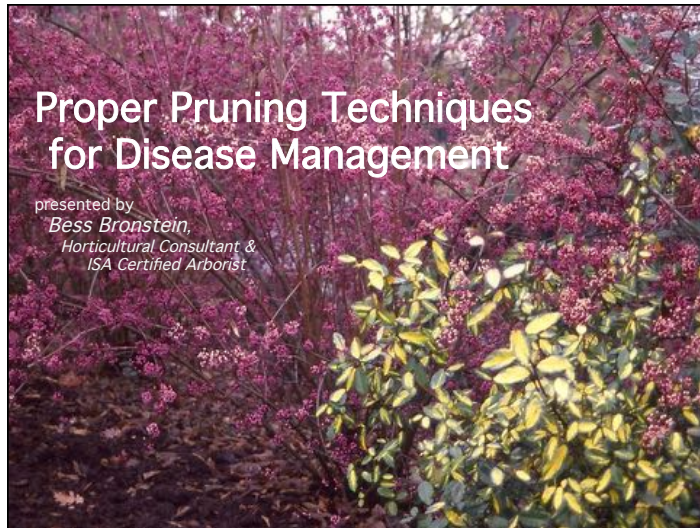



# Proper Pruning Techniques for Disease Management


presented by  
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Horticultural Consultant &  
ISA Certified Arborist




## Pruning Objectives




Plant Health



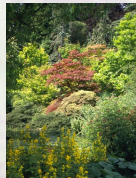
Safety



Direct Growth





Increase Flowers & Fruit



Aesthetics

### Remember-

Plants have a genetically predetermined size. Pruning can't solve all problems. So, plant the right plant in the right way in the right place.



You can try to control the size or shape, but.....

genetics will win.



### Stem & Buds

One year old  
 Two years old  
 Three years old

**Internode**

- stem area between nodes

**Node**

- buds, leaves and branches arise here

**Bud scale scars**

- indicates yearly growth and tree vigor

**Latent bud**

- inactive lateral buds at nodes

**Adventitious bud**

- found in unexpected areas (roots, stems)

### Epicormic Growth

Growth from dormant buds, either latent or adventitious. These branches are weakly attached.

**Watersprouts**

**Suckers**

### Stem & Buds

One year old  
 Two years old  
 Three years old

**Apical (terminal) bud**

- found at tips of branches

**Axillary (lateral) bud**

- found along branches below tips

**Bud scale scars**

- indicates yearly growth and tree vigor

**Latent bud**

- inactive lateral buds at nodes

**Adventitious bud**

- found in unexpected areas (roots, stems)

**Internode**

- stem area between nodes

**Node**

- buds, leaves and branches arise here

### Apical Dominance

**The apical (terminal) bud** contains the **apical meristem**, which contains plant hormones called **auxins** that inhibit growth of lateral buds.

When apical dominance is broken by injury (storms, animals, etc.) or pruning, lateral and dormant buds fight to become the new terminal leader.

### Woody Plant Tissues: **Xylem**

**Heartwood**

- provides structural backbone

**Sapwood**

- conducts water and nutrients from roots throughout the tree

### Woody Plant Tissues: **Vascular Cambium**

Cell divisions in the vascular cambium add to the:

- Secondary phloem (inner bark)
- Vascular cambium
- Secondary xylem (wood)

Vascular cambium cells (shaded) divide in three directions. The long rows of vascular ray cells also originate in the vascular cambium.

This is a secondary (lateral) meristem that allows for increase in xylem and phloem tissues, as well as cambium cells. The result is increased stem and trunk diameter.

