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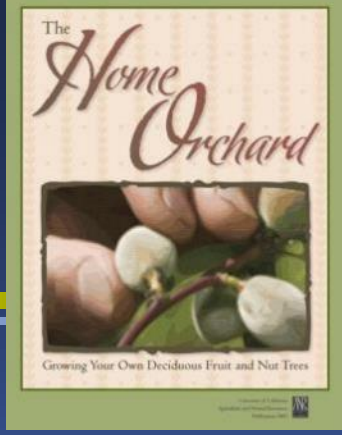
Making a Difference for California



Growing Fruit Trees in the Home Garden

Chuck Ingels

UC Cooperative Extension, Sacramento County

Master Gardener Training

Fairfield

Jan. 27, 2017

Topics to be Covered

- Fruit Tree Basics
- Planting
- Fruit Tree Growth
- Training and Pruning
- Irrigation and Fertilization
- Fruit Thinning
- Pest Management

Topics to be Covered

- **Fruit Tree Basics**
- Planting
- Fruit Tree Growth
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- Pest Management

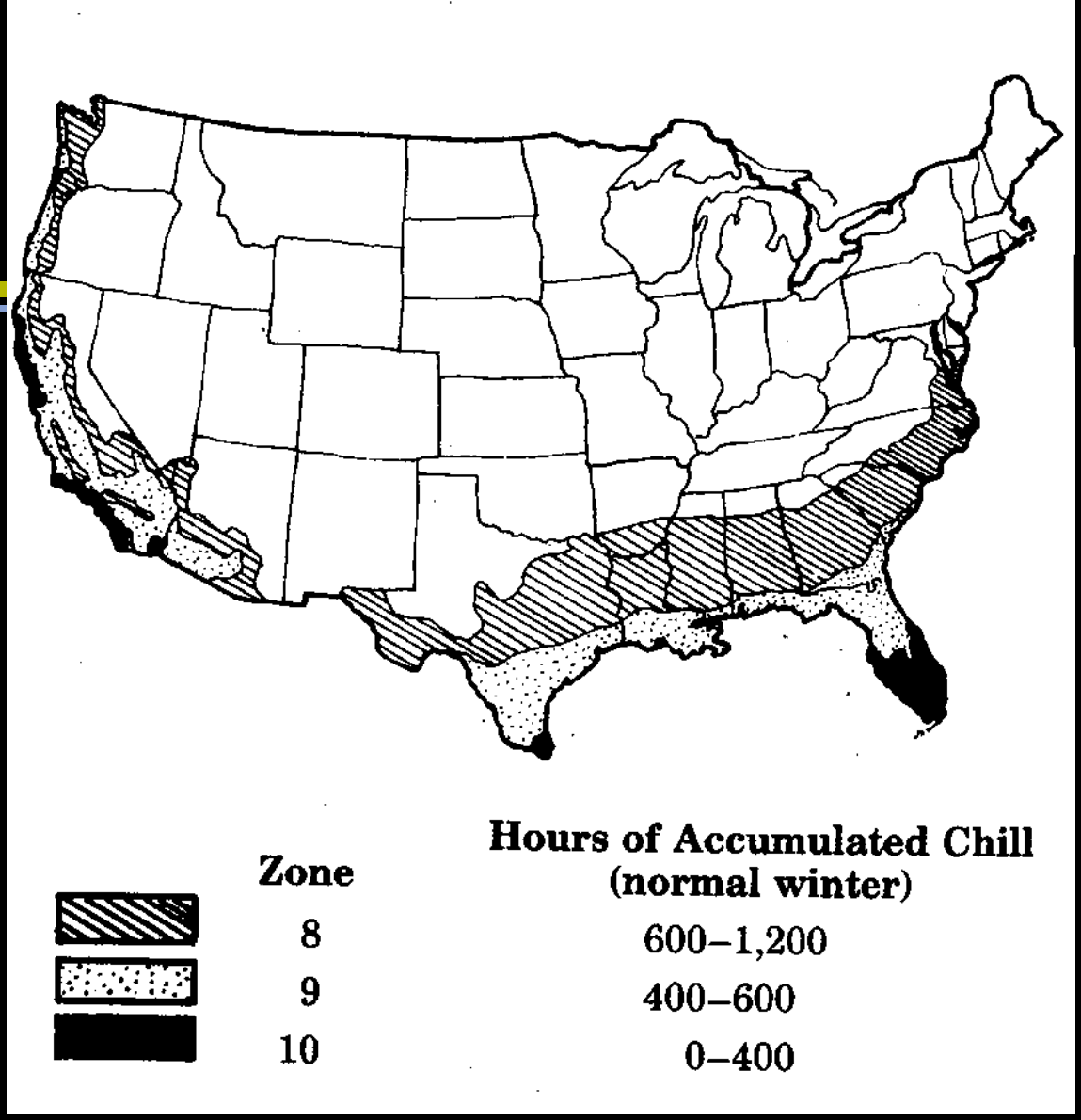
Chilling Requirement

The number of hours below 45°F required by a fruit species or variety between November 1 and February 15

Lack of chilling causes:

Death of buds, extended bloom, and poor fruit set

Extended bloom increases time pathogens may enter flowers



Three zones with low-chill winters

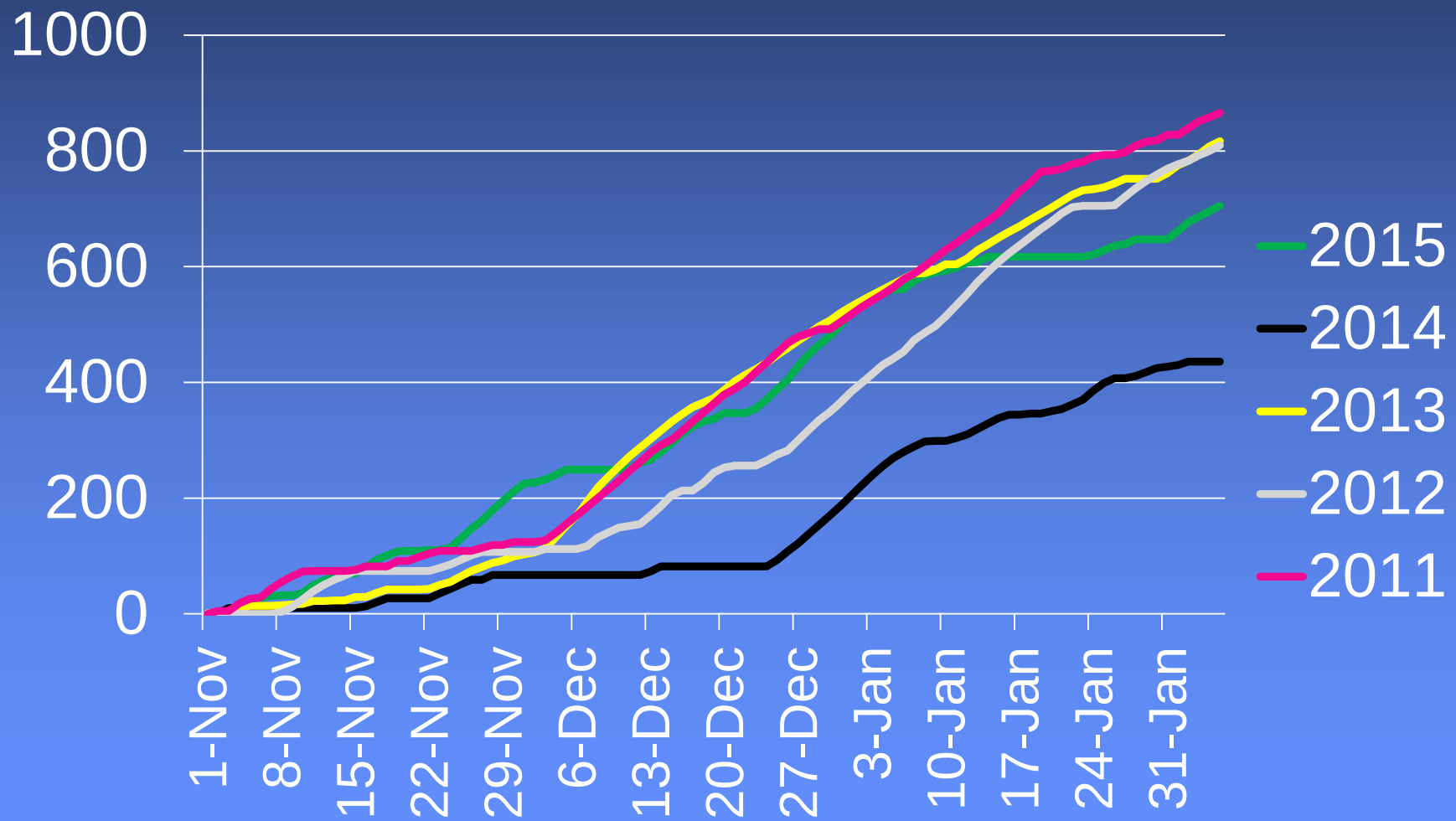
Chilling Hour Requirements
(Newer varieties may have lower requirements)

Almond	250-500
Apple*	500-1000
Apple (low chill)	400-600
Apricot*	300-800
Cherry, sweet	700-800
Fig	100
Peach/nectarine	500-800
Pear*	700-800

Pear (Asian)	350-450
Pecan	250
Persimmon	100-200
Pistachio	800
Plum, European	600-800
Plum, Japanese	700-800
Pomegranate	100-150
Walnut	500-700

