# Master class on almond growing and training systems

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Things I will discuss

- Rootstocks
- Varieties
- Training systems
- Spur dynamics
- Photosynthetically active radiation interception/yield potential
- Harvest
- Food safety
- Irrigation

Rootstocks used for almond in California

- Nemaguard seedling
- Lovell seedling
- Marianna 2624 plum cutting
- Peach/almond hybrids (clonal or seedling
  - Hansen, Nickels, Brights, Tital, Cornerstone, etc.
- Complex hybrids
  - Viking, Atlas
- Recently Krymsk 86 (peach/plum hybrid) most commonly used rootstock in north part of state due to better anchorage

For more details on rootstocks see Roger Duncan article below

http://cestanislaus.ucanr.edu/files/111484.pdf

# Specific Challenges…

- Alkaline / salty soil or water
  - P/A hybrid (not if heavy soil or ring nematodes)
    - Hansen, Bright's 5, Cornerstone, Titan, BB106
  - Viking
  - Empyrean 1
  - Rootpac R (heavy soil)

# Specific Challenges…

- Phytophthora
  - Marianna 26-24
  - Krymsk 86
  - Marianna 40
  - Ishtara
  - Citation

# Specific Challenges…

- Poor drainage / heavy soil
  - Marianna 26-24
  - Krymsk 86
  - Marianna 40?
  - Rootpac R?

# Specific Challenges…

- Verticillium
  - Atlas

# Specific Challenges…

- Anchorage / high wind
  - Krymsk 86
  - Viking
  - Hansen

# Specific Challenges…

- Bacterial Canker / Ring Nematodes
  - Viking
  - Guardian
  - Lovell

# Pollen Compatibility

In general, almonds are self-incompatible (more details: Bud Development, Pollination, and Fertilization of Flowers)

Varieties selected must be able cross-pollinate

Newer varieties may be self-fertile (e.g. Independence; Shasta) or partially self-fertile (e.g. Winters)

# Pollen Compatibility

| | |
|---|---|
| Each row represents an incompatibility group.<br>• Varieties in each row are cross-incompatible.<br>• Varieties in different rows are compatible with each other.<br>• Varieties with no others in the row are compatible with all other varieties. | Nonpareil |
| | Sonora |
| | Aldrich, Price, Ne Plus Ultra |
| | Carmel, Livingston |
| | Peerless, Fritz, Ruby |
| | Monterey, Avalon, Butte, Supareil, Folsom |
| | Winters, Sweetheart |
| | Wood Colony, Durango |
| | Padre |
| | Mission |
| | Marcona |
| Group unknown, but compatible with Nonpareil | Morley |
| Self-fertile | Independence, Shasta |

# Approximate Bloom Periods

| Early (-6d & earlier) | Early-Mid (-6d to -2d) | Mid (-2d to +2d) | Late-Mid (+2d to + 4d) | Late (+4d to +7d) | Very Late (+8d & later) |
|---|---|---|---|---|---|
| Marcona | Aldrich | Carmel | Butte | Livingston | Morley |
| Ne Plus Ultra | Avalon | Durango | | Mission | Ruby |
| Sonora | Peerless | Folsom | | Padre | |
| | Shasta | Fritz | | | |
| | Winters | Independence | | | |
| | | Nonpareil | | | |
| | | Monterey | | | |
| | | Price | | | |
| | | Supareil | | | |
| | | Wood Colony | | | |

