

Home Orchard Care for Master Gardeners



Matt Halldorson

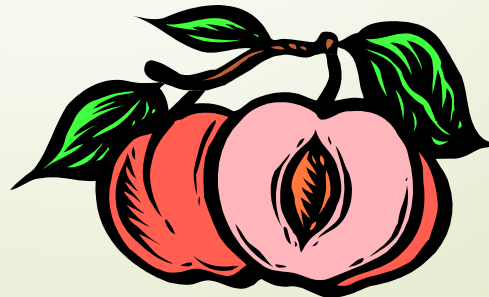
Associate Agent, ANR

University of Arizona Cooperative Extension,
Yavapai County



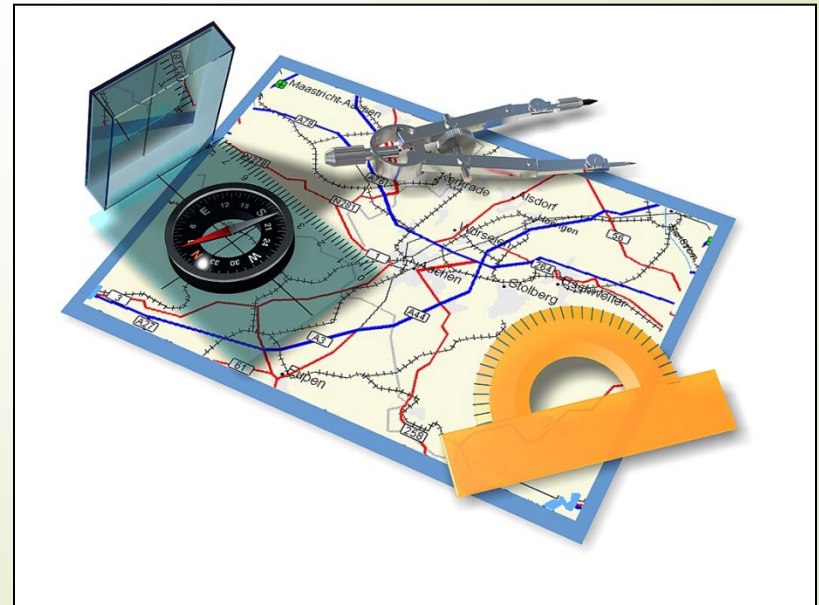
Growing Quality Fruit

- Requires planning and long-term commitment
- Annual cultural practices
 - Pruning, fertilization, irrigation, weed control, IPM, thinning, harvesting
- Different fruits have different cultural requirements



Home Orchard Road Map

- Site Selection
- Fruit Tree Propagation
- Tree Selection and Spacing
- Planting
- Irrigation
- Pruning
- Fertilization
- Thinning
- Harvest
- Pests and Problems



Site Selection

- Deep, well-drained, productive soils
- Gentle slopes are preferred
- Consider aspect
- Hours of sunlight per day
- Is this a new planting or replanting?

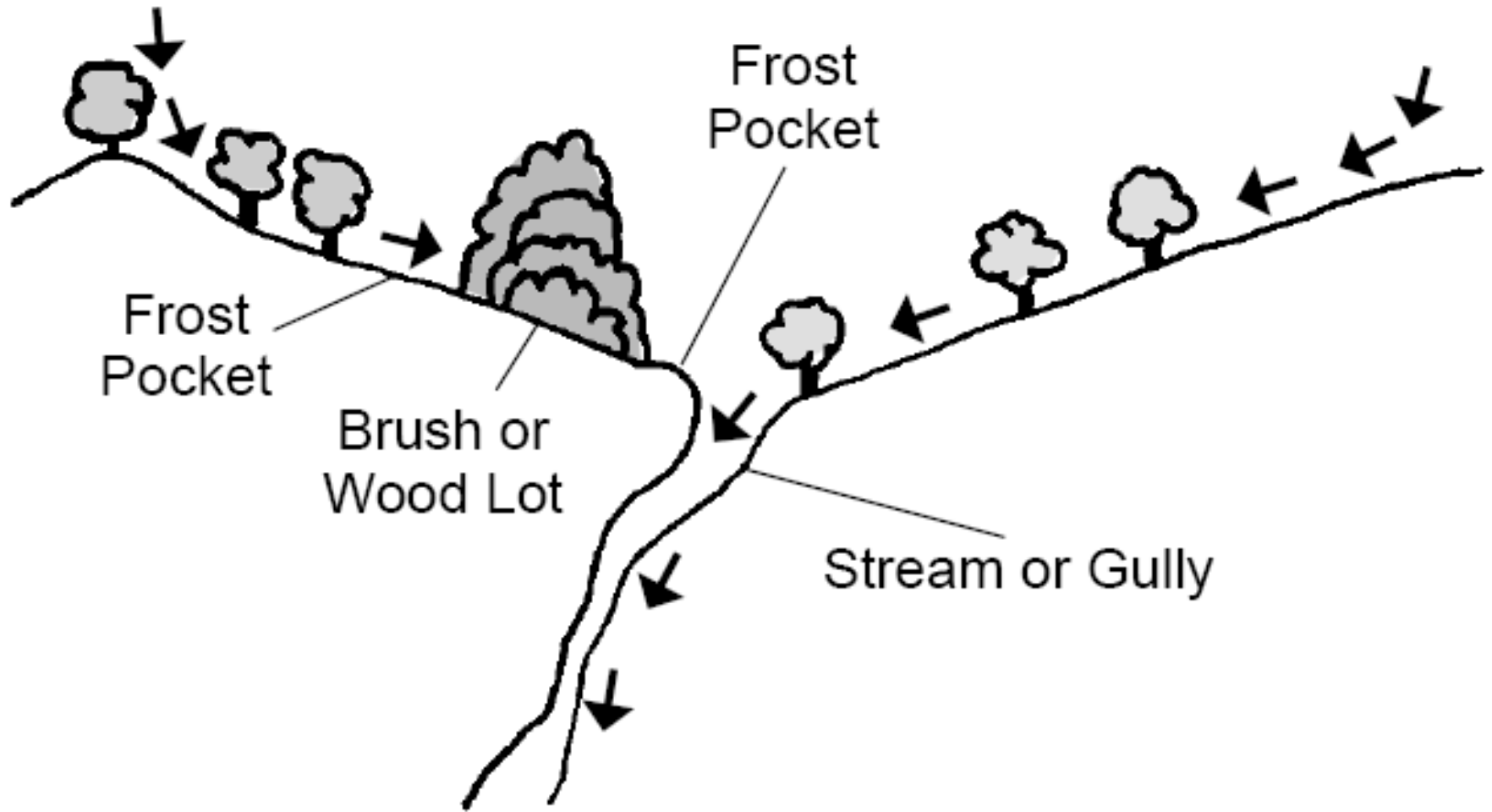


Frost Mitigation

- Cold air is denser than warmer air and flows down slope (like water)
- Avoid “frost pockets” where cold air can become trapped
- There are some inexpensive frost protection techniques



Cold Air Drainage Example



Minimizing Frost Damage

- Select appropriate varieties
- Maintain bare ground
- Irrigation?
- Covering trees to trap heat (PVC frames)
- Light bulbs/Christmas lights
- Propane heaters



Bare Ground in Peach Orchard



Frost Protection w/Irrigation



Frost Protection



Variety Selection

- Know your climate
 - Sunset, USDA Plant Hardiness, U of A
- Chilling Requirement
 - Accumulation of hours below 45°F and above 32°F
 - Each fruit variety has a corresponding chilling requirement
- Self fruitful vs. non-self fruitful (requiring cross pollination/pollinizer)
- Select varieties that bear at different times but can pollenate each other