### Woody Plant Tissues: **Bark (Inner)**

**Phloem (active)**

- conducts food from the leaves throughout the plant

### Woody Plant Tissues: **Bark (Outer)**

**Cork**

- protection

**Cork cambium**

- cambium cells present in some species and increases cork

### Annual Growth Rings



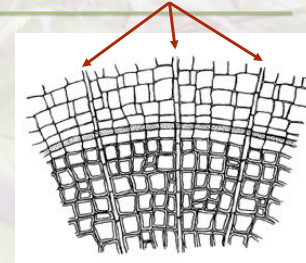
#### Earlywood (Springwood)

- First new wood in spring
- Large cells with thin cell walls
- Light in color

#### Latewood (Summerwood)

- Growth later in summer
- Small cells with thicker cell walls
- Dark in color

### Vascular Rays



Vascular rays transport sugars and other compounds radially through vascular tissues, store starch, and assist in restricting decay in wood tissue.

### CODIT: compartmentalization of decay in trees

- plants can limit, or wall off, decay that sets in after wounding
- plants don't HEAL, they chemically SEAL off damage
- CODIT works best on young wood (1-3 yrs.)
- species vary in successful compartmentalization
- 4 walls form to varying degrees of success

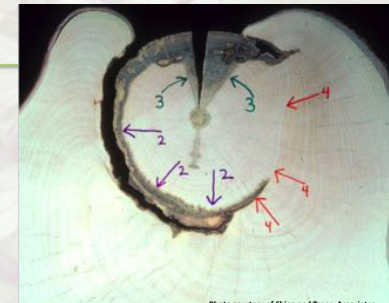
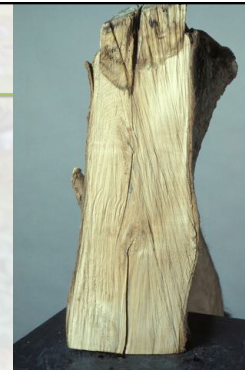


Photo courtesy of Shigo and Trees, Associates

**Wall 1:** prevents the spread of decay up and down the branch or trunk by plugging the vertical cells as a reaction to wounding (weakest wall)

**Wall 2:** pre-existing defense of cells formed at the annual growth rings to slow spread of decay toward the center of the tree

**Wall 3:** pre-existing defense of 'ray' cells that slow spread of decay around the tree

**Wall 4:** a 'barrier zone' formed as a reaction to wounding that consists of new strong dense wood (strongest wall)



### Tree Structure

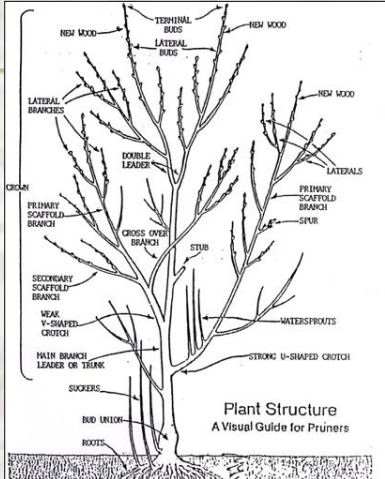
Trunk

Crown

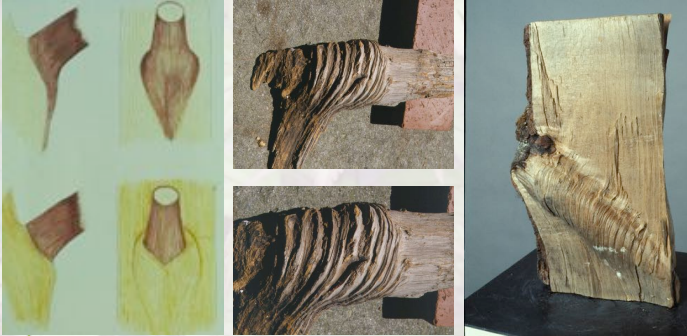
- leaders
- scaffold branches
- lateral branches
- spur shoots
- twigs