# Bud Failure

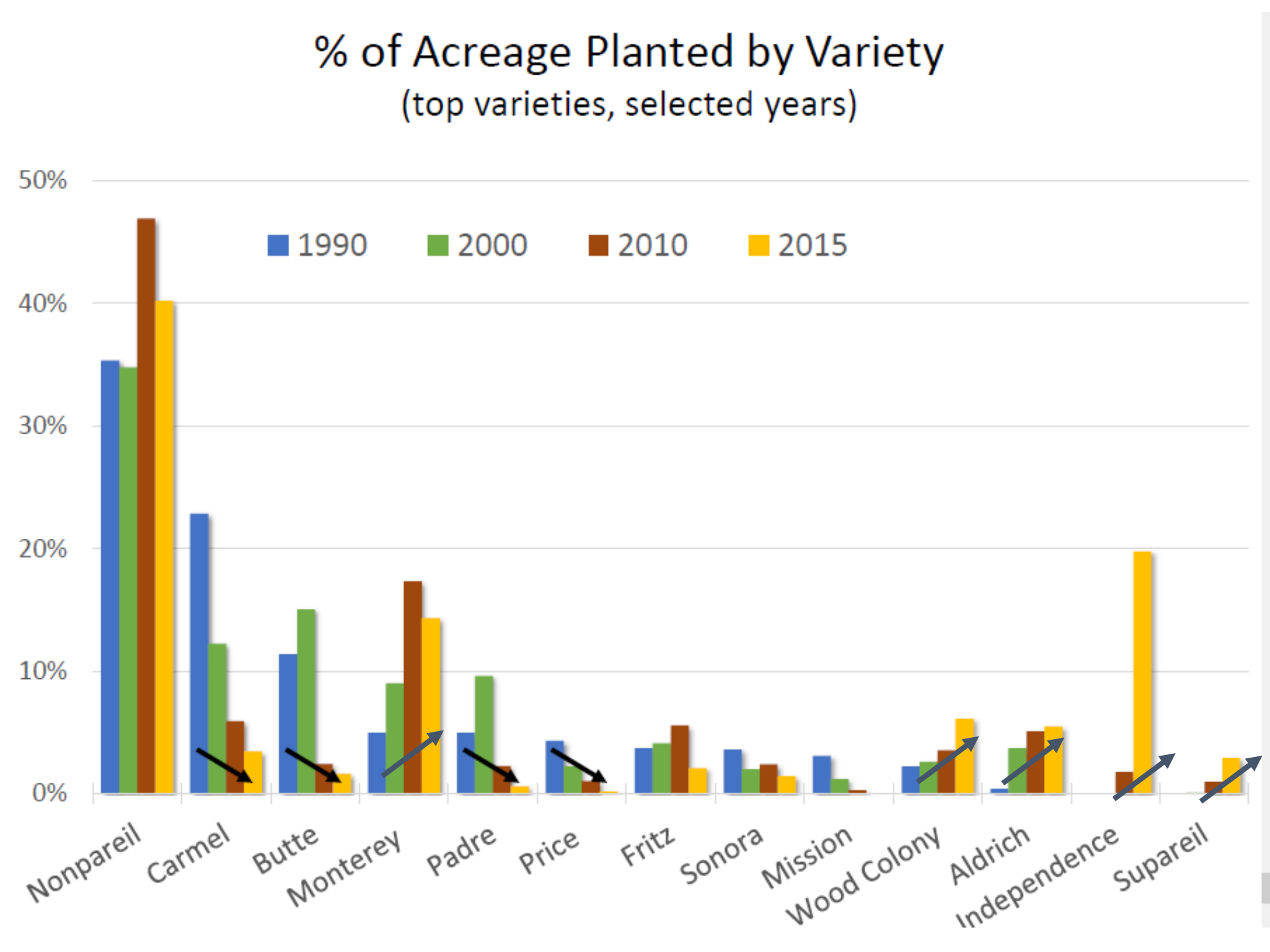

More details: Noninfectious Bud-Failure, Other Genetic Disorders, and Discussion of Certified Stock

| Varieties with known Noninfectious Bud Failure potential | |
|---|---|
| Carmel | Peerless |
| Mission | Price |
| Nonpareil | Winters |