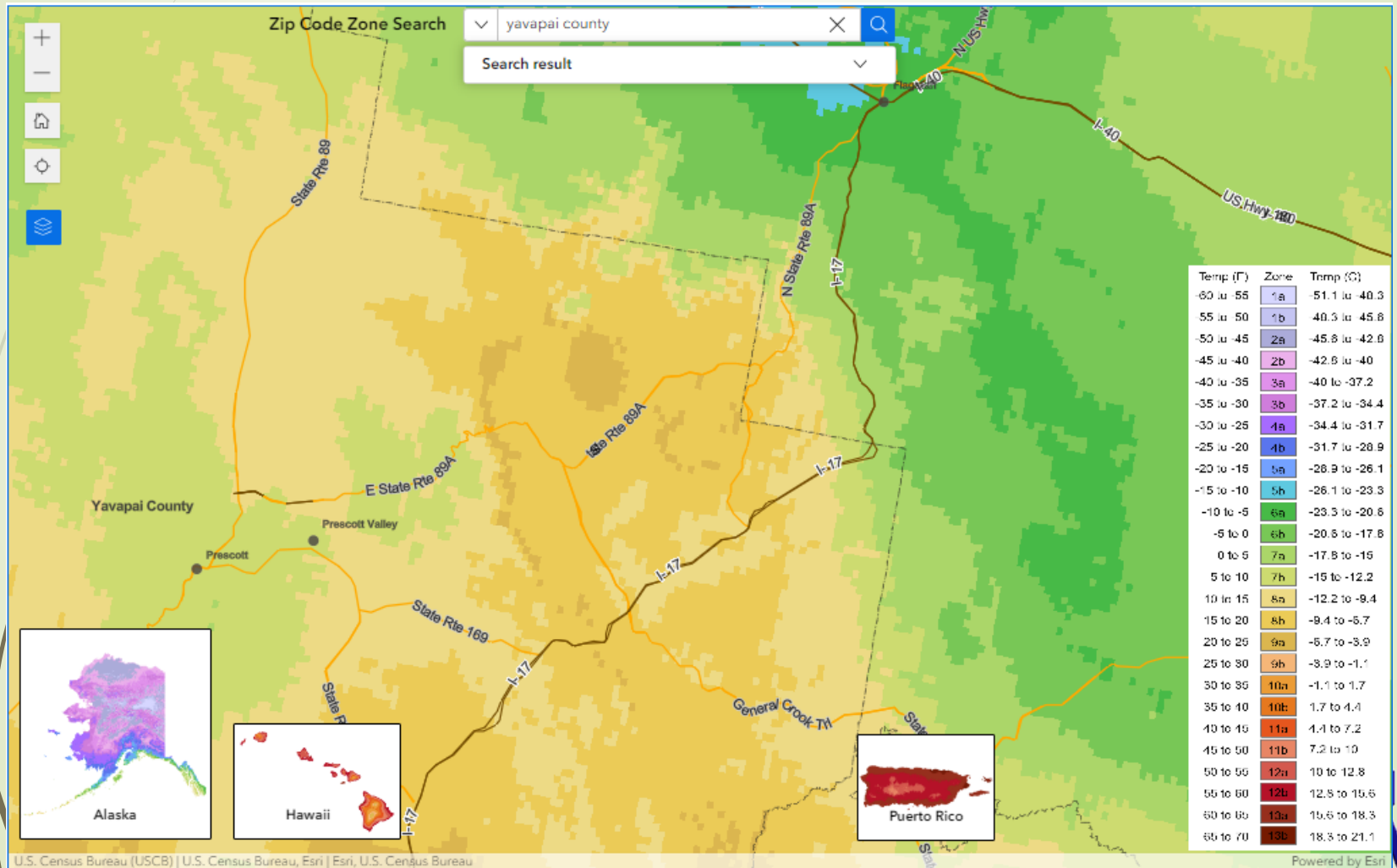


Chilling Requirements for Yavapai County

- Verde Valley (3,000 to 4,500 ft)
 - 600 to 750 chill hours
- Prescott (4,500 to 6,000 ft)
 - 750 to 1,000 chill hours
- These numbers are approximate, and some fruit varieties do not have chilling requirements high enough for our area



USDA Hardiness



Plant Selection

- Bare root
- Container
- Box
- Ball and Burlap

Look for young, well-labeled trees with healthy roots and stems. Beware of bargains. The price of the tree will be the smallest expense in the long-run.



Rootstocks and their Properties

- Dwarfing
- Precocity
- Insect/Disease resistance
- Salt tolerance
- Drought hardiness
- “wet feet” tolerance
- And more....

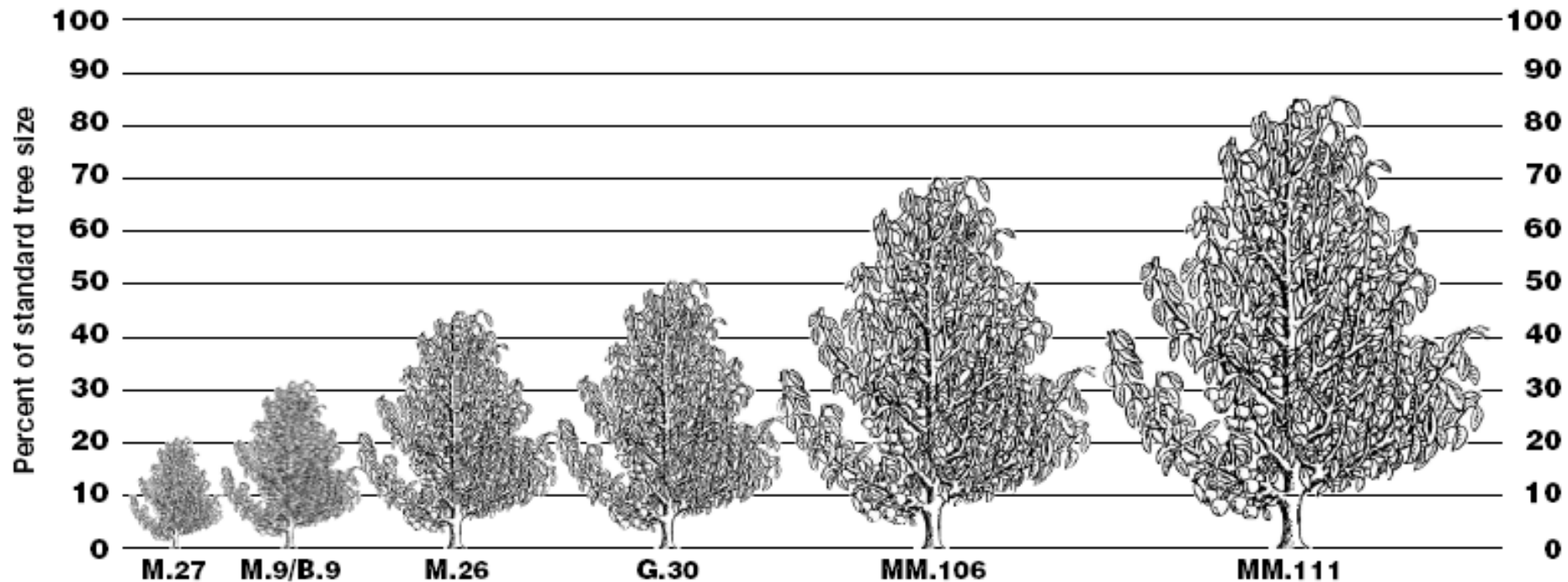


Rootstock	Description	Size (ft)
M.9	Common commercial rootstock, not for homeowners, requires trellis. Susceptible to fire blight.	8-12
M.26	Requires support. Hardy, few suckers. Produces burr knots Susceptible to fire blight. Precocious, often fruiting year after planting	12-15
G.11	35-40% size of standard, resistant to fire blight. Requires support. Most adapted Geneva to home orchard	12-15
G.30	Fire blight resistant. Needs support.	18-20
M.7	Common for home use. Tall and wide at maturity. Suckers, resistant to collar rot. Tolerant of wet soils, winter tender, needs support	15-20
B.9	Common fully-dwarf rootstock, needs support, very hardy.	7-8
M.106	Common at box stores and garden centers. Tends to throw suckers. Moderately resistant to wooly apple aphid. Excellent root anchorage.	25-30
MM.111	80-90% the size of standard/seedling. Too tall for home orchard. Resistant to wooly apple aphid. Reportedly drought tolerant	30-35
Seedling	40 ft tall and has delayed fruiting	35-40

Adapted from extension.usu.edu

Dwarfing Effects of Various Apple Rootstocks

Figure 1. Relative size of apple trees propagated on clonal apple rootstocks.



