2017 THE ALMOND CONFERENCE

HOW TO MANAGE A YOUNG ORCHARD

Room 308-309 | December 5 2017

california almonds
Almond Board of California

growing ADVANTAGE
The Almond Conference

CEUs – New Process

Certified Crop Advisor (CCA)

- Sign in and out of each session you attend.
- Pickup verification sheet at conclusion of each session.
- *Repeat this process for each session, and each day you with to receive credits.*

Pest Control Advisor (PCA), Qualified Applicator (QA), Private Applicator (PA)

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AGENDA

- **Spencer Cooper**, Almond Board of California, moderator
- **Luke Milliron**, UCCE-Butte County
- **Phoebe Gordon**, UCCE Madera and Merced Counties
- **David Doll**, UC Cooperative Extension

Young Orchard Irrigation

Luke K. Milliron

UC Cooperative Extension

Farm Advisor Butte, Glenn and Tehama Counties

Orchard Systems Advisor Butte, Glenn and Tehama Counties

- Covering all commercial tree crops
  - Primarily: almonds, walnuts, prunes and peaches

- SacValleyOrchards.com

Why is proper irrigation management in 1st and 2nd leaf so important?

Why is proper irrigation management in 1st and 2nd leaf so important?

- Tree growth
- Root health
- Efficiency of: fertilizer, weed control, pruning
- Changing supply with growing canopy and roots

A successful start…

What do you need to know?

1. How much am I **applying**?
2. How much water is the **soil** storing?
3. What's being **lost** from soil and canopy?
4. How long **between my irrigations**?
5. How **long do I run** my irrigation?

1. Have I **checked** my program by looking at soil or plant water status?

I want to know how **long** to run my irrigation sets and how **frequently**…

How much water does my **system** apply, how quickly is water being **lost** and what's my **soil** bank account between irrigations?

How do I know it's working???

1. System application rate (in/hr)

Multiply: Trees * Emitters/tree * Flow Rate/emitter

120 trees/ac * 1 emitter/tree * 8 gph emitters = 960 gal/ac/hr

& 960 gal/ac ÷ 27,154 gal/ac-in = 0.035 in/hr

1. System application rate (in/hr)

What percent of orchard being wetted?

e.g. microsprinkler with cap ≈ 8% of orchard wetted

System application rate divided by % wetted area

0.035 in/hr ÷ 0.08 in = 0.44 in/hr

1. System application rate (in/hr)

Session on **Wednesday**: **11:10-11:55 a.m**.

Tools for Better Irrigation (Room 308-309).

Allan Fulton and Spencer Cooper will discuss flow meter use and irrigation system maintenance

2. Soil water storage = Available Soil Moisture

Not all water available…

50% threshold for available soil moisture (ASM)

e.g. sandy loam, 1 ft rootzone

0.7 in/ft * 1 ft = 0.7 in

Soil Texture	50% ASM (inches water/ft soil)
Gravelly, loamy sand	0.4
Sandy loam	0.7
Fine sandy loam	0.9
Loam	1.0
Silt loam	1.1
Clay loam	1.0

3. Current demand = ETc

Evapotranspiration (ETc)
Over the season:

▲ temperature

▲ canopy

Month	1st Leaf	2nd Leaf
	Inches/day	Inches/day
February	0.01	0.02
March	0.02	0.05
April	0.05	0.09
May	0.07	0.13
June	0.08	0.15
July	0.09	0.16
August	0.08	0.14
September	0.06	0.11
October	0.03	0.06

4. Length between irrigations

50% ASM ÷ ETc = Days between irrigation (max)

e.g. 0.7 in stored / 0.08 in daily June ETc = 8.75 days (max)

- In reality… not an ideal world
- Weekly vs. multiple sets?

5. Estimating run time

How long since last irrigation? 4 days

Daily tree water use? 0.08 in/day (June)