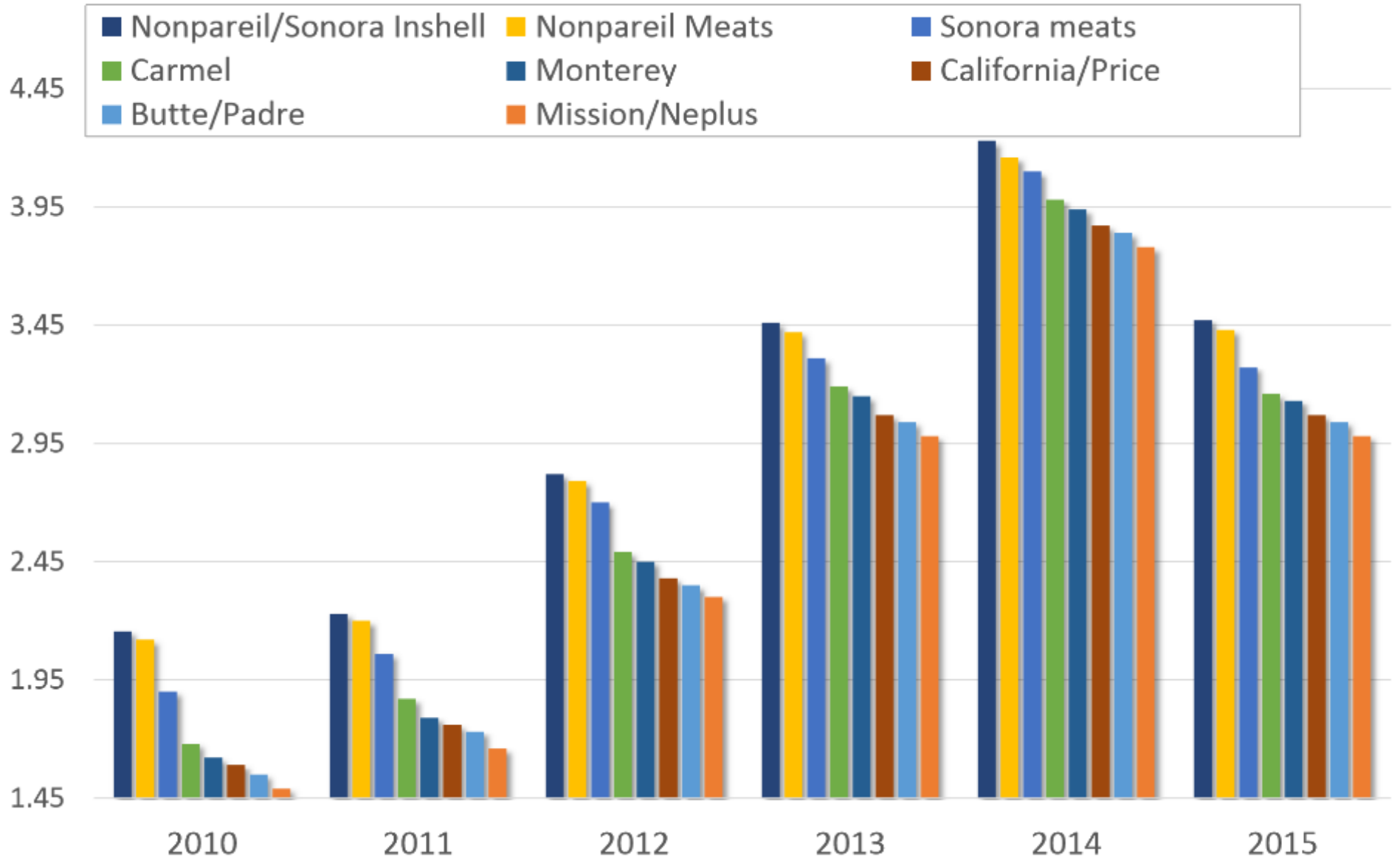
# Harvest Timing

| Nonpareil | 1-2 weeks after NP | 2-3 weeks after NP | 3-4 weeks after NP | 4-5 weeks after NP | 5+ weeks after NP |
|---|---|---|---|---|---|
| Folsom | Avalon | Aldrich | Padre | Mission | Fritz |
| Independence | Durango | Butte | | Monterey | |
| Shasta | Livingston | Carmel | | Ruby | |
| | Price | Morley | | | |
| | Sonora | Ne Plus Ultra | | | |
| | Supareil | Peerless | | | |
| | Wood Colony | Winters | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Harvest time will vary depending on location. Estimated harvest timing in this chart is based on the Fresno region.


% of Acreage Planted by Variety
(top varieties, selected years)
50%
40%
30%
20%
10%
0%
1990
2000
2010
2015
Nonpareil
Carmel
Butte
Monterey
Padre
Price
Fritz
Sonora
Mission
Wood Colony
Aldrich
Independence
Supareil

# Crop Payout by Variety 2010 - 2015




Data are from the Blue Diamond Growers payment history.

Splitting due to scaffolds being too close to each other

# Almond central leader trial 2019

Original Nickels pruning trial (Edstrom)