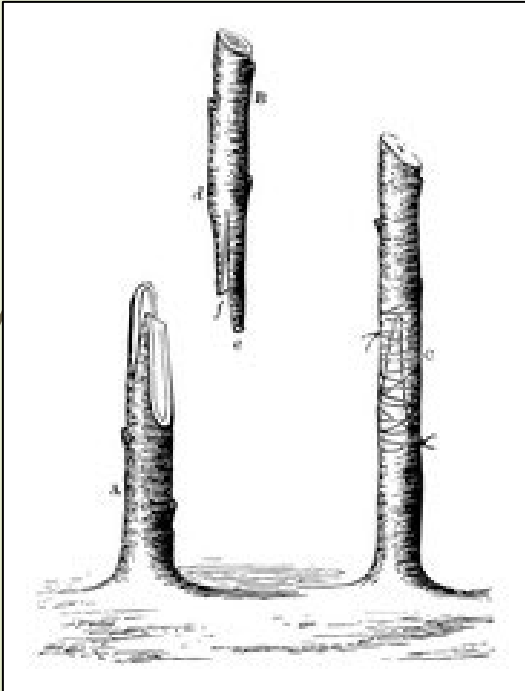
Grafting

- Scion wood- collected while plants are dormant, straight, smooth, pencil thickness (water sprouts are good)
 - Trim to 6-12"
 - Store in refrigerator until spring
- Bench Grafting- grafting a bare root piece of root stock at a "bench"
- Field Grafting- grafting to a rootstock in the field
- Sometimes an interstem is used

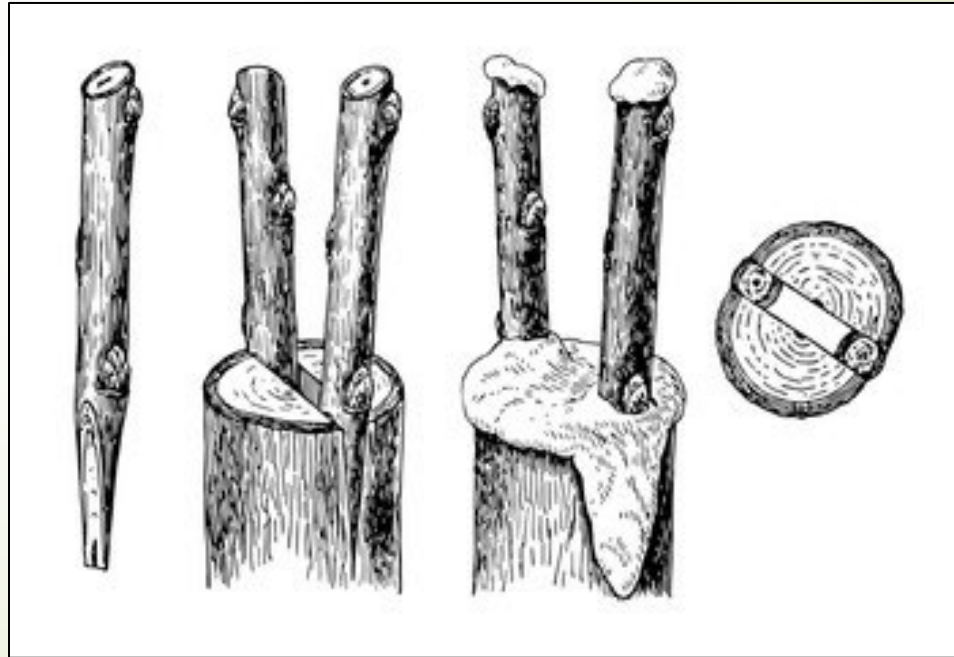


Common Types of Grafts

Whip and
Tongue

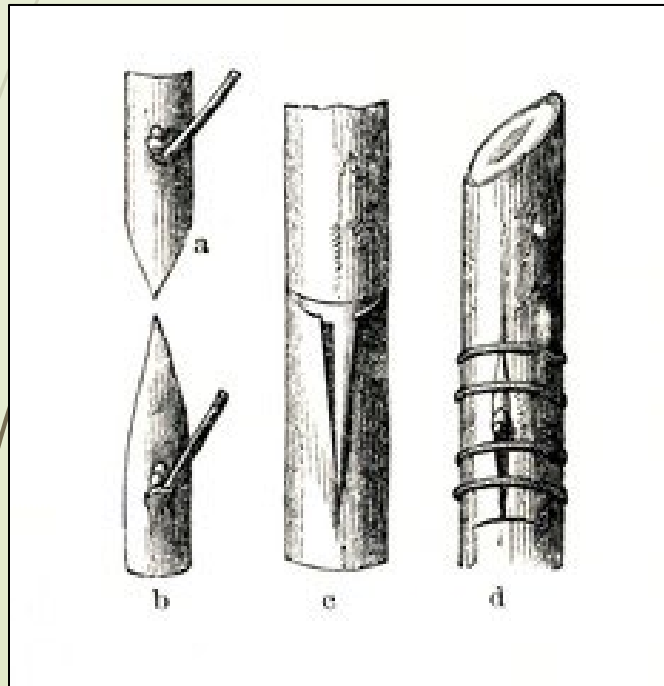


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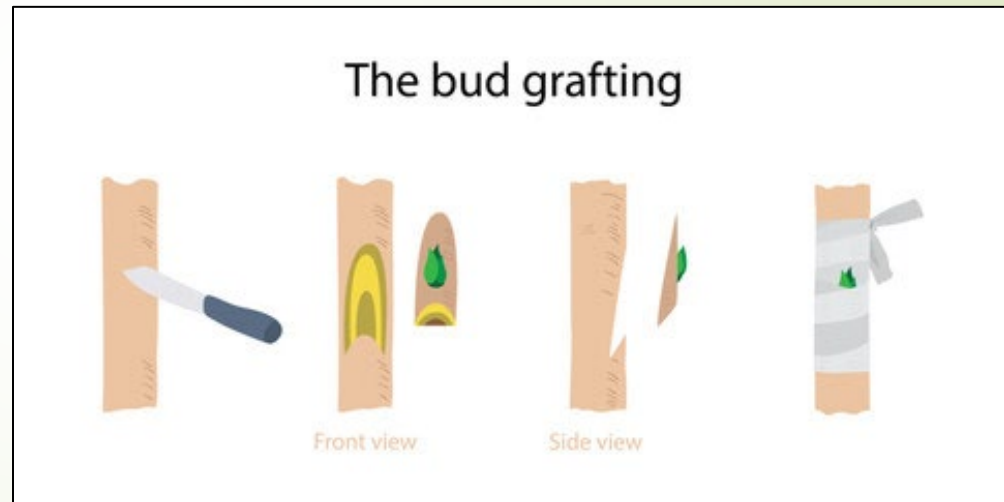


Common Budding Techniques

T or Shield



Chip Bud





Propagation

- Grown from cuttings
- Scion – known fruiting variety that makes up most of the tree you see above ground
- Rootstocks-roots and lower portion of trunk
 - Dwarfing characteristics (semi-dwarf)
 - Graft compatibility
 - Disease resistance
 - Early fruit production (precocity)



Grapevine Propagation

- ▶ Rootstock or no?
 - ▶ Depends on biological or environmental factors
 - ▶ Can be bench-grafted or in-field



Grapevine Propagation



Grapevine Propagation



Grapevine Propagation: Nursery Planting



Nursery



Spacing

- Semi-dwarf apples, peaches, apricots, and plums should be about 15-18 ft apart
- High-density planting
- Multi-budded “cocktail” trees
- Vines ideally at 6’



Planting

- Prune out damaged roots with clean, sharp tools
- Plant trees in native, non-amended soil during the month of March
- Soak the bare root tree roots in a bucket of water before planting
- Add soil and water incrementally to prevent air pockets
- Plant at same depth as it was grown in the nursery – bud union should 2-3 inches above the soil line
- Some people recommend the graft union face north



Planting and Initial Pruning



Pruning: Why Do We Prune?

- To maintain an open, well-lit canopy that will produce fruitful buds and not be overly prone to disease
- To control the size and shape of the tree
- To renew fruiting wood
- To control crop size (avoid alternate-bearing)



When Do We Prune?