Rainfall event? No

(Days * In/day) – Rain

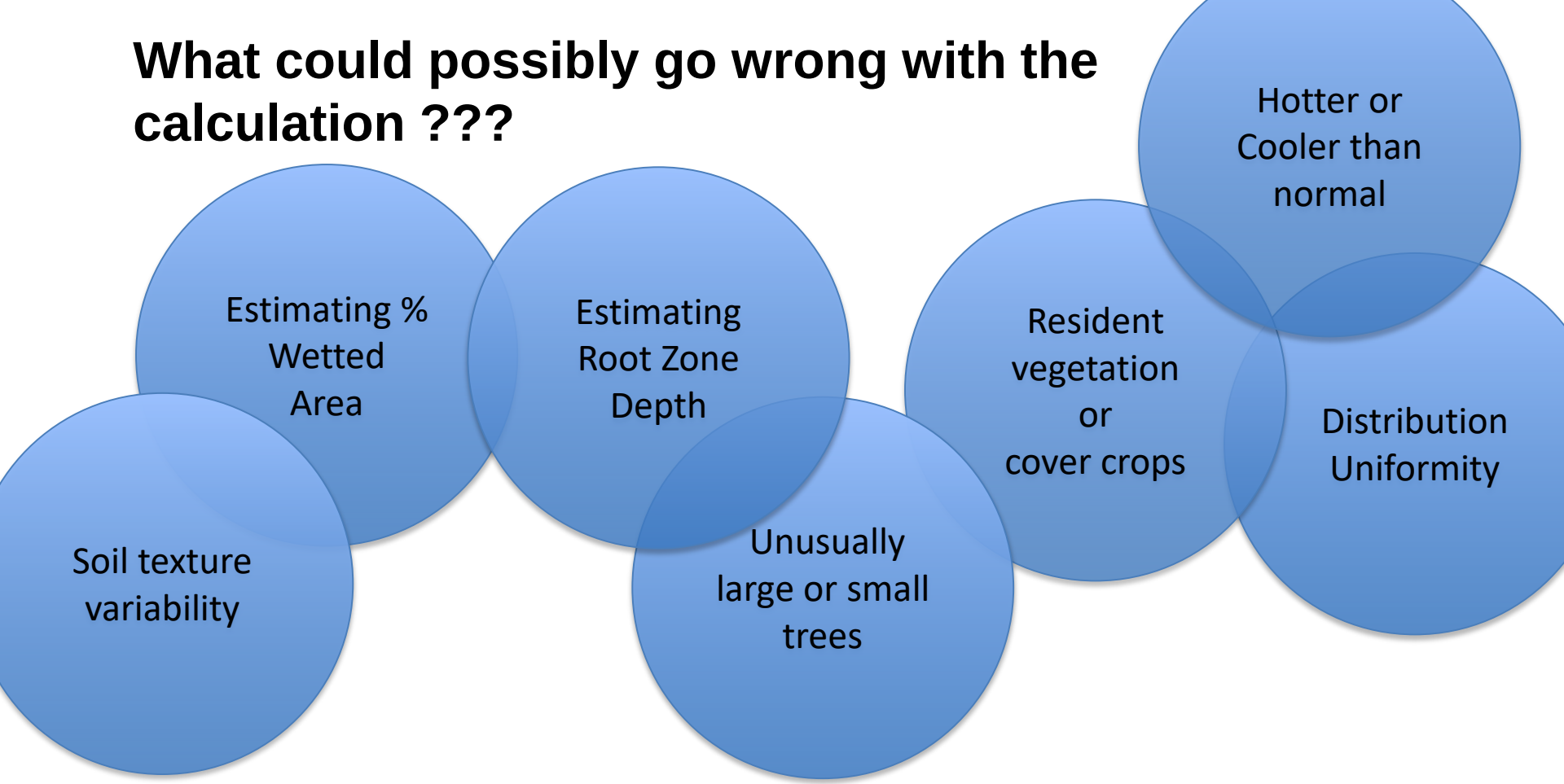
(4 * 0.08 in/day) – 0 in = 0.32 in

5. Estimating run time

In-ac to replace ÷ application rate (in/hr)

0.32 in ÷0.44 in/hr = 0.73 hrs = ≈45 min

What could possibly go wrong with the calculation ???