Cumulative yield (metric tons/ha)

| Variety | # of years of cumulative yield data | Conventional annual pruning | Unpruned trees |
|---|---|---|---|
| Nonpareil | 21 | 38.3 | 39.3 |
| **Second generation Nickels pruning trial (Edstrom)** | | | |
| Nonpareil | 13 | 35.8 | 37.9 |
| Monterey | 13 | 37.9 | 43.1 |
| Carmel | 13 | 37.6 | 33.5 |
| Aldrich | 13 | 38.3 | 35.2 |
| **Sum** | **13** | **149.6** | **149.8** |
| **Kern County Pruning Trial (Viveros)** | | | |
| Nonpareil | 8 | 21.6 | 24.1 |
| Carmel | 8 | 24.3 | 26.4 |
| Monterey | 8 | 23.3 | 24.5 |
| **Sum** | **8** | **69.2** | **75.0** |
| **Stanislaus County Pruning Rootstock Spacing (Duncan)** | | | |
| Nonpareil | 13 | 37.1 | 39.4 |
| Carmel | 13 | 37.8 | 40.1 |
| **Sum** | **13** | **74.9** | **79.4** |

# All of our data suggests:

- There is generally not a benefit to pruning almonds
- A very minimal amount of training in years 1 and 2 is the most that is needed
- Remove limbs that are too low for shaker access
- Take out crossing limbs
- Every pruning cut you make decreases yield and you never make that up
- Just let the trees grow

