2017 THE ALMOND CONFERENCE

RESEARCH UPDATE: GROWING AND HARVESTING

Room 312-313 | December 6 2017

California almonds
Almond Board of California

growing ADVANTAGE
The Almond Conference

CEUs – New Process

Certified Crop Advisor (CCA)

- <u>Sign in and out of each session you attend.</u>
- Pickup verification sheet at conclusion of each session.
- *Sign in sheets are located at the back of each session room.*

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

- Pickup scantron at the start of the day at first session you attend; complete form.
- <u>Sign in and out of each session you attend.</u>
- Pickup verification sheet at conclusion of each session.
- Turn in your scantron at the end of the day at the last session you attend.

Sign in sheets and verification sheets are located at the back of each session room.

AGENDA

- **Bob Curtis,** Almond Board of California, moderator
- **Franz Niederholzer**, UCCE-Colusa Co.
- **Mohammad Yaghmour**, UCCE-Kern Co.
- **Roger Duncan**, UCCE-Stanislaus Co.
- **Anna Davidson**, UC Davis
- **Brian Bailey**, UC Davis
- **Bruce Lampinen**, UC Davis

Research at Nickels Soil Lab

F.J.A. Niederholzer
UC ANR CE Farm Advisor,
Colusa/Sutter/Yuba Counties

california alm
Almond B

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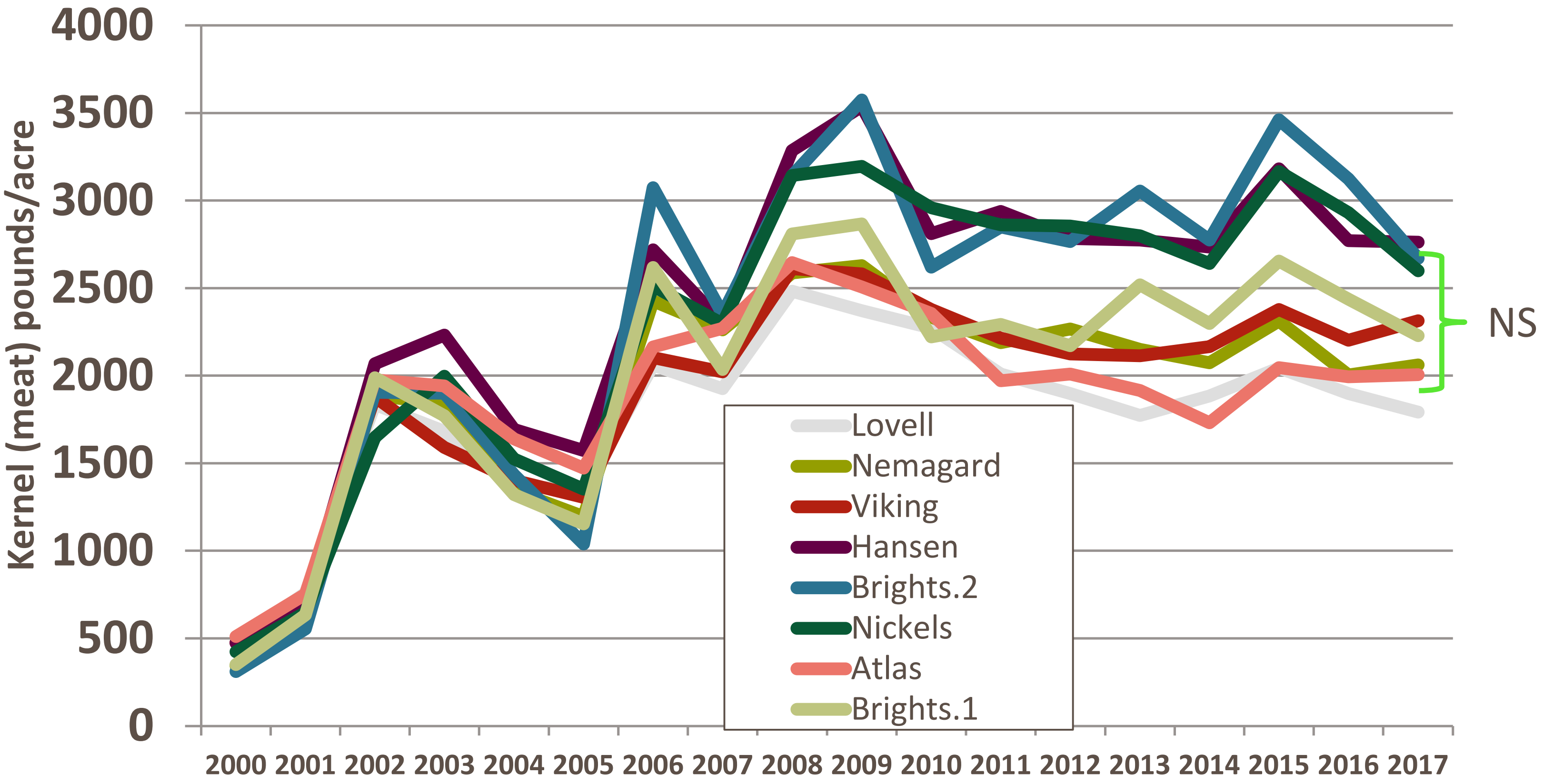
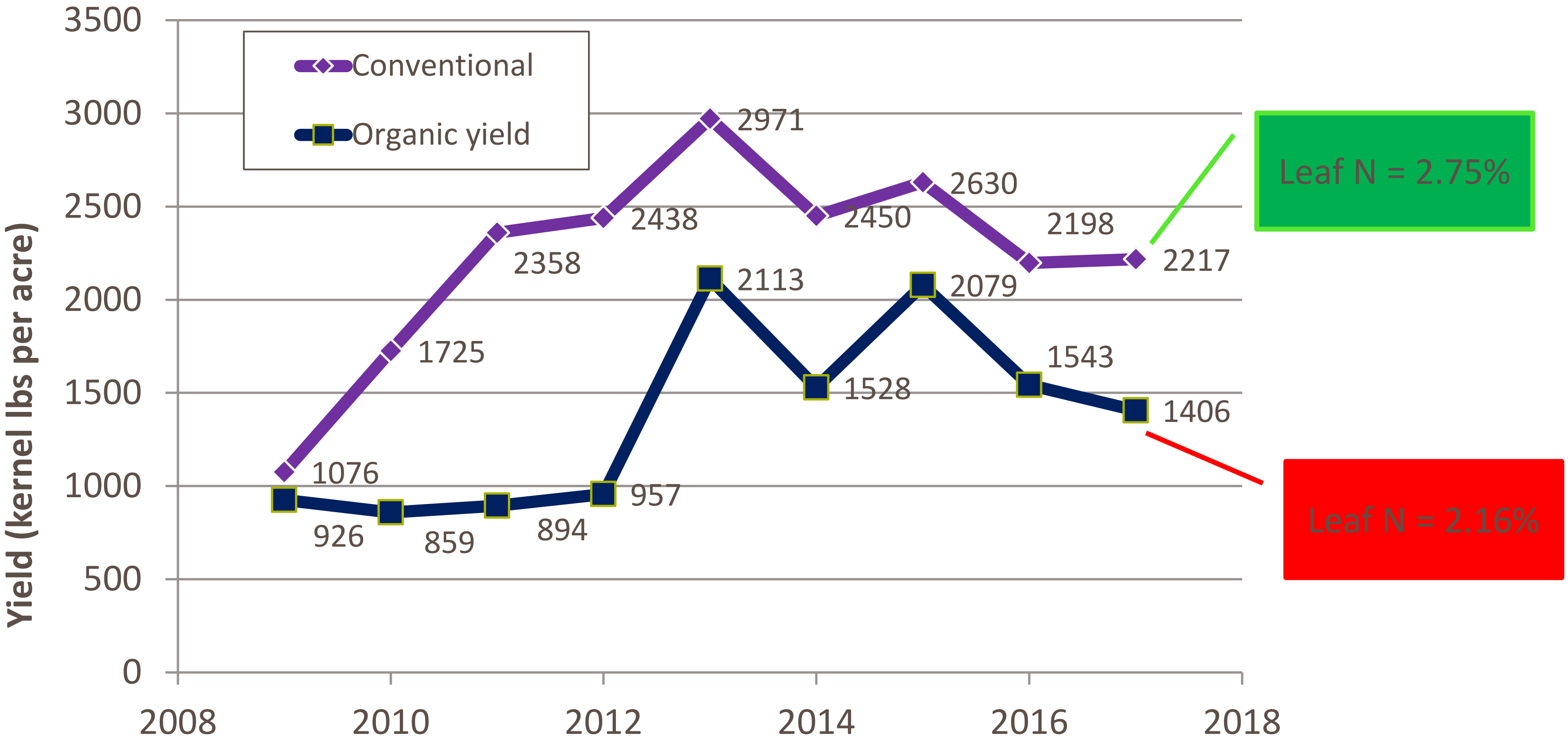
MAJOR PROJECTS UNDERWAY AT NICKELS & YEAR PLANTED

- **Rootstocks: peach, peach/almond hybrids, plum and plum hybrids (1997, 2006, 2008)**
- **Pruning (1997)**
- **Nonpareil pollinator groups (2006)**
- **Organic demo (2006)**
- **Self-fertile vs. high value NP planting (2013)**
- **Planting density down-the-row (2017)**

ANNUAL YIELD, ROOTSTOCK TRIAL



AVERAGE PRODUCTION IN THE ORGANIC AND CONVENTIONAL DEMONSTRATION BLOCK. 4TH – 12TH LEAF



IMPACT OF POLLINATOR SELECTION ON NP YIELD (KERNEL LBS/ACRE), 12TH LEAF. 2017

Variety Group	Rep 1	Rep 2	Rep 3	Ave*
A.Fritz/Nonpareil/Monterey	2818	2558	2531	2636
B.Winters/Nonpareil/Aldrich	2835	2809	2654	2766
C.Winters/Nonpareil/Monterey	2599	2631	2827	2686

*No significant statistical difference at 5% (Duncan's HSD)

CUMULATIVE YIELD FOR EACH VARIETY AND REP, 3RD TO 12TH LEAF. 2017

	Rep 1	Rep 2	Rep 3	Average
Aldrich.B				
Fritz.A	21702	20773	19631	20,702 ab
Nonpareil.B	21091	21635	21145	21,290 ab
Winters.B	21227	22024	19337	20,863 ab
Nonpareil.A	21204	21284	21801	21,430 ab
Winters.C	22724	20814	20805	21,448 ab
Nonpareil.C	21737	22300	21420	21,819 ab
Monterey.A	22328	21717	22120	22,055 b
Monterey.C	23119	21985	21582	22,229 b

NEW SPACING TRIAL, PLANTED 2017

- 17 acres
- 50% Nonpareil, 25% Aldrich, and 25% Kester
- 21’ across the rows
- 12’, 14’, 16’ or 18’ down the row
- ‘Titan’ or ‘Rootpac-R’ rootstock (all treatments repeated on each rootstock)
- Our attempt to reproduce, in northern California, Roger Duncan’s East Stanislaus Co spacing/pruning/rootstock trial.

THANK YOU!

POSTER
47 FOR
MORE INFO

ALMOND CULTURE AND ORCHARD MANAGEMENT

Mohammad Yaghmour

Orchard Systems Advisor, UCCE Kern Co.

california almonds

Almond Board of California

ALMOND CULTURE AND ORCHARD MANAGEMENT

- The almond culture and orchard management project are conducted by UC Farm Advisors from throughout the almond growing areas in California.

- In 2017/2018, Nine UC Farm Advisors participated in this project.

MECHANICAL TOPPING OF DORMANT 2ND LEAF ALMONDS

DANI LIGHTLE, UCCE ORCHARDS ADVISOR, GLENN, BUTTE & TEHAMA

How does mechanical topping during 2nd dormant affect 3rd & 4th leaf almond yields?

Average yield (lbs / acre) – 3rd leaf

	Topped	Untopped
Orchard 1	1157 ± 238	1149 ± 248
Orchard 2	304 ± 11	308 ± 46

No difference in yield between topped and untopped trees in 2017 (3rd leaf). We will measure yields again in 2018.

Mechanically topped tree (left) next to an untopped tree (right)

SACRAMENTO VALLEY ARTHROPOD PEST MONITORING AND IPM EXTENSION

Emily J. Symmes, Area IPM Advisor, Sacramento Valley
Cooperators: FJA Niederholzer and RP Buchner

Project Objectives:

- Monitor the activity of key arthropod (insect & mite) pests of almonds the Sacramento Valley production region
- Maintain historical records of arthropod pest activity in almonds Sacramento Valley
- Disseminate timely IPM information to pest/crop consultants and growers

Extension efforts:

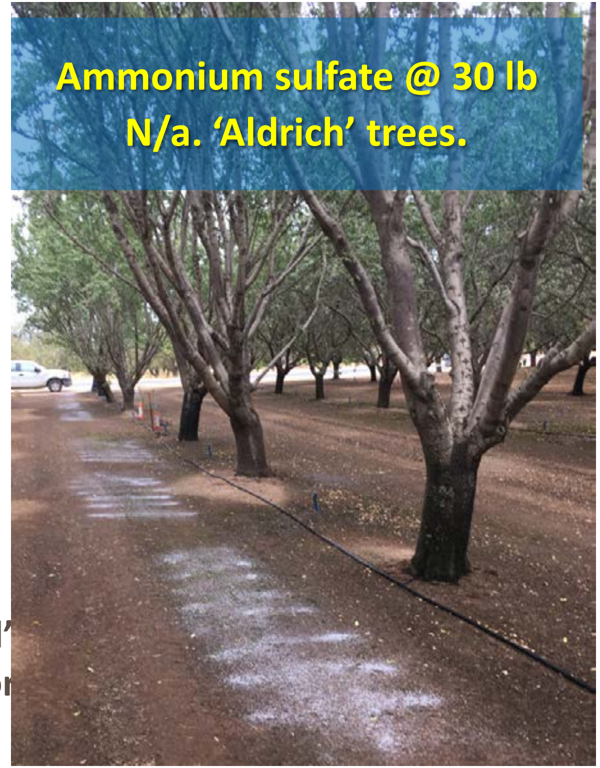
- Pest activity reports disseminated weekly via email list-serves
- Pest activity reports posted weekly on Sacramento Valley Orchard Source website
- Pest activity and seasonal IPM strategies presented at monthly IPM meetings (February – November)

Please visit Poster 99 for project details

DOES FALL NITROGEN APPLICATION IMPROVE ALMOND YIELD?

F. Niederholzer, UCCE Colusa and Sutter/Yuba Counties; **B. Lampinen**, UCCE Specialist, UC Davis; and **S. Cutter**, Farm Manager, Nickels Estate, Arbuckle

- Adequate nitrogen (N) nutrition is essential for high volume almond production. Current UC guidelines recommend 20% of annual N budget be applied between hullsplit and leaf drop.
- With late harvest varieties (‘Monterey’,‘Fritz’,etc.) the hullsplit/leaf drop N application may not go out until October.
- “Unused” soil nitrate is vulnerable to leaching below the root zone with winter rains, especially in the Sacramento Valley.
- Given the environmental risk and limited time/money in fall, is late season N application worth it?**...Does fall N improve almond yield?**
- **UN32 or ammonium sulfate was applied to productive, mature ‘Nonpareil’ and ‘Aldrich’ trees under micro-irrigation on Oct 20, 2016 at rate = 0, 30, or 60 lb N/acre.**
- Fall, 2016 N fertilization did not change 2017 yield in ‘Nonpareil’ or ‘Aldrich’ trees. (Ditto for NP in 2015/16.) **See Poster 48 for details.**



SURVEY TO DETERMINE FREQUENCY OF PRUNUS NECROTIC RINGSPOT VIRUS AND OTHER ILARVIRUSES IN NEWLY ESTABLISHED ALMOND ORCHARDS

David Doll, UCCE Merced County

- Once established within an orchard, Prunus necrotic ringspot virus (PNRSV) can spread and reduce yields.
- Often, the disease is introduced through nursery material.
- Survey occurred in which 20 orchards were sampled. Sampling of each variety occurred within the selected orchards for total of 41 samples from 7 different nurseries.
- 4/41 samples tested positive for PNRSV with material sourced from three different nurseries.
- All three of these nurseries participate in viral screen programs, suggesting either budwood was sourced from un-tested trees or false negative/positive.
- This rate of occurrence may indicate a more widespread problem within the industry.