- ▶ Winter Pruning-done between the coldest part of winter and bud-swell
 - ▶ Preferably when weather is cold and dry to avoid disease issues
- ▶ Summer Pruning (tree fruit)-when temperatures are hot and dry
 - ▶ Good time to remove water sprouts
 - ▶ Cuts do not induce growth like winter pruning



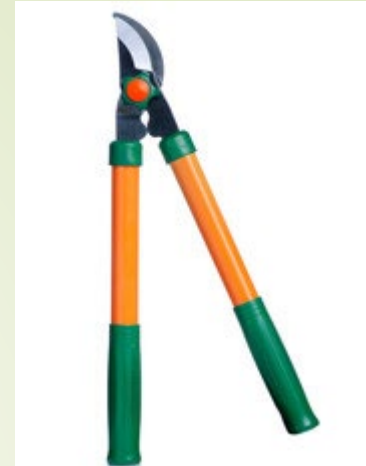
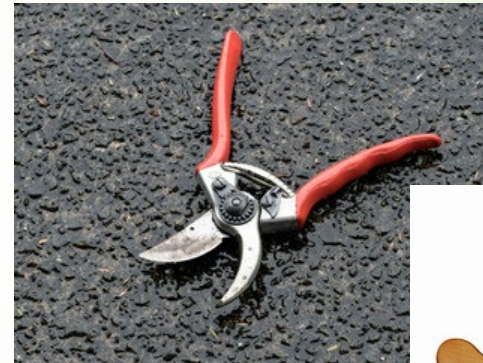
Basic Fruit Tree Terminology

- ▶ **Branch Collar-** raised tissue at the base of a branch
 - ▶ Contains specialized cells that seal off pruning wounds from disease
- ▶ **Crown-** base of the trunk where tree meets soil
- ▶ **Crotch angle-** angle formed between 2 limbs
 - ▶ Ideally between 45 and 60 degrees for strength
- ▶ **Leader-** the uppermost portion of a limb
- ▶ **Scaffold limb-** a large, main limb that forms a tree's framework
- ▶ **Spur-** short shoot that fruits
- ▶ **Stub-** short portion of a branch left after a cut-avoid
- ▶ **Sucker-** 1 year old shoot that grows from roots or crown
- ▶ **Water sprout-** 1 year old shoot that grows from a limb
- ▶ **Capacity-** a plant's ability to produce fruit and shoots in a single year



Pruning Tools

- Pruning shears (preferably bypass style)
- Long-handled loppers
- Pruning saw
- Sharpening tool
- PPE (eye protection and gloves)
- Disinfectant
- Ladder (safe)



How Do We Prune? (Techniques and Types of Cuts)



- ▶ Thinning cut - pruning cut that completely removes the shoot or branch at the “crotch” or junction between branches
 - ▶ Has minimal impact on regrowth near the cut
 - ▶ Redirects “capacity” to remaining branches/buds
 - ▶ Preferred cut for minimizing size/removing excess shoots
 - ▶ Reduces the number of branches



How Do We Prune? (Techniques and Types of Cuts)



- Heading Cut – removing a terminal bud or a shoot, causing the buds below it to break
 - Increases the number of branches by removing apical dominance
 - Will promote vegetative growth as opposed to flowering
 - Cut at a 45-degree angle to discourage water accumulation



How Do We Prune? (Techniques and Types of Cuts)

- Bench Cut – special type of heading-cut where the terminal section of a branch is removed just above a side branch
 - Redirects upright branches to the outside
 - Sort of a “reverse thinning cut”



Proper Pruning Techniques

- A proper cut is made just outside the collar
- Collar acts as a protective barrier, producing a callus layer that occlude disease

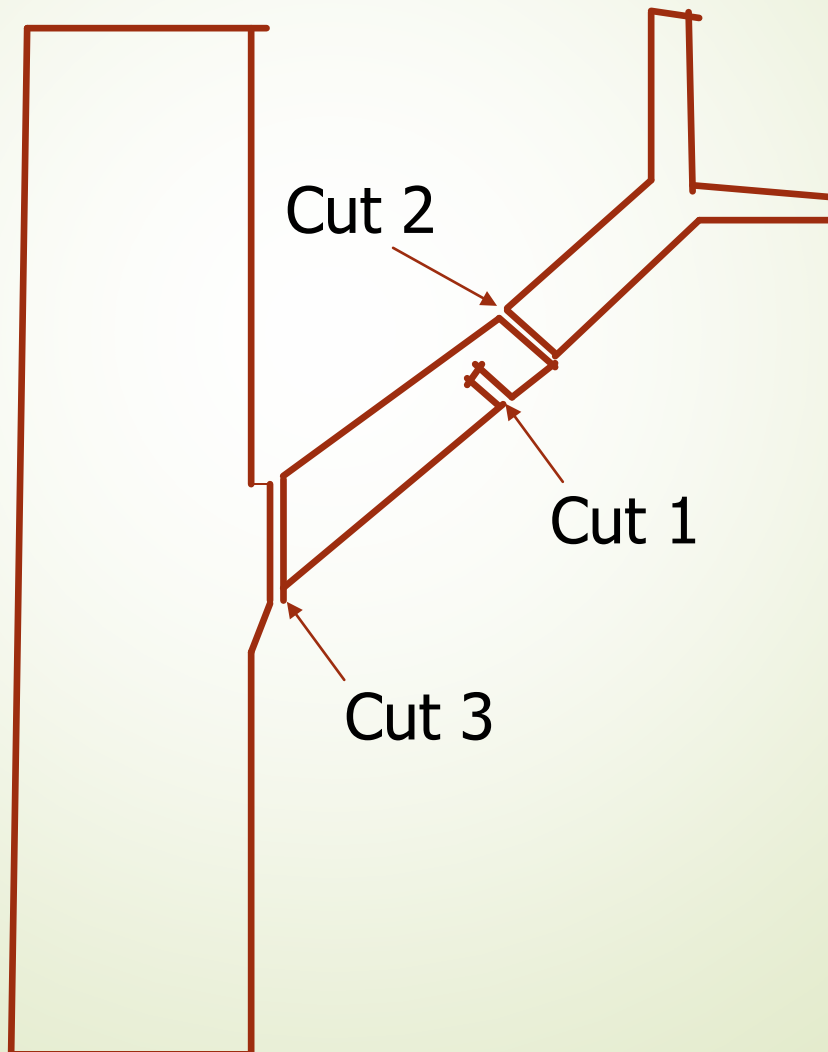


What do we Prune?

- Dead, Diseased, and Damaged (wood), and Duplications
- Suckers, (water) Sprouts, Straight Wood
- Crossing branches, Congestion, (poor) Collars, and (bad) Crotches



Proper Pruning Techniques: the 3-Cut Method



Proper Pruning Techniques

Throw prunings
outside of tree for:

- Safety
- Cleanliness
- To estimate the amount of prunings you've taken relative to the size of tree



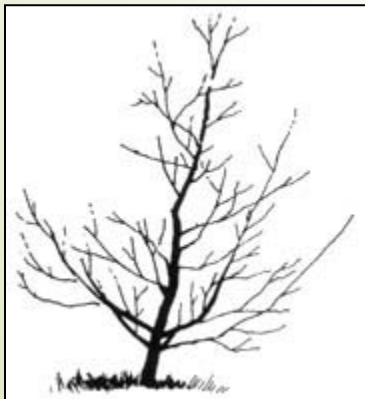
What Shape Do I Want the Tree to Have?

- What kind of shape does the tree naturally have?
- Does it want to have a strong central leader?
- Does it lean?
- What is the vigor level of the tree?
- Are there areas of congestion?
- Where is the sun?
- Where is the prevailing wind coming from?