Epicormics

- suckers
- watersprouts

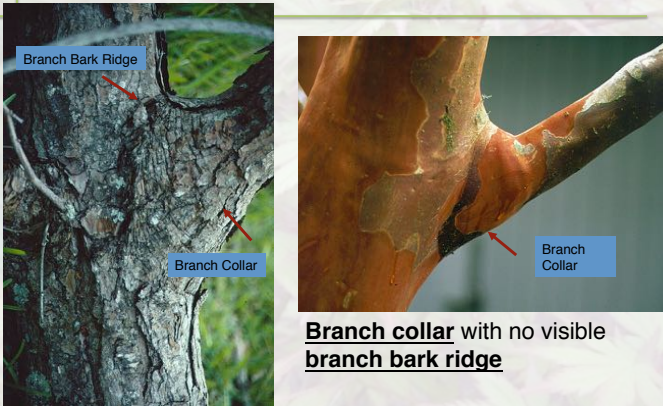


### Branch Wood and Trunk Wood



Photos by Edward F. Gilman, Professor, Environmental Horticulture Department, IFAS, University of Florida

### Branch Collar & Branch Bark Ridge

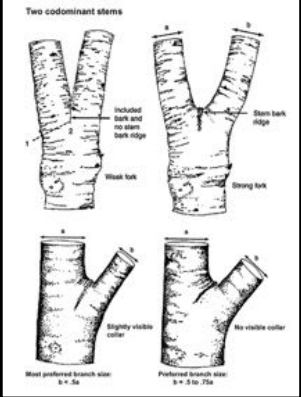


**Branch collar with no visible branch bark ridge**

Photos by Edward F. Gilman, Professor, Environmental Horticulture Department, IFAS, University of Florida

### Types of Branch Attachments

- strong attachments have smaller branches (**branch wood**) secured in larger branches or trunks (**trunk wood**)
- trunk wood forms a **branch collar** around the branch wood, and a **branch bark ridge** is often visible
- codominant** stems are poorly attached
- included bark** forms both in codominant and narrow angled attachments



Two codominant stems

Labels in diagram: Included bark and no stem bark ridge, Weak fork, Stem bark ridge, Strong fork, Slightly visible collar, Most preferred branch angle: b = 30, Preferred branch angle: b = 5 to 75.

Illustrations by Edward F. Gilman, Professor, Environmental Horticulture Department, IFAS, University of Florida

### Codominants & Included Bark



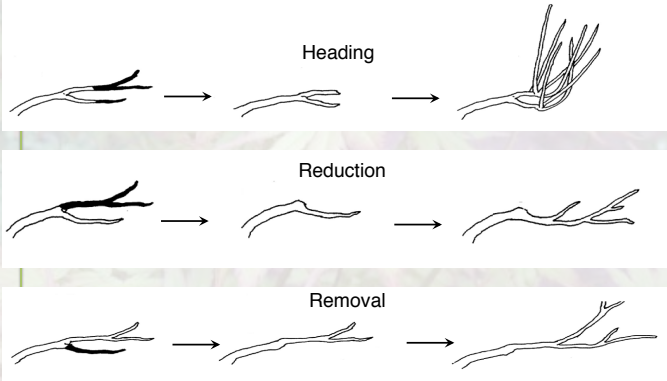
Photo by Edward F. Gilman, Professor, Environmental Horticulture Department, IFAS, University of Florida

### Codominants with included bark (and decay)



Photo by Edward F. Gilman, Professor, Environmental Horticulture Department, IFAS, University of Florida

### Pruning Cuts




Heading

Reduction

Removal


### Pruning Cuts

Heading



<http://www.aisinnadams.com/tag/illustration-botanical/>

Reduction  
(Thinning)



<http://www.sunset.com/garden/garden-basics/basic-pruning-cuts>

Removal

### Pruning Cut: Heading

- localized response
- 'hydra' effect
- leaves stubs
- cut to a node  
(selective heading)
- shearing  
(non-selective heading)
- topping  
(non-selective heading)


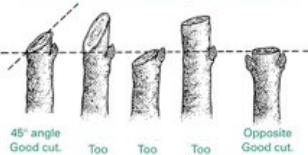
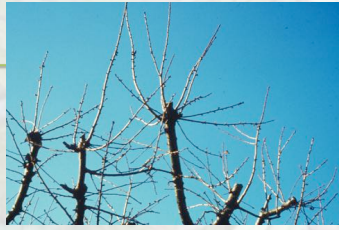

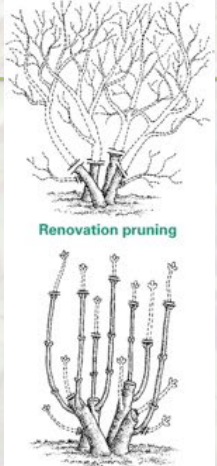


Photo by Edward F. Gilman, Professor, Environmental Horticulture Department, IFAS, University of Florida.