Almond Bloom Disease Fungicide Efficacy Trial

By Brent A. Holtz, UC Farm Advisor in San Joaquin County

Brown Rot Per 100 Flowers
Butte Variety

Treatment	Rates per acre	Brown Rot[a]	
12 A19649B Experimental[1,2,3]	5.13 fl oz	1.50	a
14 A20560C Experimental[1,2,3]	6.84 fl oz	2.50	a
04 Aproach + Fontelis 1.67 SC[1,2,3]	6 fl oz + 14 fl oz	3.25	a
16 R-106506 SC Experimental[1,2,3]	5.08 fl oz	4.00	a
13 A20259E Experimental[1,2,3]	13.7 fl oz	4.00	a
15 R-106506 SC Experimental[1,2,3]	3.38 fl oz	4.50	a
11 Quadris Top[1]	14 fl oz, Bravo[2] 4 pt (no DA), Inspire EC[3], 7 fl oz	4.50	a
09 RON94-112 Experimental[1,2,3]	43.4 fl oz (no Dyne-Amic)	4.75	a
05 Aproach + Fontelis 1.67 SC[1,2,3]	8 fl oz + 16 fl oz	5.25	ab
20 Fontelis[1,3]	20 fl oz, Regalia[2], 2 quarts	5.50	ab
08 RON94-112 Experimental[1,2,3]	43.4 fl oz	5.50	ab
10 RON94-112[1]	28.9 fl oz, RON94-374 Experimental[2,3], 28.9 fl oz	6.50	ab
07 RON94-112 Experimental[1,2,3]	28.9 fl oz	6.75	ab
06 Quadris Top[1,2,3]	12 fl oz	9.00	abc
03 Aproach 2.08 SC[1,2,3]	12 fl oz	9.00	abc
17 Timorex Gold[1,2,3]	1.5 L/Ha	10.50	abcd
02 Aproach 2.08 SC[1,2,3]	8 fl oz	15.75	bcd
01 Aproach 2.08 SC[1,2,3]	6 fl oz	19.75	cde
19 Microthiol Disperse[1,2,3]	20 lbs	21.00	de
18 Timorex Gold[1,2,3]	2.0 L/Ha	29.75	e
21 Untreated Control		48.25	f
22 Untreated Control		49.50	f

[a]Brown Rot = Brown Rot was rated on the Butte variety on March 21st, 10 limbs per tree and 10 blossoms per limb were rated for brown rot infections, determined per 100 blossoms. Data was analyzed by ANOVA with means separated by Fisher's Protected LSD ($\alpha = 0.05$) test. Means followed by the same letter are not significantly different. Most treatments significantly reduced the incidence of brown rot when compared to our two untreated controls. See poster 68 for more details.

Scab Incidence
Carmel Variety

Treatment	Rates per acre	Incidence[a]	
14 A20560C Experimental[1,2,3]	6.84 fl oz	4.50	a
06 Quadris Top[1,2,3]	12 fl oz	6.50	a
13 A20259E Experimental[1,2,3]	13.7 fl oz	11.25	a
12 A19649B Experimental[1,2,3]	5.13 fl oz	11.25	a
11 Quadris Top[1]	14 fl oz, Bravo[2] 4 pt (no DA), Inspire EC[3], 7 fl oz	12.50	a
19 Microthiol Disperse[1,2,3]	20 lbs	20.75	ab
05 Aproach + Fontelis 1.67 SC[1,2,3]	8 fl oz + 16 fl oz	37.25	abc
08 RON94-112 Experimental[1,2,3]	43.4 fl oz	38.75	abc
15 R-106506 SC Experimental[1,2,3]	3.38 fl oz	39.25	abc
10 RON94-112[1]	28.9 fl oz, RON94-374 Experimental[2,3], 28.9 fl oz	52.25	abcd
16 R-106506 SC Experimental[1,2,3]	5.08 fl oz	66.00	bcd
07 RON94-112 Experimental[1,2,3]	28.9 fl oz	68.25	bcd
09 RON94-112 Experimental[1,2,3]	43.4 fl oz (no Dyne-Amic)	72.25	cd
04 Aproach + Fontelis 1.67 SC[1,2,3]	6 fl oz + 14 fl oz	84.75	cd
02 Aproach 2.08 SC[1,2,3]	8 fl oz	87.75	cde
20 Fontelis[1,3]	20 fl oz, Regalia[2], 2 quarts	100.75	def
21 Untreated Control		135.75	efg
01 Aproach 2.08 SC[1,2,3]	6 fl oz	138.25	efg
22 Untreated Control		140.50	fg
17 Timorex Gold[1,2,3]	1.5 L/Ha	146.00	fg
18 Timorex Gold[1,2,3]	2.0 L/Ha	158.25	gh
03 Aproach 2.08 SC[1,2,3]	12 fl oz	197.50	h

[a]Incidence = number of nuts that have scab lesions on 100 nuts randomly sampled. 222 nuts per tree were randomly sampled on August 3, and taken back to the laboratory in order to determine incidence and severity.
Data was analyzed by ANOVA with means separated by Fisher's Protected LSD ($\alpha = 0.05$) test. Means followed by the same letter are not significantly different. Most treatments significantly reduced the incidence of almond scab when compared to our two untreated controls. See poster 68 for more details.

PRE-PLANT SOIL FUMIGATION OR POST-PLANT SOLARIZATION FOR CONTROL OF VERTICILLIUM WILT DISEASE

Roger Duncan, UC Cooperative Extension, Stanislaus County

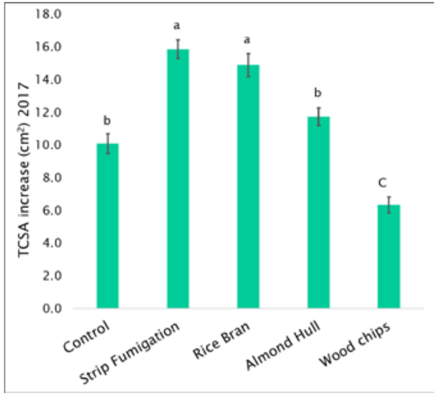
- New almond orchards expanding into traditional row crop land (tomatoes, melons, etc.)
- Many Westside orchards affected by Verticillium wilt disease
- Will pre-plant treatments reduce disease severity?
- Testing:
  - Preplant: fumigation with Telone II, chloropicrin, Dominus
  - Postplant: black polyethylene film
- Trees planted November 2016
- Will record disease severity, tree performance and yield response
- Results pending. Vert expected in spring 2018!

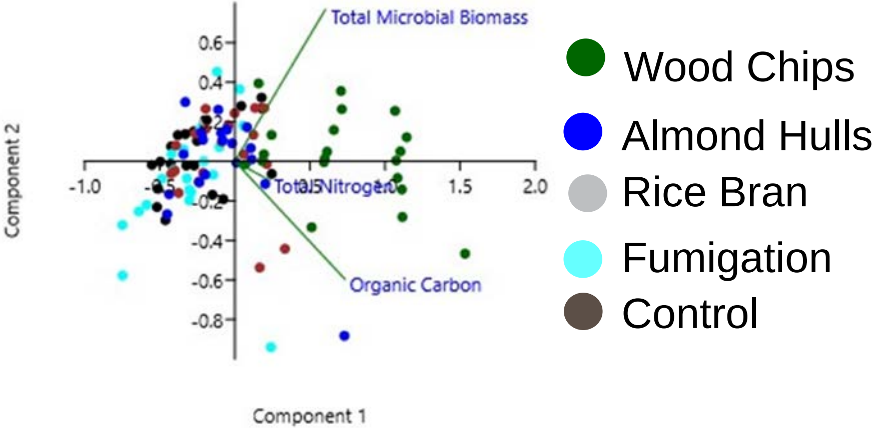
TREE GROWTH AND SOIL NUTRIENT RESPONSES TO WHOLE ORCHARD RECYCLING IN A NEWLY ESTABLISHED ORCHARD

Mae Culumber, UCCE Fresno County

85-90 tons/acre wood mulch application was detrimental to growth of young almond trees in comparison to other pre-plant agricultural waste product amendments and industry standard practices after one growing season.

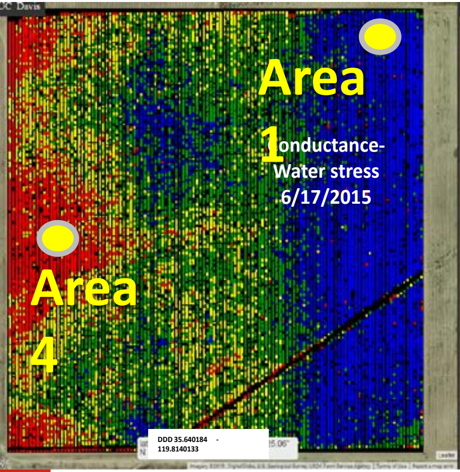
Soil chemical and biological indicators suggest wood mulch significantly increases soil microbial biomass, organic carbon, and total nitrogen levels in the soil within the first year of application.

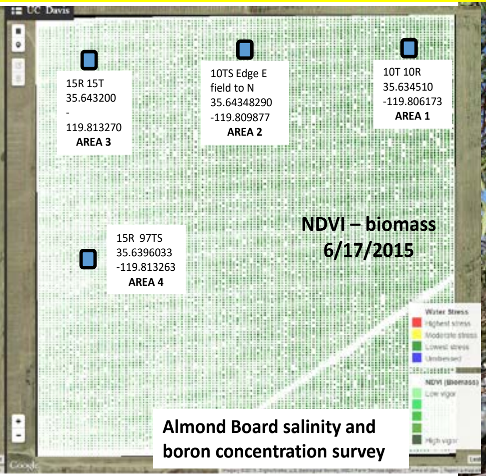


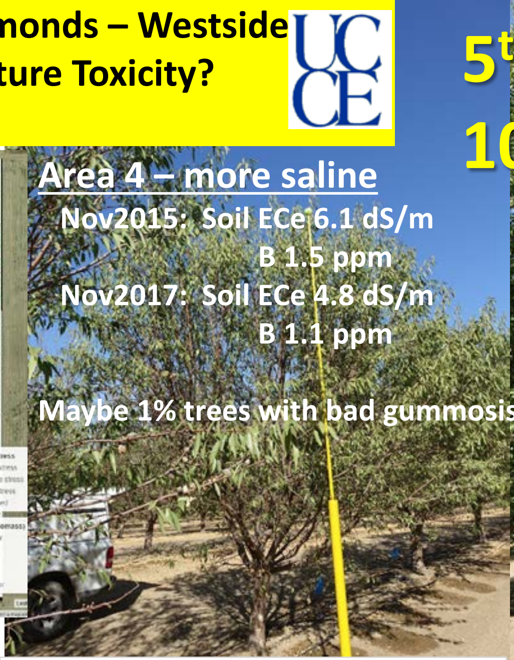


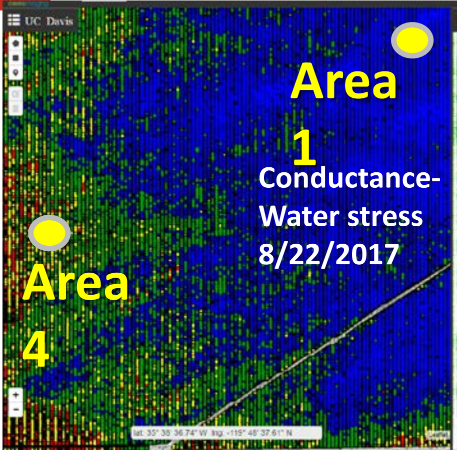
Sodium, Chloride and Boron Accumulation in Almonds – Westside
Can Salt Levels in Woody Tissue Forecast Future Toxicity?

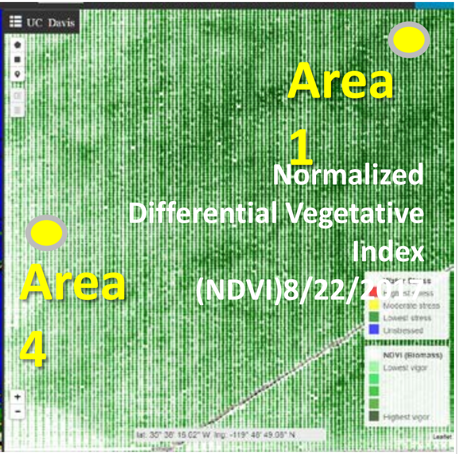
Blake Sanden, Patrick Brown

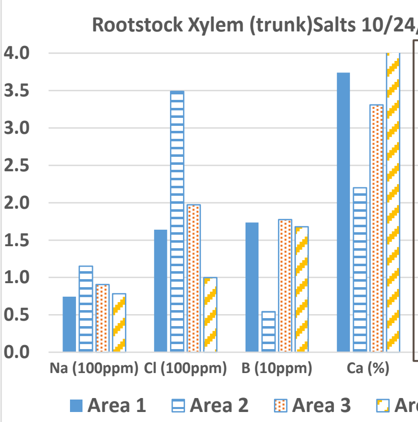




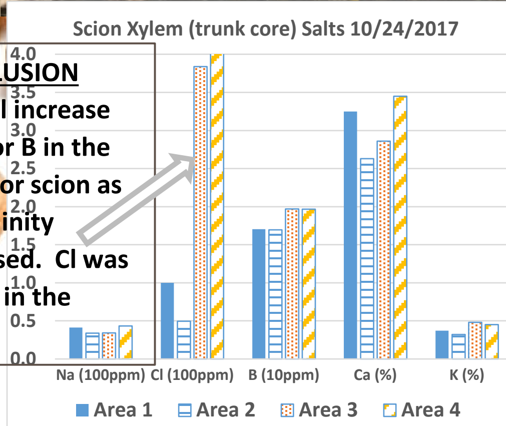






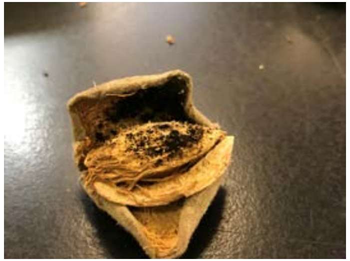


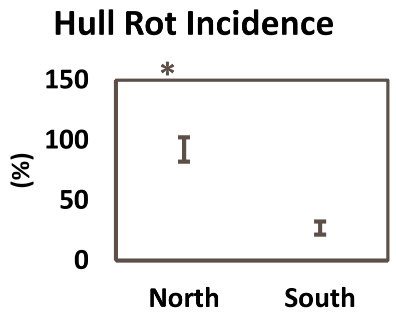
CONCLUSION
No real increase in Na or B in the xylem or scion as soil salinity increased. Cl was higher in the scion.

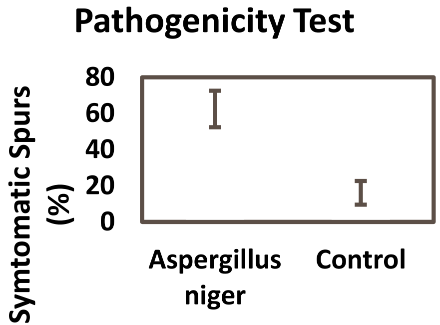


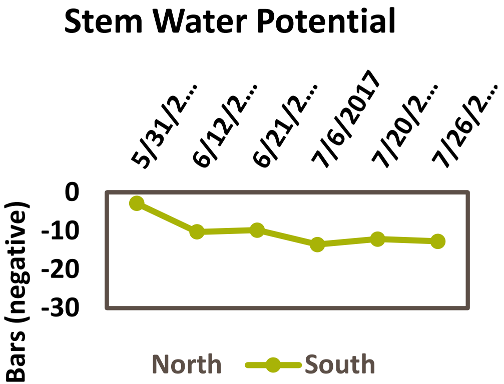
INVESTIGATION OF HULL ROT CAUSAL AGENTS, AND ENVIRONMENTAL CONDITIONS CONDUCIVE TO DISEASE DEVELOPMENT IN KERN COUNTY

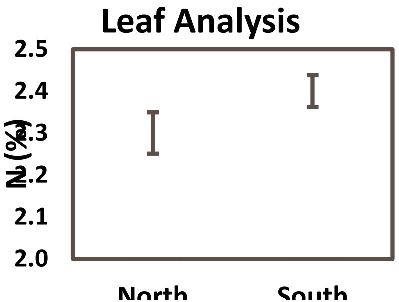
MOHAMMAD YAGHMOUR, UCCE KERN











THANK YOU!

Please visit our posters for more information

INTEGRATION OF HIGHER TREE DENSITY AND MINIMAL PRUNING FOR EFFICIENT ALMOND PRODUCTION

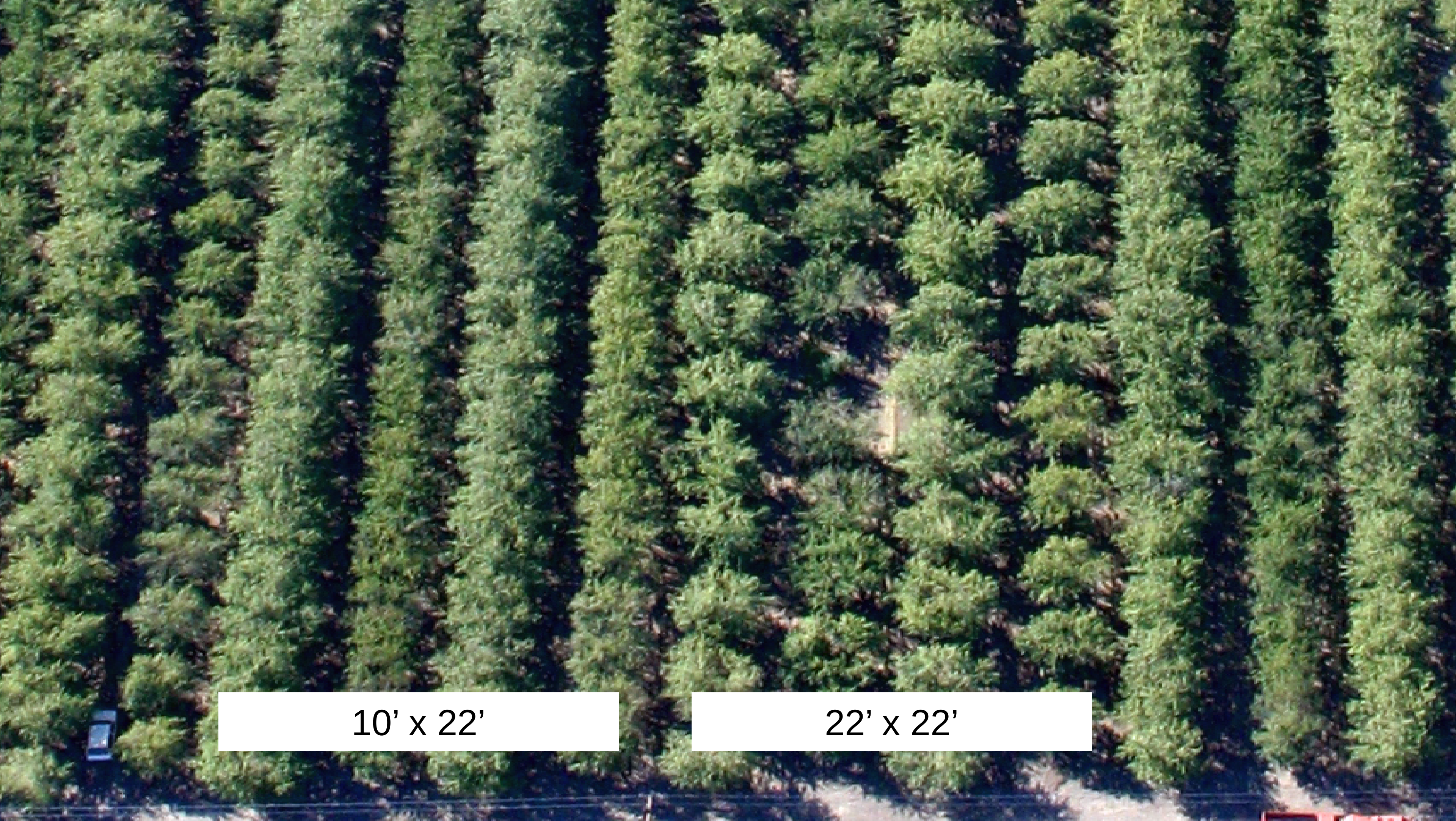
Roger Duncan, UCCE, Stanislaus County

GOAL WHEN DESIGNING AN ALMOND ORCHARD – MAXIMIZE YIELD POTENTIAL BY MAXIMIZING LIGHT CAPTURE:

- Capture as much sunlight as early and for as long as possible.
- Each 1% of intercepted sunlight ~ 50 pounds of yield potential.
- Does higher tree density = higher yield in short term? Long term??
- What is the limit? Do high density orchards crash over time?
- What role does pruning play in maintaining yield?