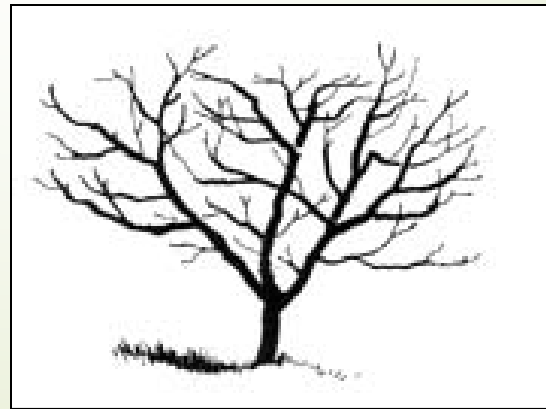


Training

- ▶ Modified Central Leader
 - ▶ Apples and pears
- ▶ Open Center
 - ▶ Stone fruits: peaches, nectarines, plums, apricots, cherries, etc. Some people prune apples and pears this way too



Central Leader/ Modified Central Leader

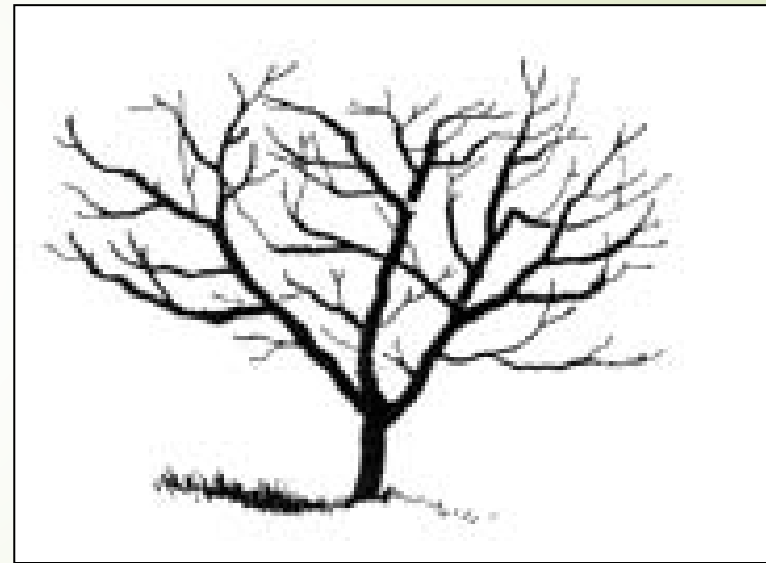


Open Center



Training Styles: Open Center

- 3 to 5 main scaffolding branches, spaced out evenly
- Good for keeping tree low to the ground
- Start scaffolding about 18-24" above the ground
- Branches should ideally be at a 45-degree angle

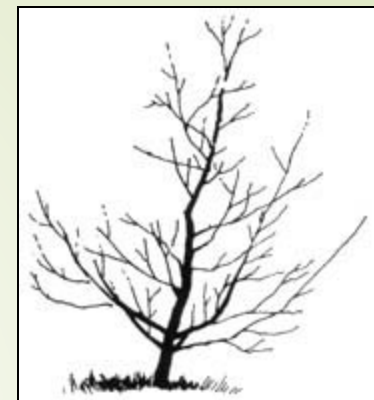


Open Center Pruning

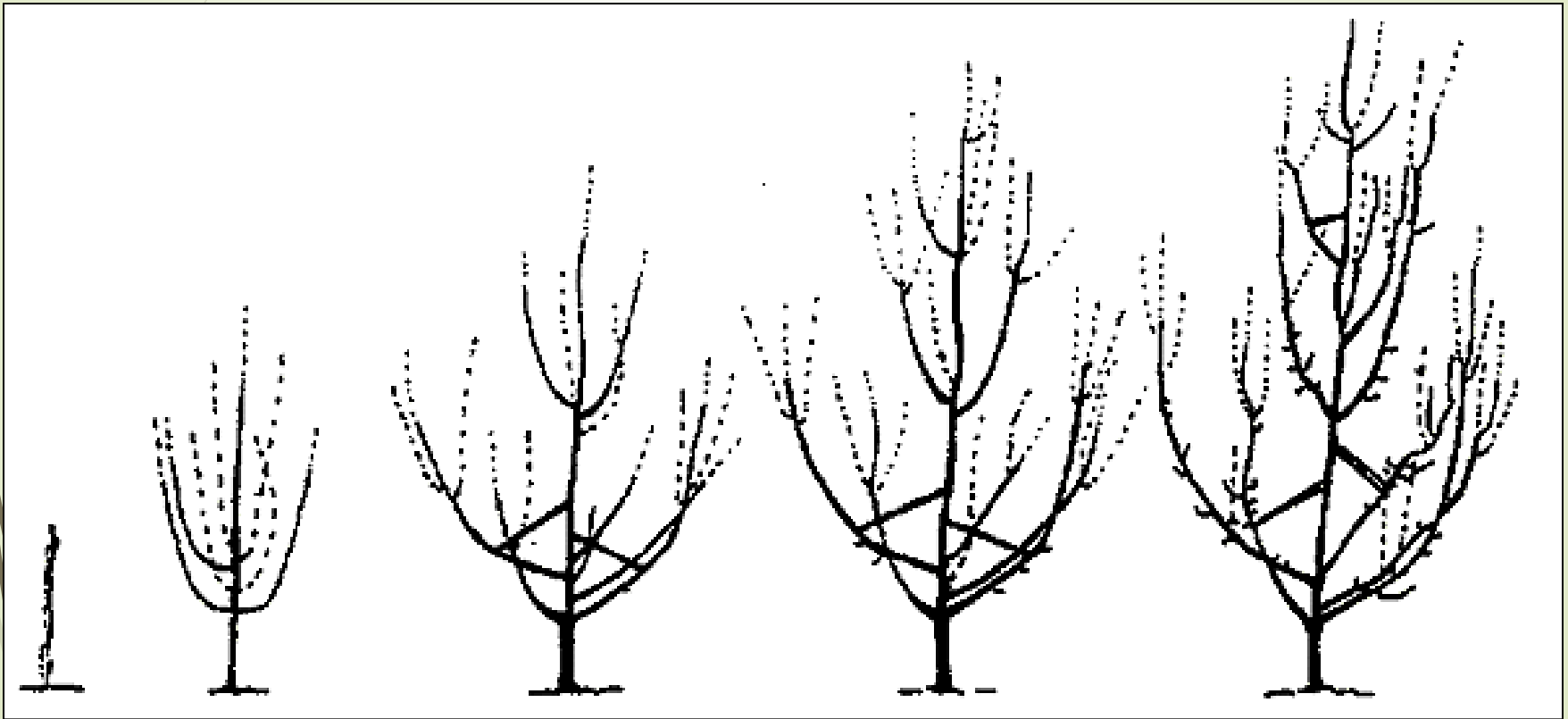


Training Style: Central Leader

- Christmas tree-shaped
- Lowest scaffolds being the largest and producing the most fruit
- Each subsequent tier of scaffolds smaller than the last
- Upper tiers ideally have wide angle branch to control vigor
- Modified Central Leader- a heading cut is made on central leader tree at about 6 feet
 - Top branches and should be maintained as the top of tree
 - Easier to manage than Central Leader



Central Leader Pruning



Basic Grapevine Terminology



- Trunk- main body of the vine
- Cordon-"arms" of vine that often hang on trellis wire
- Shoot-vegetative growth, arising from buds
- Cane-mature, browned shoot
- Spur-short, pruned canes that arise from cordons
- Bud-3 compound buds in one, borne on nodes