Illustrations: VanDerZanden, Ann Marie and Diane Nelson. 2004. Pruning Ornamental Shrubs, PM 1958, Iowa State University Extension


**Renovation pruning**

Illustration: VanDerZanden, Ann Marie and Diane Nelson. 2004. Pruning Ornamental Shrubs, PM 1958, Iowa State University Extension





### Shearing

- use on plants with small leaves that are tough enough to take it
- some large leaf plants OK
- formal look
- non-selective heading, can lead to increased plant stress and increase in pest/disease problems





### Disease Problems of Commonly Sheared Plants

- boxwood (*Buxus spp.*)
  - boxwood blight
  - boxwood canker
- photinia (*Photinia x fraseri*)
  - entomosporium fungal leaf spot
  - powdery mildew
- pyracantha (*Pyracantha spp.*)
  - bacterial blights
- junipers (*Juniperus spp.*)
  - juniper phomopsis fungal blight

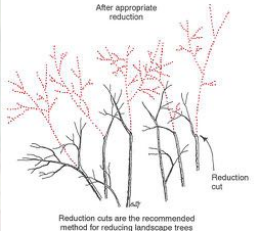
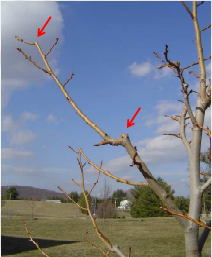
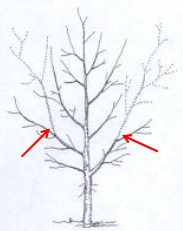
### Topping

- cuts through several years old wood
- ugly
- doesn't work to reduce height; plant responds with new, poorly attached stems
- expensive to maintain
- unhealthy; opens tree to decay

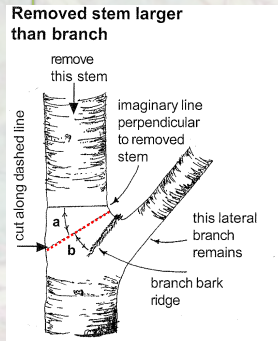



### Pruning Cut: Reduction

- Selective removal of branches or parts of branches to decrease height and/or spread of a tree

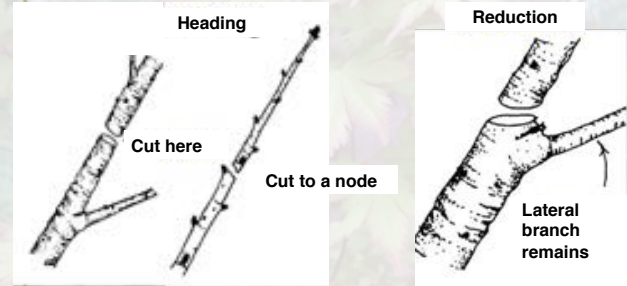
### Reduction Cut



- cut the branch to a lateral stem large enough to assume the role of terminal leader
- at least  $\frac{1}{3}$  to  $\frac{1}{2}$  the diameter of the removed stem
- if the lateral stem or branch is too small of a diameter, epicormic shoots will develop



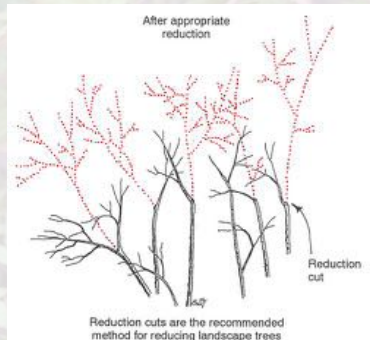
### Heading or Reduction Cut?



