University of California

Nitrogen Management Training

for Certified Crop Advisers

MODULE 7B

Permanent Crops

Part 2

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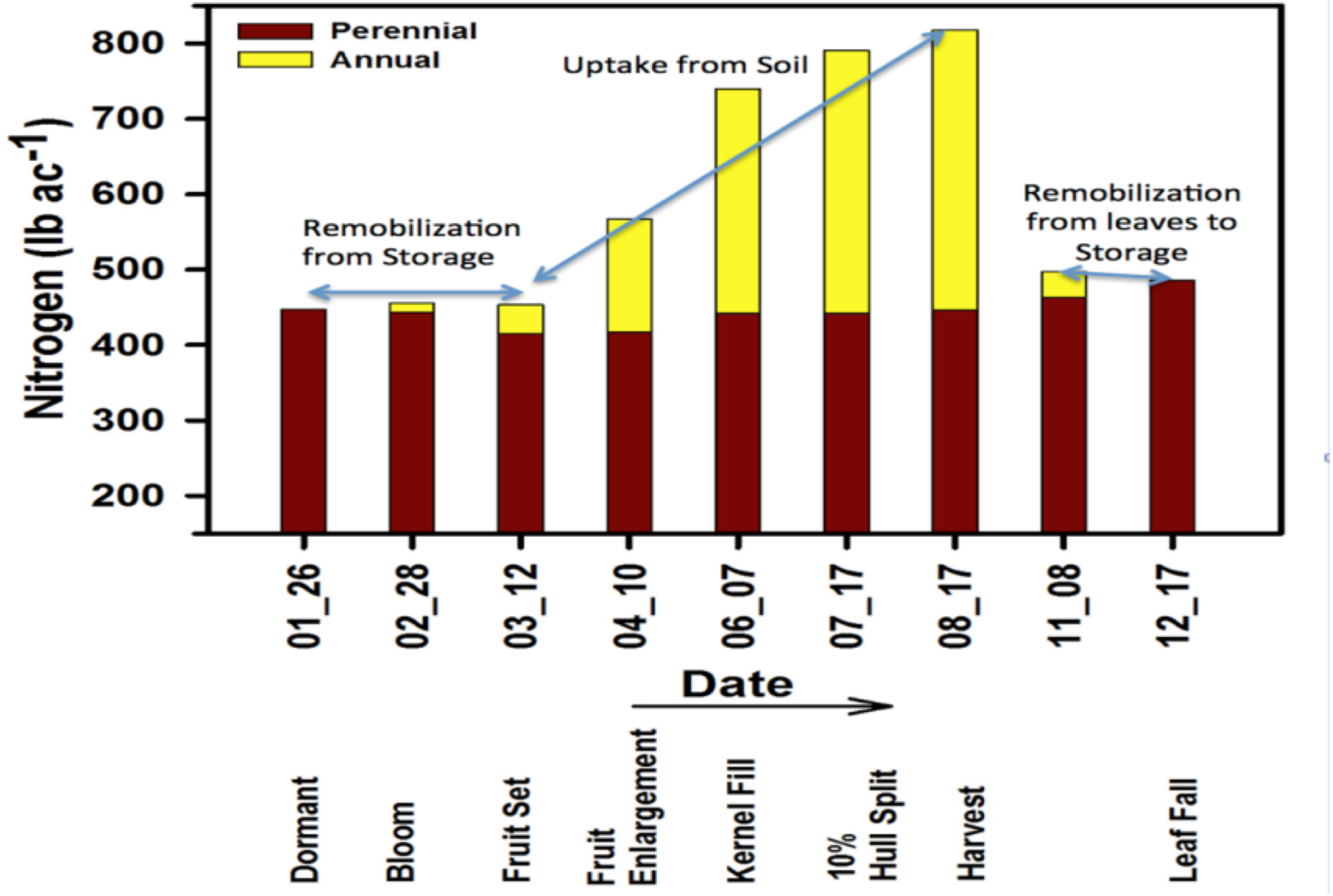
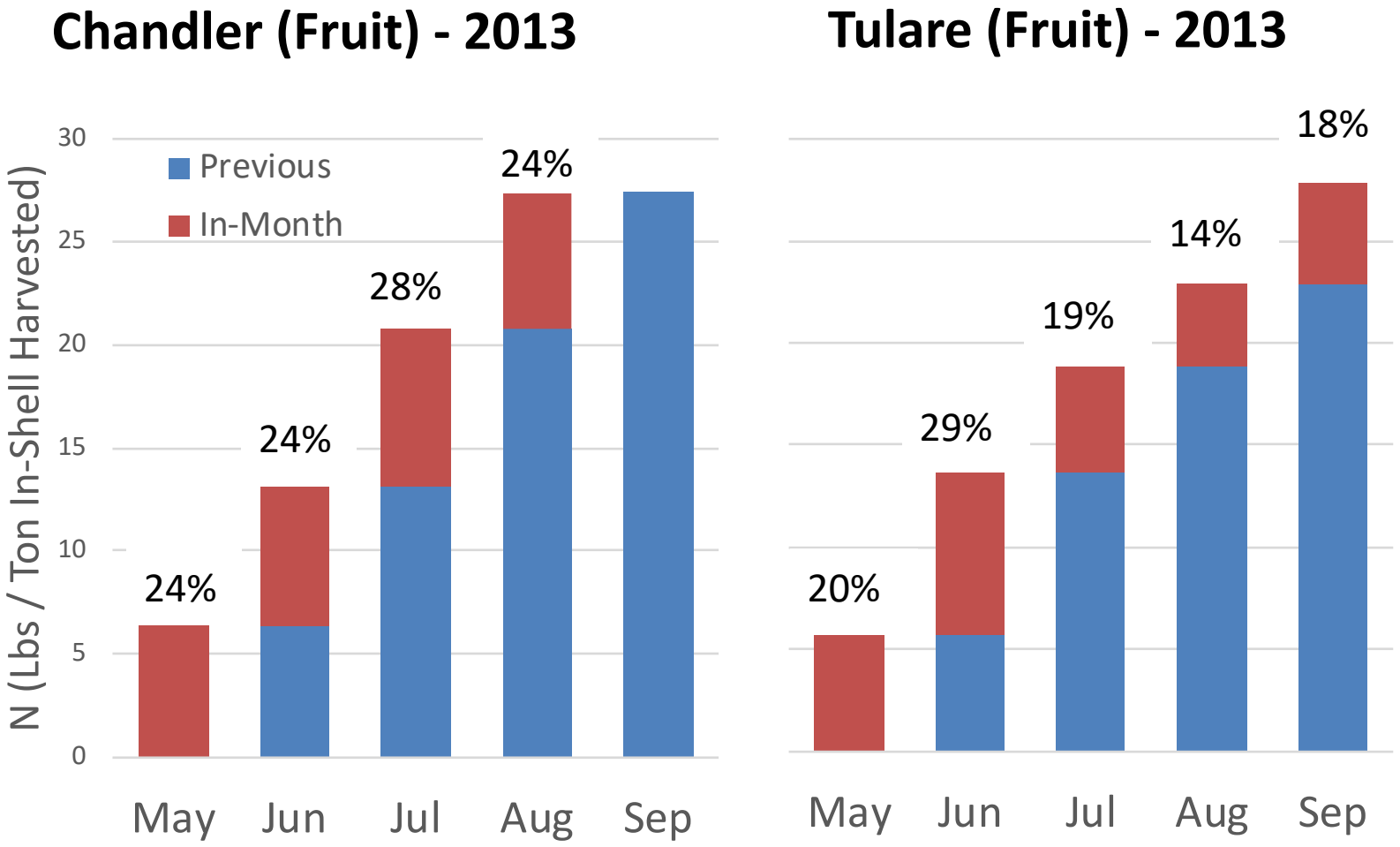
Crop N Demand Timing