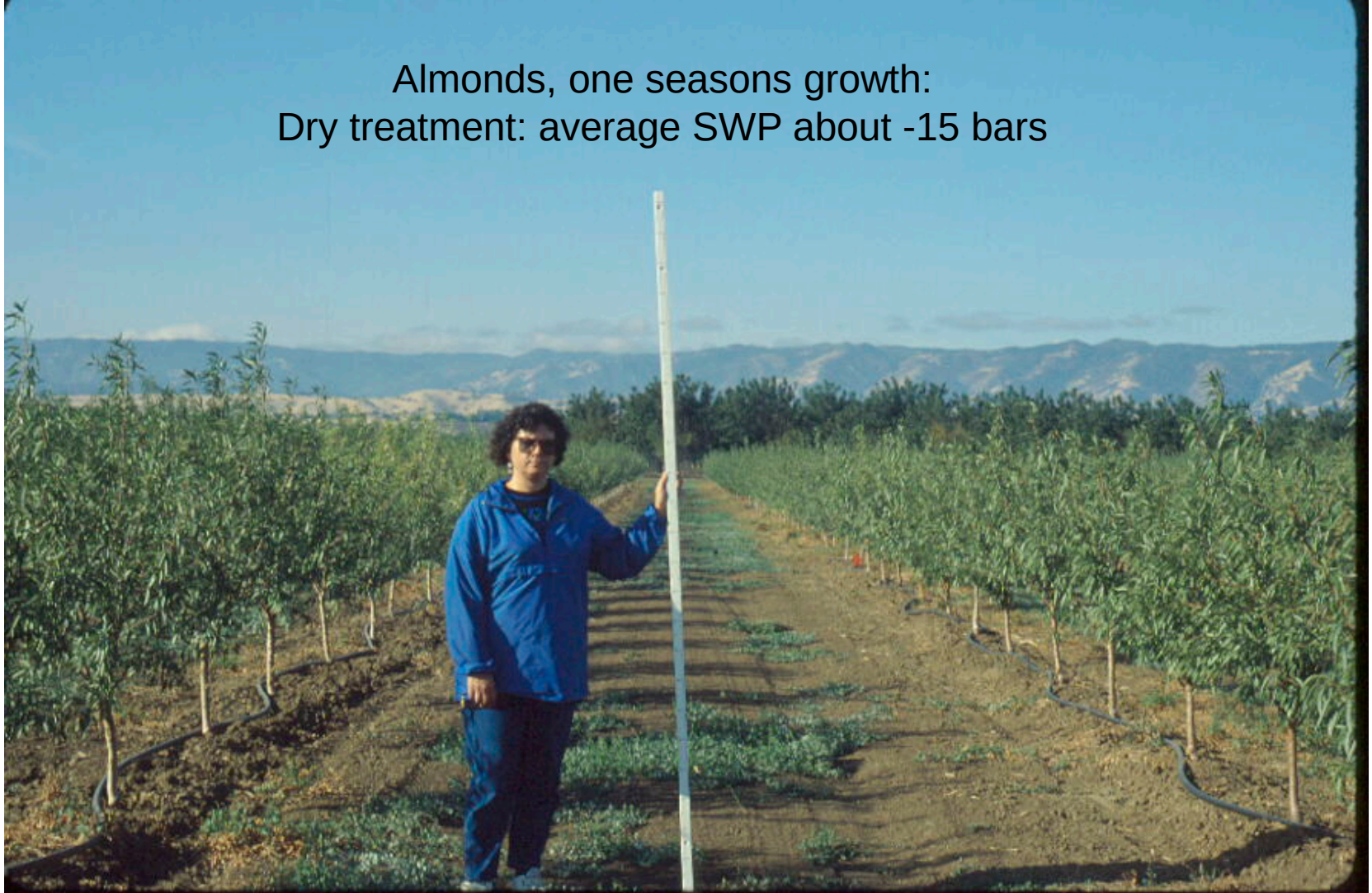
6. How do I know it’s working ???
Check the plant or soil

Pressure chamber

Stem water potential (bars of pressure)