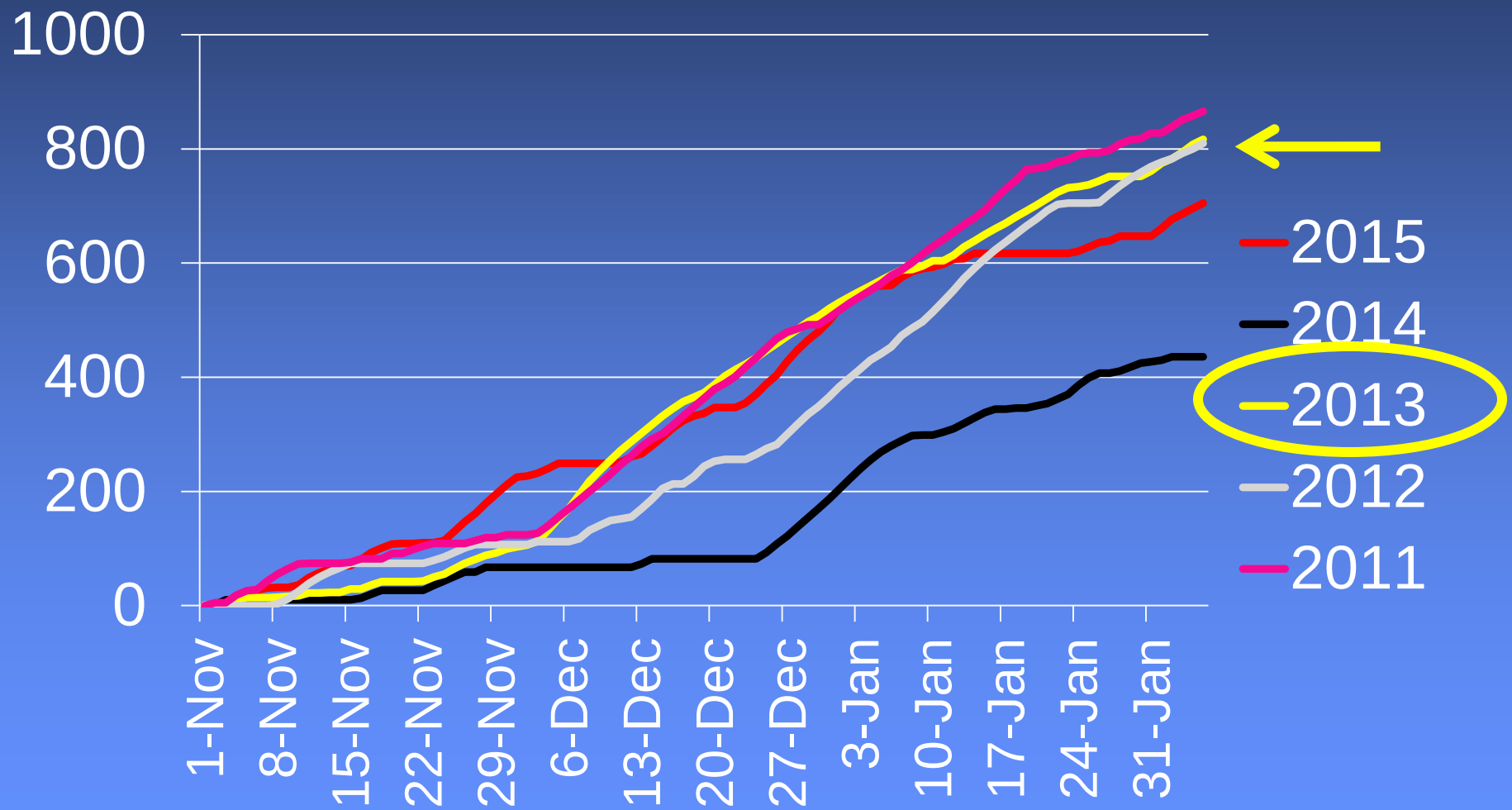
Cumulative Chill **Hours**

CIMIS Station – Fair Oaks, 2011-15



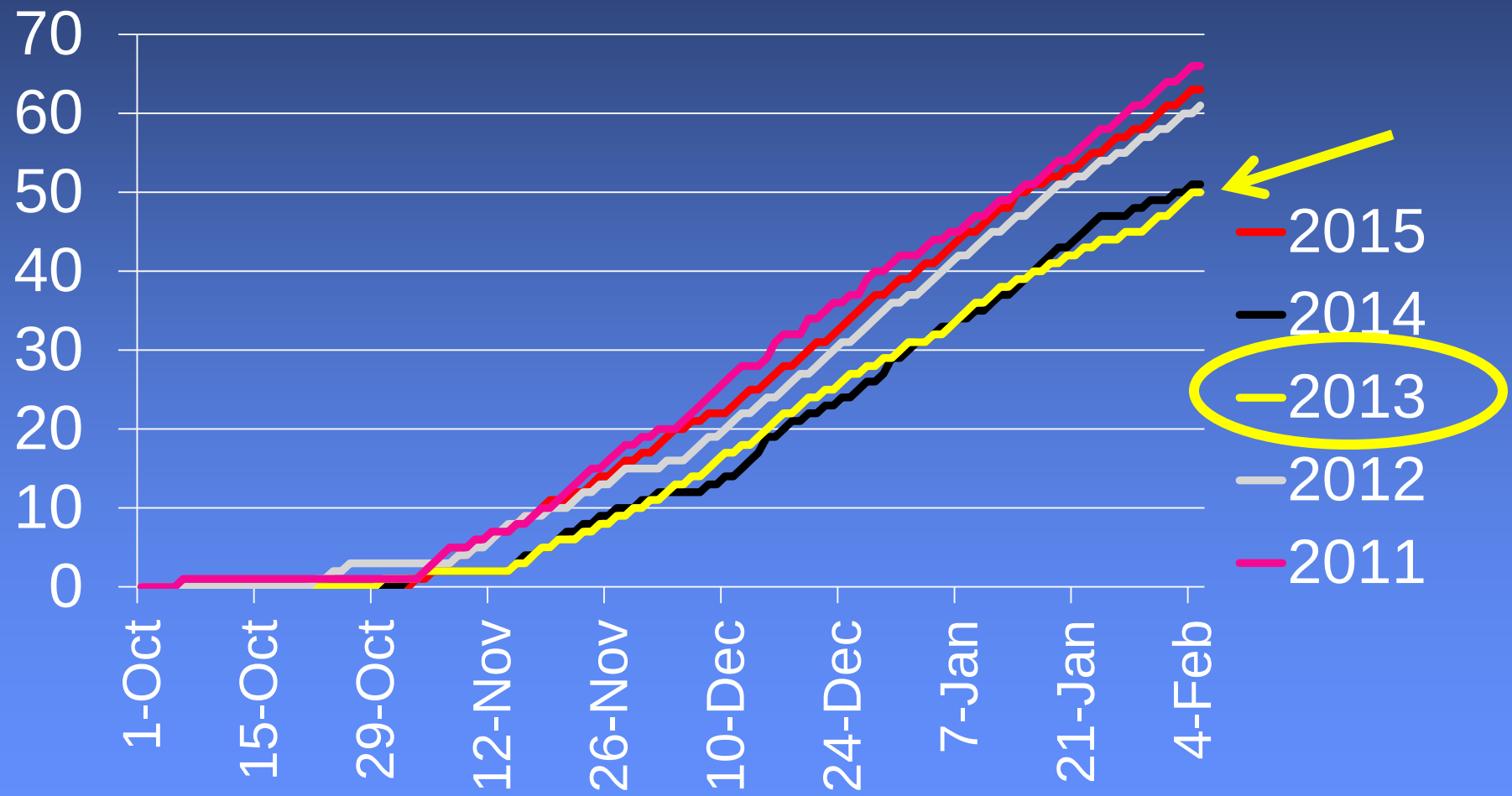
Cumulative Chill **Hours**

CIMIS Station – Fair Oaks, 2011-15



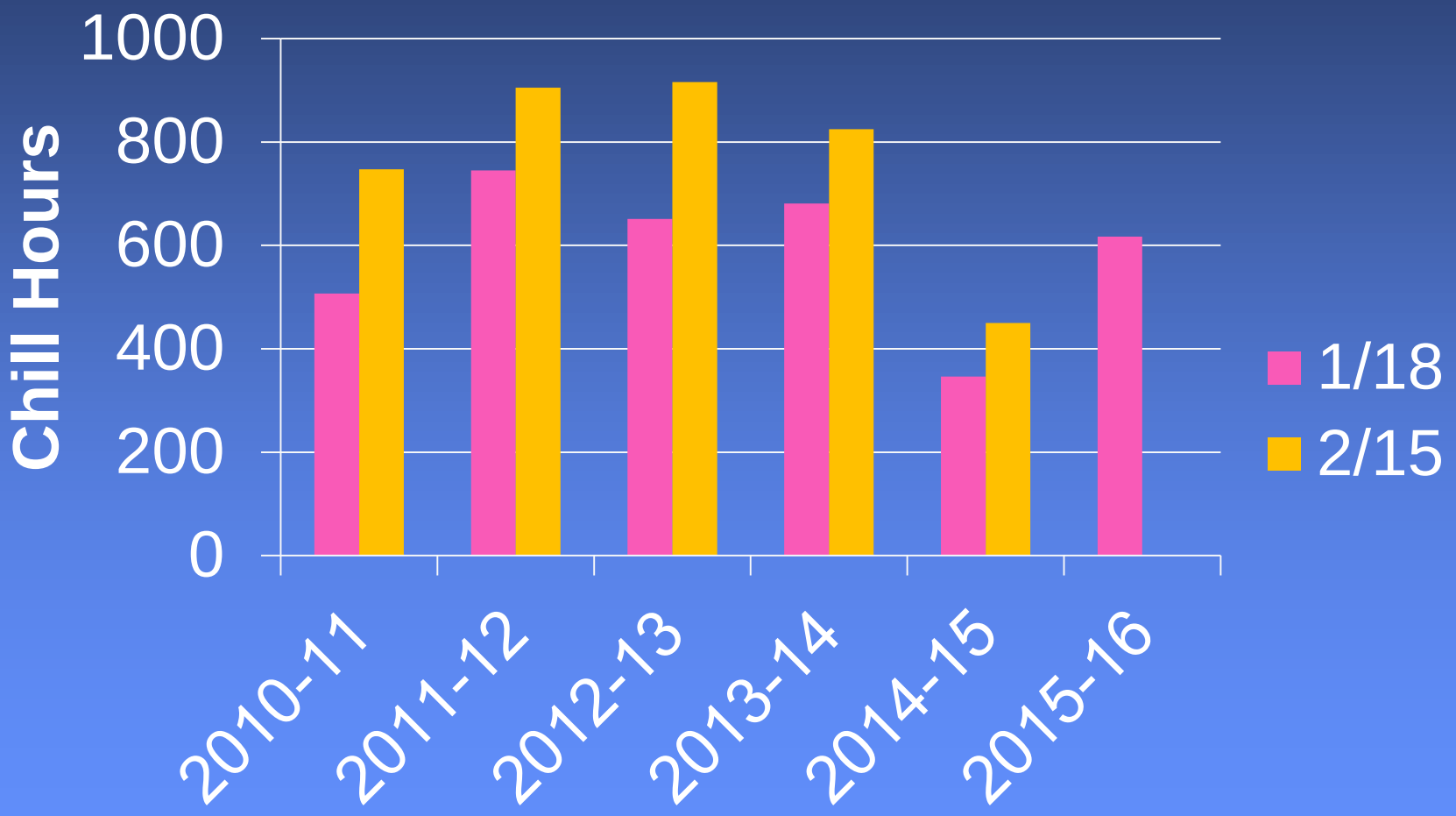
Cumulative Chill **Portions**

CIMIS Station – Fair Oaks, 2011-15



Cumulative Chill Hours

CIMIS Station – Fair Oaks



Pollination

- Polle(i)nize: To supply with pollen
- Pollinate: To convey pollen to a stigma and so allow fertilization
- Polle(i)nizer: Another variety planted or grafted nearby to provide pollen (and fruit)
- Pollinator: An insect that pollenizes
- Fertilization: The act of initiating biological reproduction by pollination; union of male and female gametes (cells) to form a zygote

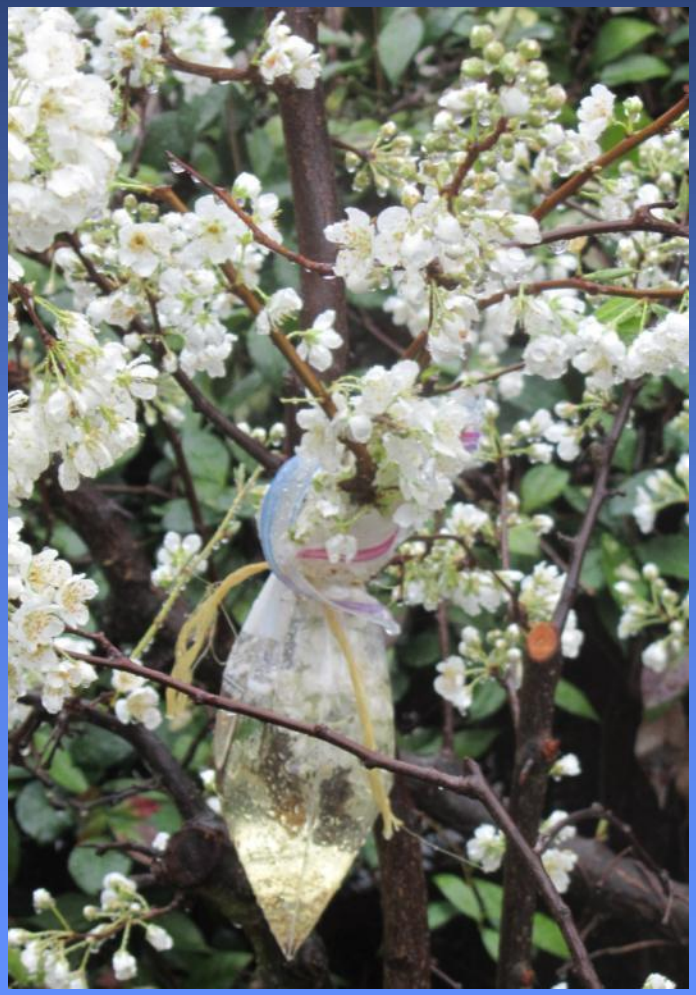
Pollination and Fruitfulness

- Self-fruitful = The pollen from one flower will pollinate the pistil of the same flower
  - » A nearby pollinizer may still enhance pollination
  - » Apricot, peach, nectarine, pomegranate
  - » Cherry: Lapins & Stella, Apple: several
- Partially self-fruitful = Will set some fruit, but set far more with pollinizer
  - » Many pome fruit, plum, & plum hybrid varieties

Pollination and Fruitfulness

- Self-unfruitful / Self-sterile: Use another variety
  - » Many pome fruit, cherry, plum (& hybrid) varieties
  - » The closer the better for pollinizer
  - » Bloom timing must overlap (they often don't, so more than one pollinizer variety is best)
  - » 50 ft. – Stark Bros., Chuck
  - » 75-100 ft. – The New Fruit Grower
  - » 100 ft. – UC Calif. Backyard Orchard, Amherst Nurseries, sfgate.com, Lowes
  - » 100-200 ft. – Purdue Univ.