Right Rate: Walnuts

Walnuts: Monthly Nitrogen Accumulated in Fruit

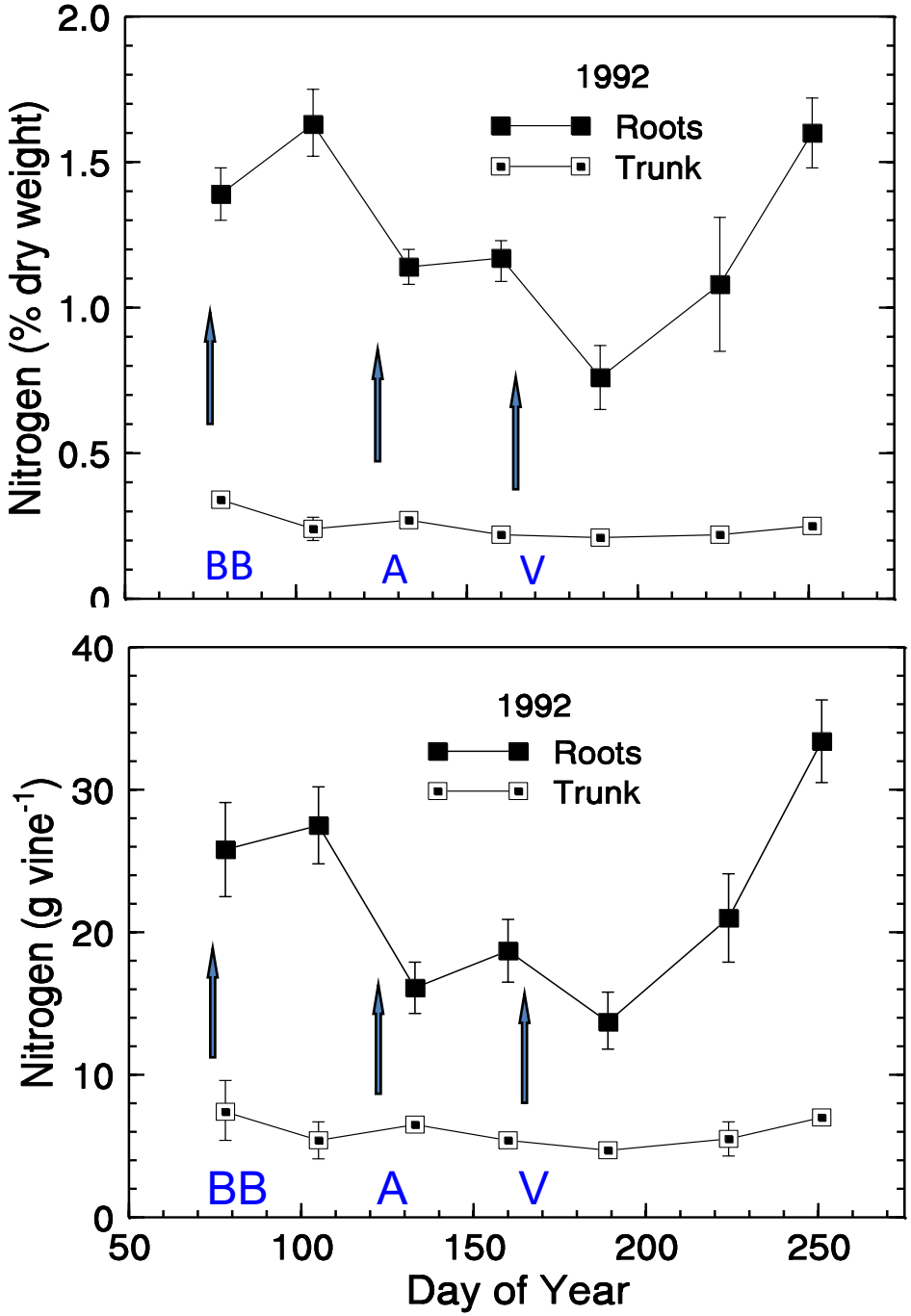
(For every harvested ton. Lbs & Percent of Total)



N Demand and Timing: Peach

- In O'Henry peach, the first 25-30 days of the growing season are supplied exclusively by N storage from perennial tissues
- After that, about 0.89 lbs N per acre per day are taken up by the trees after the spring flush until harvest.
- After harvest, a positive net N storage occurs as a result of a large decrease in the N demand from growth
- Much of the N that is taken up by the tree is returned to the soil as leaf litter and prunings.