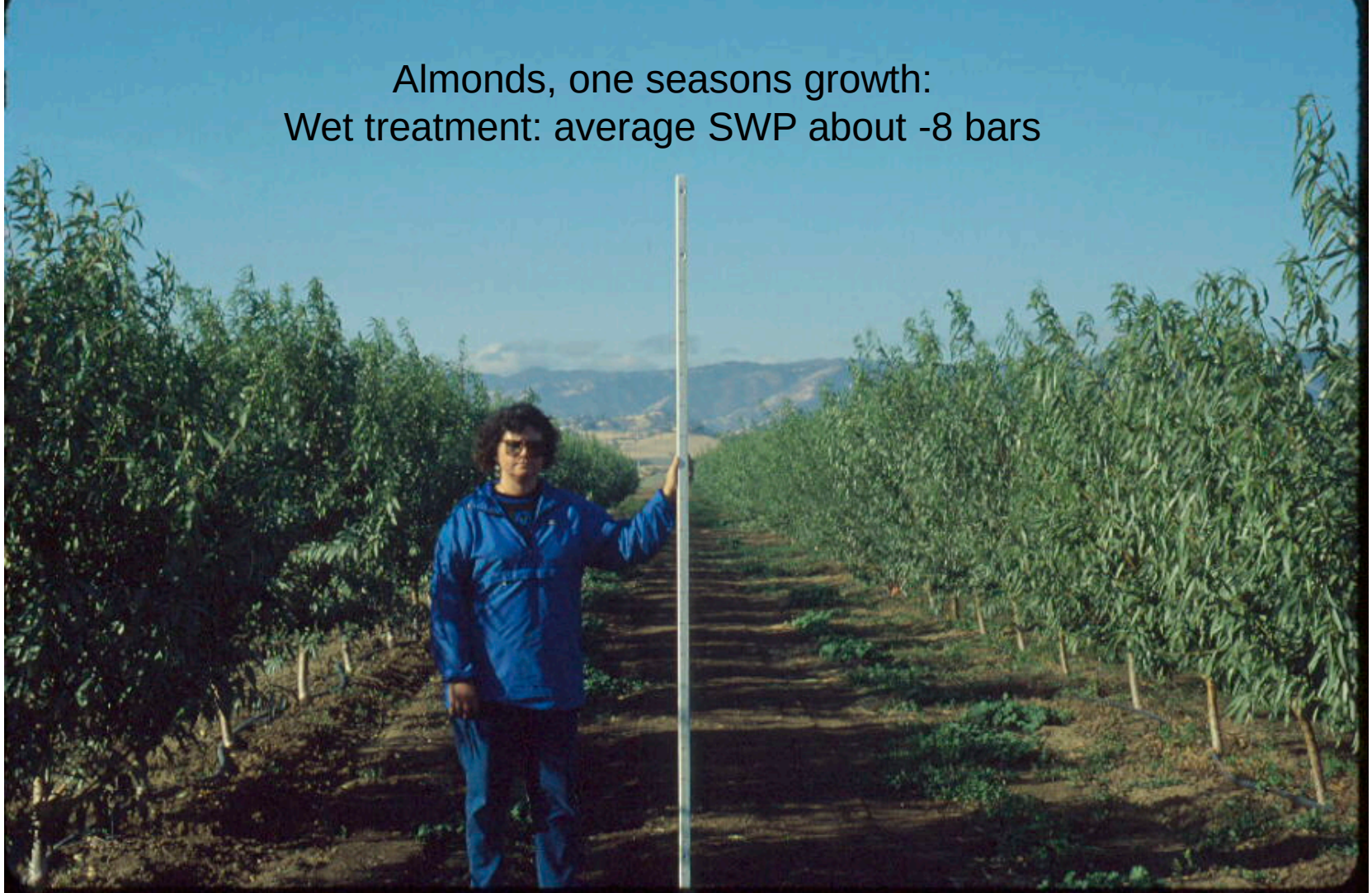
Backsaver Soil Sampler

Available soil moisture by feel and appearance


Almonds, one seasons growth:
Dry treatment: average SWP about -15 bars


Almonds, one seasons growth:
Medium treatment: average SWP about -12 bars

Almonds, one seasons growth:
Wet treatment: average SWP about -8 bars



Which treatment are your trees in?

Additional Resources

- Google search: “Young Orchard Handbook”
  by Farm Advisor Katherine Jarvis-Shean & others

- Consulting your local farm advisor
  - thealmonddoctor.com
  - sacvalleyorchards.com

- almonds.com/irrigation
  - Irrigation Improvement Continuum (1.0, 2.0, 3.0)

Young Orchard Care: Fertilization, Pests, and Diseases

Phoebe Gordon, Ph.D.

UCCE Madera and Merced Counties

UC CE University of California Agriculture and Natural Resources Cooperative Extension

Fertilization

- Nitrogen
- Zinc (and sometimes iron)
- Phosphorus and Potassium
  - Sandy soils
  - Potassium fixing soils