What if You Have No Pollenizer Nearby? Plant, Graft, or:



Topics to be Covered

- Fruit Tree Basics
- **Planting**
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- Fruit Thinning
- Pest Management

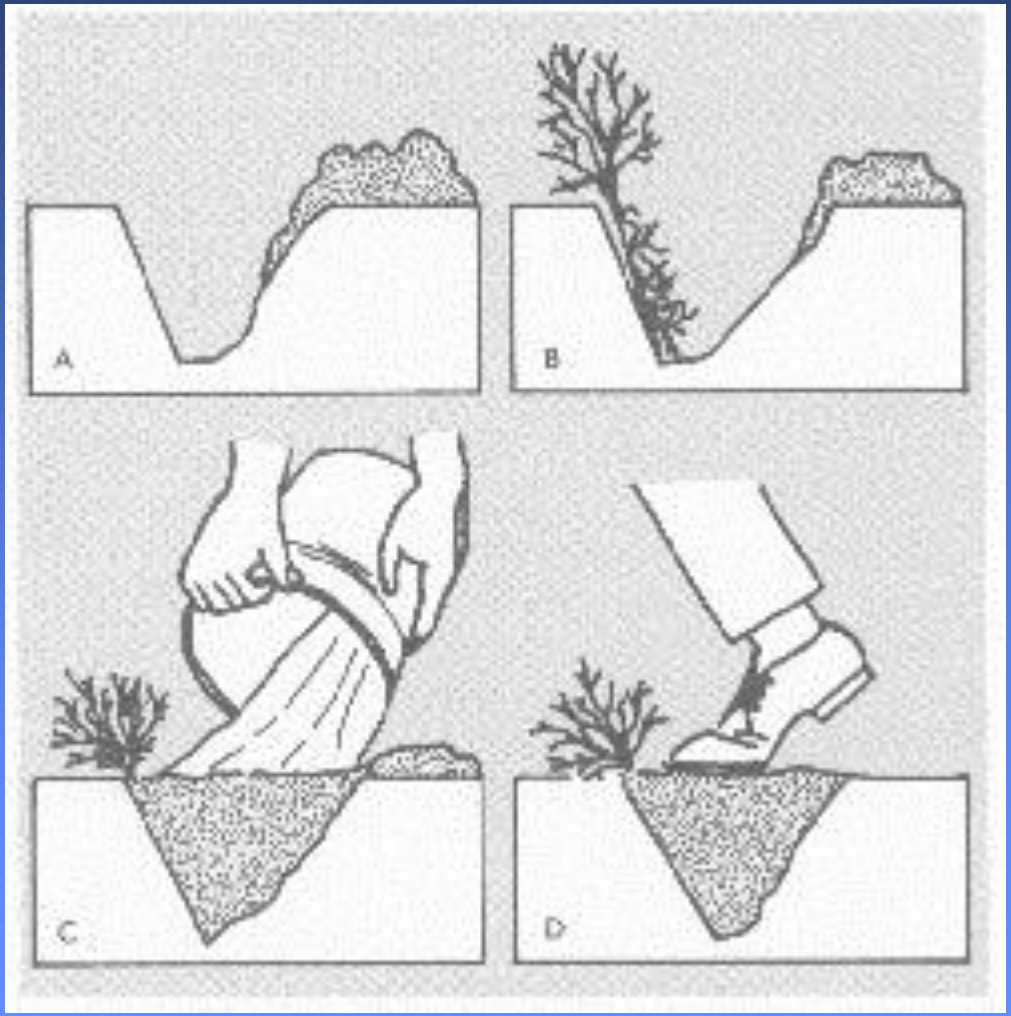
Soil Amendments

- Incorporate compost in planting area
- Uncomposted amendments incorporated months before planting
- No amendments in planting hole
- Avoid pockets of undecomposed organic matter in heavy soils
- Add mulch or compost to surface

Choosing and Handling Trees

- Bare root cheaper than potted
- Use 1/2 to 5/8 in. caliper trees
- Avoid drying of bare roots
- “Heel in” bare root trees if planting is delayed

Heeling in



Planting Fruit Trees

- Check roots, cut off dead or damaged
- Hole size: Wide, and deep if compacted
- Plant on mound to keep crown dry
- Plant high! – Reduces chances of crown & root rot
  - Graft union well above soil
  - Previous soil line at or above soil level
  - Allow for soil settling

Undercutting the Trees

Planting a Bare Root Tree

Dig hole to fit roots

Lightly tamp soil

Emitters 1 ft. away

Planting a Containerized Tree

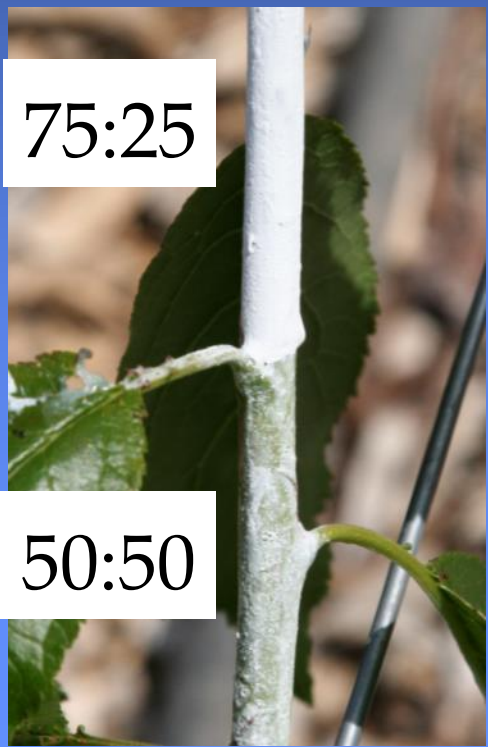
Water in

Don’t cover soil in pot

Pull out wound roots

Post-Planting Care

- Head tree at 18-24 in. (bare root only)
- Cut back well-placed laterals to 3-8 in., remove all others
- Paint trunk white
  - Interior latex paint & water, 50:50 (75:25)
  - Entire trunk to 2 in. below soil
  - Prevents sunburn & borers



Pruning a Bare-Root Tree

Branches thinner than 3/16

Branches thicker than 3/16

New Shoots on Branches of Newly Planted Tree

Paint Trunks White

(Hot Climates, Afternoon Sun on Trunk)

To prevent this

Topics to be Covered

- Fruit Tree Basics
- Planting
- **Fruit Tree Growth**
- **Training and Pruning**
- Irrigation and Fertilization
- Fruit Thinning
- Pest Management

Fruit Tree Terms

- Rootstock/Stock – tree below graft union
- Scion – above union; bud or shoot grafted
- Crown: trunk below ground (also canopy)

Semi-Dwarf vs. Genetic Dwarf

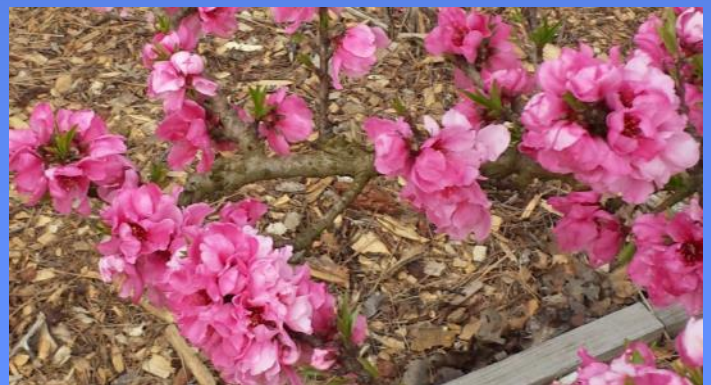
- Standard: 20-25^{+} ft.
- Semi-dwarf (dwarfing rootstock): 12-20 ft.
  - Variable dwarfing
- Genetic dwarf (std. rootstock): 8-12 ft.
  - Available in apricot, apple, olive, peach, nectarine, pomegranate
  - Selection of varieties is limited
  - Not available in citrus, fig, pear, persimmon, plum/ pluot

Genetic Dwarf Peach/Nect.

INTERNODE LENGTH

Standard Peach

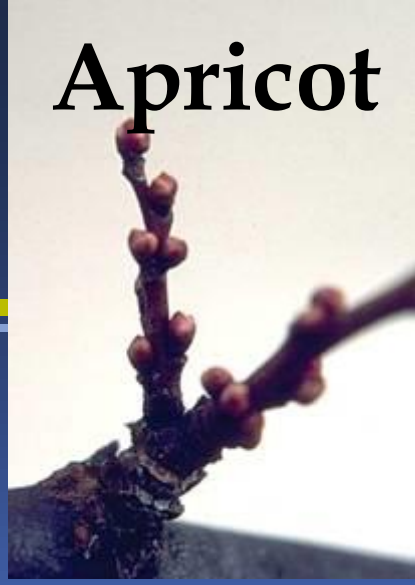
Genetic Dwarf Peach



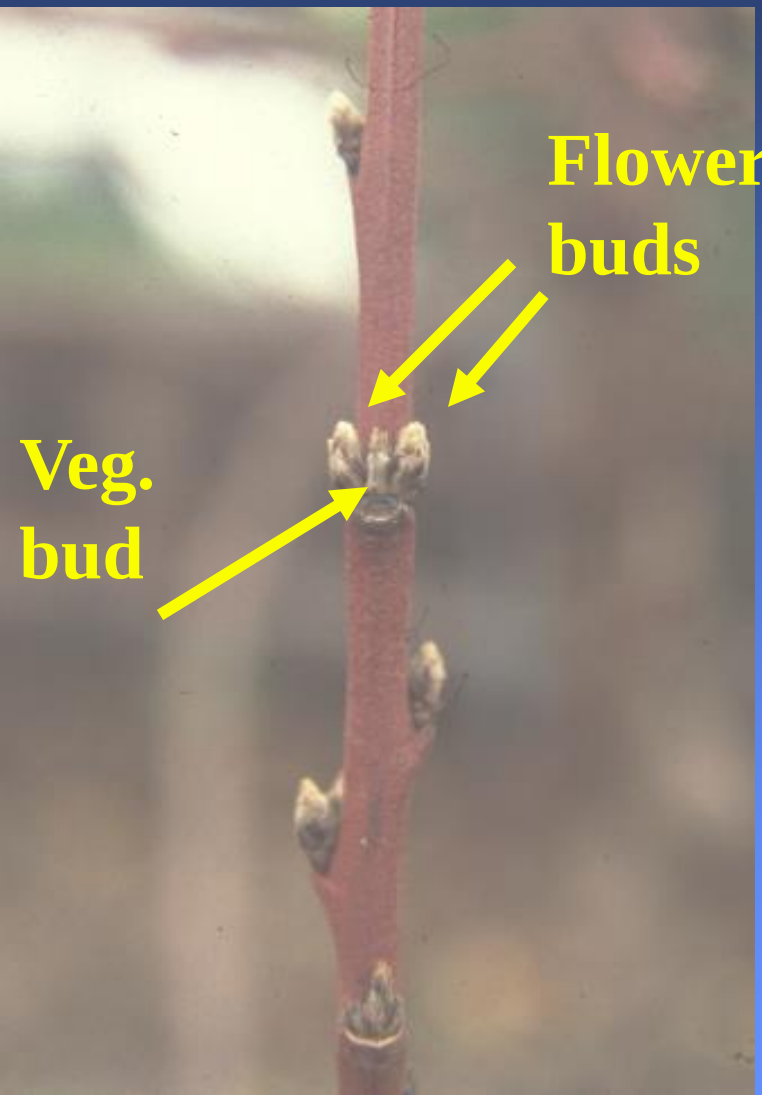
More Fruit Tree Terms

- Scaffold branch: main structural limb
- Spur: short fruiting twig
- Shoot: current season elongated growth
- Water sprout: vigorous shoot from branch
- Sucker: shoot from rootstock or roots