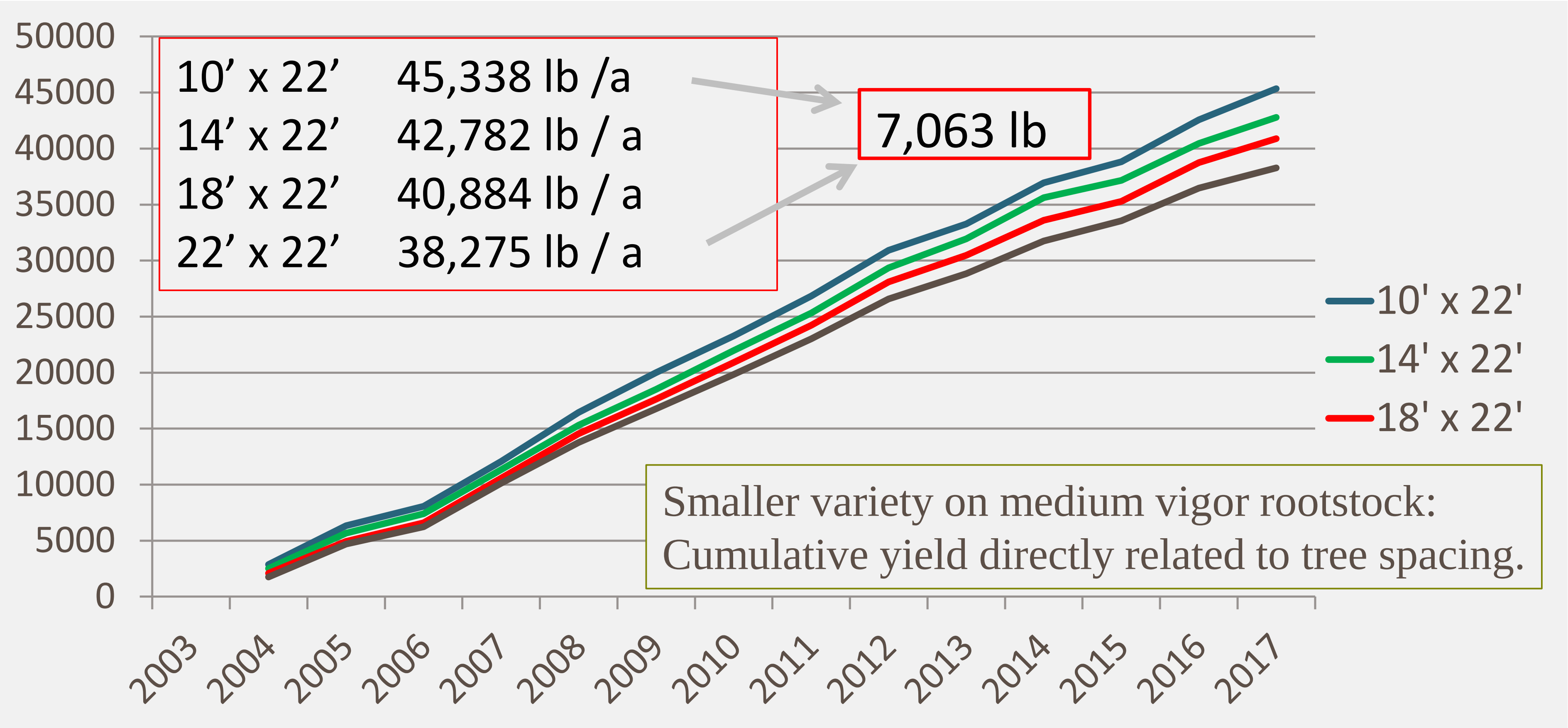
ALMOND SPACING & PRUNING TRIAL

- Planted fall, 1999
- 37 acres
- Four tree densities
    - -10’ x 22’ (198 trees / acre)
    - -14’ x 22’ (141 trees / acre)
    - -18’ x 22’ (110 trees / acre)
    - -22’ x 22’ (90 trees per acre)
- Overlaid with four pruning strategies and two rootstocks (Nemaguard & Hansen)


10’ x 22’
22’ x 22’

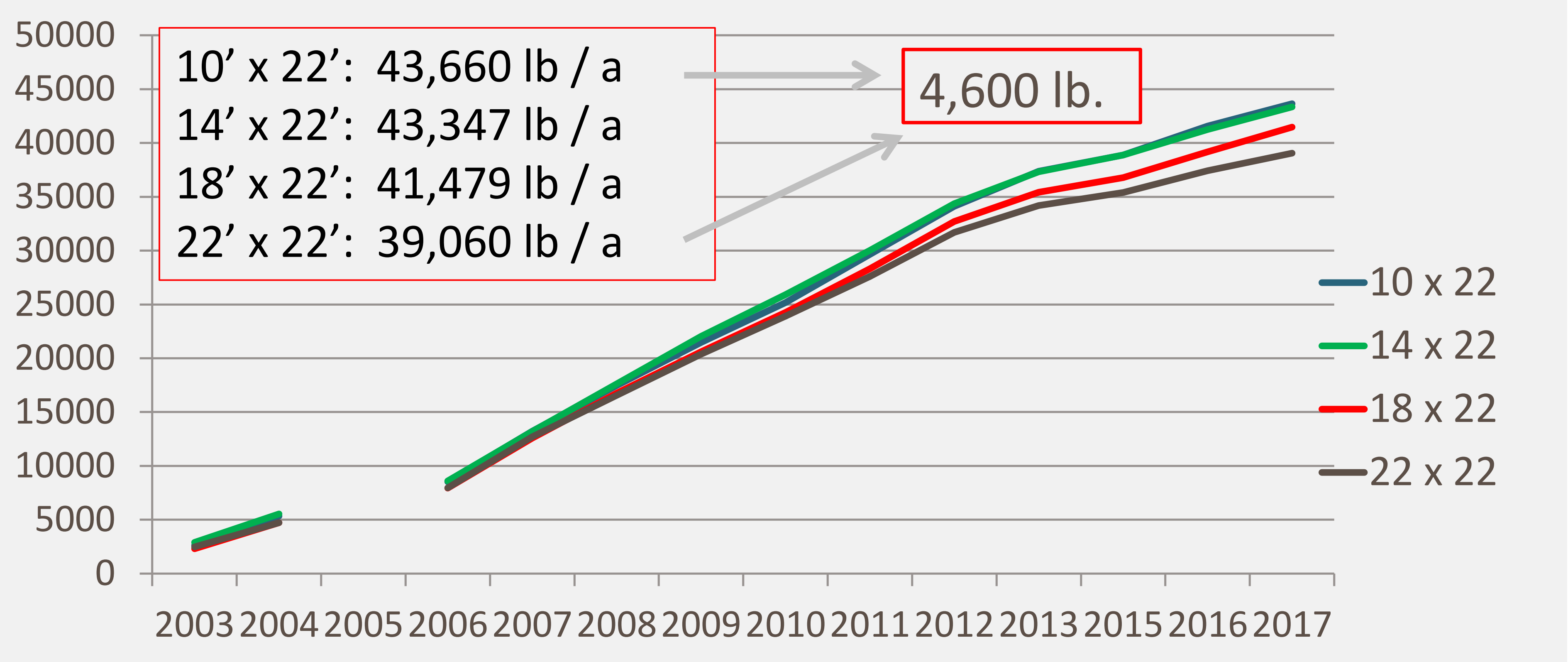
The Effect of Tree Spacing on Cumulative Yield Through 18th Season

Carmel on Nemaguard

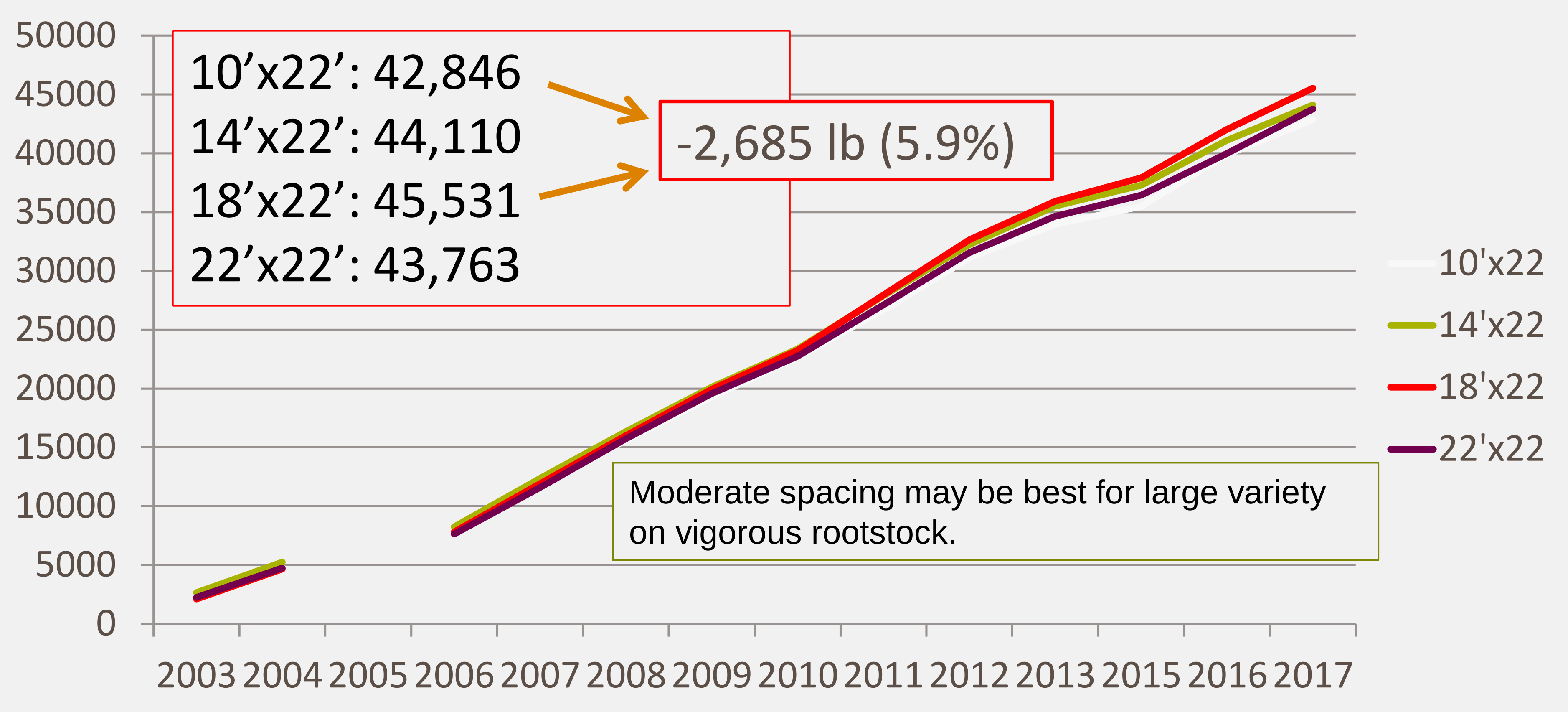


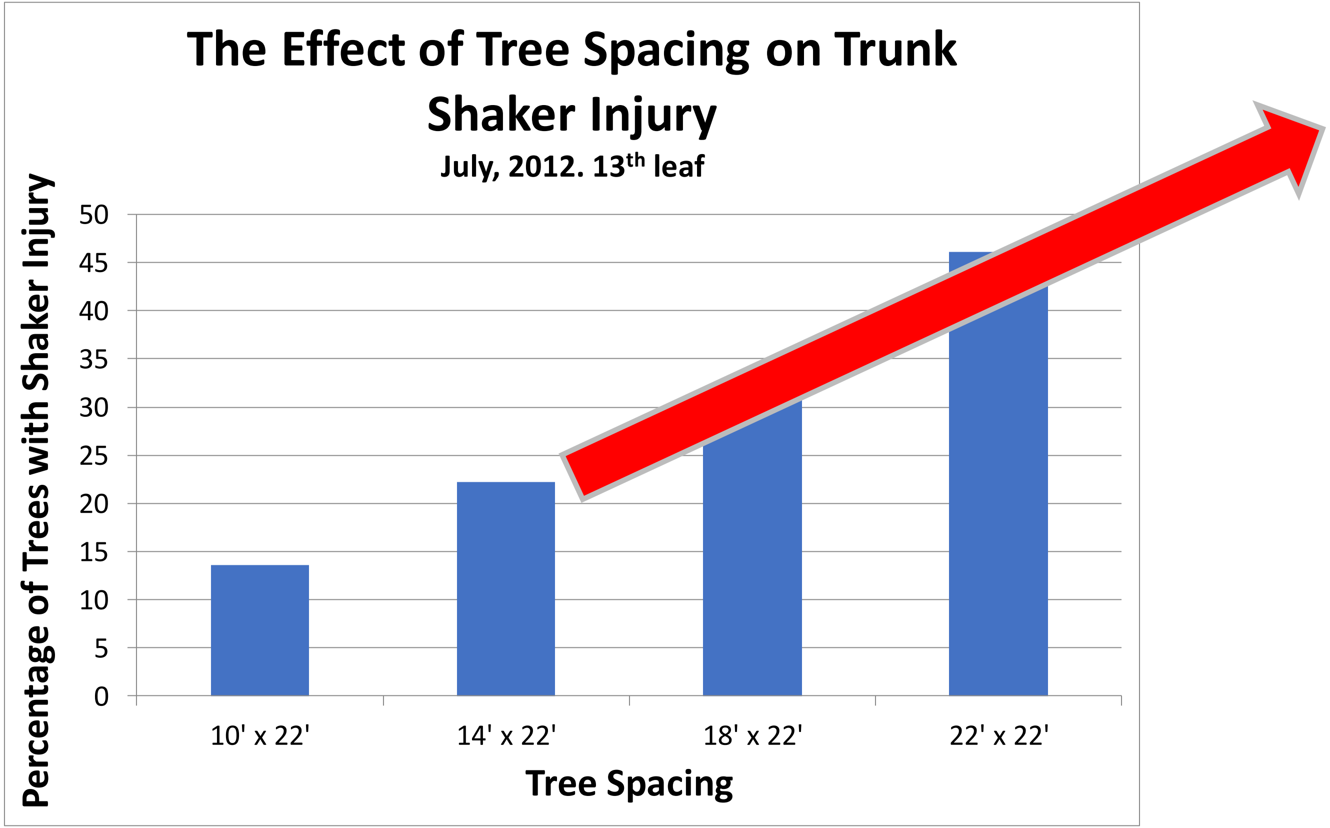
The Effect of Tree Spacing on Cumulative Yield Through 18th Season