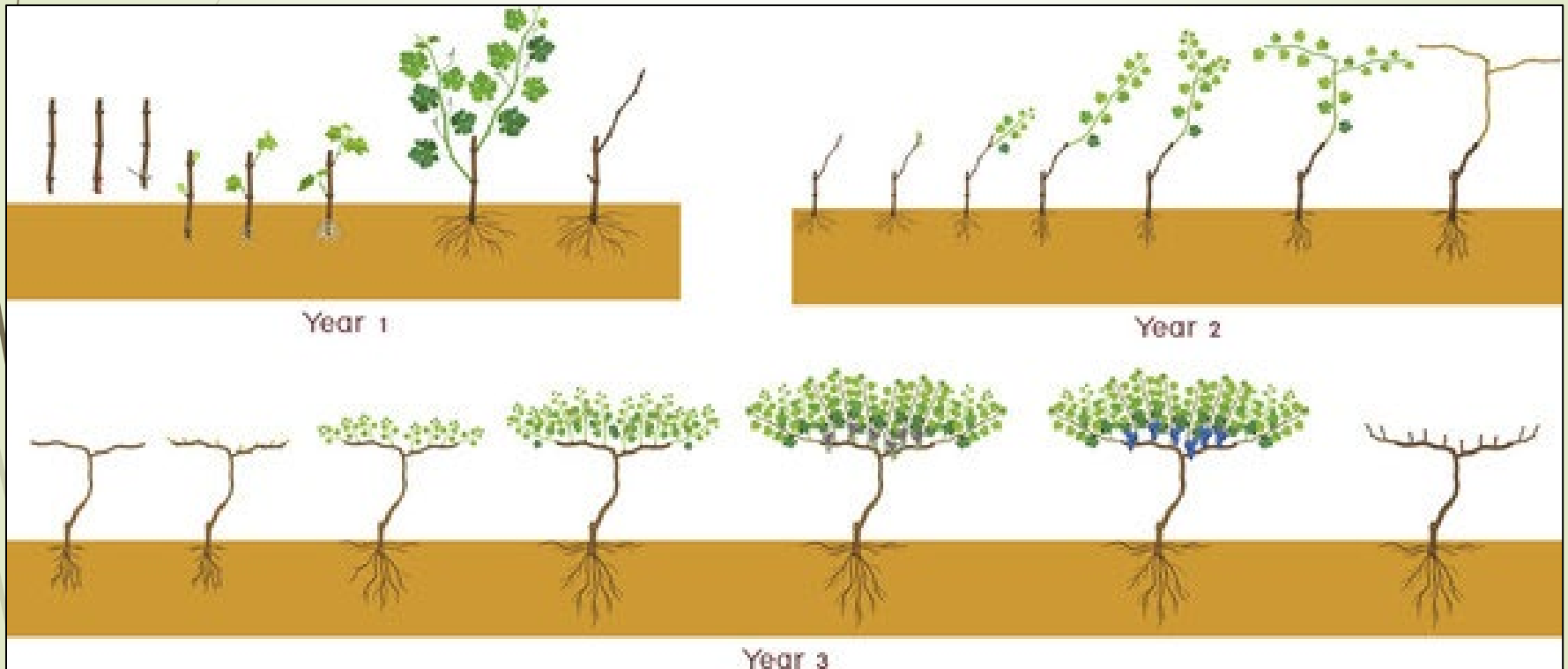


Why Do we prune Grapes?

- ▶ To maintain the shape of the individual vine to ease management practices
- ▶ To produce fruit of a desired quality
- ▶ To select buds which are fruitful
- ▶ To determine the number of shoots and clusters
- ▶ To control the vigor of the vines

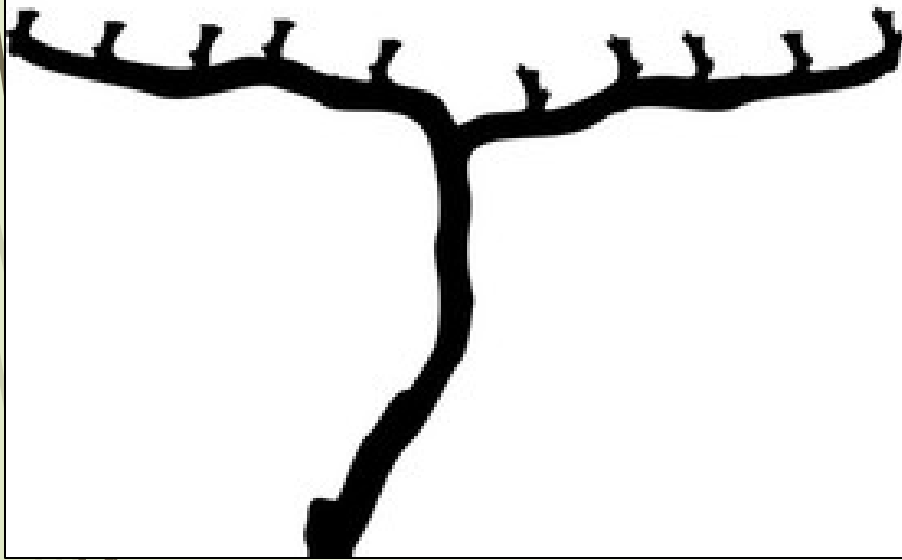


Training and Pruning Grapes

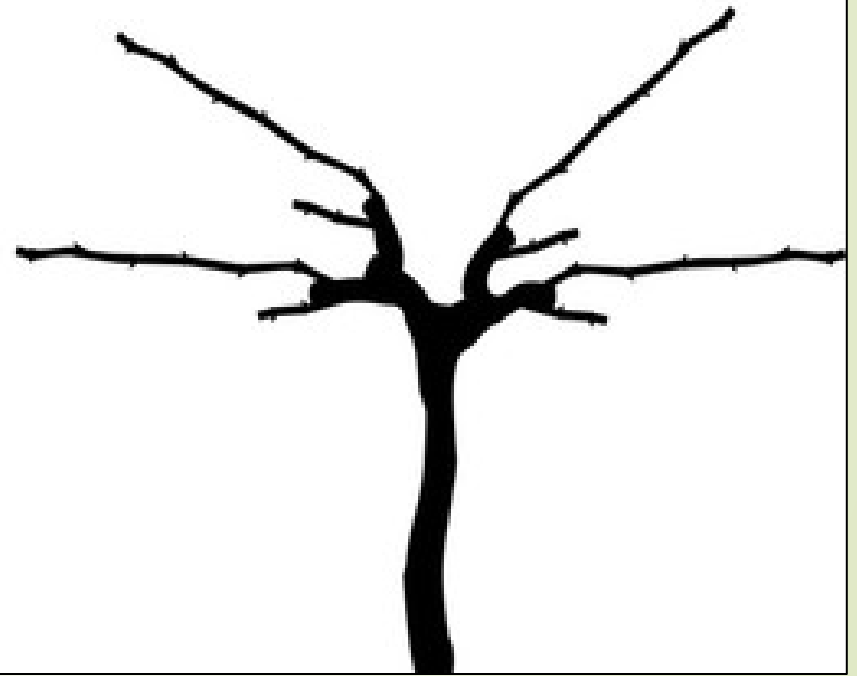


Spur vs Cane Pruning Grapes

spur pruning

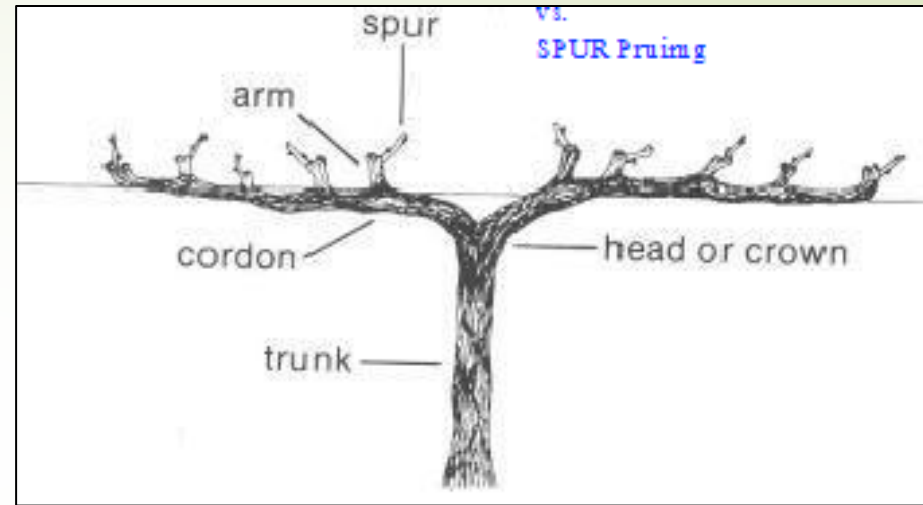


cane pruning

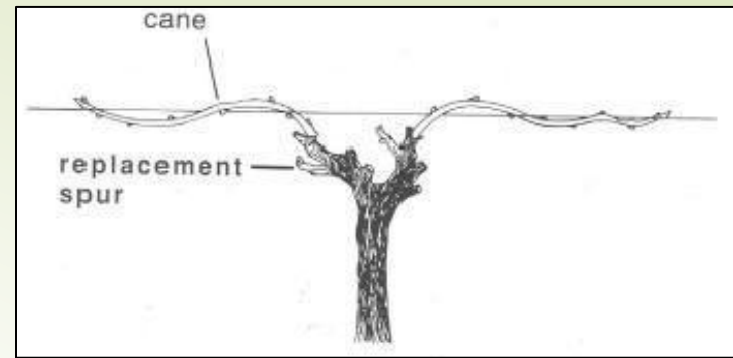


Spur-Pruning

- Head or cordon-trained
- Generally, 2 or 3 bud spurs
- 4 to 6 inches apart
- Leave extra cane tissue to protect bud nearest cut
- Spurs should be upright
- Renewal spurs may need to be retained
- Spur diameter should be “pencil-sized”