Rufat, J, DeJong, TM (2001) Estimating seasonal nitrogen dynamics in peach trees in response to nitrogen availability. *Tree Physiology* 21, 1133-1140.



N Demand Timing & Partitioning:

Thompson Seedless

KEY:

BB = budbreak
A = anthesis (flowering)
V = veraison (berry softening)
H = fruit harvest

N Demand and Timing: Cherry, Apricot, Apple, Pear

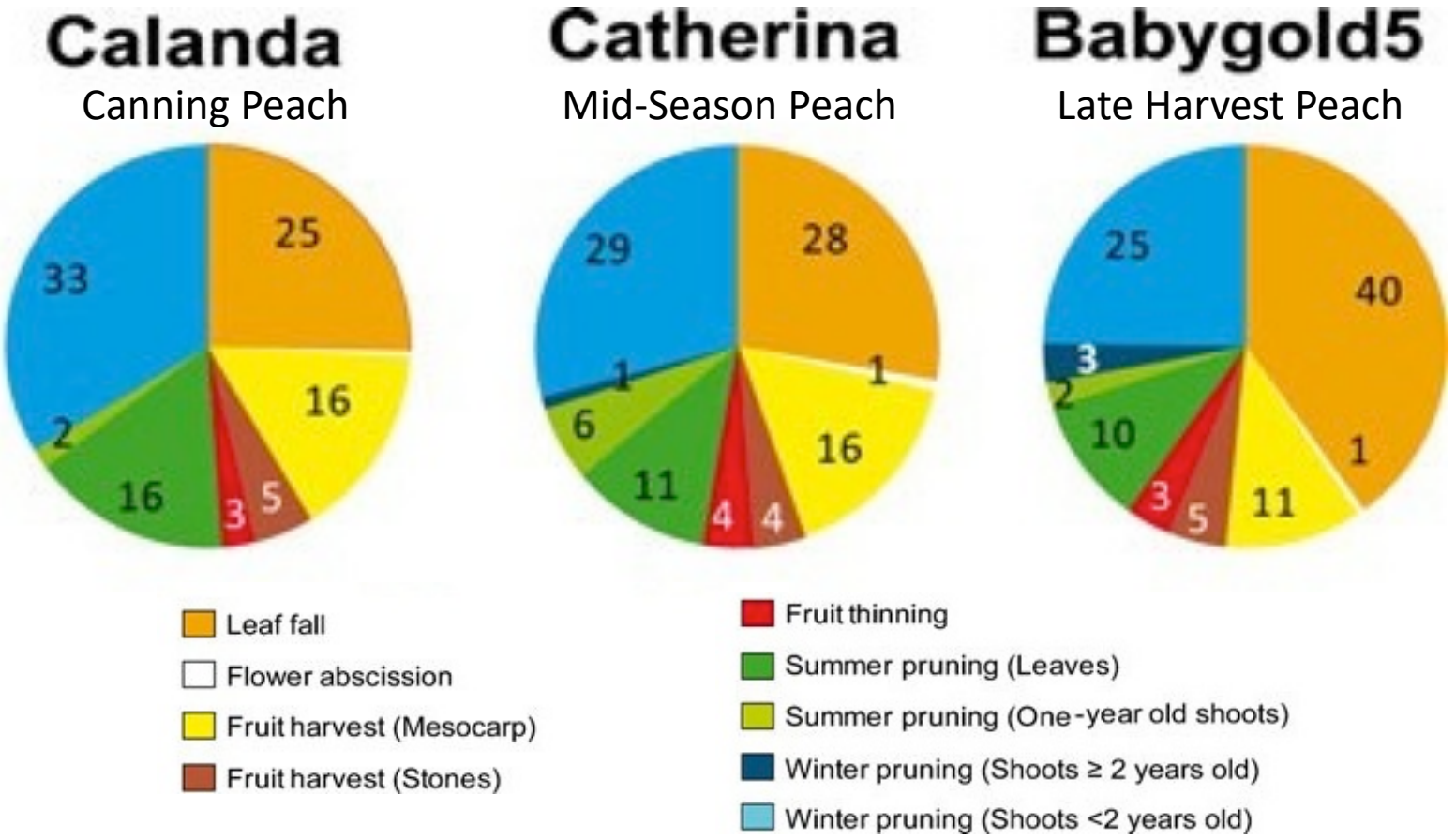
- Data on crop offtake is available for apple and sweet cherry
  - Apple 0.5 - 0.6 lbs N per 1000 lbs fruit
  - Sweet cherry 2.0 - 2.35 lbs N per 1000 lbs fruit
- Data on uptake patterns for these crops is currently not available, though it can be inferred that the patterns will resemble peach:
  - Early season demand (until 80% leaf expansion) is met by stored N
  - Timing of leaf and fruit development will determine timing of uptake
  - Information on when N is allocated to perennial storage is inadequate.