Spurs



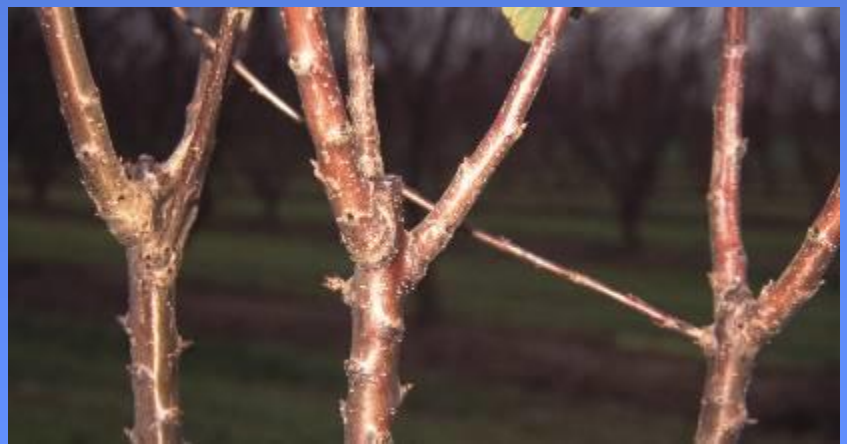
Peach Fruiting Branches



Pruning

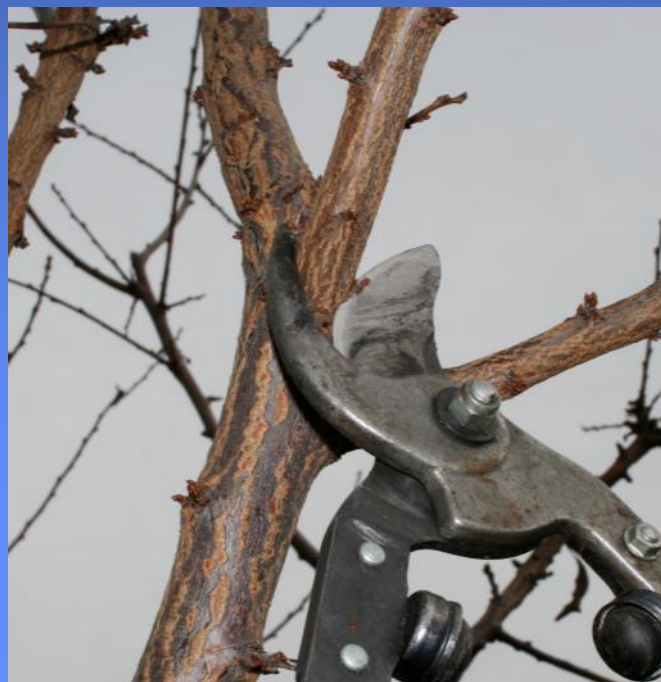
Heading Cut

- Removal of part of branch or shoot
- Used to promote branch development, especially on young trees
- Stimulates growth just below cuts
- Can reduce sunlight penetration



Thinning Cut

- 1) Removal of entire branch
- 2) A cut to a branch that is >1/3 the thickness of the branch from which it arises
- Used to prevent crowding and improve sunlight penetration
- Defines main branches



Summer Pruning of Young Trees

- Purpose: promote scaffold branches
- Head unwanted shoots to 4-6 in.
- Pinch 2 ft. long shoots to promote side branching if necessary
- Reduces training time, shortens time to first fruit production

Summer Pruning for Training
(Open Center)

Before

After

Summer Pruning of Mature Trees

- Purpose: To increase sunlight & productivity of lower fruiting wood
- Remove unwanted vigorous, upright shoots 1-2 times during season
- Bring down tree height
- Large branches may sunburn if pruning is excessive

Summer Pruning (Plum)

Before

After

Prune Apricots and Cherries in August to Avoid Branch Diseases (Eutypa, others)

Specific Fruit & Nut Tree Training Methods

- **Open center**
- Central leader
- Modified central leader
- Perpendicular “V”
- Fruit bush
- Espalier

Open Center

- Most common method
- Stone fruits and almonds; can also use for apples, pears, figs
- Select scaffolds during first 2 growing seasons, touch up in dormant season
- Keep center open during summer from the start

Pruning a One-Year-Old Peach

Pruning a Two-Year-Old Peach

Pruning a Mature Peach

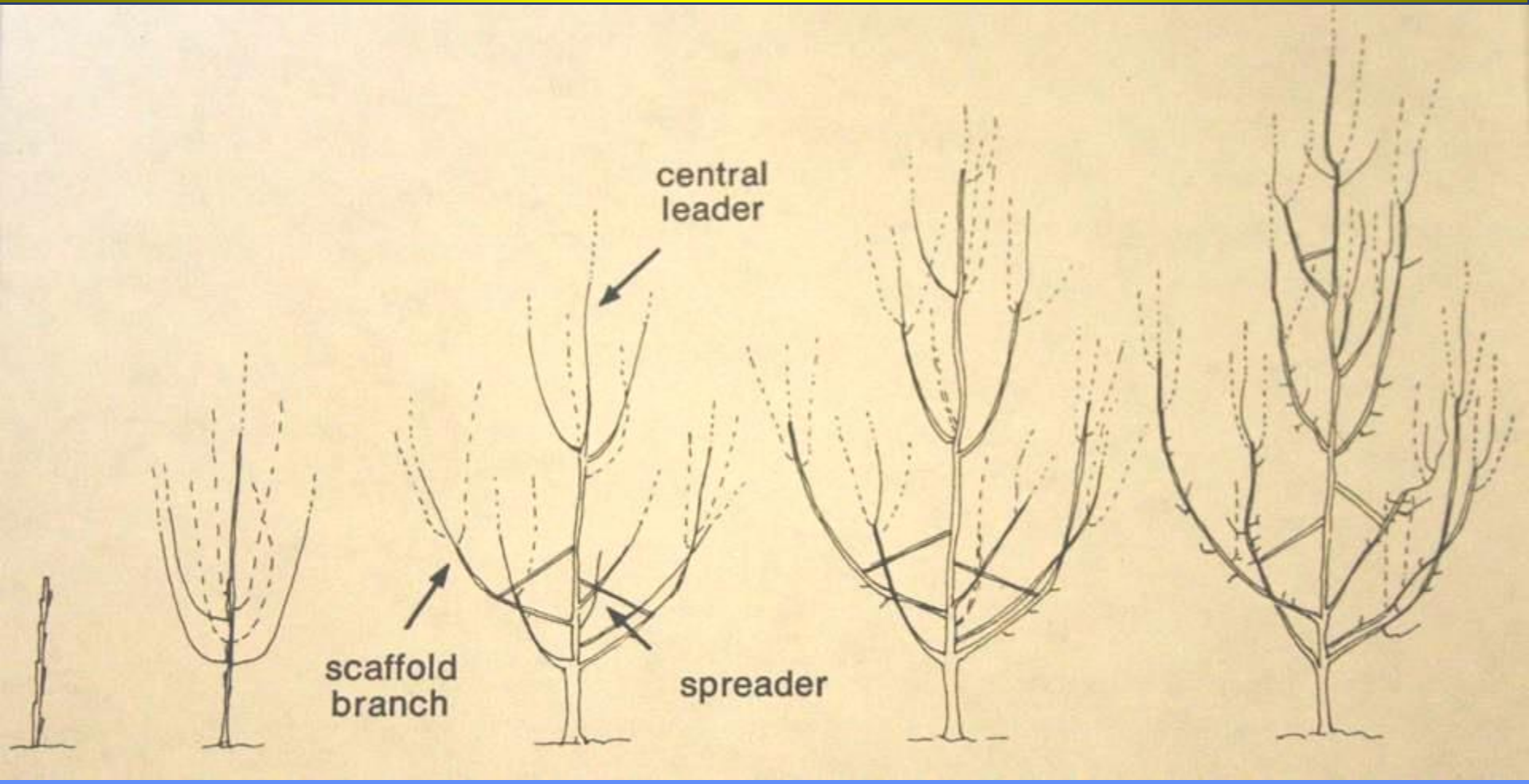
Specific Fruit & Nut Tree Training Methods

- Open center
- **Central leader**
- Modified central leader
- Perpendicular “V”
- Fruit bush
- Espalier

Central Leader Training

- Used for apples, pears, Asian pears, persimmons
- Maintain leader, remove at certain height
- Tie or stake lateral branches outward
- Create 3-4 whorls of branches
- Branches offset from those below

Central Leader Training



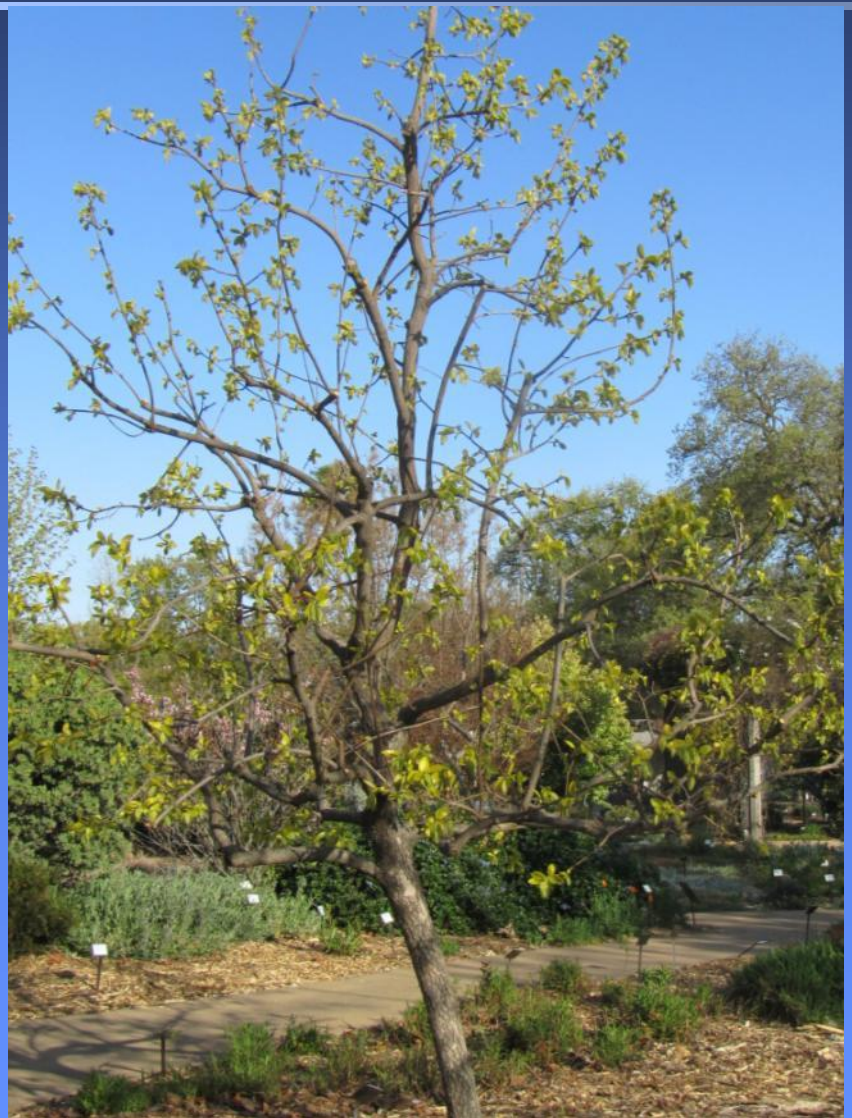
Central Leader Apple
(Genetic Dwarf, planted 2000)