Cane Pruning



- Often used with varieties with low fruitfulness in their basal buds
- Head or cordon-trained
- To avoid apical dominance, canes are often bent
- Renewal spurs must be retained
- Wood selection is important
- Requires more skill

Double Pruning

- Used in HOT areas (Australia) where acids are “washed” out
- Frost-avoidance
- A “pre-prune” once at the normal, “winter pruning” time
- Prune again, just after frost, fruit-set
- Resulting ripening happens later, when temperatures are lower



Shoot Thinning Grapes

- Done in the Summer, usually after inflorescences are visible
- Removal of unwanted shoots/fruit
- Improves air movement/fruit exposure to light



Irrigation

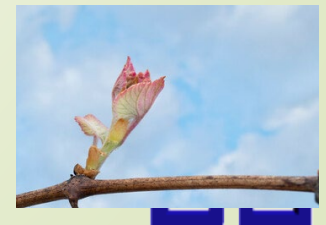
Tree fruit should be well-watered

- ▶ Build a “berm” 2 feet beyond trunk, sloping outward; fill with water during irrigation event
- ▶ Drip irrigation is also effective as long as it adequately designed and function
- ▶ Micro-sprinklers will also do the job
- ▶ Apply some water during dry winter periods
- ▶ Mulching will prevent evaporation



Wine Grapes Employ Deficit Irrigation

- **Budbreak to Fruitset:** Irrigation to full E_t grapes
- **Fruitset to Veraison** (color change): Use deficit irrigation to slow canopy growth
- **Veraison to Harvest:** If growth has stopped, normal E_t water can be applied, shoots should be browning to canes
- **Harvest to dormancy:** If growth has stopped, soil profile should be filled



Fertilization

- Nitrogen is the primary concern (P and K are probably adequate)
- Pears-0.05 lb N/inch of trunk diameter and up to 0.5 lb N/tree
- Apples and Stone Fruits-0.1 lb N/inch of trunk diameter and up to 1.0 lb N/tree
- Grapes-.5 to 1.0oz per plant of N



Fertilizer Calculations and Application Timing

- Apple with a 7-inch trunk diameter
- 7 inches x 0.1 lb. N/inch dia.=0.7 lbs. N
- Using ammonium sulfate (21-0-0)
- $0.7 \text{ lbs. N} \times 1 \text{ lb } 21-0-0 \text{ fert} / 0.21 \text{ lb. N} =$

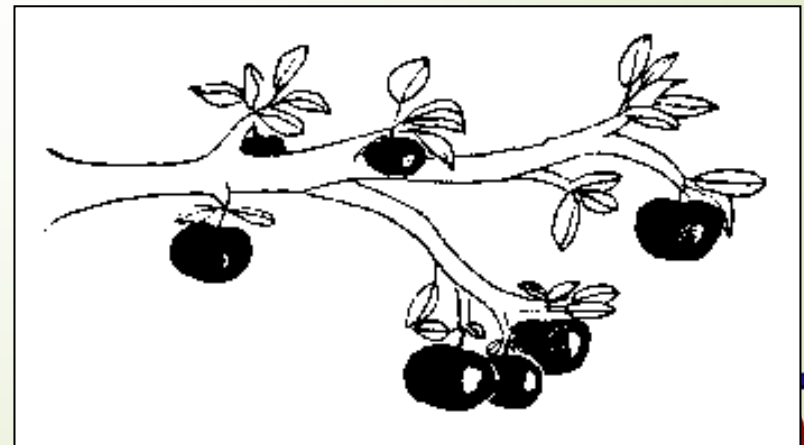
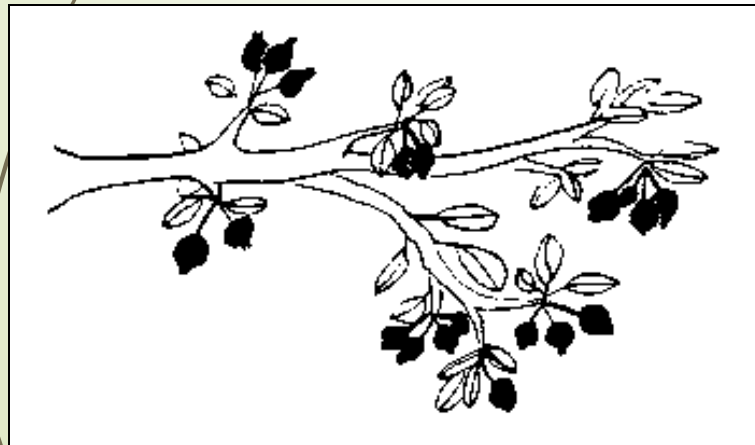
3.3 lb. ammonium sulfate/tree

- It is best to split three ways $\frac{1}{2}$ in April/May (after leaf out), $\frac{1}{4}$ in July, and $\frac{1}{4}$ in September
- 1.7 lb in April/May, and 0.8 lb. in July and again in September



Thinning Fruit

- ▶ Thinning improves fruit quality and can increase individual fruit size
- ▶ Thin fruit to be about 5 to 8 inches apart and only one fruit per cluster



Harvesting Fruit

➤ Apples

- When normal, unblemished fruit begin to drop
- Flesh color at the bottom of the fruit has changed from green to yellow-green
- Taste it (the birds will also eat it)

➤ Pear

- Should be picked slightly before ripe and will ripen further indoors
- Change in fruit color from green to yellow



Harvesting Fruit (cont.)

- Apricots
 - Softens slightly and easily separates from the stem
- Plums
 - Sugar increases and color changes
 - Flesh softens somewhat



Harvesting Fruit (cont.)

- Cherry
 - Maximum sized and full-flavored
 - Will not ripen off the tree
 - Sweet cherries remain firm when ripe
 - Sour cherries pull off stem easily
- Peaches/Nectarines
 - Fruit separates easily from the stems
 - Will ripen best on the tree



Harvesting Fruit (cont.)

- Grapes-Color change from green to red/purple/black or translucent yellow is called “veraison”
- Stem/rachis turns from green to brown
- Seeds will turn brown
- Sweeter and less acidic



Indicators of Maturity and Ripening



- Background color change- the color of the skin on the fruit that isn't exposed to the sun changes
- Ease of separation of fruit from tree
- Aroma- volatile, aromatic compounds are given off to signal ripeness
- Taste-unripe fruit is starchy, lack sweetness
 - Acid and tannin high
- Seed Color changes from yellow/white to brown
- Feel- generally, flesh softens as fruit ripens
- Color not always a good indicator, depending on variety



Orchard Pests





Codling Moth (*Cydia pomonella*)

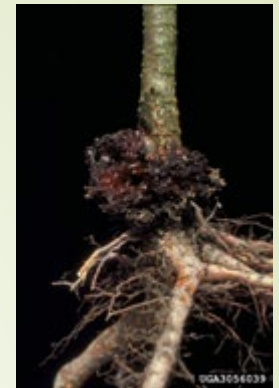


- Pest of apple, pear
- Causes black center in fruit (insect larvae frass)
- Can use pheromone disruption
- Spray BT (*Bacillus thurengensis*)
- Use traps to monitor
- Keep ground clean of old apples
- Adults: 3/8", brown/grey
 - Emerge in spring, just before bloom
- Larvae: 1/2", pink body, brown head



Peach Tree Borer (*Synanthedon exitosa*)

- Attack *Prunus* species (peach, cherry, plum and other stone fruits)
- Often, larvae attack the bases of young peach trees-girdle the tree
- Larvae become a clearwing moth (wasp-mimic)
- Adult moths lay eggs on trunk or in soil
- Often identified by “glob of clear sap”
- Use a straight paperclip to stab larvae inside
- Larvae overwinter below ground



Aphids

- Seasonal, not terribly harmful
- Wash off with hose
- Farmed by ants
- Signs of severe feeding include curled, stunted leaves
- Identified by “tailpipe-like” cornicles, which produce “honeydew”
- Parthenogenic-no need to sexually reproduce and give birth to live young
- Lots of beneficial insects eat aphids