Nonpareil on Nemaguard

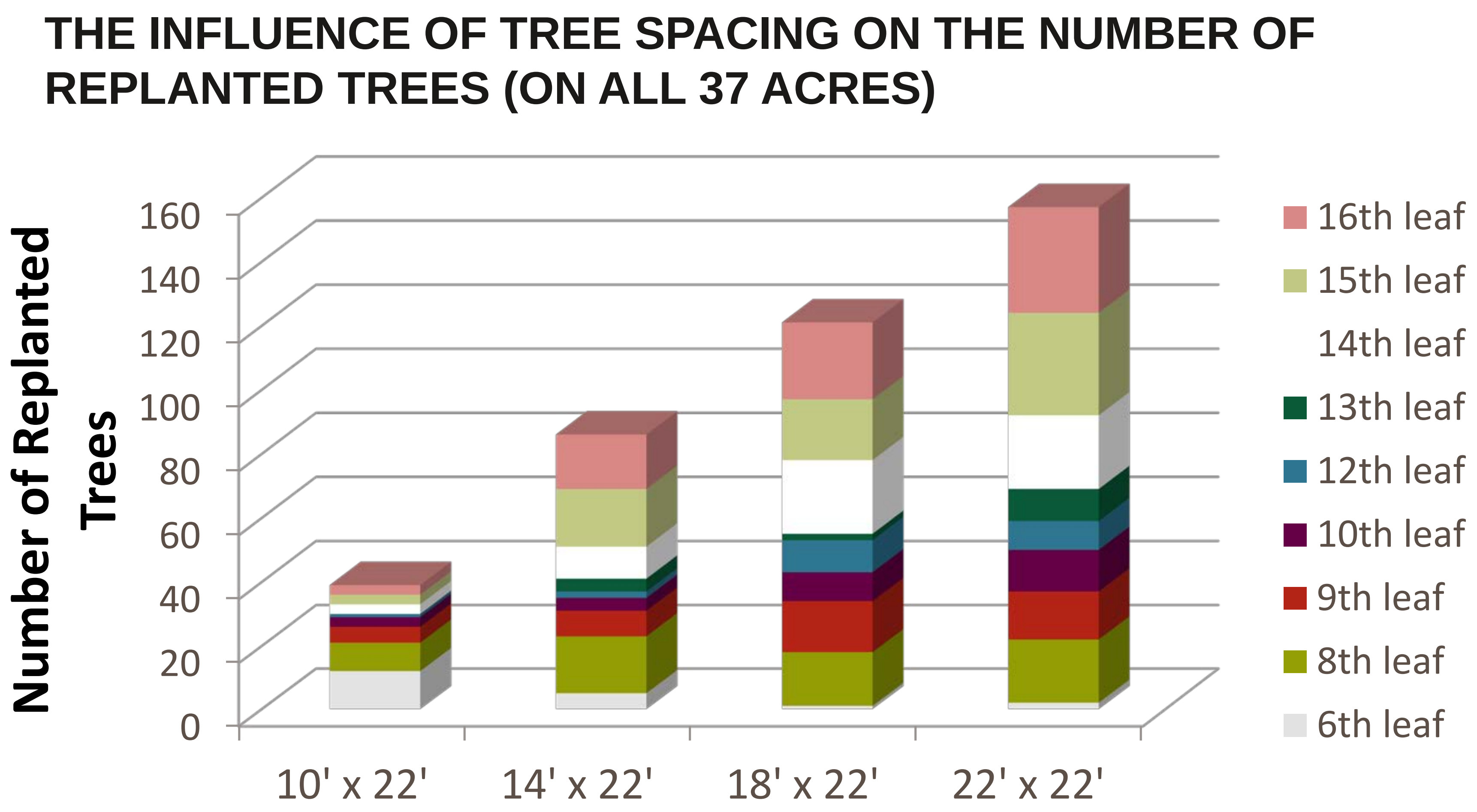


Spacing on Cumulative Yield Through 18th Leaf
Nonpareil on Hansen





The Effect of Tree Spacing on Trunk Shaker Injury
July, 2012. 13th leaf
Percentage of Trees with Shaker Injury
50
45
40
35
30
25
20
15
10
5
0
10' x 22'
14' x 22'
18' x 22'
22' x 22'
Tree Spacing



THE INFLUENCE OF TREE SPACING ON THE NUMBER OF REPLANTED TREES (ON ALL 37 ACRES)
Number of Replanted Trees
0
20
40
60
80
100
120
140
160
10' x 22'
14' x 22'
18' x 22'
22' x 22'
16th leaf
15th leaf
14th leaf
13th leaf
12th leaf
10th leaf
9th leaf
8th leaf
6th leaf

THE INFLUENCE OF TREE SPACING ON MISSING CANOPY

	Cumulative Number of Replants	Square Footage of Missing Canopy
10 x 22	39	8,580
14 x 22	86	26,488
18 x 22	121	47,916
22 x 22	157	75,988

Through the 16^{th} leaf

EFFECT OF TREE DENSITY ON YIELD TO DATE:

- Yield advantage to tighter spacing is highly dependent on inherent tree vigor
  - Smaller trees (varieties, rootstocks, etc.) will benefit most from tight spacing
  - Benefit may persist throughout orchard’s life
  - Vigorous trees may not have higher yields at higher density.
  - Active canopy is the ticket, not the number of trunks per acre
- Advantages other than yield (smaller trees, easier to shake, fewer structural problems, fewer mummies, etc.)
- Perhaps more risk of planting too wide than too close??

1) Standard trained, standard annual pruning

- 3 scaffolds
- medium annual pruning to maintain open centers

2) Standard trained, unpruned after 2nd dormant

- 3 scaffolds
- unpruned after second dormant season

3) Minimally trained, “minimally” pruned

– 4-6 scaffolds
– 3 pruning cuts annually

4) Untrained & “unpruned" forever

– Limbs interfering with machinery removed

Standard trained & pruned vs. Untrained & unpruned.

End of 3rd Season.

The Effect of Pruning on 2017 (18th Leaf) & Cumulative Yield

	Nonpareil		Carmel	
	2017 Yield (lb. / a)	Cumulative	2017 Yield (lb. / a)	Cumulative
Training & Pruning Strategy				
Trained to 3 scaffolds; Annual, moderate pruning	2671 a	39,383	1583 a	36,391
Trained to 3 scaffolds; Unpruned after 2nd year	2557 ab	40,277	1583 a	38,947
Trained to multiple scaffolds; Three annual pruning cuts	2384 b	38,073	1521 a	38,189
No scaffold selection; No annual pruning	2554 ab	40,498	1635 a	40,474

EFFECT OF PRUNING ON YIELD TO DATE

- Pruning has not increased or sustained yield in the short or long term. Pruning has either had no significant effect or has reduced yield.

- 18 years x $275 pruning / shredding costs = $4950

- Decrease in yield by about 1000 to 3500 pounds = loss of ~$2500 - $9000 / acre
  - Cumulative loss from annual pruning likely $7,500 - $14,000 / acre

REMARKS ON PRUNING

- Sometimes pruning is needed for safety, equipment access, removing broken branches, limb cankers, etc.

- Reason to prune should justify expense and yield loss

Thank you for your Attention

See you at the posters 3:00 – 5:00

Roger Duncan
209-525-6800

raduncan@ucdavis.edu

University of California
Agriculture and Natural Resources

CARBOHYDRATE OBSERVATORY

Physiology of carbohydrate management in trees

Anna Davidson, Aude Tixier and Maciej Zwieniecki

california almonds
Almond Board of California

Lab

CARBOHYDRATES (NSC'S), THE CURRENCY OF THE ALMOND TREE

Carbohydrates provide energy for:

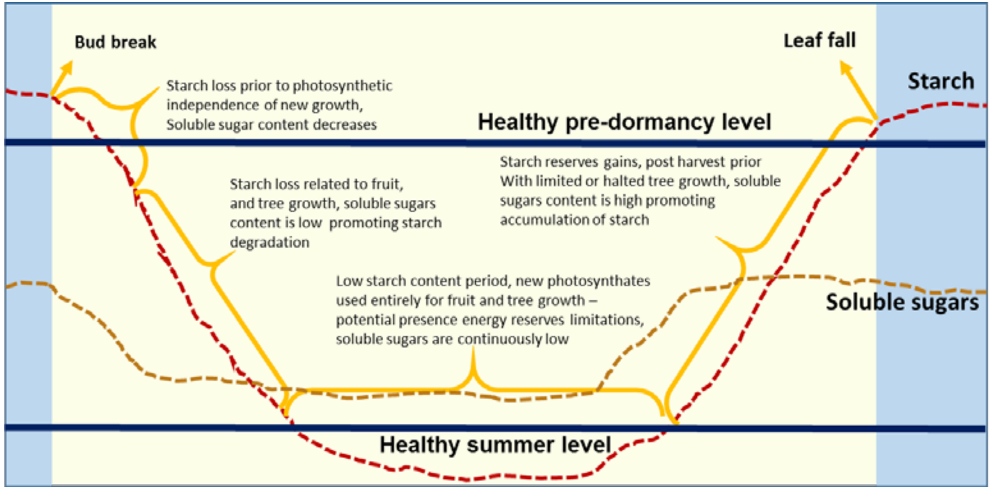
- Growth
- Defense
- Reproduction
- **Yield**

Soluble carbohydrates (sugar) = "cash" that flows around the tree

Starch = savings account

Carbohydrate Observatory = accelerated research.

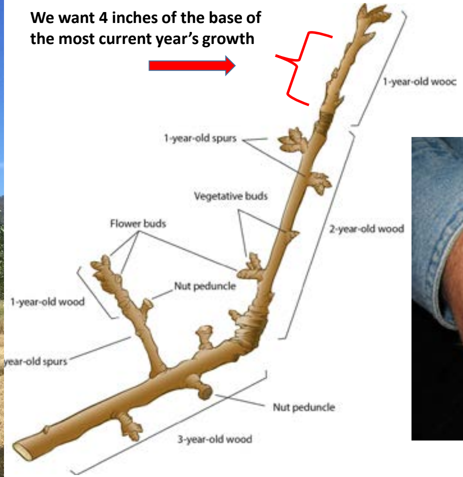
Generalized Starch and Sugar Pattern



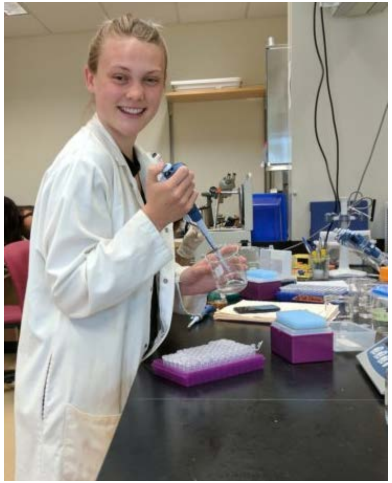
CITIZEN SCIENTISTS COLLECT AND SEND SAMPLES

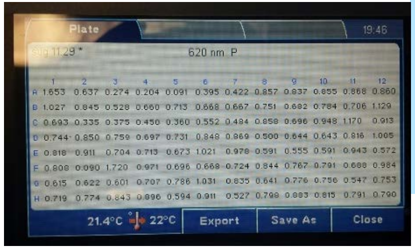
Joy Valdez

Walnut Grower in Lake Co.

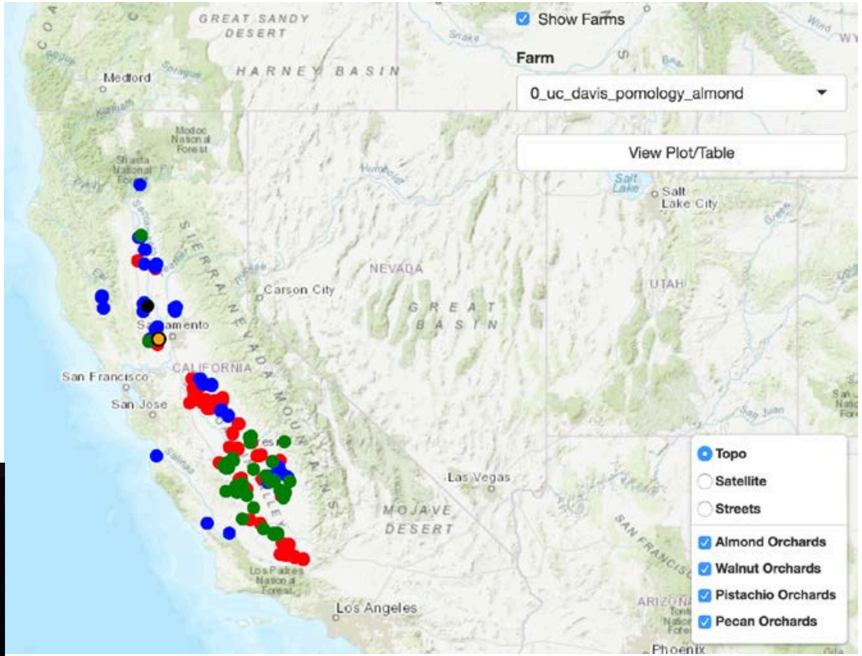


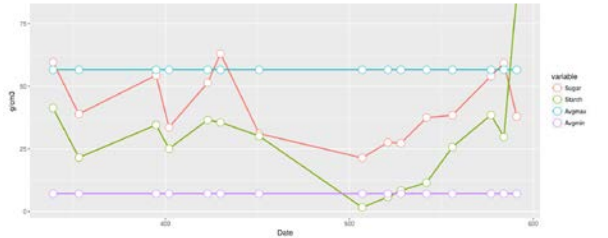
WE ANALYZE SAMPLES IN THE LAB AND UPLOAD RESULTS TO OUR WEBSITE.





	1	2	3	4	5	6	7	8	9	10	11	12
A	1.653	0.637	0.274	0.204	0.091	0.395	0.422	0.857	0.837	0.855	0.868	0.860
B	1.027	0.845	0.528	0.660	0.713	0.668	0.667	0.751	0.682	0.784	0.706	1.129
C	0.693	0.335	0.375	0.450	0.360	0.552	0.484	0.858	0.696	0.948	1.170	0.913
D	0.744	0.850	0.759	0.697	0.731	0.848	0.869	0.500	0.644	0.643	0.816	1.005
E	0.818	0.911	0.704	0.713	0.673	1.021	0.978	0.591	0.555	0.591	0.943	0.572
F	0.808	0.090	1.720	0.971	0.696	0.668	0.724	0.844	0.767	0.791	0.688	0.984
G	0.615	0.622	0.601	0.707	0.786	1.031	0.835	0.641	0.776	0.756	0.547	0.753
H	0.719	0.774	0.843	0.896	0.594	0.911	0.527	0.798	0.883	0.815	0.791	0.790





Show entries Search:

Farm	Date	Sugar	Starch	Crop	Avgmax	Avgmin
103_v.om._14_1	339	59.53737	41.321018	pistachio	56.58993	7.13146
103_v.om._14_1	353	38.90935	21.532595	pistachio	56.58993	7.13146
103_v.om._14_1	395	54.38012	34.553152	pistachio	56.58993	7.13146
103_v.om._14_1	402	33.56310	25.077660	pistachio	56.58993	7.13146
103_v.om._14_1	423	51.37553	36.534993	pistachio	56.58993	7.13146
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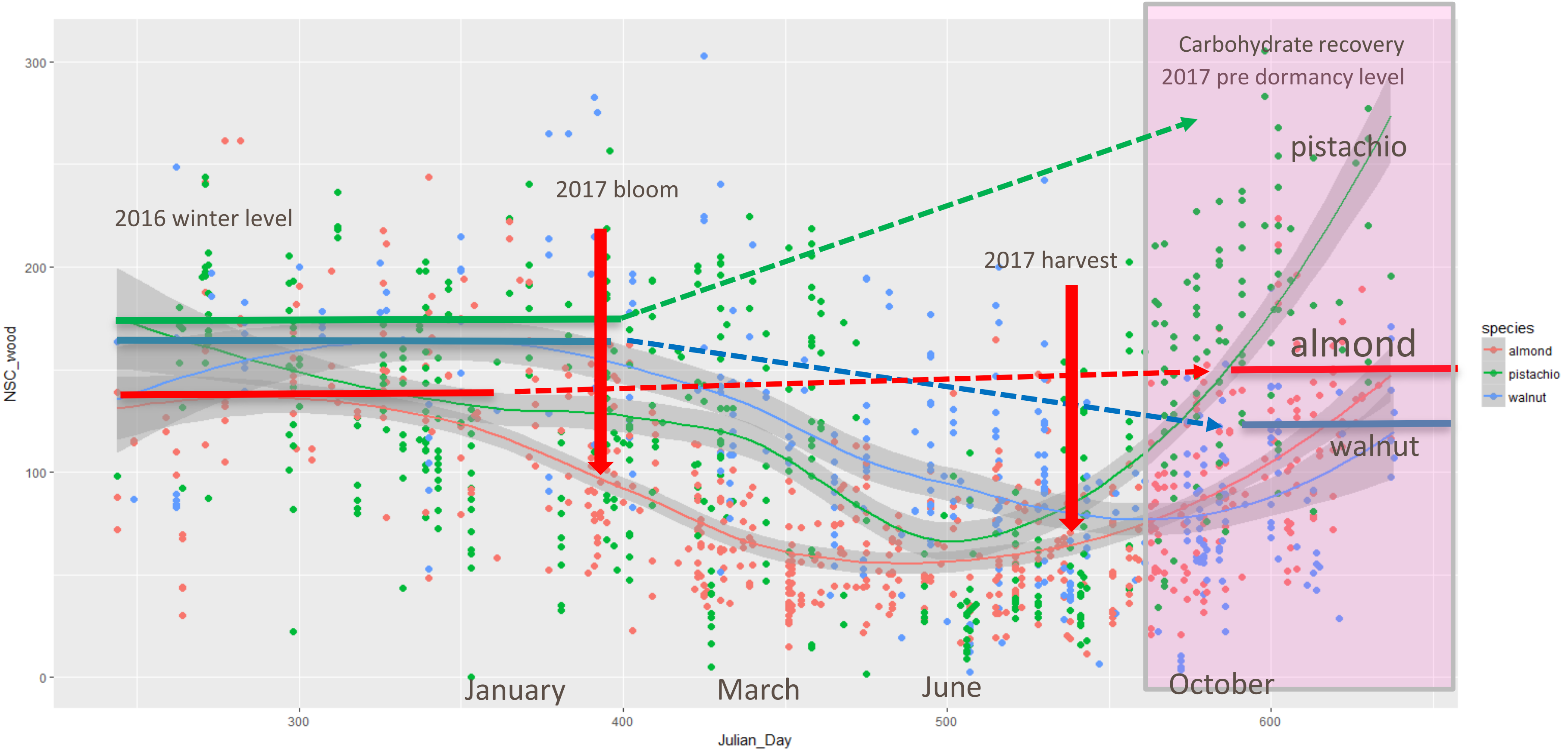
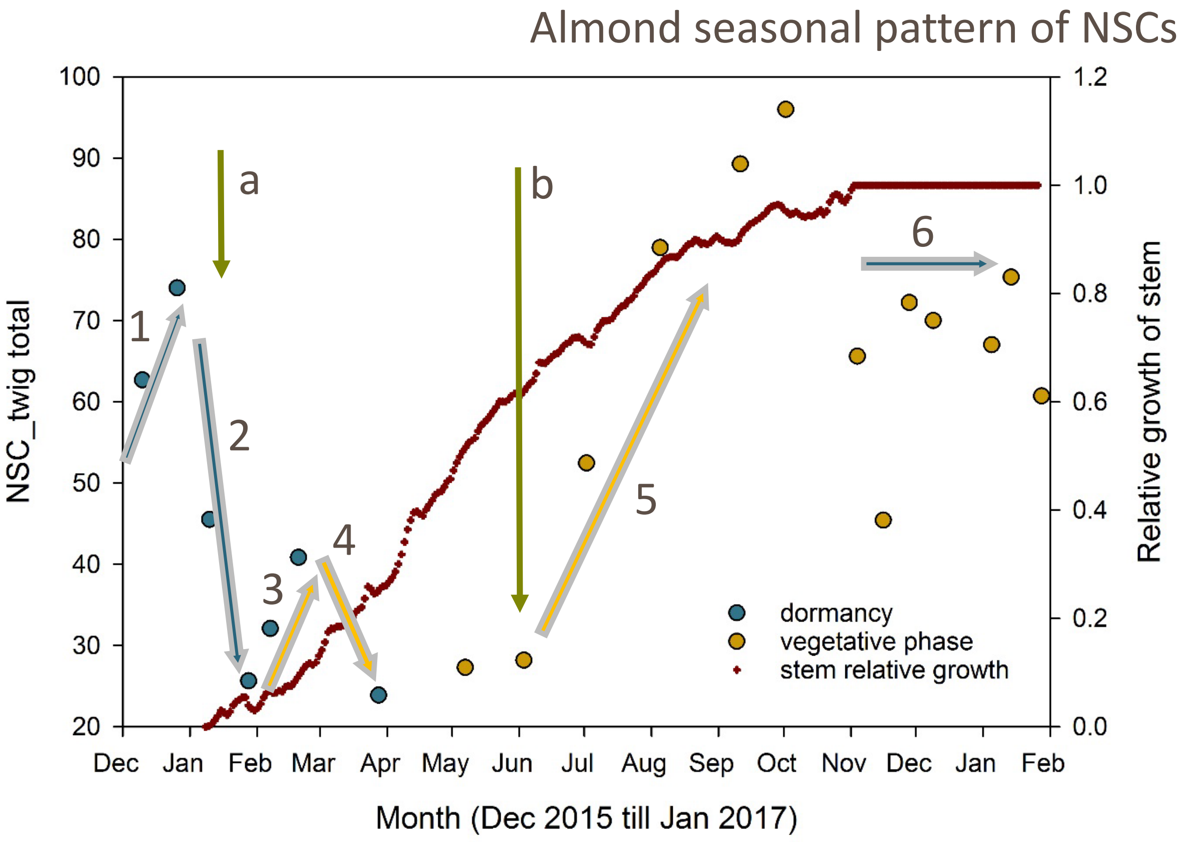
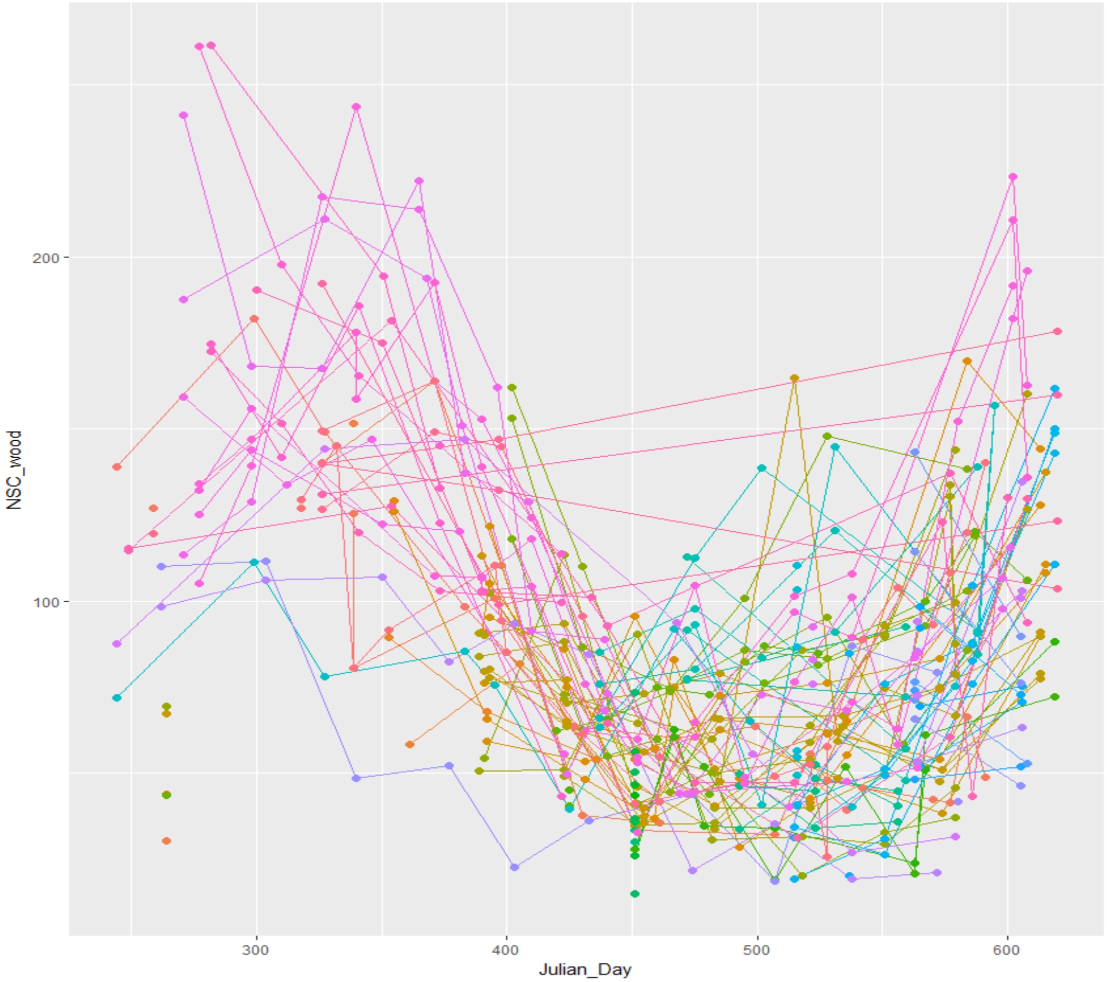
PRE-DORMANCY IS VITAL FOR CHO RECOVERY



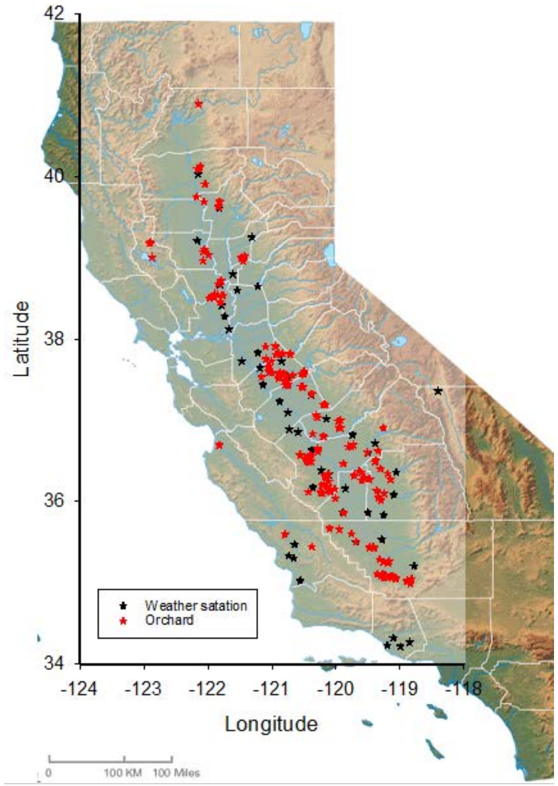
CARBOHYDRATE OBSERVATORY

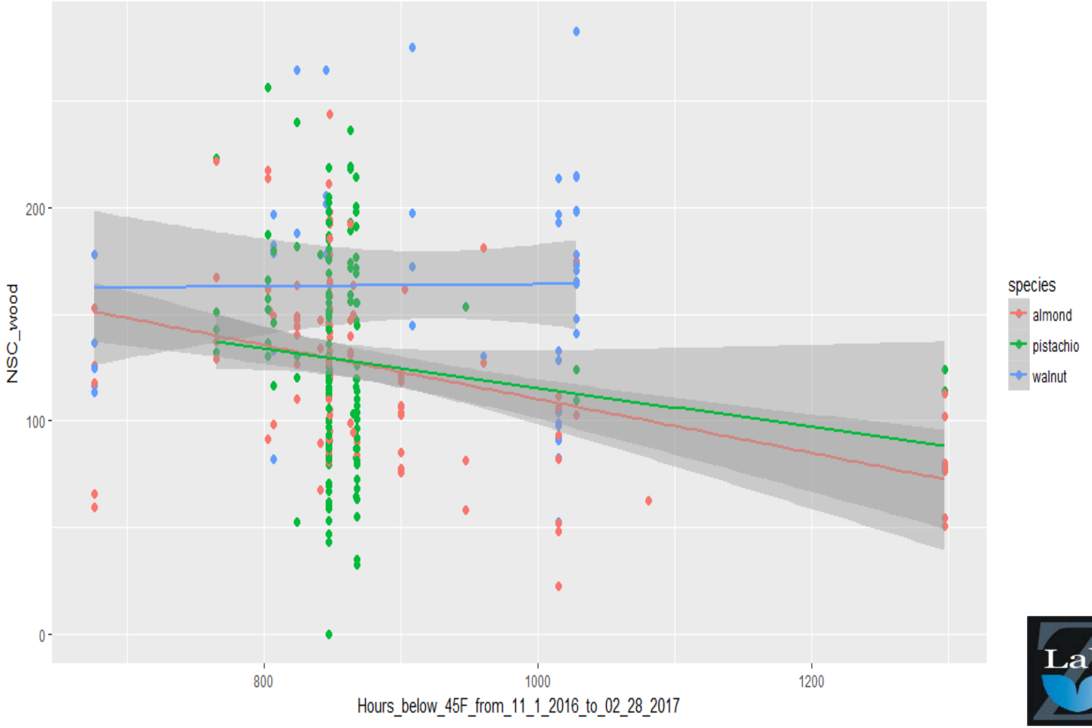


ALMOND

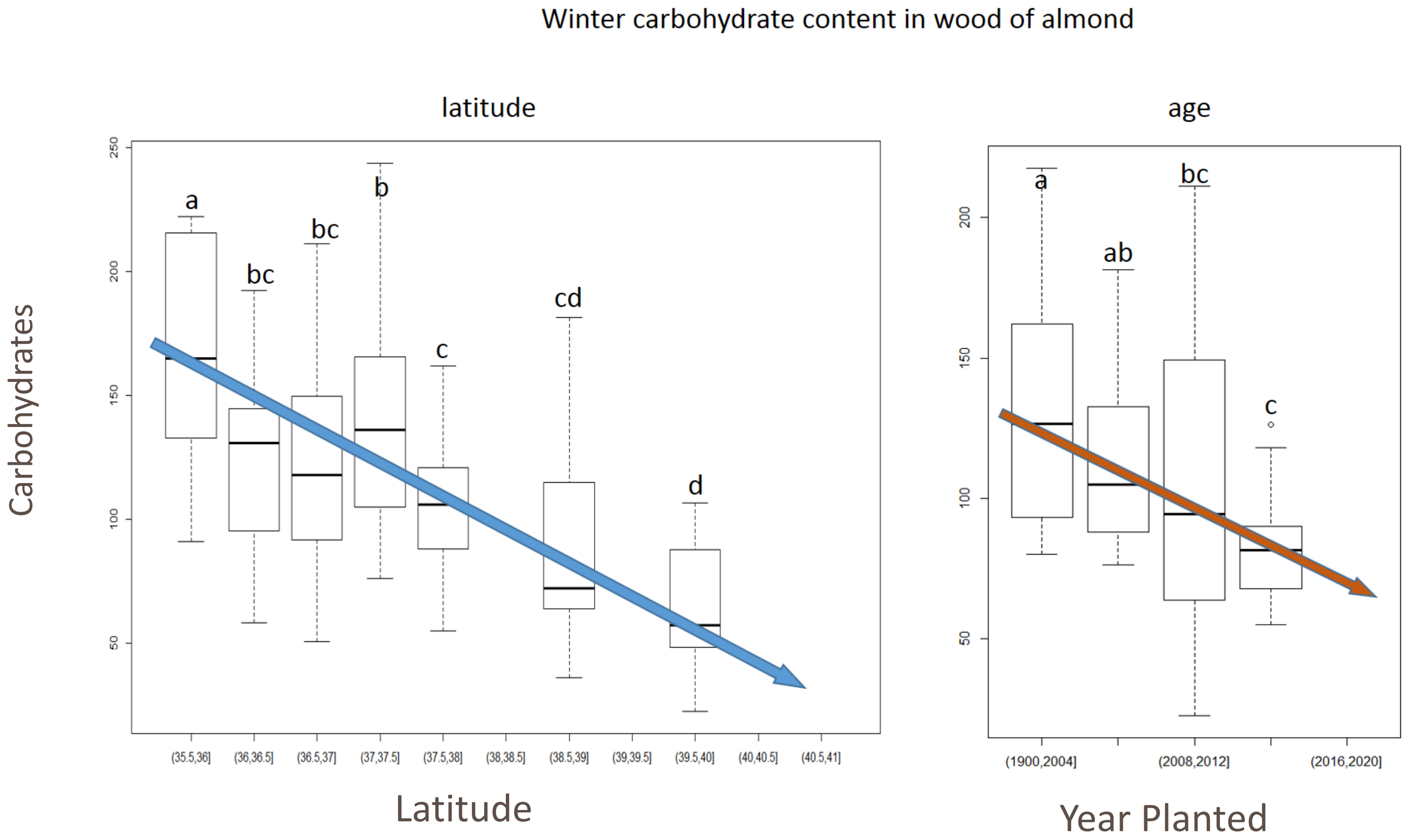


CARBOHYDRATES DECREASE WITH INCREASING CHILL HOURS/PORTIONS





CARBOHYDRATES DECREASE WITH INCREASING LATITUDE AND INCREASE WITH TREE AGE



CARBOHYDRATE OBSERVATORY

Want to Participate?

Contact Anna Davidson

Email: adavidson@ucdavis.edu

Phone: (815) 212-4409

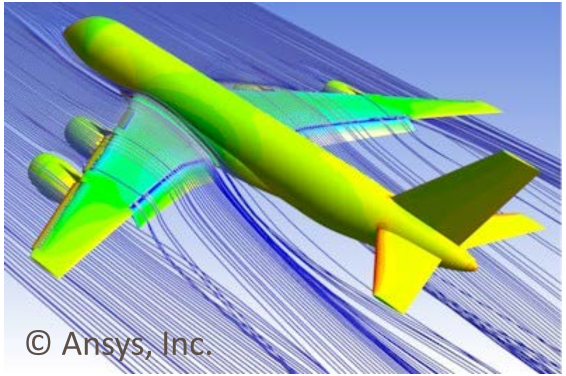
THREE-DIMENSIONAL MODELING OF ALMOND ORCHARDS

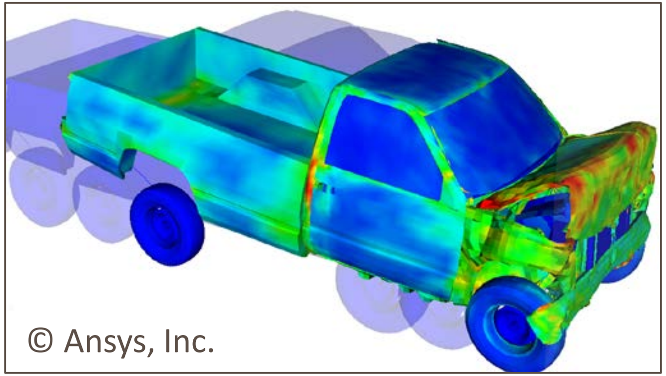
Brian Bailey – U.C. Davis Dept. Plant Sciences

Project Cooperators: Ted DeJong, Matthew Gilbert, Ken Shackel – U.C. Davis Dept. Plant Sciences

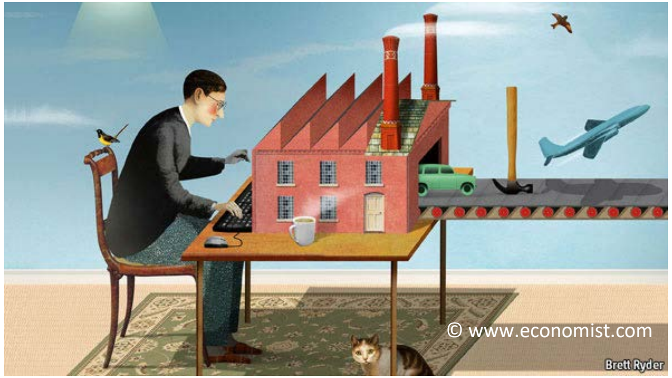
california almonds
Almond Board of California