2004

2016

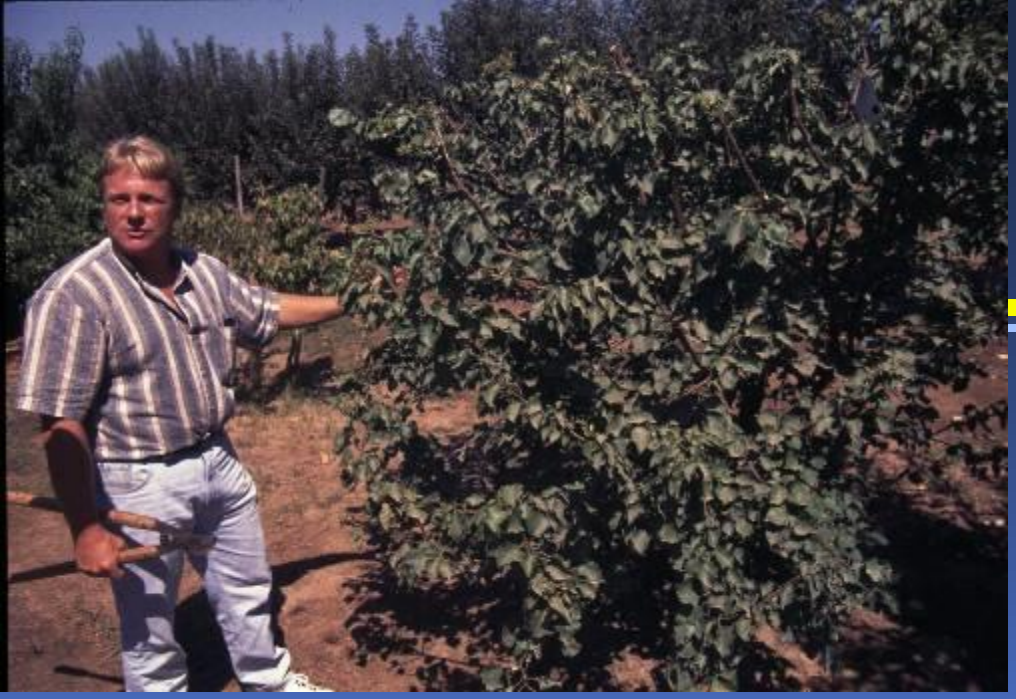
Persimmon (FOHC)

Central Leader



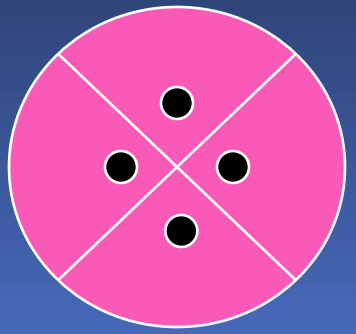
Specific Fruit & Nut Tree Training Methods

- Open center
- Central leader
- Modified central leader
- Perpendicular “V”
- **Fruit bush**
- Espalier



Fruit Bushes Kept at Desired Height

Fruit Bushes
Configuration & Spacing



- 1, 2, 3, or 4 trees per “hole”
  - 2 or 3 trees – 18” apart
  - 4 trees – 24” apart
- 1 tree planted 4-10 ft. apart (std. = 6-8 ft.)
- Group planted 10-12 ft. apart

Fruit Bushes
Pruning – Years 1 & 2

- At planting, head trees to 18-24 in.
- Mid-spring – cut back new growth by half
- Mid-summer – cut subsequent growth back by half
- Thinning cuts for sunlight penetration
- May need to prune 1-2 more times

Cutting New Shoots in Half

Mid-Summer

Fruit Bushes
Pruning Mature Trees

- Cut back new growth above selected tree height 2-3 times during growing season
- Thinning cuts for sunlight penetration

Mature Fruit Bush
Maintaining Tree Height

Cherry, Pome Fruits Ideal for Fruit Bush

Apricot, Plum/Pluot Fruit Bushes

Vigorous Growth – Extra Work

Fruit Bushes

- Advantages
  - Tree maintenance without ladder
  - Trees for small spaces
  - Sequential ripening
- Disadvantages
  - Less fruit
  - No shade
  - Timing of pruning critical

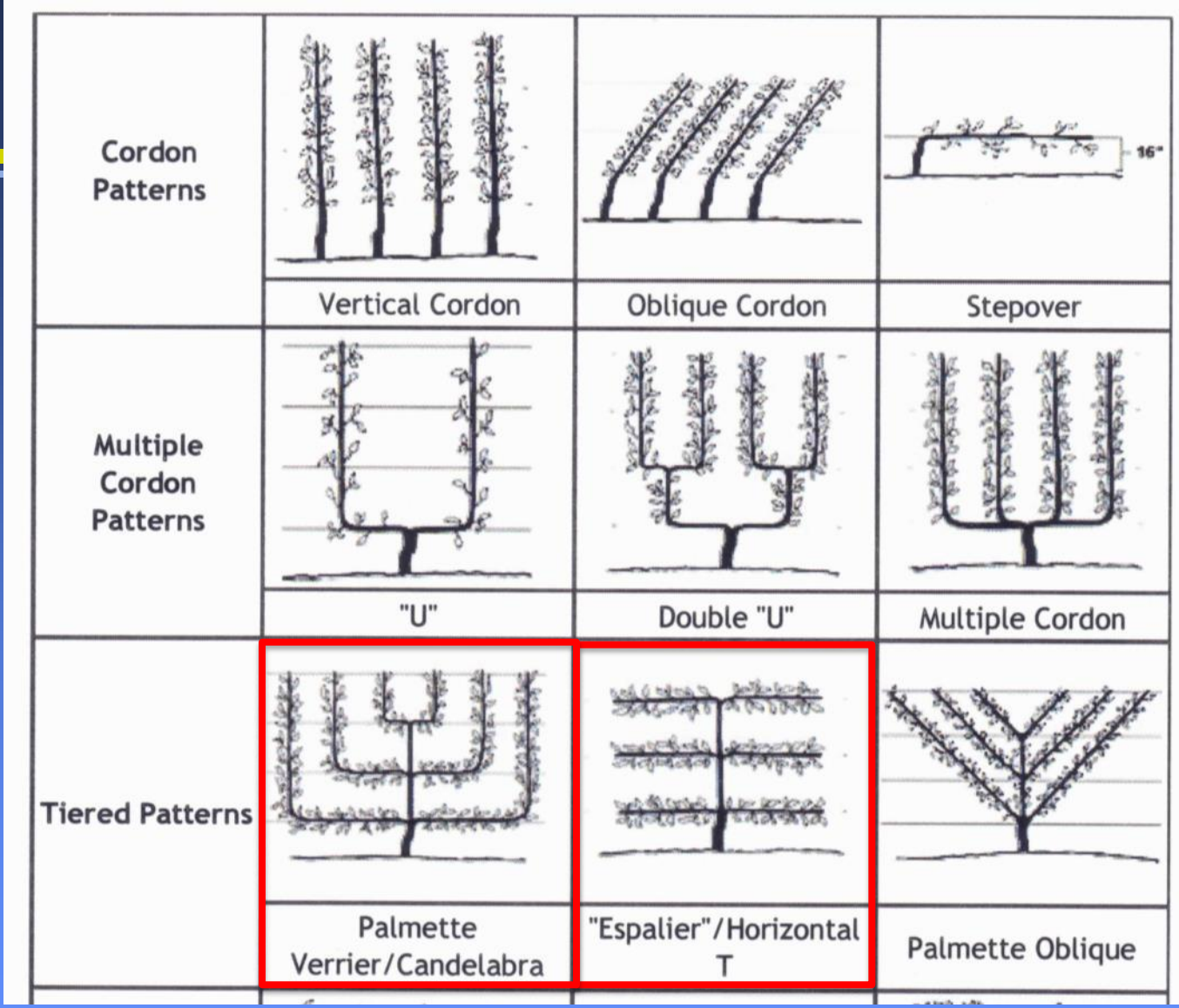
Key Summer Pruning Missed

Specific Fruit & Nut Tree Training Methods

- Open center
- Central leader
- Modified central leader
- Perpendicular “V”
- Fruit bush
- **Espalier**

Typical Espalier Patterns

Source: EspalierServices.com



Typical Espalier Patterns

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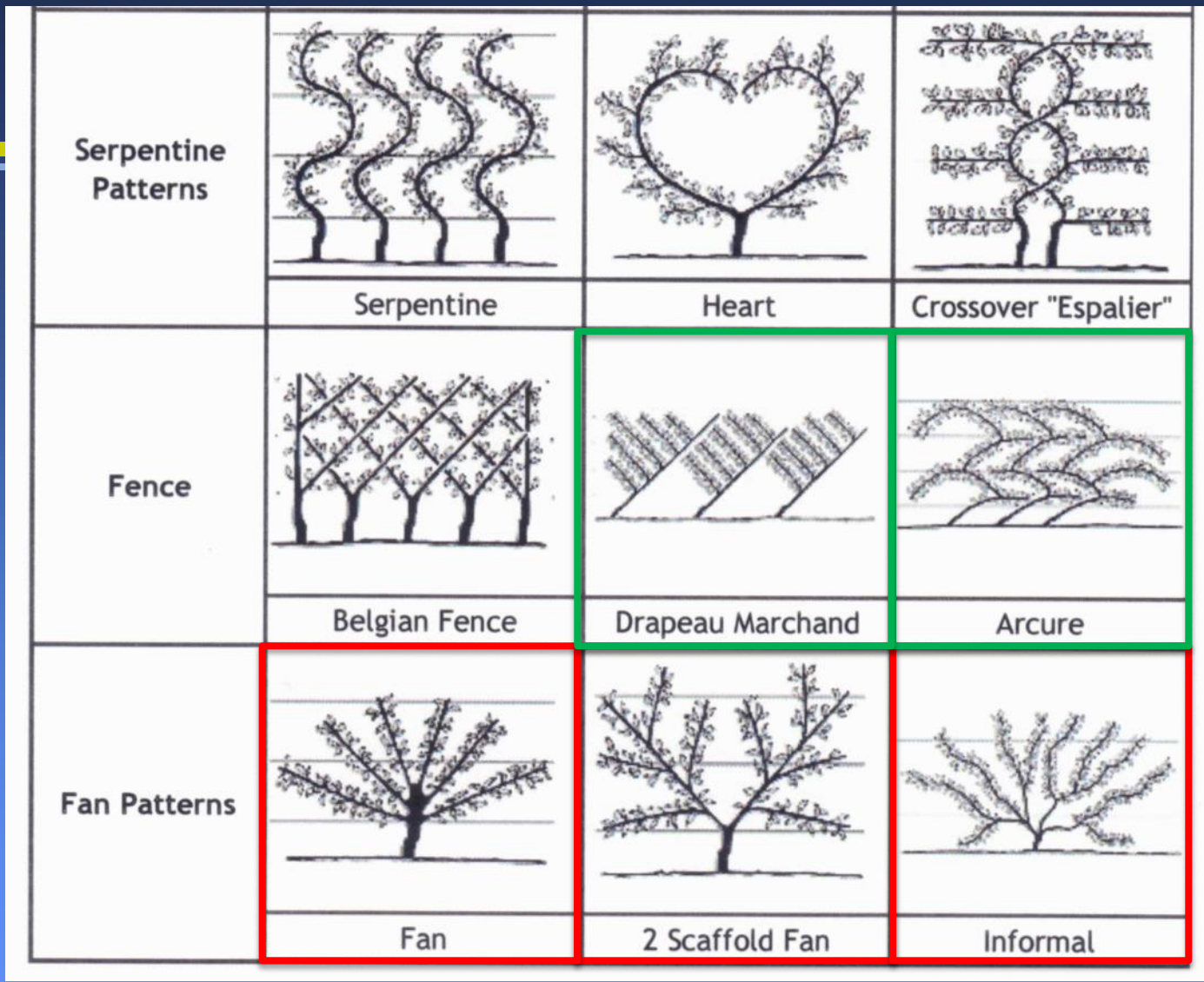
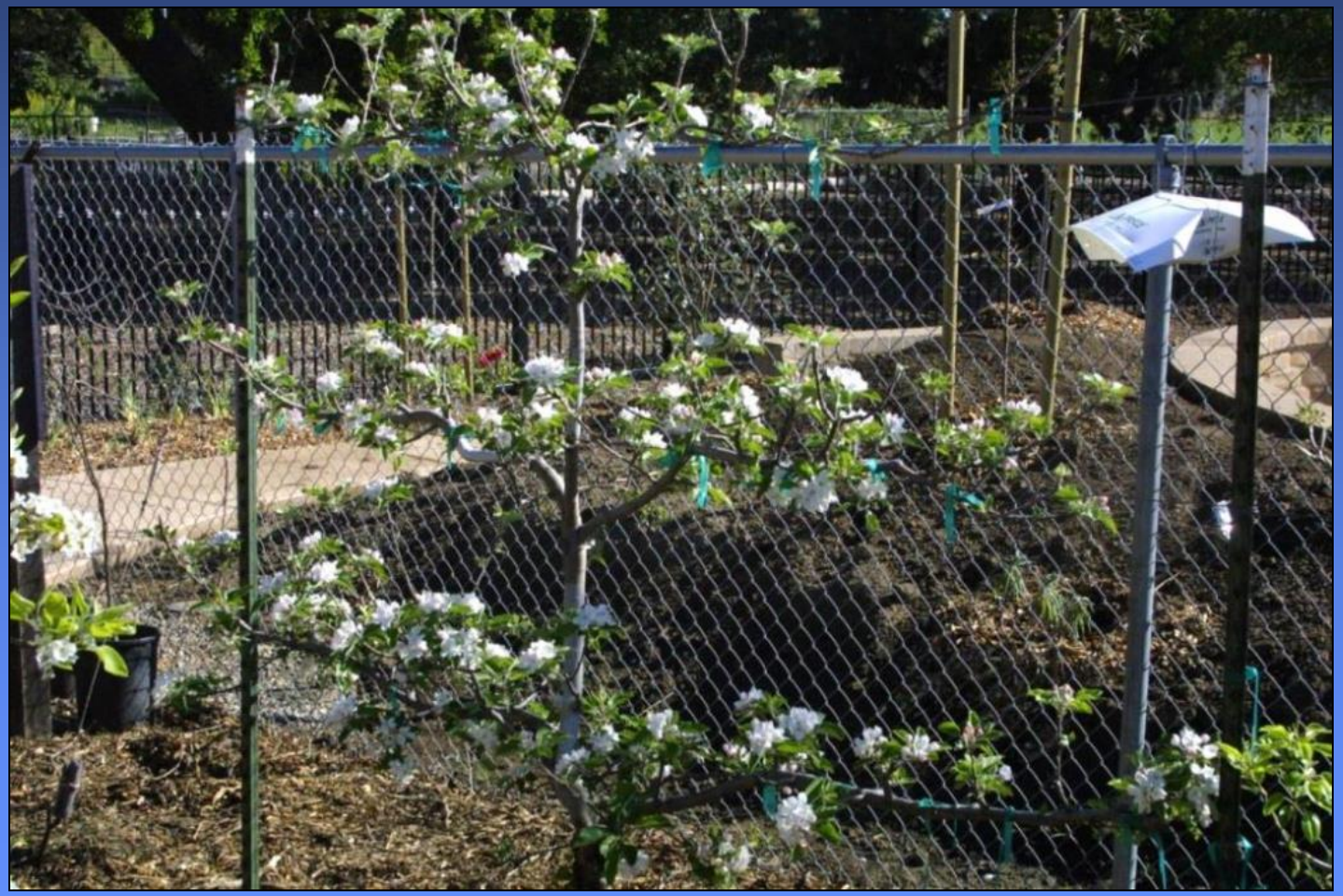