Illustrations by Edward F. Gilman, Professor, Environmental Horticulture Department, IFAS, University of Florida

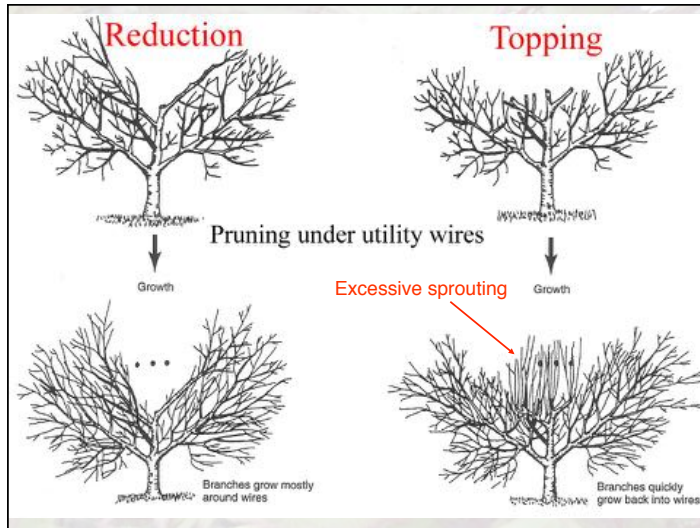
### Crown Reduction

- Selective removal of branches or parts of branches to decrease height and/or spread of a tree



### Oops!





### Pruning Cut: Removal

- cut to branch's point of origin
- preserves apical dominance and looks natural
- cut outside of **branch collar** and avoid tearing plant tissue
- no flush cuts

Photo by Edward F. Gilman, Professor, Environmental Horticulture Department, IFAS, University of Florida

<http://www.sunset.com/garden/garden-basics/basic-pruning-cuts>

### How to Make a Removal Cut

**Branch bark ridge**

**Branch collar**

Cut #3

Cut #2

Cut #1

Photo by Edward F. Gilman, Professor, Environmental Horticulture Department, IFAS, University of Florida

- locate **branch collar** (use **branch bark ridge** for guidance)

- cut just outside the branch collar
- the branch collar is kept intact

Photo by Edward F. Gilman, Professor, Environmental Horticulture Department, IFAS, University of Florida

### Callus & Woundwood

- symmetrical formation indicates proper cut
- asymmetrical formation indicates cut into trunk wood

### Crown Cleaning

- Removal of dead, diseased, broken, and rubbing branches
- Reduces the risk of branch failure

### Thinning

- Selective removal and reduction of live branches to reduce density in the crown of a tree or in a shrub
- Increase light and air
- Reduce risk of tree branch failure in wind and storms

**BEFORE**

- cut smaller laterals off main stems

**AFTER**

- open and natural look


Photos by Edward F. Gilman, Professor, Environmental Horticulture Department, IFAS, University of Florida

### Thinning

- Useful renovation technique for previously over-pruned plants

### Crown Thinning

- Selective removal and reduction of live branches to reduce density in the crown
- Increase light and air in canopy
- Reduce risk of branch failure in wind and storms



Pruning Trees

### Good Thinning



### Bad Thinning (Lions-tailing)



### Response to Over-thinning

weight



be



Large

### Excessive end weight


### Unbalanced Canopy

after

before



Large pruning cut



## Structural Pruning

- Improve structural strength
- Reduce maintenance costs over time
- Increase life of the tree



Photos by Edward F. Gilman, Professor, Environmental Horticulture Department, IFAS, University of Florida



Remove defects such as

- codominant stems
- weak branch attachments
- large lower limbs



Photos by Edward F. Gilman, Professor, Environmental Horticulture Department, IFAS, University of Florida



Early structural pruning means less need for maintenance of larger, mature trees:

- fewer branches mean less pruning
- well spaced branches mean easier access
- pruning can be done faster

## 5 Steps for Pruning Young Trees

- STEP 1:** Remove dead, dying, diseased, damaged and broken branches.
- STEP 2:** Select and establish a central leader.
- STEP 3:** Select and establish the lowest permanent branch.
- STEP 4:** Select and establish scaffold branches.
- STEP 5:** Select temporary branches below the lowest permanent branch.