What you are really managing in an almond orchard is a population of spurs

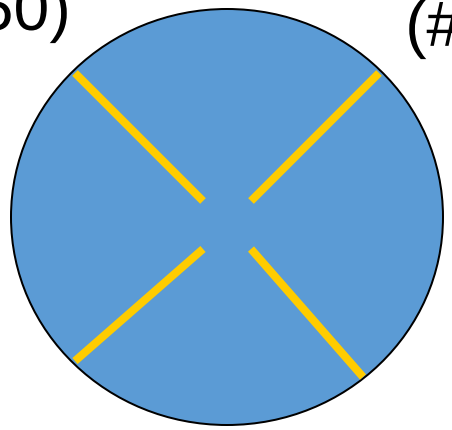

# Spur Dynamics and Almond Productivity

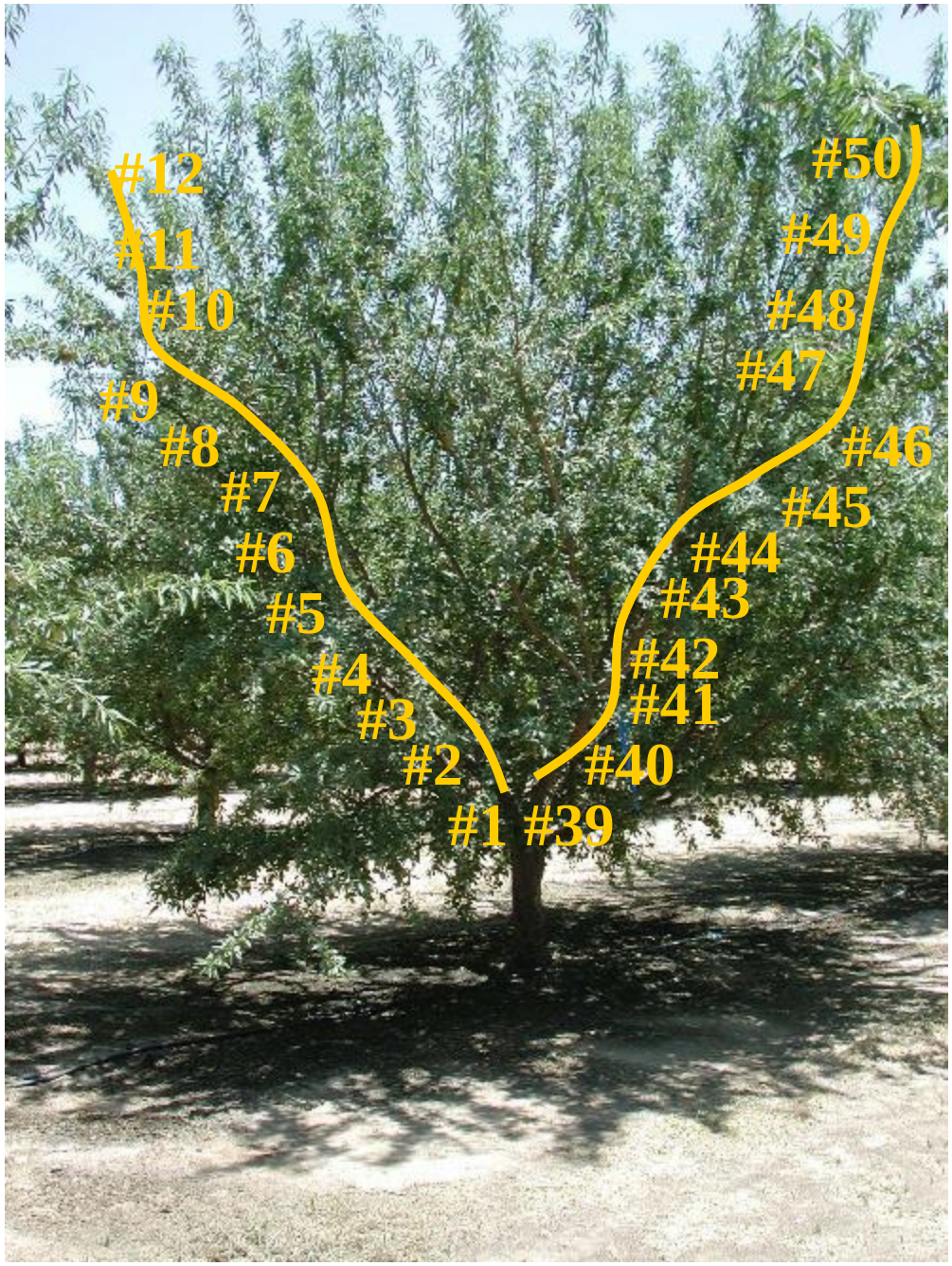
Bruce Lampinen, Ted DeJong, Steve Weinbaum, Sam Metcalf, Claudia Negrón, Joe McIlvane, Rob Baker, and Nadav Ravid

In mature almond (*Prunus dulcis*) orchards, the majority of crop is borne on spurs (short, proleptic shoots) that can live for many years and can produce from zero to four or more fruits.

•2400 spurs were tagged in 2001- distributed around tree and throughout canopy

Top View



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