“Espalier” / Horizontal T

Promote Spurs



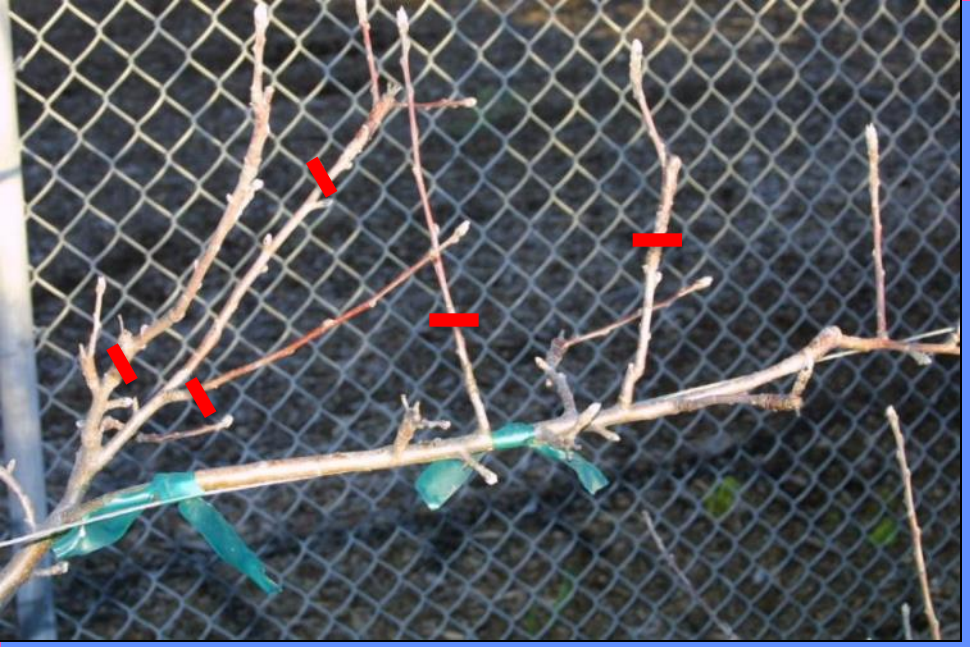
Espalier Pruning

Growing Season

Source: Pruning and Training (Amer. Hort. Soc.)

Dormant Pruning

Young Espalier



Before

After

Palmette Verrier (Menorah)

Asian Pear: Planted Jan. 2001

Late April, 2002

Late May, 2002

Palmette Verrier (Menorah)

2004

Palmette Verrier (Menorah)

2014

2-Scaffold Fan Peach

Fair Oaks Hort. Center

2013

Peach Cherry

Cherry, Peach Espalier

FOHC, planted Feb. 2013

February

April

Peach Espalier
2013

April

June

July

Peach Espalier

Feb./March 2014

Row cover (Agribon)

Peach Espalier

(1) April 2, 2014

1

2

3

Peach Espalier

(5) July 12, 2014

Before

After

2nd Year: 20 fruits

Peach Espalier

March 2015

August 2015 (205 fruit)

Before and After Pruning

May 2016 (2nd pruning)

Flowering and Fruiting

360 fruits
2016 (year 4)

Pruning Overgrown Trees

Methods of Reducing Height of Large Trees

1. Cut to desired height in thirds over 3 years
   - Thin upright shoots in summer to provide light for lower fruiting wood

Pruning Overgrown Apple

What else can be done?

Methods of Reducing Height of Large Trees

1. Cut to desired height in thirds over 3 years
   - Thin upright shoots in summer to provide light for lower fruiting wood
2. Bring down height in one year
   - Saw off limbs well below desired height
   - Leave one “nurse” limb to feed roots
   - Thin new shoots, train tree as desired
   - Paint exposed limbs white

Pruning Overgrown Apple – One Year

1999

1999

2012

2012

Topics to be Covered

- Fruit Tree Basics
- Planting
- Fruit Tree Growth
- Training and Pruning
- **Irrigation and Fertilization**
- Fruit Thinning
- Pest Management

Irrigation

- Best = drip and microsprinkler irrigation
- Also, furrow, doughnut ring, sprinkler
- Worst = in a lawn
- Water should reach at least 2 ft. deep
- A 2-year-old tree can use about 2 gal./day
- A mature tree can use >50 gal./day

Drip Irrigation

- Low volume
- Output: 0.5-2 gph

Mulch pulled back

Second Drip Line Added (Inline emitter tubing)

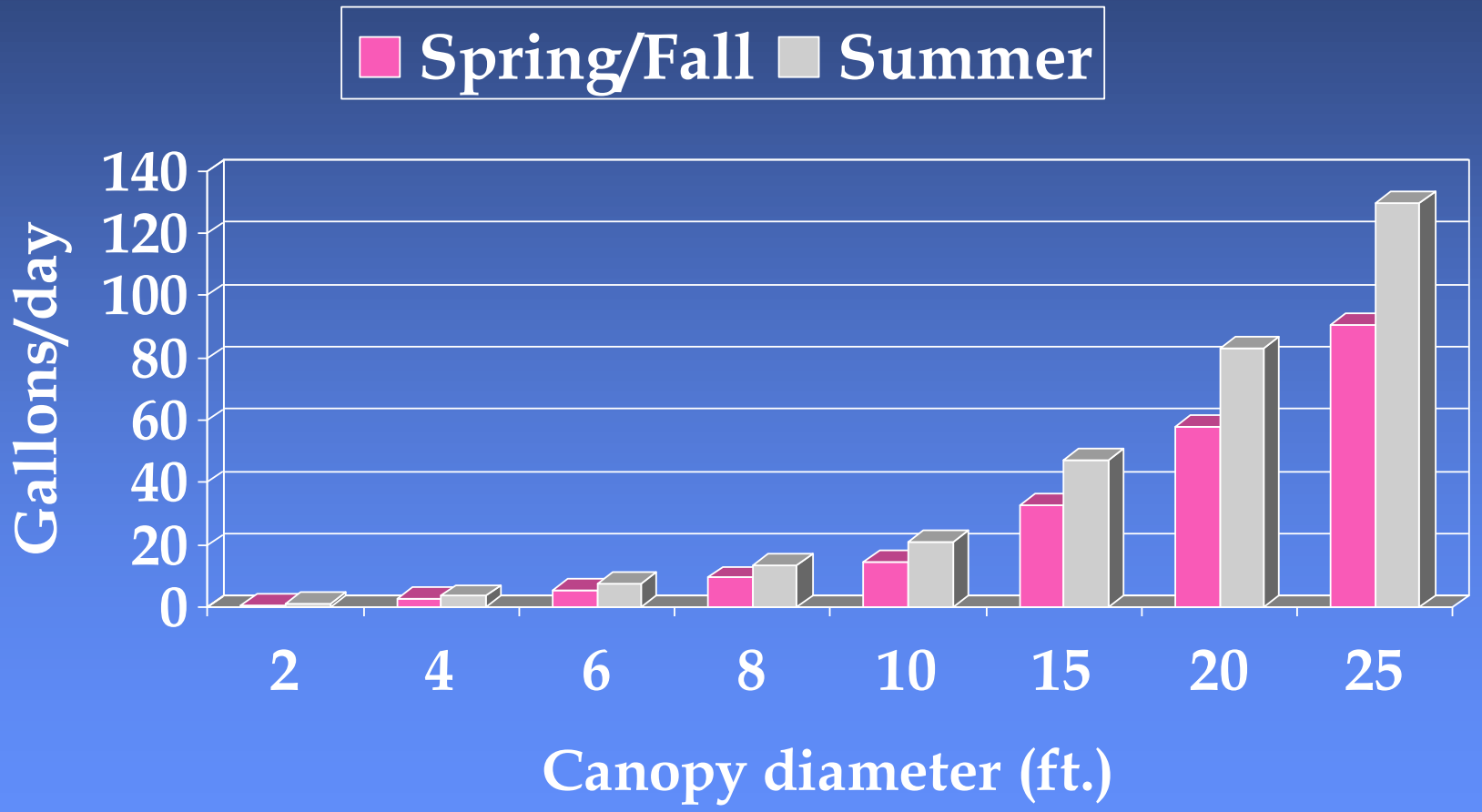
Microsprinkler

- Considered low volume
- Most are adjustable
- Output: ~4-15 gph
- Avoid water hitting trunks

Don't Water Around Trunk!