Before Pruning



After Pruning



Photos by Edward F. Gilman, Professor, Environmental Horticulture Department, IFAS, University of Florida

## 2 Years Later



Photo by Edward F. Gilman, Professor, Environmental Horticulture Department, IFAS, University of Florida



Photo by Edward F. Gilman, Professor, Environmental Horticulture Department, IFAS, University of Florida



Photo by Edward F. Gilman, Professor, Environmental Horticulture Department, IFAS, University of Florida

## Pruning Cycle & Pruning Dose

### Pruning cycle:

- the interval between each pruning

### Pruning dose:

- the amount of live tissue removed at one pruning

Pruning cycle **more than 3-5 years** = higher pruning dose

Pruning cycle **every 1-2 years** = smaller pruning dose

## Shrubs



## Cane Growing Shrubs



- renew growth by sending up canes
- very tough- can take hard pruning
- remove  $\frac{1}{2}$  -  $\frac{2}{3}$  of old, puny canes to the base
- can renovate by coppicing

### 3-5 Year Renovation



Illustrations: VanDerZanden, Ann Marie and Diane Nelson. 2004. Pruning Ornamental Shrubs, PM 1956. Iowa State University Extension

### Radical Renovation



### Radical Renovation




### Mounds or Forms



- grow in defined shape or form
- mostly thinning cuts
- reach in and thin out unruly or too tall branches
- renovate by thinning (reduction & removal cuts)



### Tree-likes



- form resembles a miniature tree
- needs least amount of pruning
- thinning cuts only (removal, some reduction)
- can be arborized

### Tree-likes

This slide contains three photographs of tree-like shrubs. The top-left photo shows a large, dense green shrub. The bottom-left photo shows a person standing next to a large, dark green shrub. The right-side photo shows a tree-like shrub with a thick, gnarled trunk and red flowers, positioned in front of a house.

### Rhododendrons



This slide contains three photographs of rhododendrons. The large central photo shows a rhododendron with bright pink flowers. The top-right photo shows a rhododendron with purple flowers in a garden setting. The bottom-right photo shows a rhododendron with green leaves and small flowers near a stone wall.

Is radical renovation of rhododendrons a good thing?



### Hedges

- small leaved plants work best
- usually a formal look
- taper so the top is narrower than the base



### Hedge Renovation



### Hedge Renovation



### Hedge Renovation

The 'Hedge Renovation' slide features three photographs. The top-left photo shows a dense hedge with tall grasses in the foreground. The middle-left photo shows a hedge with a dirt path leading alongside it. The bottom-right photo is a cross-section of a hedge, revealing a thick, fibrous root system.

### Conifers

The 'Conifers' slide contains three photographs. The left photo shows a tall, slender cypress tree next to a person for scale. The top-right photo shows a large, rounded, bushy conifer on a stone wall. The bottom-right photo shows a garden scene with several different types of conifers, including tall cypresses and a yellow-leaved conifer.

### Timing

Winter

Spring

The 'Timing' slide is divided into two columns. The 'Winter' column shows a tree with bright yellow flowers and a close-up of red-tinted branches. The 'Spring' column shows a green pine tree and a green hedge.

### Timing

Summer

Fall

The 'Timing' slide is divided into two columns. The 'Summer' column shows a tree with yellow flowers and a close-up of pink flowers. The 'Fall' column shows a tree with vibrant red leaves and a long, dark green hedge.

### The bottom line on pruning-

- remove the 4 d's first- dead, damaged, diseased and deranged
- with ornamentals, do mostly thinning cuts to retain natural form and structure
- if you can't identify the plant, don't over prune
- know WHY you are making each cut



### Don't get lost-



Have fun!