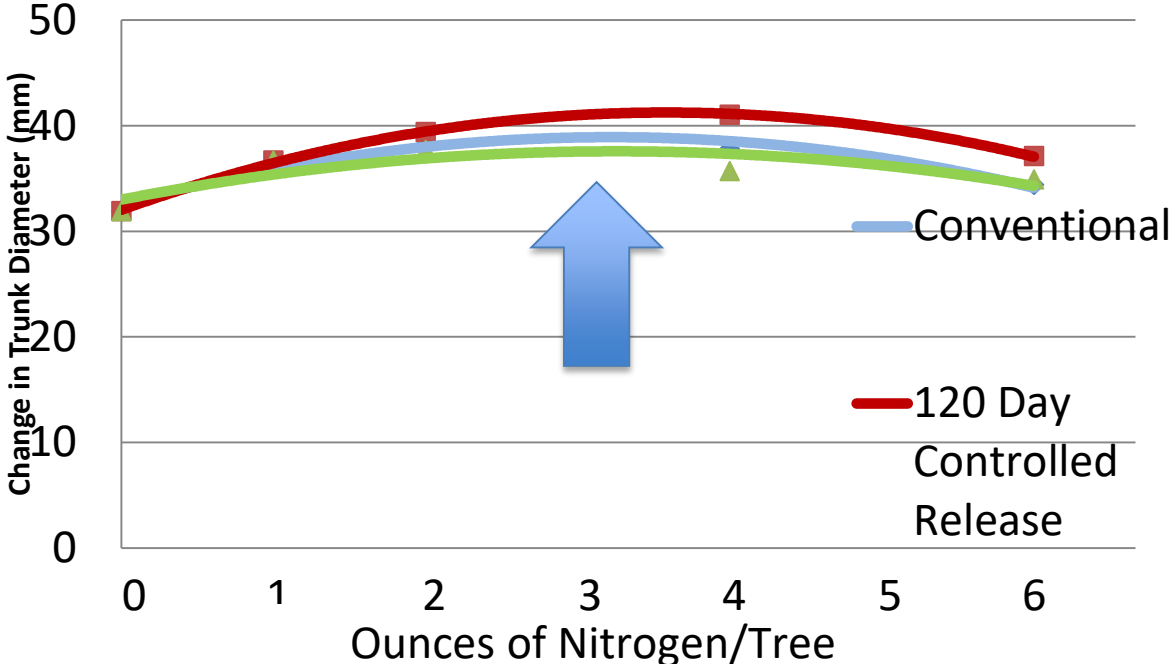
Photo: Jack Kelly Clark

Fertilization

- Nitrogen
  - Necessary for all basic cellular functions
  - Deficient in all production systems
- Goal of fertilization: **Provide just enough to get 'good' growth**

Photos: D. Doll

First Year Almond Fertilization Rate Trials by D. Doll



Fertilization

- Fertilizer (e.g. urea, CAN-17, potassium nitrate)
- Irrigation water
- Manure, cover crops, other organic amendments
- Residual soil nitrogen

- Lbs residual N/acre = $\frac{ppm\ NO3\text{–}N * 2 * depth\ soil\ sampled\ (in)}{6\ (in)}$
- Lbs N in irrigation water =
  - Acre-inch: ppm NO3-N * 0.23
    ppm NO3 * 0.052
  - Acre-foot: ppm NO3-N * 2.72
    ppm NO3 * 0.62

Fertilization

- 21’ x 21’ = 99 trees/acre at 3 oz N/tree
  - Trees need 20 lbs N/acre
- Irrigation water: 2 ppm NO3-N, 14.5 acre-inches water
  - 6.7 lbs N/acre
- Soil test: 5 ppm NO3-N in top foot of soil
  - 20 lbs N/acre

- 20’ x 18’ = 121 trees/acre at 6 oz N/tree
  - Trees need 45 lbs N/acre
- Irrigation water: 20 ppm NO3-N, 14.5 acre-inches water
  - 66.7 lbs N/acre
- Soil test: 2 ppm NO3-N in top foot of soil
  - 8 lbs N/acre

Fertilization

- Zinc
  - Required for the function of a large number of enzymes
- Deficient in many areas of California
- Goal of fertilization: prevent deficiency and avoid burning leaves off of the plant

Fertilization

- Soil
  - Less effective above pH 7.5 or in sandy soils
- Foliar application
  - Can burn leaves if improperly applied/mixed
- Many forms available
  - Salt (e.g. zinc sulfate)
  - chelate

Pests

- Scales
  - San Jose scale
  - European Fruit Lecanium
- Borers
  - American plum borer, prune limb borer, shothole borer
- Mites
  - Webspinning spider mite

Pests

- Borers
  - Like to attack stressed trees
  - can damage scaffold
- Best cure is prevention
  - Paint trunks in a 50% white latex paint solution
  - Tree guards

Pests

- Webspinning spider mites
  - Danger is in defoliation
- Two main species:
  - Two spotted spider mite
  - Pacific spider mite
- Monitoring and control:
  - Prevent trees from becoming stressed
  - Treat before webspinning starts

Diseases

- Rust – caused by *Tranzchelia discolor*
- Danger is in early defoliation
- Spores move through the air
- Risk factors:
  - High humidity,
  - Late season rain
  - Trees high in nitrogen

Photo: Jack Kelly Clark

Diseases

- Treatments need to start BEFORE symptoms occur
  - First application five weeks after petal fall
  - Second four to five weeks later
  - Later applications if populations are high

Photo: Jack Kelly Clark

Diseases

- Phytophthora
  - Susceptibility dependent on rootstock
- Other diseases with similar symptoms
  - Other cankers (e.g. bacterial canker)
  - Borer damage
  - Abiotic stress
  - Overirrigation!