COMPUTER-AIDED DESIGN AND ANALYSIS

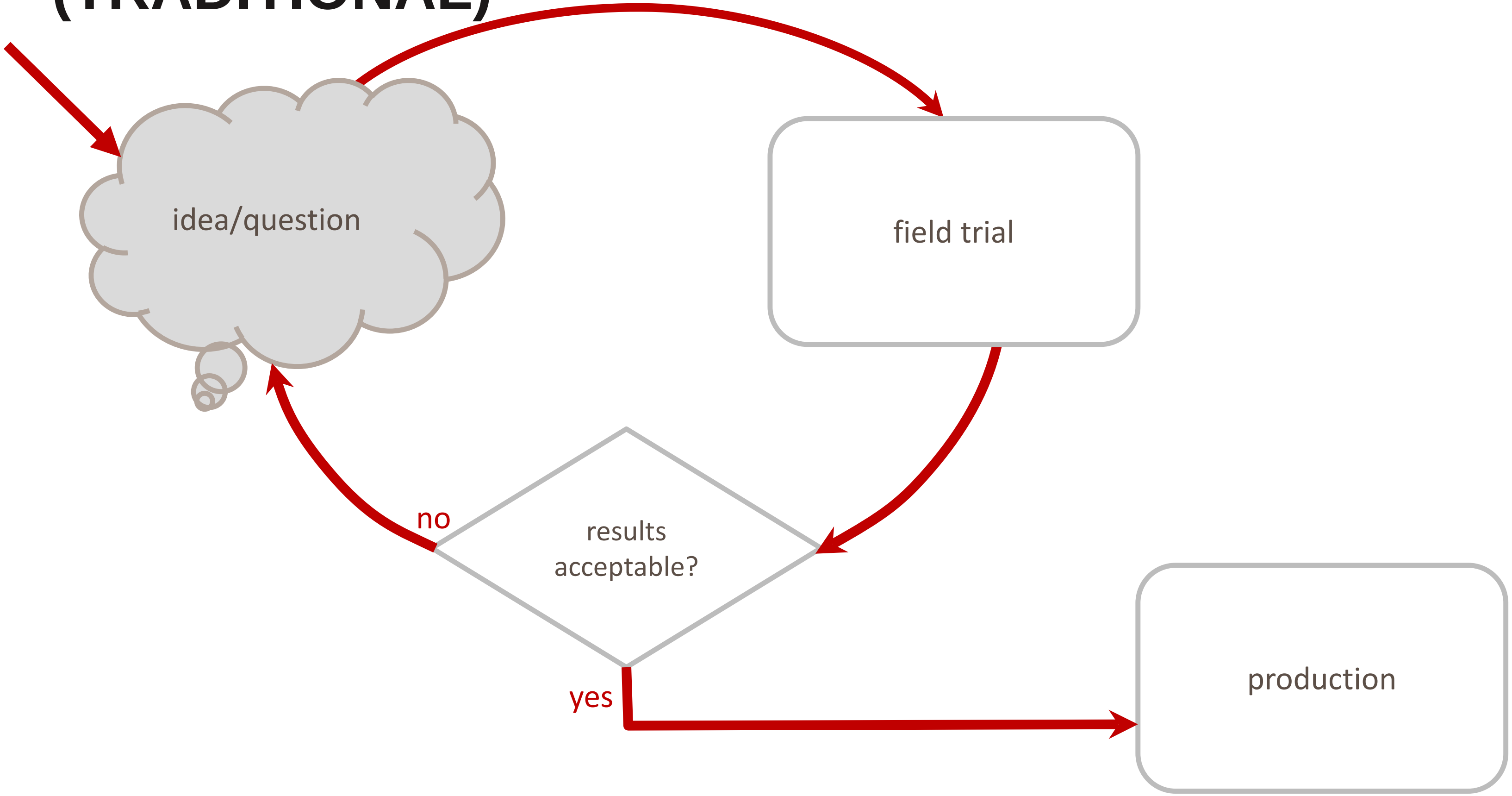




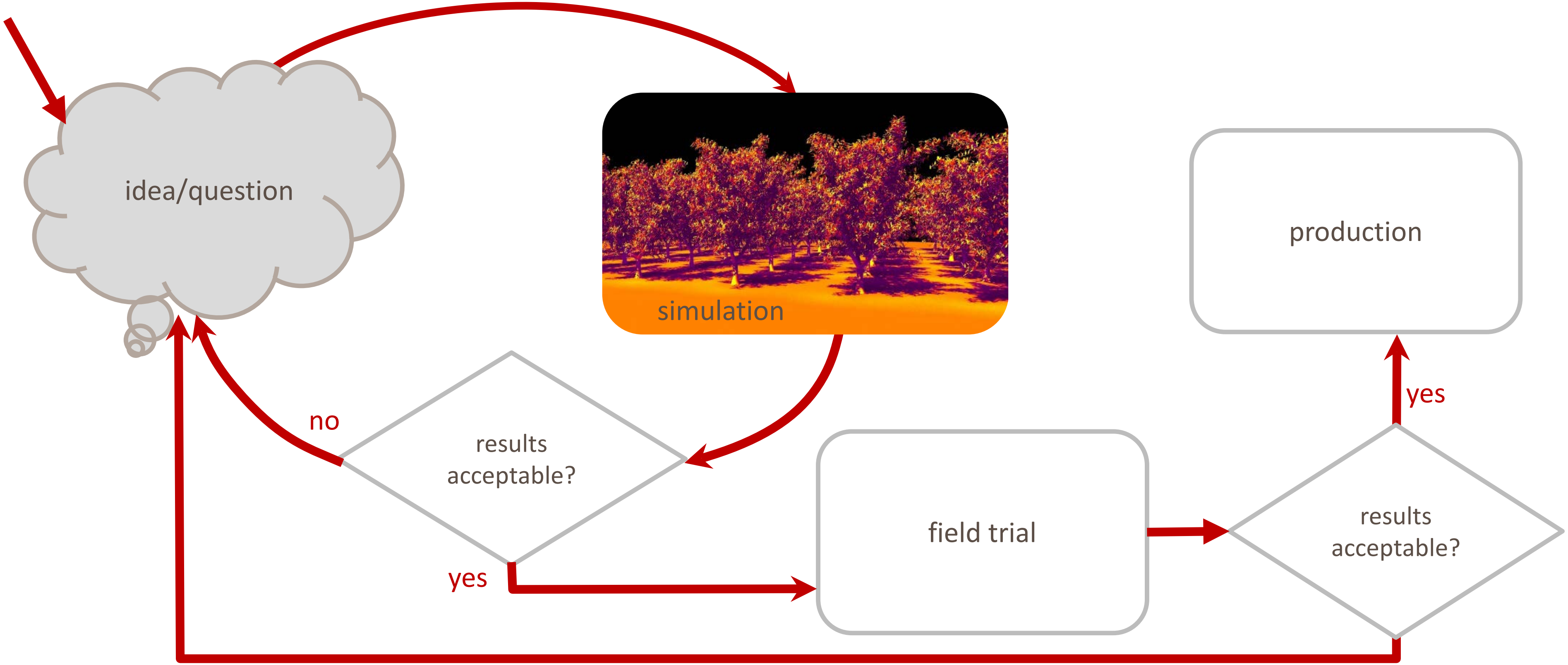
The "Third Industrial Revolution"



AGRICULTURAL INNOVATION PROCESS (TRADITIONAL)



COMPUTER-BASED DESIGN PROCESS



MODEL COMPONENTS

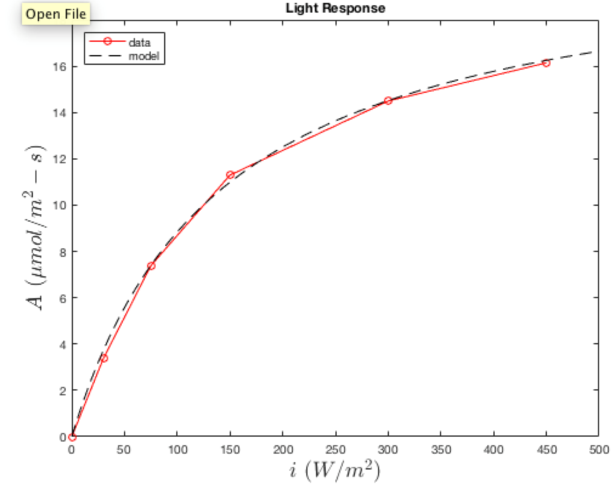
this project

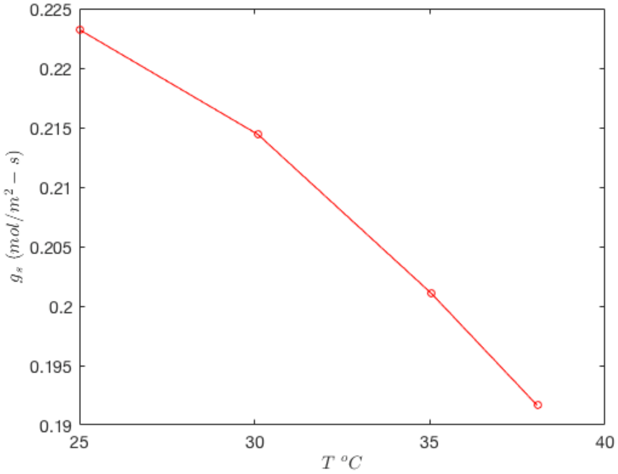
- Sunlight interception
- Microclimate
- Evapotranspiration
- Photosynthesis

- Carbohydrate transport
- Growth/structure
- Yield
- Disease risk

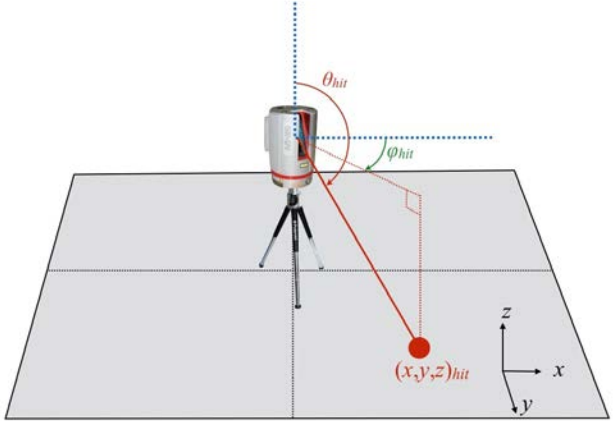
future

INITIAL DATA: TRANSPIRATION & PH



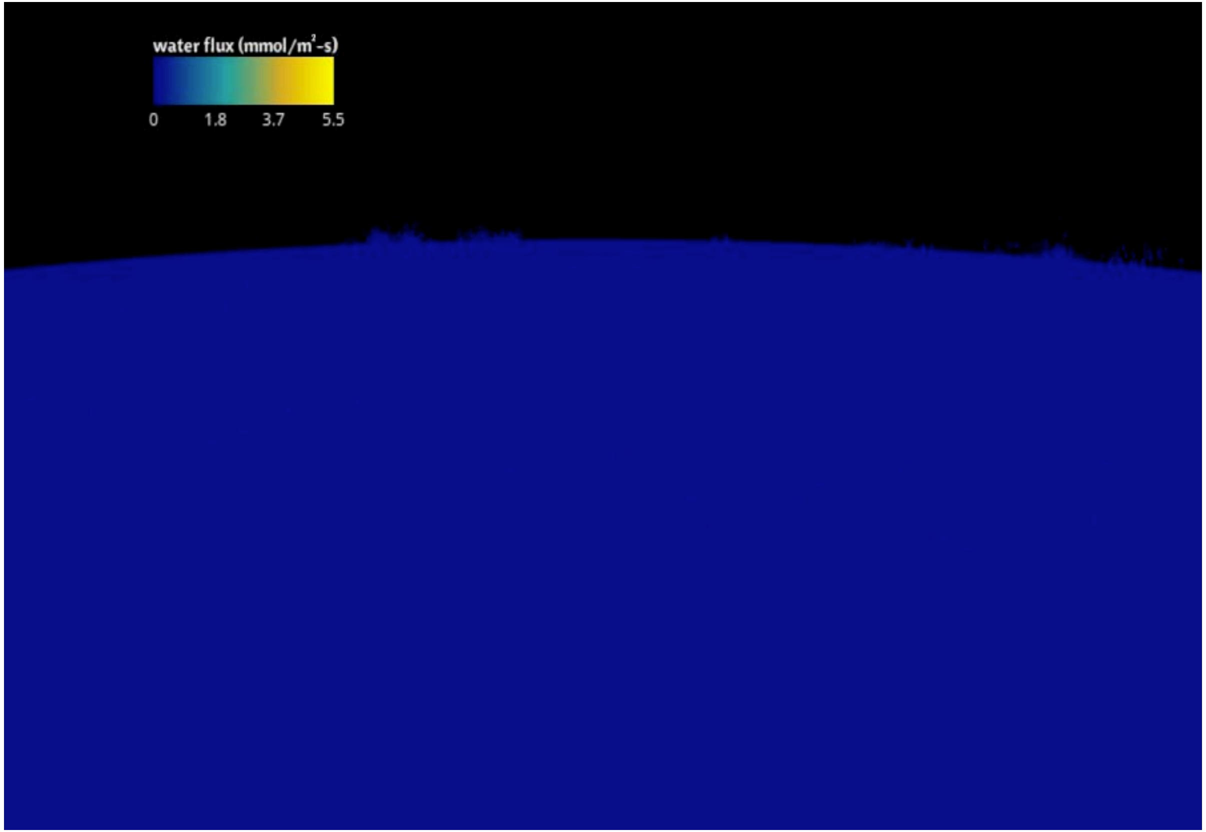


INITIAL DATA: LIDAR SCANNING



INITIAL DATA: LIDAR SCANNING

SIMULATION OF EVAPOTRANSPIRATION



THANK YOU

Contact:

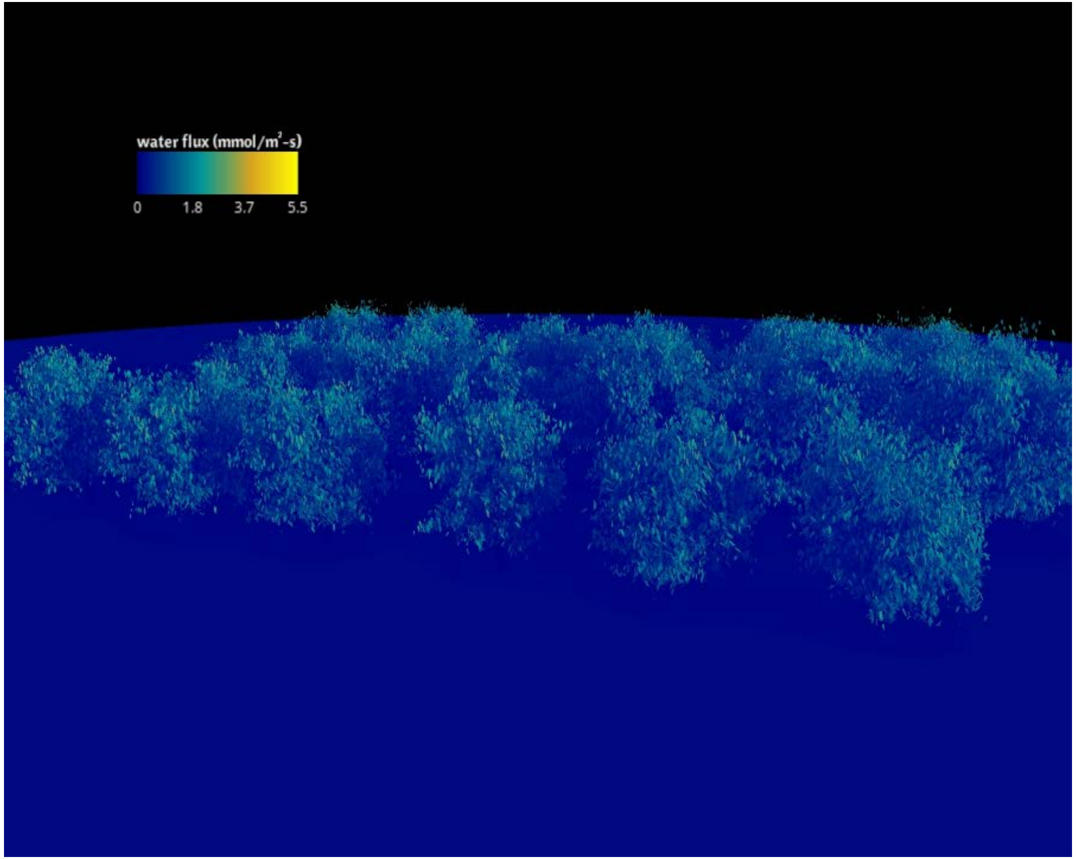
bnbailey@ucdavis.edu

baileylab.ucdavis.edu

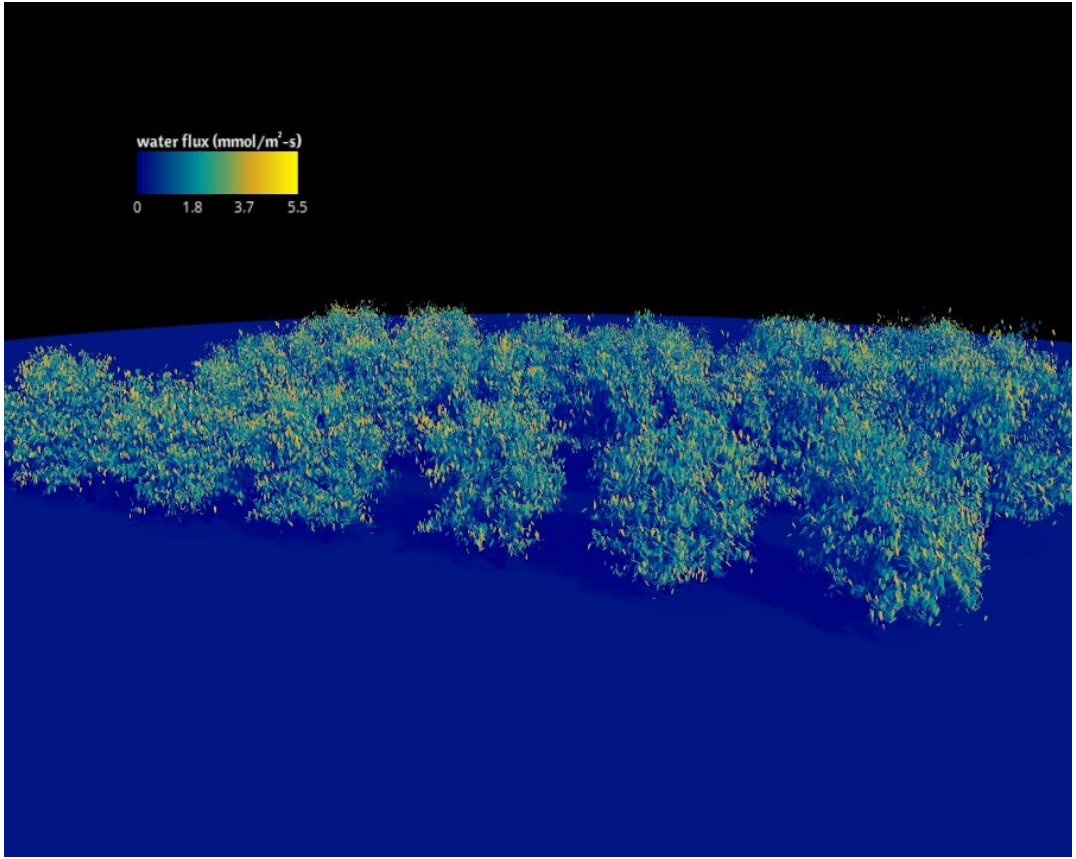
UCDAVIS PLANT SIMULATION LABORATORY

This research was supported by the Almond Board of California project #17-PREC1-Bailey