Fruit Tree Water Use

Based on Tree Size



Water Use
Based on Tree Size

Bigger tree
(Using more water)

Smaller tree – Espalier
(Using less water)

Water Use
Based on Tree Size

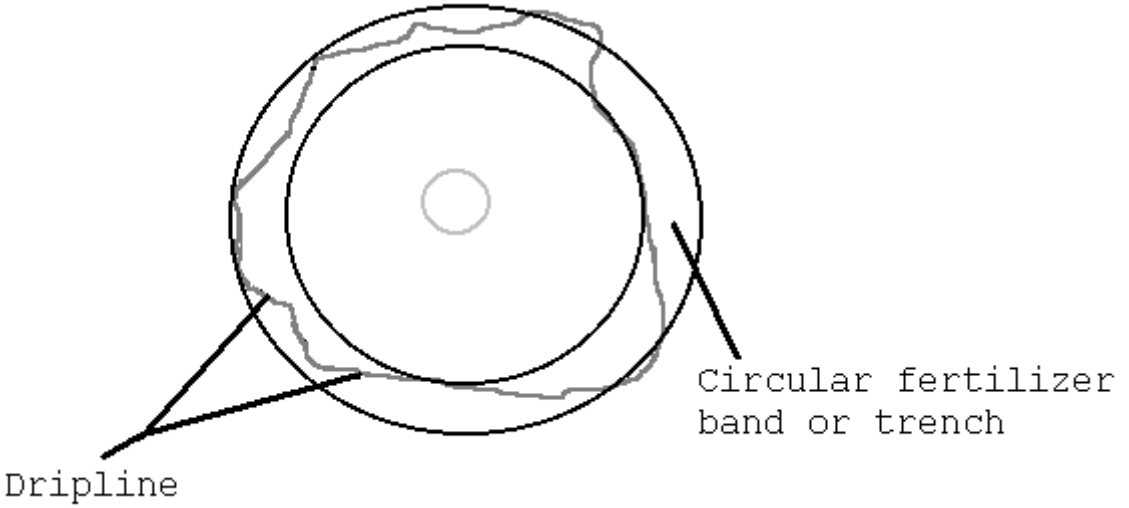
Bigger tree
(Using more water)

Smaller tree – Fruit bush
(Using less water)

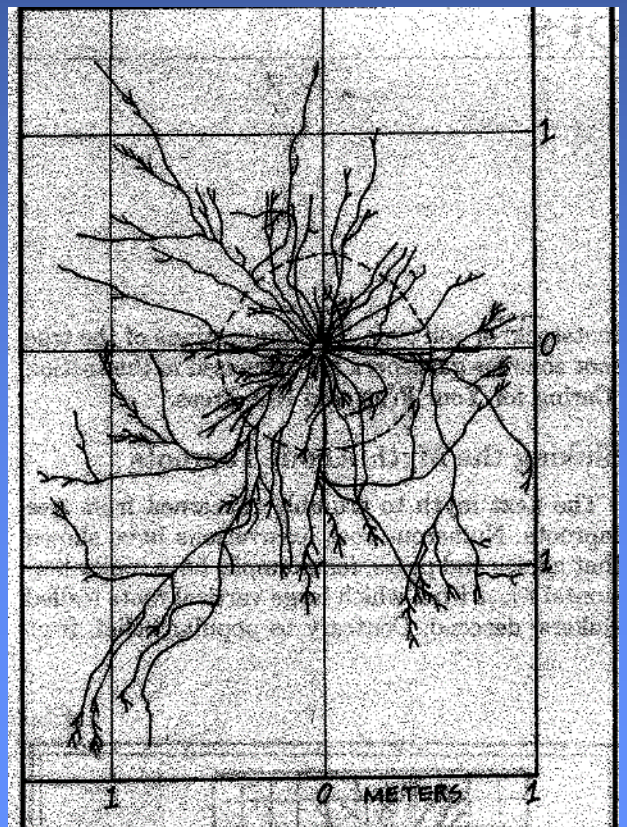
Fertilization

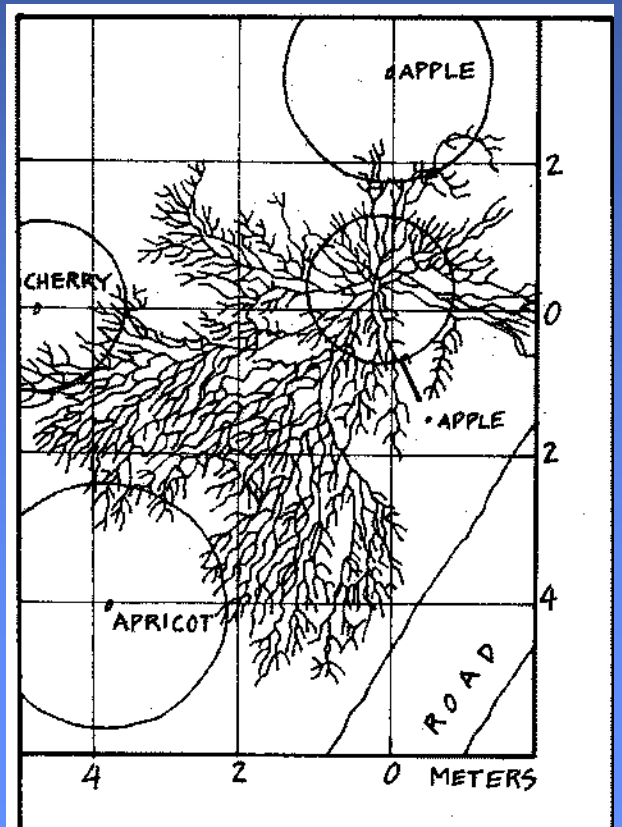
- Don’t overfertilize! Little N required.
- Use no more than 1 lb. actual N per year on mature trees
- Too much N → excessive growth, shading of lower wood
- Other nutrients usually sufficient
- Use organic amendments

Standard Location of Fertilizer Band



Many roots are in the drip line, but many grow beyond it also





Topics to be Covered

- Fruit Tree Basics
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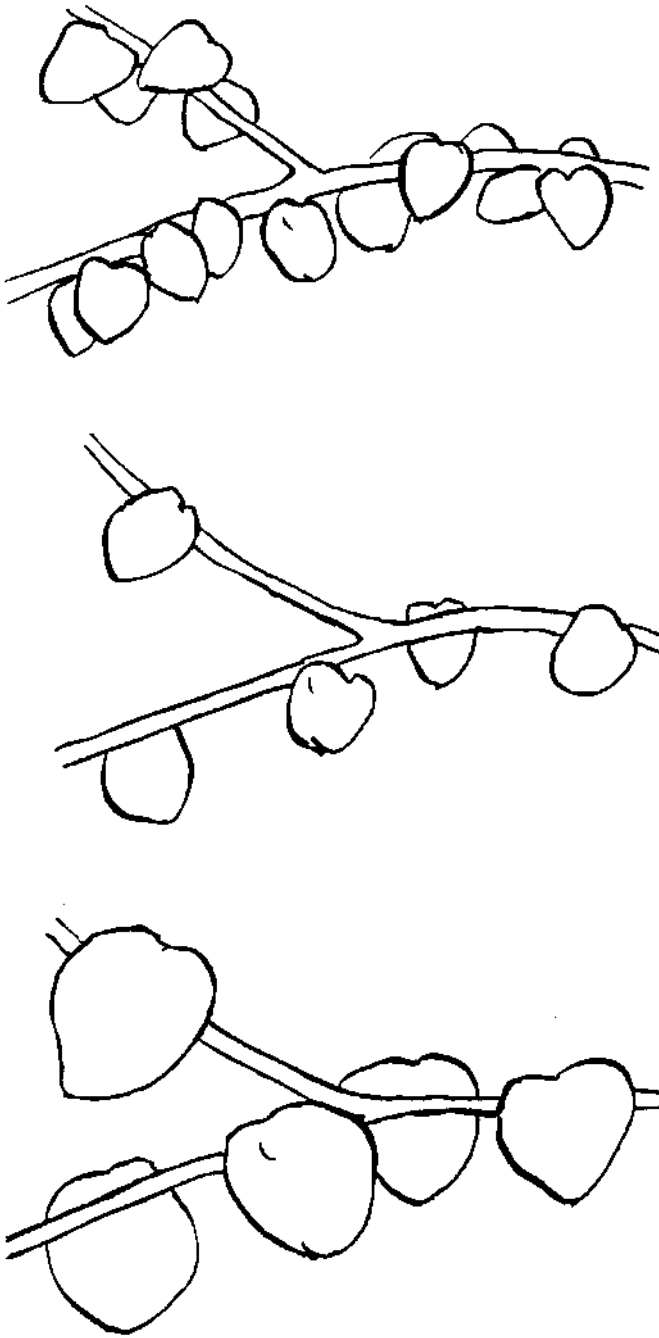
- **Fruit Thinning**
- Pest Management

Fruit Thinning
(Apricot)



Before

After

Harvest

Reasons for Fruit Thinning

- Increases fruit size
- Reduces diseases (esp. brown rot)
- Reduces alternate bearing
- Reduces limb breakage

Methods of Fruit Thinning

- Hand thinning
  - Most thorough but time consuming
  - Selectively eliminate small, damaged fruit
- Pole thinning
  - Short hose piece on mop handle
  - Quick, but not selective
  - May damage fruit

Fruit Thinning
Timing and Spacing

- Timing: ¾ to 1 in. dia. (late April-early May)
- Spacing
  - Depends on tree vigor
  - Fruit should not touch at harvest
  - Peaches: 6 in. Apricots: 5 in.
  - Apples: Thin to 1 fruit per cluster or 6 in.
  - Pears: Thin to 1 fruit/cluster (Bartlett – no thinning)

Topics to be Covered

- Fruit Tree Basics
- Planting
- Fruit Tree Growth
- Training and Pruning
- Irrigation and Fertilization
- Fruit Thinning
- **Pest Management**

Fire Blight

UC Statewide IPM Project
© Regents, University of California

Shoot dieback

Bark/ cambium damage

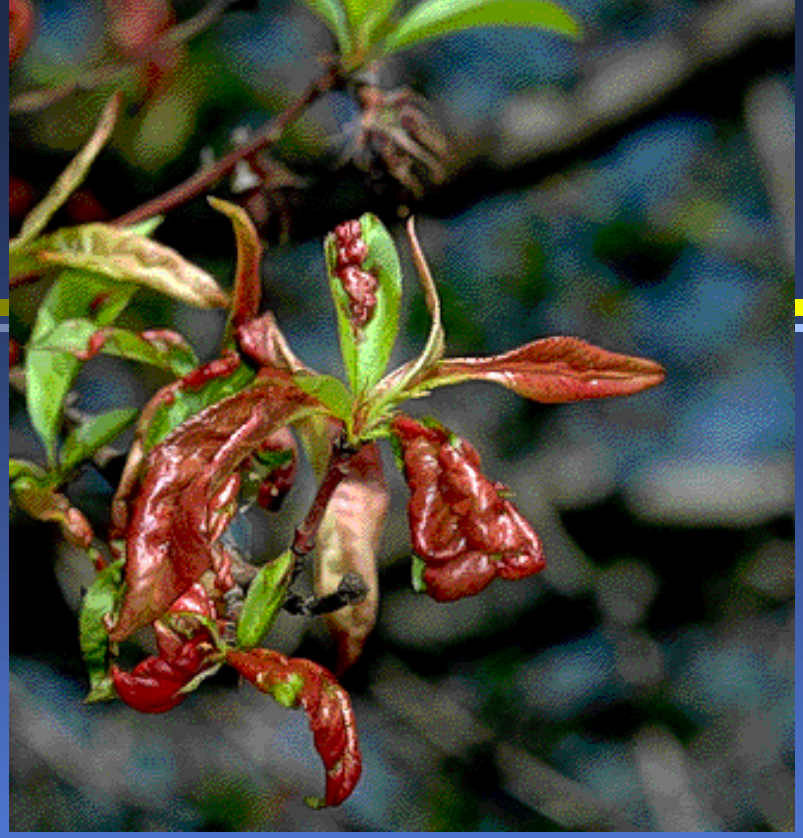
Fire Blight
Characteristics

- Bacteria – enters through flowers under warm, moist conditions
- Affects apple, pear (esp. Bartlett), Asian pear, flowering pear, quince, loquat, pyracantha, hawthorne

Fire Blight
Control Methods

- Cut shoot or branch 12 in. below infection zone
  - »Sterilize shears between cuts (20% solution of bleach)
- Spray copper product twice during bloom

Peach Leaf Curl



Peach Leaf Curl

- Affects peaches, nectarines
- Fungal diseases spread by rain, wind
- Spores overwinter in buds and twigs

Control of Peach Leaf Curl

- Lime sulfur, Microcop no longer available
- Copper sprays
  - Tribasic or basic copper sulfate (hard to find)
  - Copper ammonium complex (e.g., Liqui-Cop)
  - Copper soap (e.g., Concern)

  1. Early Dec.
  2. In Feb. as flower buds swell
- Consider covering trees

2012 Peach Leaf Curl Trial

Treatments and Timings

Product	Rate/Gal.	Timing(s)
Lime sulfur - Microcop	1 cup 2 1/3 Tbsp.	Dec. 4 Feb. 11
Copper soap	2 fl. oz. (+ oil)	Dec. 4, Feb. 11
Liquicop	1 fl. oz. (+ oil)	Dec. 4, Feb. 11
Agribon (fabric)	AG-30, doubled	Before rains
Agribon + Liquicop	Same as above	Dec. 4, Feb. 11
Maxicrop (kelp extract)	1.7 oz.	Feb. 20 Mar. 2, 8, 12, 15, 26, 28