Photo: Jack Kelly Clark

Diseases

No flooding

Flooding

Photos: E. Fichtner and M. Morad

Questions?

Email: pegordon@ucanr.edu

Phone: 559-675-7879 ext 7209

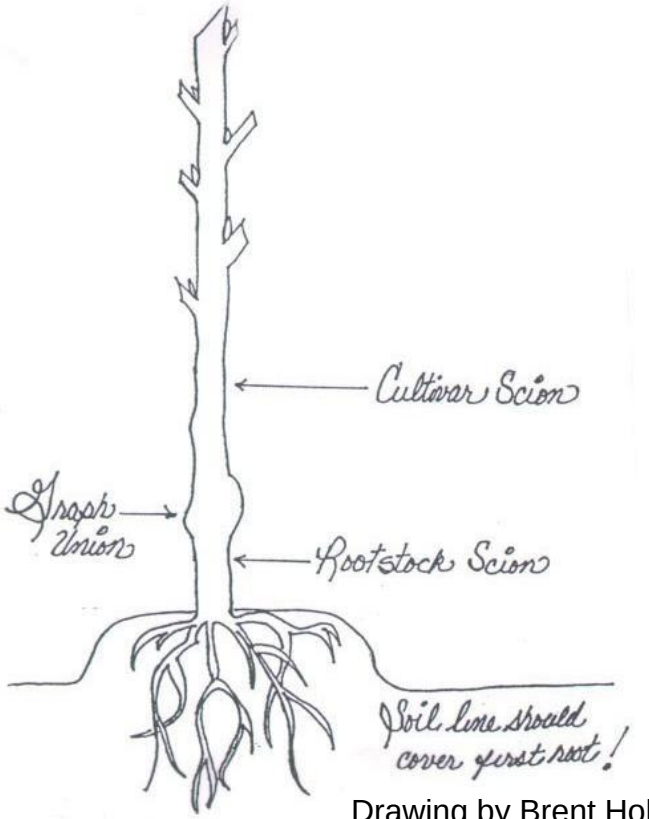
Twitter: PhoebeG_orchard

Developing and Managing a New Orchard

David Doll
Farm Advisor
University of California Cooperative Extension
Merced County

Planting, Staking and Trimming

Planting Bare Root Trees



Drawing by Brent Holtz

- Dig a big hole
- Plant high
  - Highest root should be covered with a few inches of soil
  - Graft union must be above soil line
  - Allow 3-4 inches for settling
- Tank in the tree with 3-5 gallons of water
  - Re-tank if needed (i.e. hot weather)
- Trim branches, high heading cut (36”+)

Planting Bare Root Trees

Be careful!

Planters often are in a hurry and

Keep an eye on the field

Planting Potted Trees

Allows for adjustment in schedules due to fumigation, land preparation

Trees should be evaluated for structure and pot-bound roots

Different processes for spring and fall plantings:

Winter/Spring: Remove limbs back to two buds, if too young, delay until the next winter

Fall: Allow to take root, prune back in winter to two buds

Concerns with Potted Trees

Be on the lookout for pot-bound plants!

Pot-bound plants can root girdle.

Managing Potted Trees

Poor tree structure is common w/potted plants

In fall of first year, prune back to two buds to re-develop the scaffolds

After pruning: essentially a bare-root

Tree Staking

Trees are grown at an angle, creating problems with shaking, eventual barking of tree.

Stake should be placed away from the tree, tie is looped through upper 1/4th of trunk.