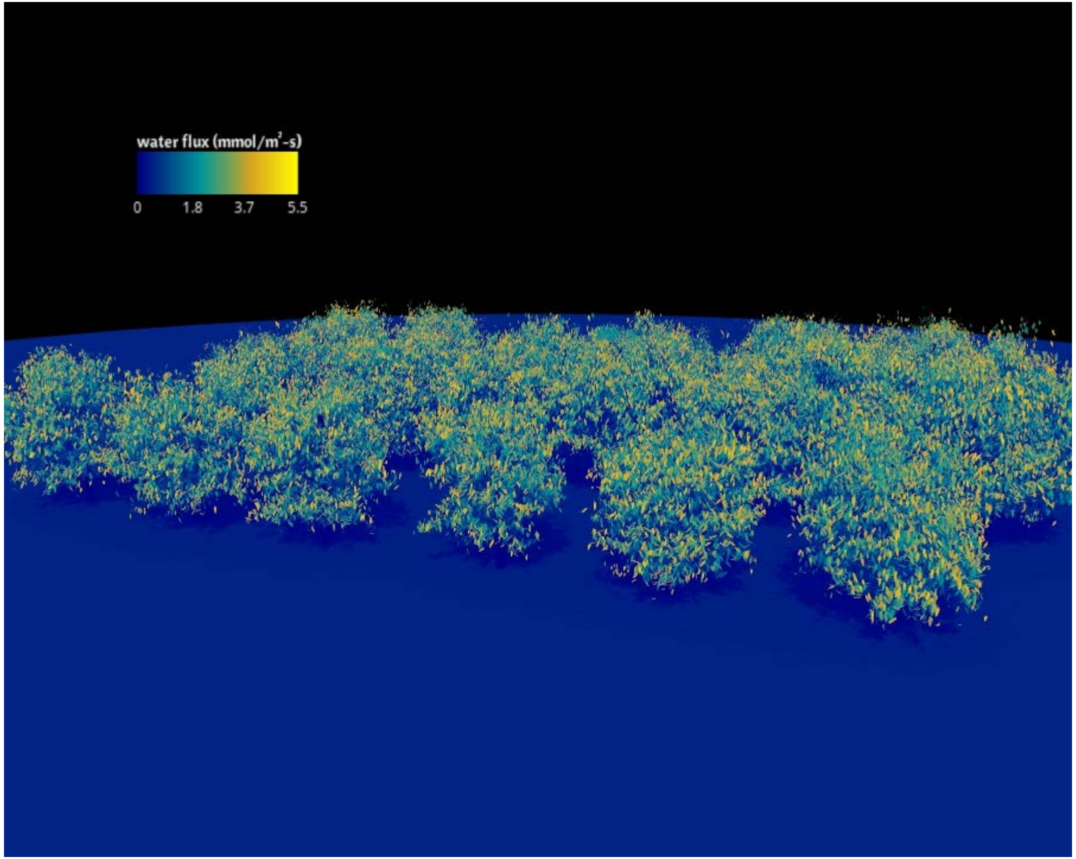
BACK-UP IMAGES IN CASE THE MOVIE DIDN'T WORK….



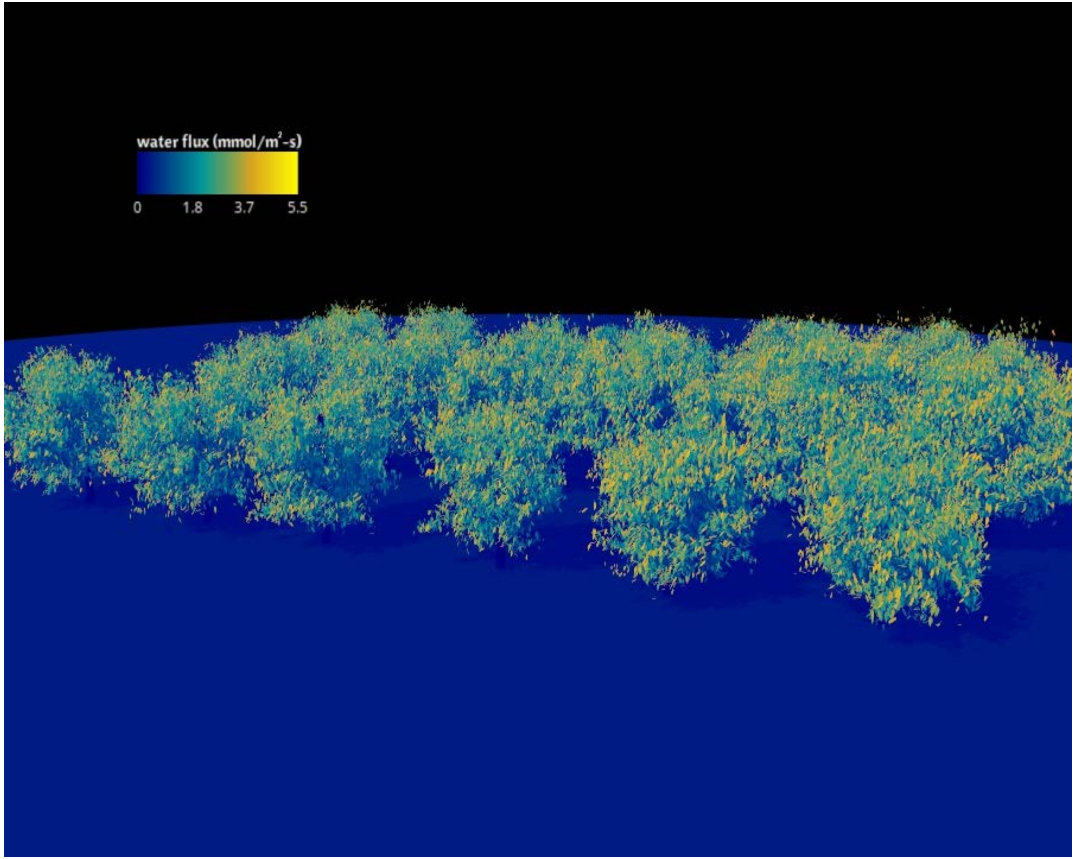
BACK-UP IMAGES IN CASE THE MOVIE DIDN'T WORK….



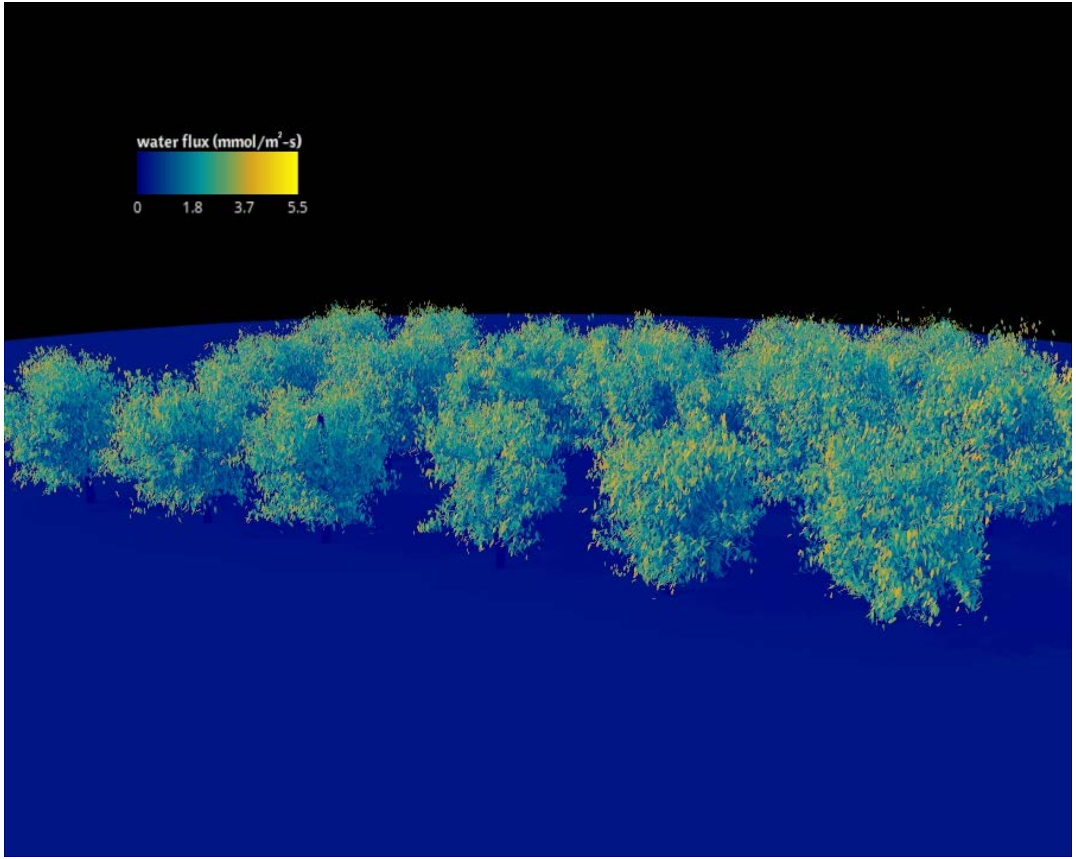
BACK-UP IMAGES IN CASE THE MOVIE DIDN'T WORK….



BACK-UP IMAGES IN CASE THE MOVIE DIDN'T WORK….



BACK-UP IMAGES IN CASE THE MOVIE DIDN'T WORK….



Measuring Canopy Light Interception

Bruce Lampinen
Department of Plant Sciences
University of California at Davis

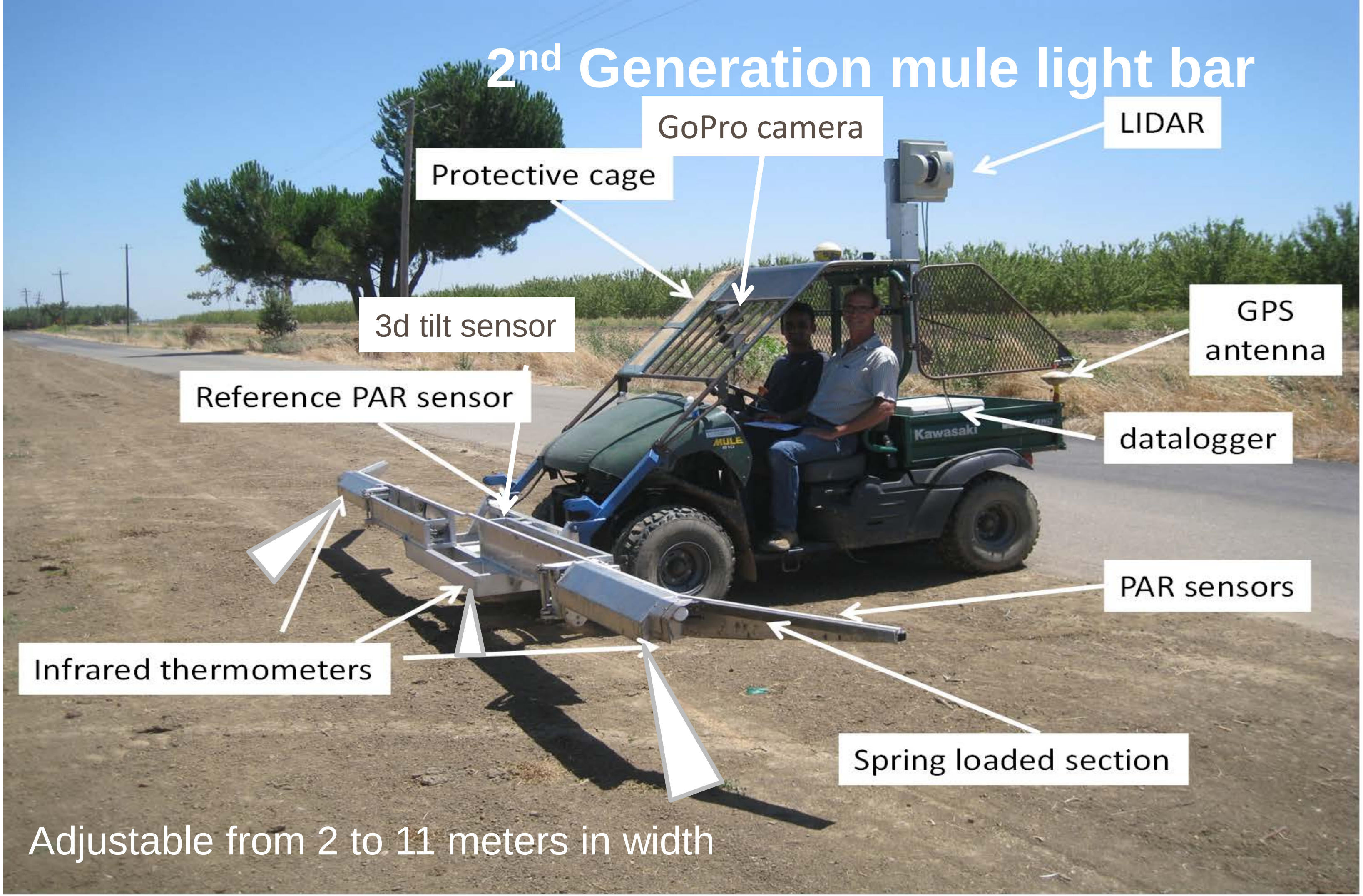
Collaborators: Greg Browne, Shrini Upadhyaya, Sam Metcalf, Loreto Contador, Mae Culumber, David Doll, Roger Duncan, Allan Fulton, Phoebe Gordon, Katherine Jarvis-Sheen, Dani Lightle, Luke Milliron, and Franz Niederholzer


4000+ kernel pounds per acre



491

2nd Generation mule light bar

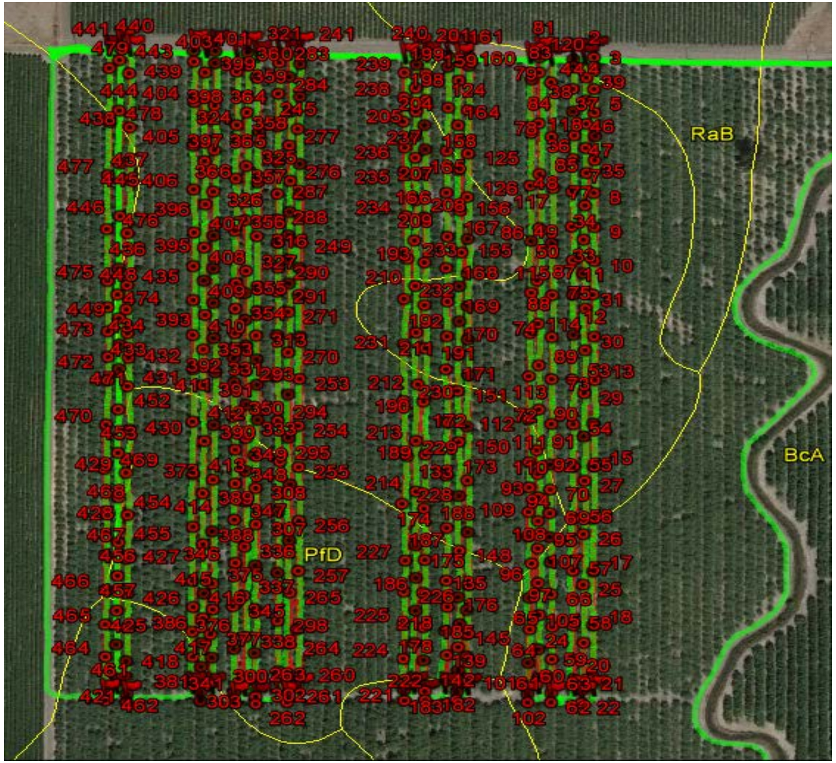



5LOY930

We set up a portable weather station with temp, RH, windsweed and PAR sensors outside orchard