In nut trees the majority of the annual N budget is exported from the orchard when we harvest the fruit

In peaches, grapes, apple, cherries is this also true?

N Partitioning: Peach Experiment Results

% N requirements through the season in three peach varieties:



El-Jendoubi, H, Abadia, J, Abadia, A (2013) Assessment of nutrient removal in bearing peach trees (Prunus persica L. Batsch) based on whole tree analysis. *Plant and Soil* **369**, 421-437.

Right Place: Where does N uptake occur?

Crop	Depth of Main Root Feeding Zone (inches)	Reference
Almond	3-18	Olivos et al (2013)
Apricot	3-12	Ghena and Tercel 1962
Cherry	3-15	Tamasi 1975
Peach	0-25	Dziljanov and Penkov 1964b
Plum	1-20	Tamasi 1973
Walnut	0-20	Kairov et al. 1977

Adapted from: Atkinson, 1980. The Distribution and Effectiveness of the Roots of Tree Crops. Horticultural Reviews.

Leaf Sampling

- July/August leaf sampling is useful to monitor general performance or identify deficiencies but is inadequate as a management strategy
  - Does not provide rate or timing information
  - Too late to respond for current year, too early for next year.
- UCD has developed new Early Leaf Sampling (UCD-ESP) methods for Almond and Pistachio, in Progress for Walnut
  - Useful as a means to determine if leaves will have adequate N for the season
- Several labs have adopted these methods
  - Ask your lab if they use the UCD-ESP program

Managing N in Almond, Pistachio and Walnut:

- Base preseason fertilizer plan on expected yield LESS N in irrigation and other inputs.
  - 1000 lbs almond kernel removes 68lb N
  - 1000 lbs pistachio (CPC yield) removes 28 lbs N
  - 1000 lbs in-shell walnuts removes 14-20 lbs N
  - Account for vegetative growth for each tree nut crop
- Conduct a leaf analysis following full leaf out.
- In April-May, review leaf analysis results and updated yield estimate, then adjust fertilization for remainder of season.

Conclusions: N Management in Tree Crops

- Efficient N management is determined by the 4Rs
- Determine N demand for each individual crop
- Time to match demand – 80% in-season 20% post maturity if needed and trees are healthy
- Target placement where roots are active
- Account for all potential N sources including fertilizer, cover crops, compost, manure, and irrigation water

Every field, every year, is a unique decision

Online Tools:

- N Calculator developed by SureHarvest and the Almond Board of California available at

  www.sustainablealmondgrowing.org
- CDFA FREP website for all tree ntus

  Almond - http://apps.cdfa.ca.gov/frep/docs/Almonds.html

  Walnut - http://apps.cdfa.ca.gov/frep/docs/Walnut.html

  Pistachio - http://apps.cdfa.ca.gov/frep/docs/Pistachio.html
- UC Davis Fruits and Nuts website

http://fruitsandnuts.ucdavis.edu/Weather_Services/Nitrogen_Prediction_Models_for_Almond_and_Pistachio/

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Course materials available at:

ciwr.ucanr.edu/NitrogenManagement

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