Issues with Tree Staking

Tree tie too low, too tight

Tree is growing around tie

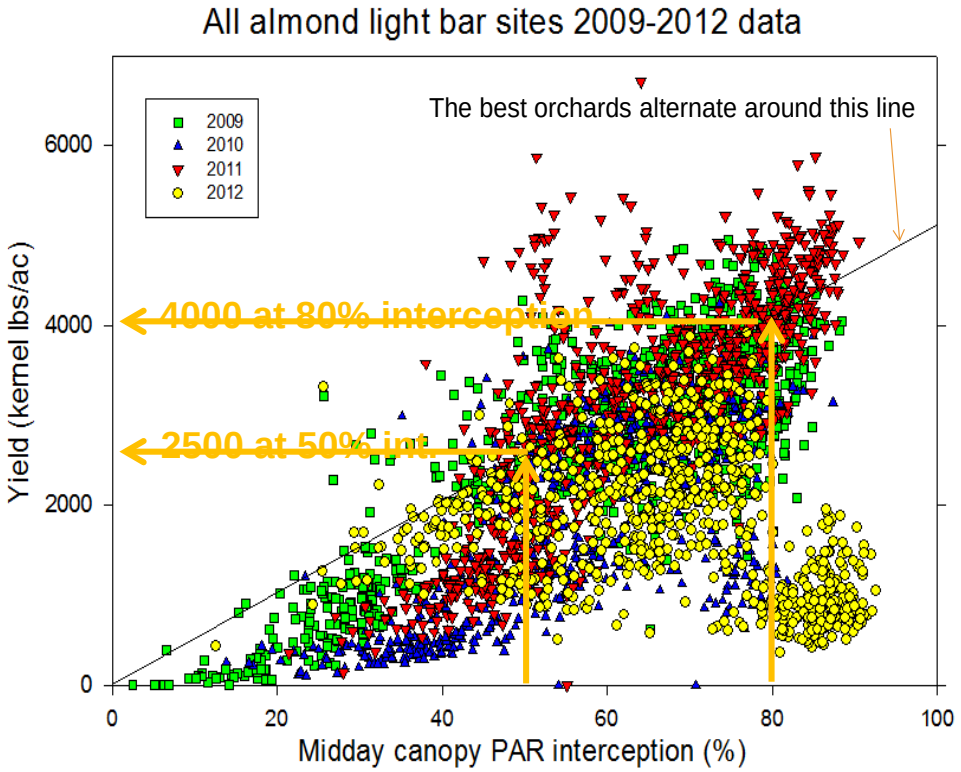
Tree Staking

Stake is oriented into the prevailing wind, shortly after planting. Tie is loose.

Trellis systems have been used in areas with multi-directional winds

Training Almond Trees

Training after the First Growing Season



Two goals of growing almonds:

1. Capture Light;
2. Capture light as fast as possible.

Long Term Almond Training Trials in CA

Stanislaus County Training Trial

Planted fall, 1999

Very vigorous orchard in development years

Four pruning strategies

Four tree spacings

See his poster!