Thrips

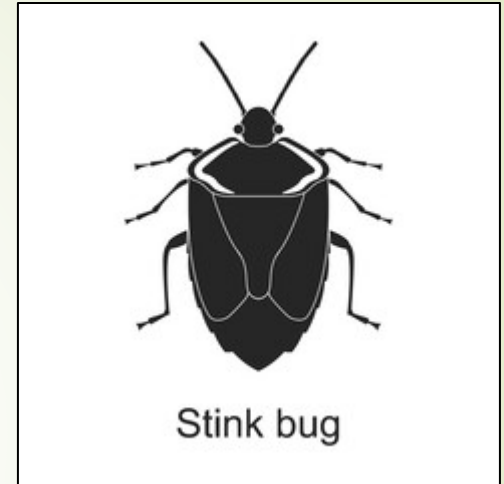
(*Frankliniella occidentalis*)

- Omnivores that can be pests or beneficials
- Extremely small, with “rasping” mouthparts
- Don’t like extreme heat
- Usually not a serious threat
- Spend time in weeds and will migrate if you mow
- Vigorous plants usually outgrow damage



Stink bugs/Plant bugs

- Have piercing/sucking mouthparts
- Scar the fruit
- Often give off bad odor
- Eggs spherical on the underside of leaves
- Rub off egg masses when found
- Adults killed by submerging in soapy water

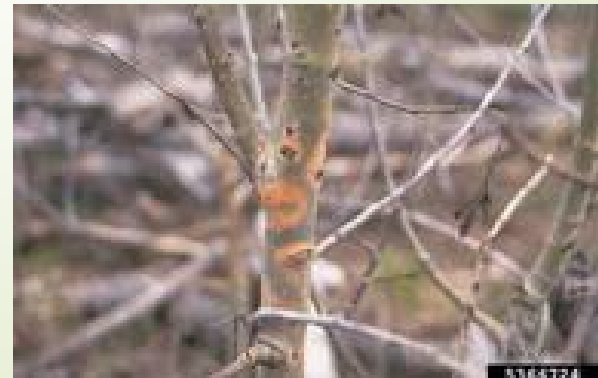


Woolly Apple Aphid (*Eriosoma lanigerum*)

- Creates waxy, cottony material
- Insect under “wool” is reddish-brown to purple
- Blood red mess when crushed
- Can live and reproduce on apple year-round
- MM and G rootstocks are resistant
- Predatory insects effective

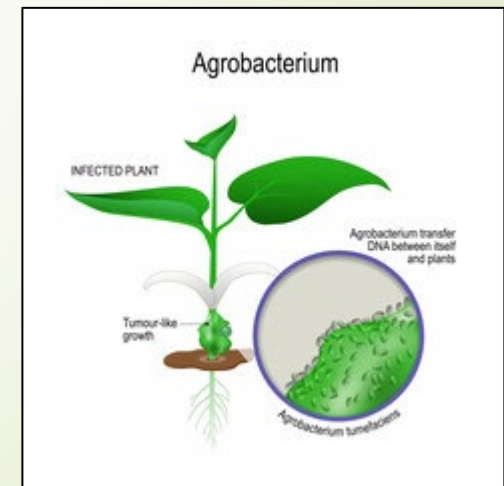


Orchard Diseases



Crown Gall (*Agrobacterium* spp)

- Bacterial disease common in grapes
- Forms galls, usually at base of trunk
- Galls disrupt the vascular system
- May cause foliage to turn bright red
- Nature's first GMO engineer
- Often spread through nursery propagation
- Symptoms often occur when host is injured due to cold or machine



Powdery Mildew

- White, “powdery”-looking fungus
- Different species for different hosts
- Likes warm (not hot), humid (not wet) conditions
 - Infection period is marked by .1” of rain and above 50-degree avg temps
 - Temps above 95 kill PM
- Grows in areas of congestion
- Sulfur and oil effective at eradication



Fire Blight (*Erwinia amylovora*)

- Bacterial disease of apple and pear
- Likes warm, wet conditions
- Survives winter in cankers
- In springs, cankers ooze, which attracts insects who spread bacteria to flowers
- Rain splashes also spread
- Enters plant through wound
- Infected tissues turn black
- Current year's growth wilt: "Sheppard's crook"
- Cut out as soon as possible and dispose



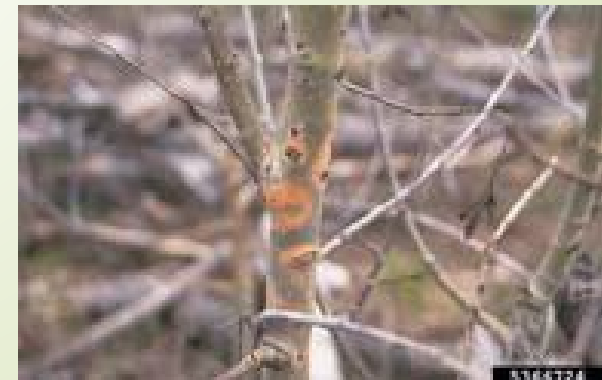
Texas Root Rot (*Phymatotrichum omnivorum*)

- Problem in Southwest US (Verde Valley)
- Native soil-inhabiting fungus in calcareous soils
- Disease of Cotton, alfalfa, fruit and nut orchards and grapes
- Symptoms: leaves turn yellow/brown quickly, remain attached to plant
- Roots can be pulled out of the ground easily
- Covered with fungal hyphae
- Often shows up with Monsoons
- Infection radiates outward



Cytospora Canker (Valsa and Leucostoma spp)

- Slow, creeping fungal disease of plant
- Peach and Cherry
- Orange fruiting bodies
- Canker exude gum from necrotic center, slowly enlarging
- Tree will attempt to form callus over to fight invasion
- Disease attacks weakened hosts
 - Drought and waterlogging of roots
 - Wounds from string trimmers

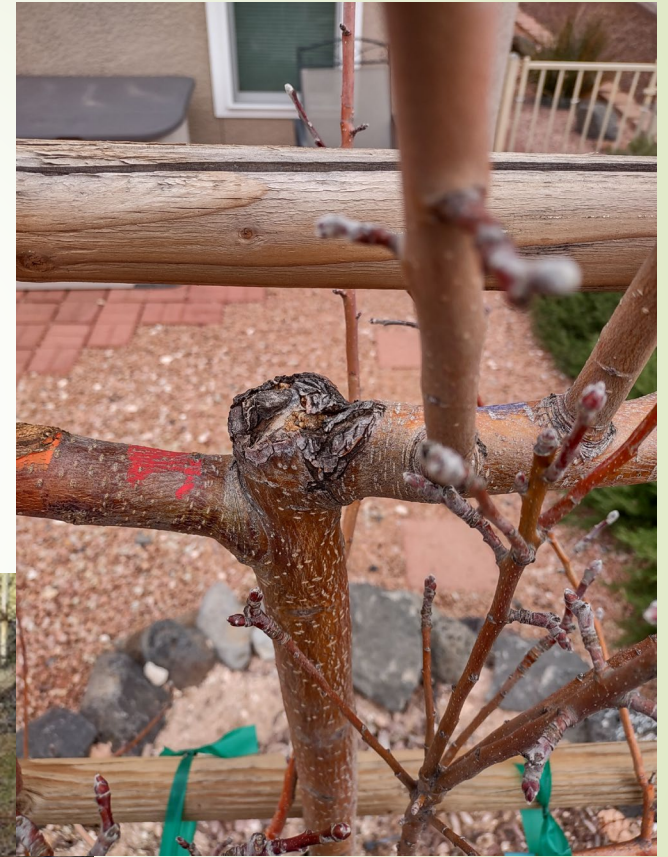


Cedar Apple Rust (*Gymnosporangium* spp)

- Disease of apple
- Juniper is alternative host
- Moves from apple to juniper and back again
- Not terrible in AZ
- Remove galls from juniper trees
- Use resistant apple varieties



Southwest Injury



Fruit Tree IPM-Vertebrates

- Pocket Gophers
- Deer/Elk
- Sapsuckers/Woodpeckers
- Birds



Final Thoughts

- Choose appropriate varieties
- Grow what you enjoy
- When the trees get old, replace them
- Keep good records (flavor, productivity, years of crops, etc.)
- Have Fun!