Individual Branches Treated

Sprayed individual branches

Agribon on branch at home

Untreated

Lime sulfur – Microcop

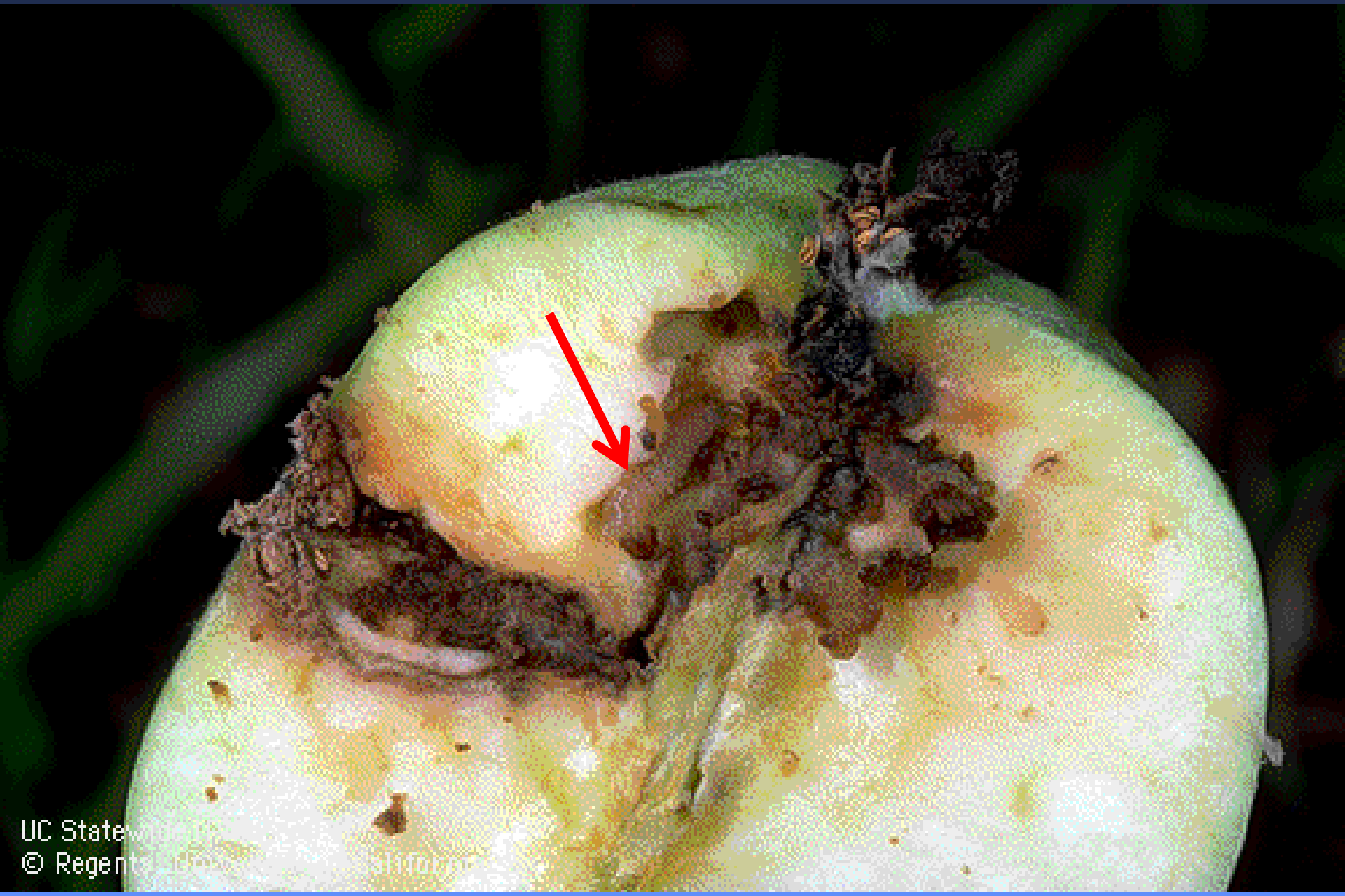
2012 Peach Leaf Curl Trial
Conclusions

- Very effective:
  - Lime sulfur / Microcop
  - Agribon + Liquicop
- Somewhat less effective:
  - Copper soap, Liquicop, and Agribon
  - But still provided 60-80% control
- No effect:
  - Maxicrop

Codling Moth

Eggs and newly hatched larva

Pupating larvae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Codling Moth
Characteristics

- Pest of apple, pear, quince, walnut
- Overwinter as larva in cocoon
- Mating begins during or just after flowering (temp. dependent)
- 2-4 generations per year
- Extremely difficult to control

Codling Moth
Control Methods

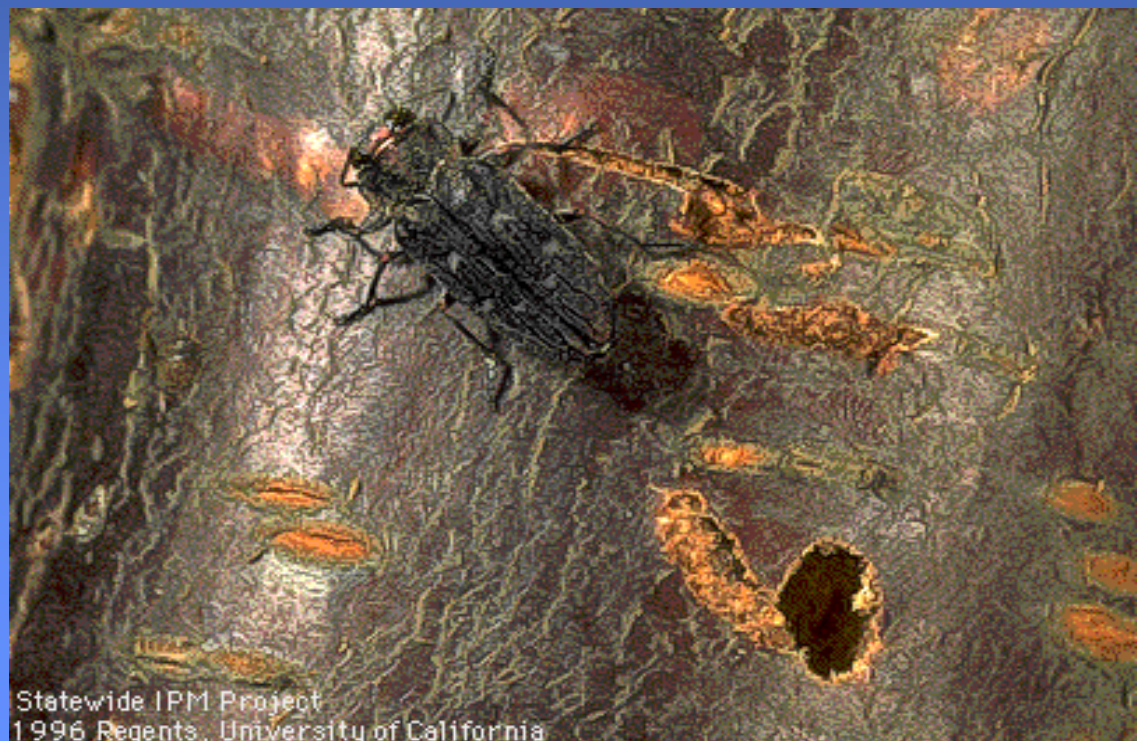
- Take what you get, cut damage out
- Remove/destroy infested fruit early
- Bag individual fruits
- Mass trapping of males
- Organic products: Hort. oil, granulosis virus (Cyd-X), spinosad, kaolin clay (Surround)
- Chemical: Sevin (kills beneficials!)
- Good coverage is essential

Pheromone Trap

Pacific Flatheaded Borer

Larva

Adult



Shothole Borer

Borers

- Control methods:
  - »Keep trees healthy
  - »Prevent sunburn!
    - –Paint new trees and exposed branches white
    - –Proper dormant & summer pruning

Frequent Tree Branch Problem

Sample brought in

Frequent Tree Branch Problem

Sample brought in

Photo sent in

Sapsucker Damage

On pear

On grapefruit

Scale Insects

Hard (Armored) Scale

Waxy Outer Covering

Soft Scale (Lecanium)

No Covering – Shell is Female Body

Kuno Scale

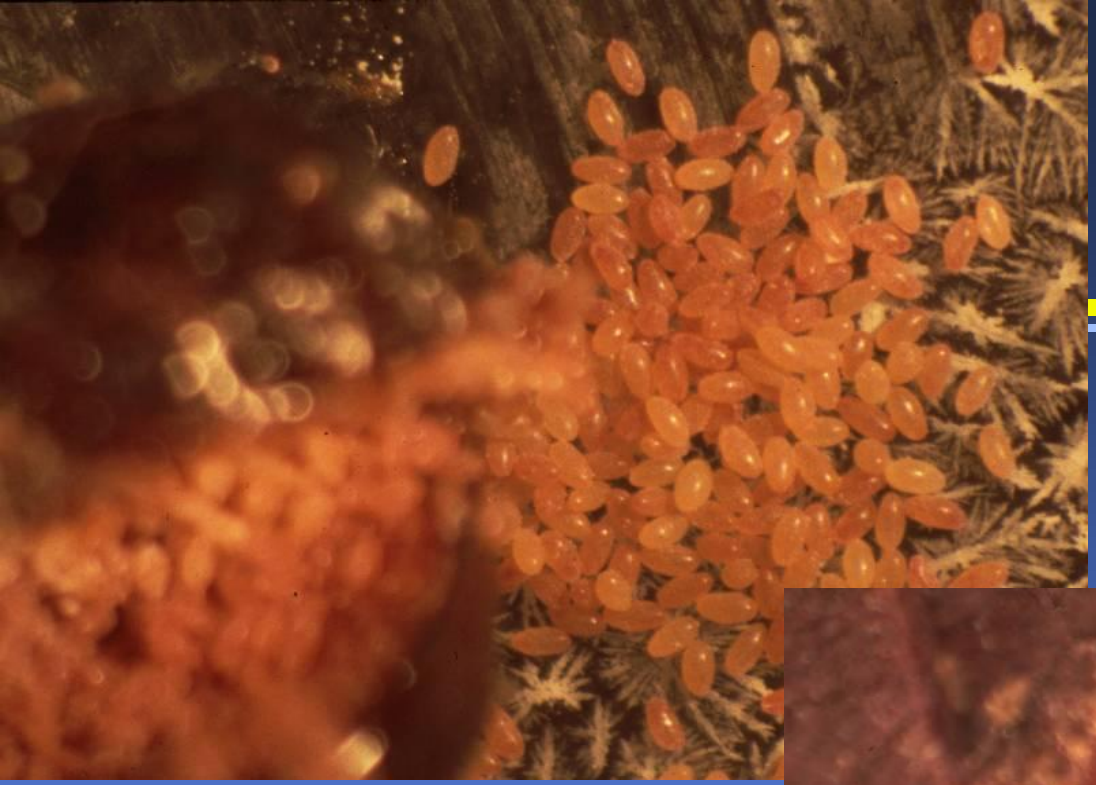
Females in Winter

Females in Spring

Kuno Scale

Females in Summer

Kuno Scale



Eggs in
late May

Nymphs in
June

Scale Insects
Characteristics

- Soft scale
  - Kuno, lecanium, brown, black, etc.
  - Covering is body of adult female
  - Excrete honeydew
- Armored scale
  - Calif. Red, San Jose, Euonymus, etc.
  - Covering is waxy secretion
  - Little honeydew
- Cottony cushion scale →

Scale Insects
Control Methods

- Tanglefoot to prevent ants (soft scale)
- Dormant oil spray at bud swell
- Monitor crawlers with sticky tape - May
- Spray oil after crawlers emerge (June)
  - »Foliage hinders good coverage

Deer Protection

Fencing, High Pruning

Bird & Squirrel Netting

AviGuard (Plantra)

Available by the foot (17’ wide) from Valley Vineyard & Orchard Supply, Lodi

Questions?

http://ccag-eh.ucanr.edu/