Roger Duncan, UC Farm Advisor

Stanislaus County's Training Experiment Treatments

1) Standard trained, annually pruned

2) Standard trained, left unpruned

Stanislaus County's Training Experiment Treatments

3) Minimal training

4) Untrained

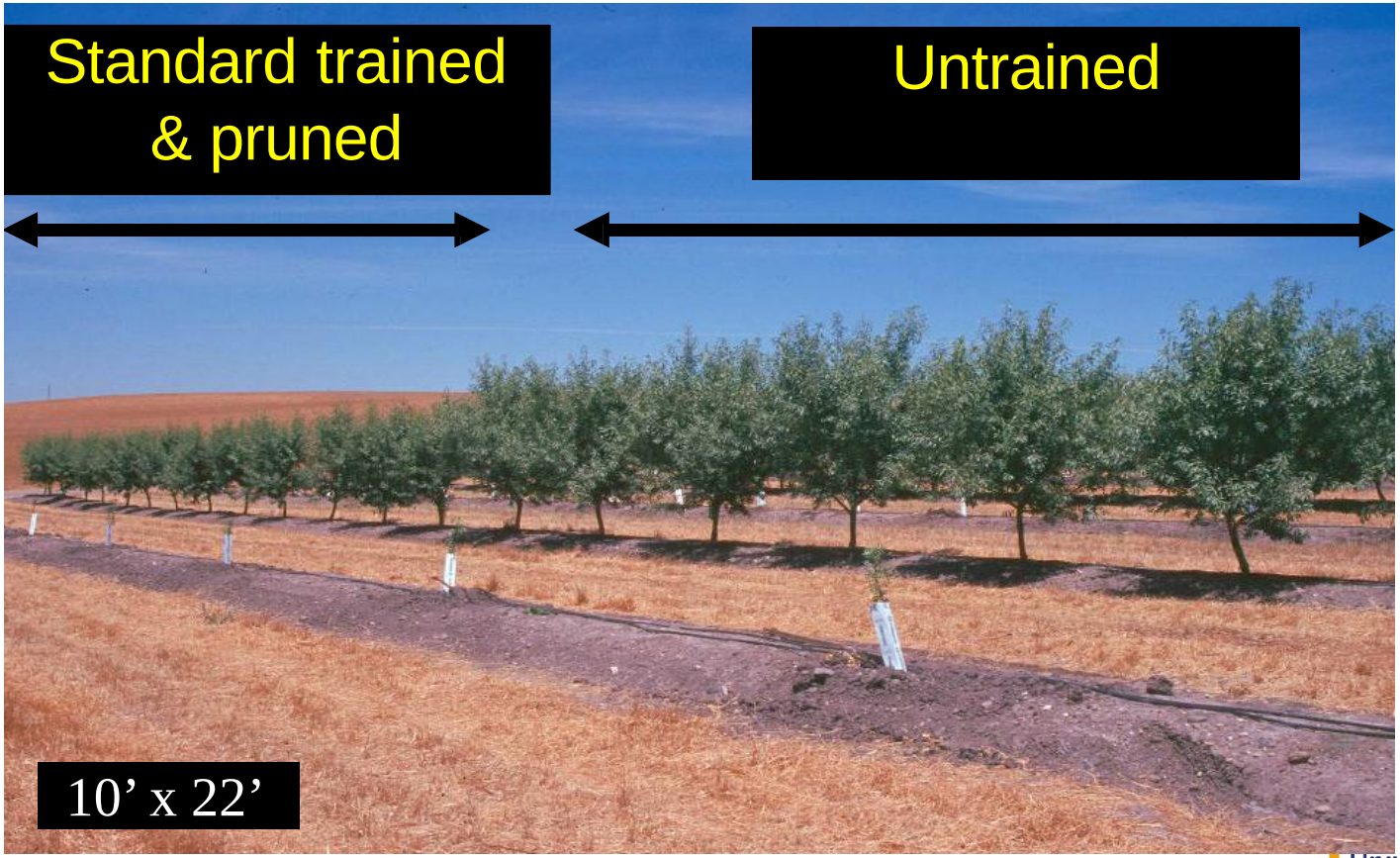
First “dormant” pruning
February 2001

Trained to 3 scaffolds

Minimally trained

Untrained

2 Year Old – Spring 2001



After Second “dormant” pruning Spring 2002

Standard trained, pruned annually

Minimally trained, minimally pruned

Untrained, unpruned

Stanislaus County Training Trial 2000-2012

The Effects of Pruning on Current (13th Leaf) & Cumulative Yield

	Nonpareil		Carmel	
	2012 Yield (lb / acre)	Cumulative	2012 Yield (lb/acre)	Cumulative
Trained to 3 scaffolds; Annual, moderate pruning	4209 ab	29,338	3126 b	25,620
Trained to 3 scaffolds; unpruned after 2nd year	4387 a	30,670	3508 ab	27,535
Trained to multiple scaffolds; Three annual pruning cuts	3979 b	28,769	3308 ab	27,080
No scaffold selection; no annual pruning	4220 ab	30,683	3685 a	28,836

Courtesy of Roger Duncan, UCCE

See his poster for updates.

Training First Leaf Almonds

Trained to 3-4 Leaders

Thinning cuts are made to remove scaffolds

Limited heading cuts are made

Tying is typically necessary, depending on tree vigor

Trained to 6+ Leaders

Thinning cuts are made to remove scaffolds

Typically, only 2-3 are removed

Tying is necessary for years 2-4

Removing double breaks at nodes is a good idea

Once a decision is made, stick to it!

Training Second Leaf Almonds

Before

After

Typically 1-2 cuts are removed from the internal part of the tree

- Thinning cuts
- Typically vertical wood or limbs crossing over the tree

Training Second Leaf Almonds and Later

Before

After

Typically 1-2 cuts are removed from the internal part of the tree

- Thinning cuts
- Typically vertical wood or limbs crossing over the tree
- Cutting too much causes regrowth

Developing and Managing Young Orchards: Conclusions

Plant trees properly as many mistakes occur at this stage;

Tree staking should occur to keep trees straight to prevent barking, tie loosely with stake into the prevailing wind;

The more cuts made on young trees, the less yield in the first few harvests;

Training should vary by tree and age, with larger # of cuts being made after year one, fewer cuts in years two and three.

Thank you!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Almond Board of California


growing
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Research Poster Sessions

Wednesday, December 6
3:00 p.m. – 5:00 p.m.

Featured topics:
- Irrigation, nutrient management
- Breeding
- Soils, if related to organic matter input
- Sustainability, irrigation improvement continuum, life cycle assessment, dust
- Food quality and safety

Thursday, December 7
1:30 p.m. – 2:30 p.m.

Featured topics:
- Insect and disease management
- Fumigation and alternatives
- Biomass (including biochar-related efforts)
- Pollination
- Almond Leadership Program

2017 Research Update Book

- Pickup your copy at the ABC Booth in Hall A+B
- Includes a one-page summary of every current ABC-funded research project

What's Next

Tuesday, December 5 at 4:15 p.m.

- State of the Industry – Hall C

Be sure to join us at 5:30 p.m. in Hall A+B for Dedicate Trade Show Time and Opening Reception, sponsored by The Bank of Stockton