Normal speed of travel is 10 km/hr so we can map about 20 km within 1 hour of the time the sun is directly overhead


RbB
PeD
RaB
BcA
PfD

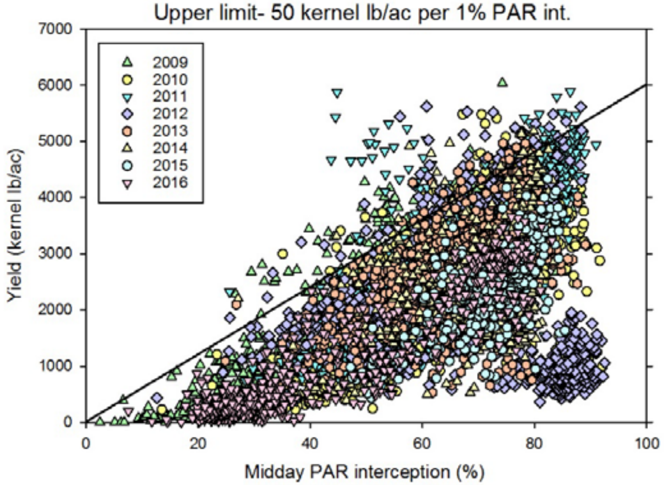

RaB
BcA
PfD

Self contained hydraulic system for operating augers, autosampler and elevator

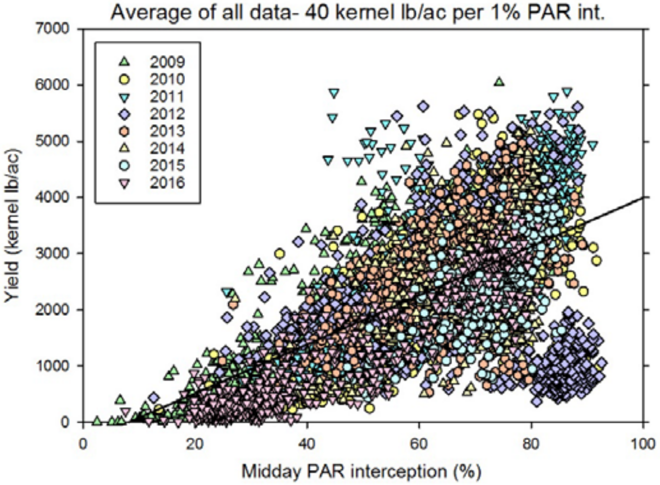
Trimble GPS acts as datalogger to collect continuous yield data

Front skirt to prevent nuts from overflowing as cart fills

Wireless controller for hydraulically operated auto sampler

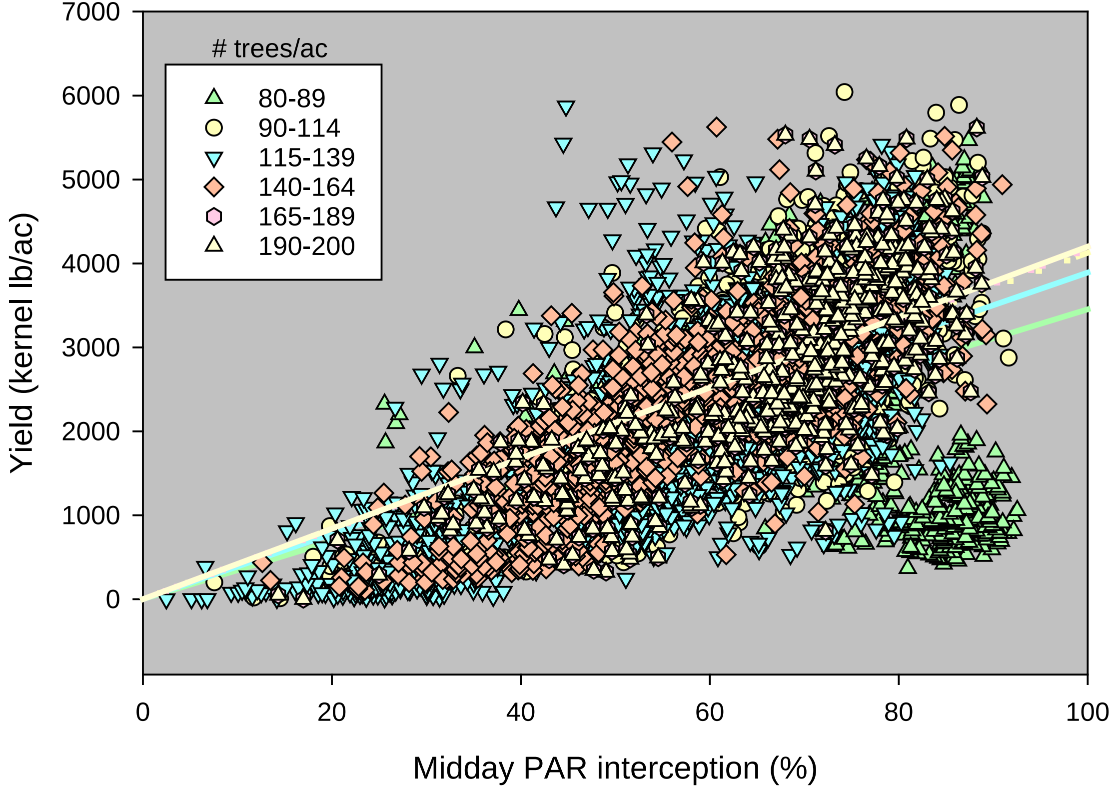


⇦ We have found the best managed orchards (but very few) can alternate around this line (50 kernel lbs/1% intercepted) after about 5 years of age



⇦ Regression through all data (40 kernel lbs/1% intercepted)

Broken up by number of trees per acre



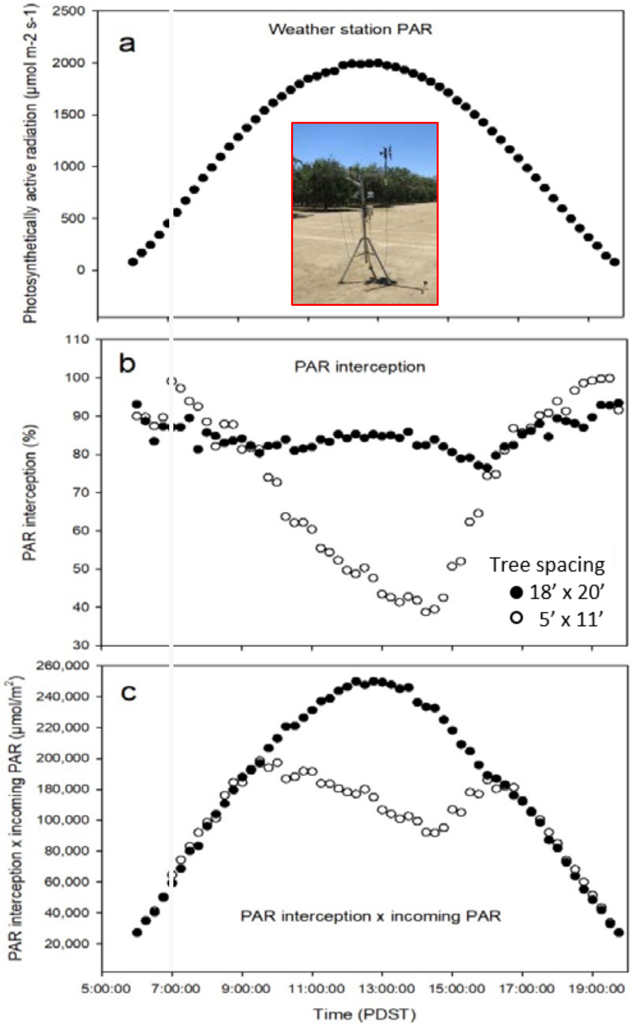
28% PAR int. X 50 = 1400 kernel lb/ac potential

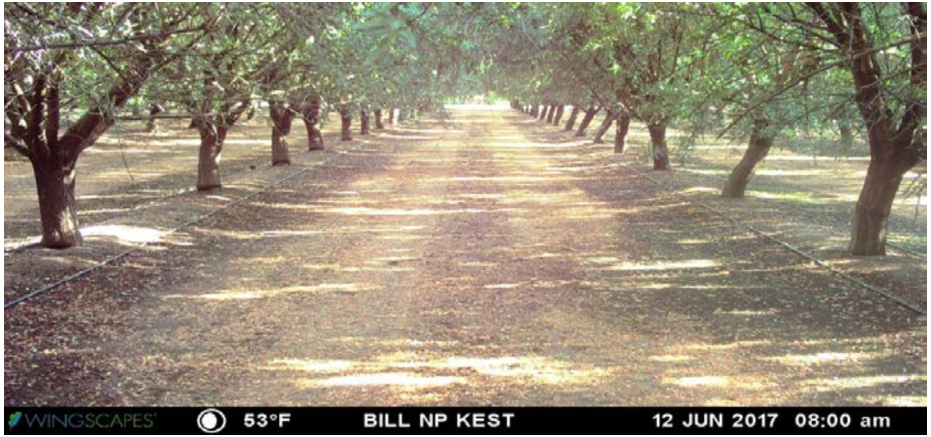
48% X 50 = 2400 lb/ac potential

64% X 50 = 3200 lb/ac potential

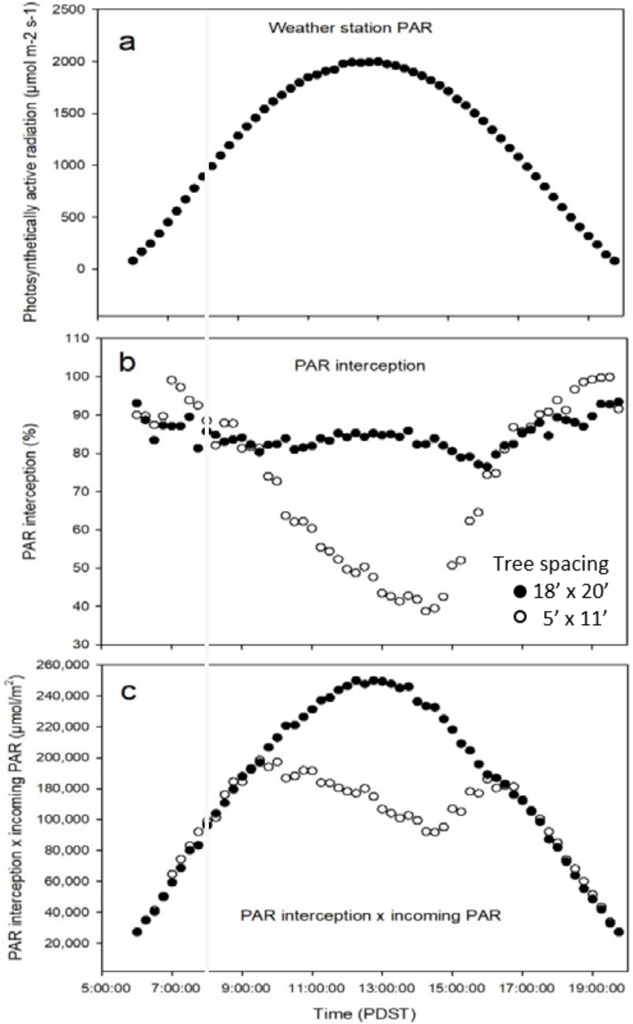
82% X 70 = 4,100 lb/ac potential

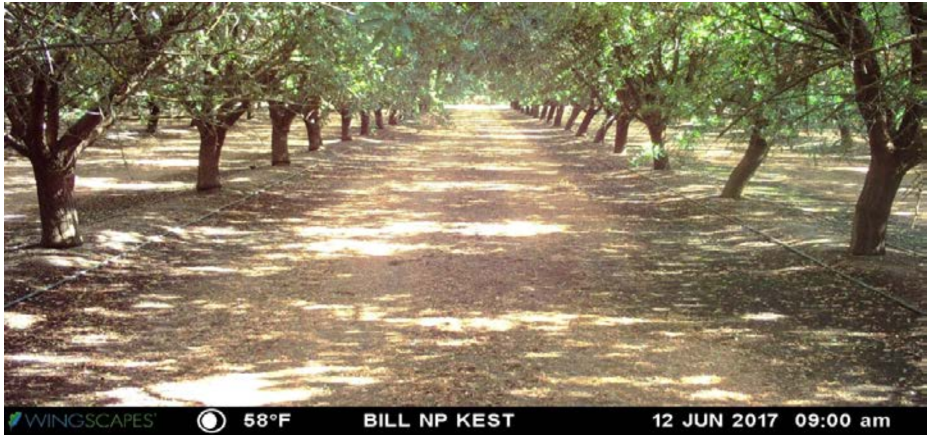
PAR = photosynthetically active radiation (mmol^{-2} sec^{-1})




WINGSCAPES
53°F
BILL NP KEST
12 JUN 2017 08:00 am


WINGSCAPES
57°F
HIGHDENS ALM
12 JUN 2017 08:00 am


a
Weather station PAR
Photosynthetically active radiation (µmol m-2 s-1)
2500
2000
1500
1000
500
0
b
PAR interception
PAR interception (%)
110
100
90
80
70
60
50
40
30
Tree spacing
18' x 20'
5' x 11'
c
PAR interception x incoming PAR
PAR interception x incoming PAR (µmol/m²)
260,000
240,000
220,000
200,000
180,000
160,000
100,000
80,000
60,000
40,000
20,000
5:00:00
7:00:00
9:00:00
11:00:00
13:00:00
15:00:00
17:00:00
19:00:00
Time (PDST)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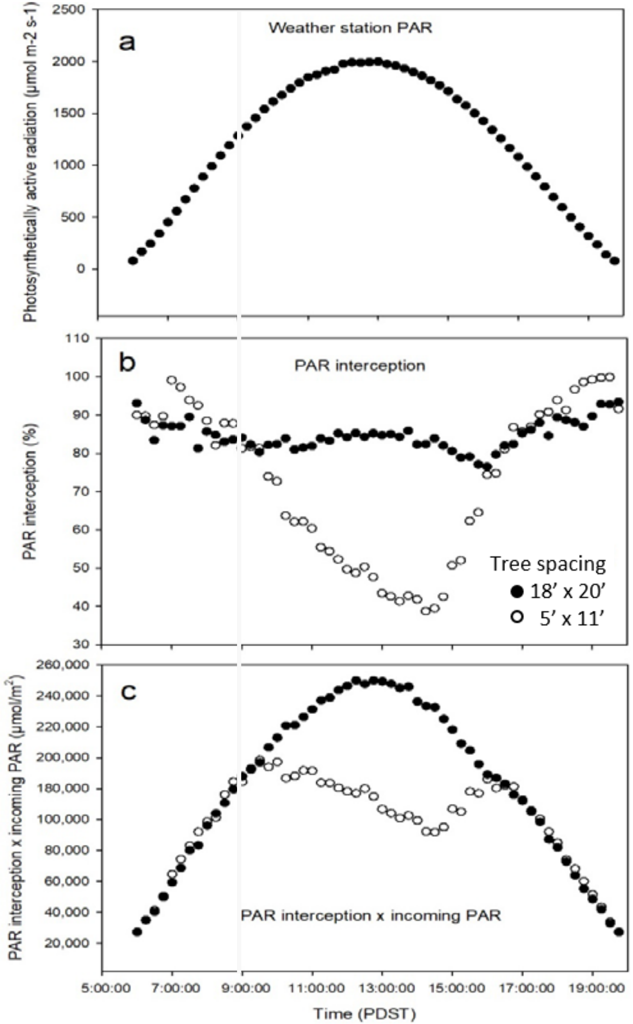
BILL NP KEST
12 JUN 2017 09:00 am


WINGSCAPES
65°F
HIGHDENS ALM
12 JUN 2017 09:00 am


a
Weather station PAR
Photosynthetically active radiation (µmol m-2 s-1)
2500
2000
1500
1000
500
0
b
PAR interception
PAR interception (%)
110
100
90
80
70
60
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Tree spacing
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260,000
240,000
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160,000
140,000
120,000
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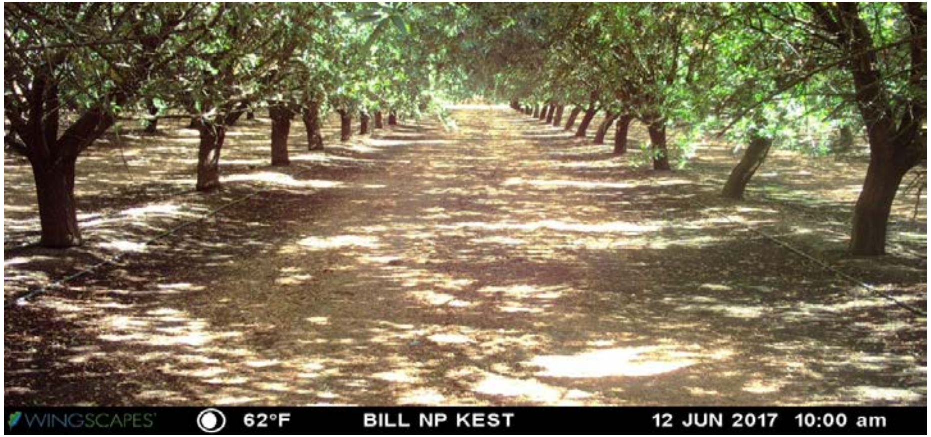
17:00:00
19:00:00
Time (PDST)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BILL NP KEST
12 JUN 2017 10:00 am


WINGSCAPES
71°F
HIGHDENS ALM
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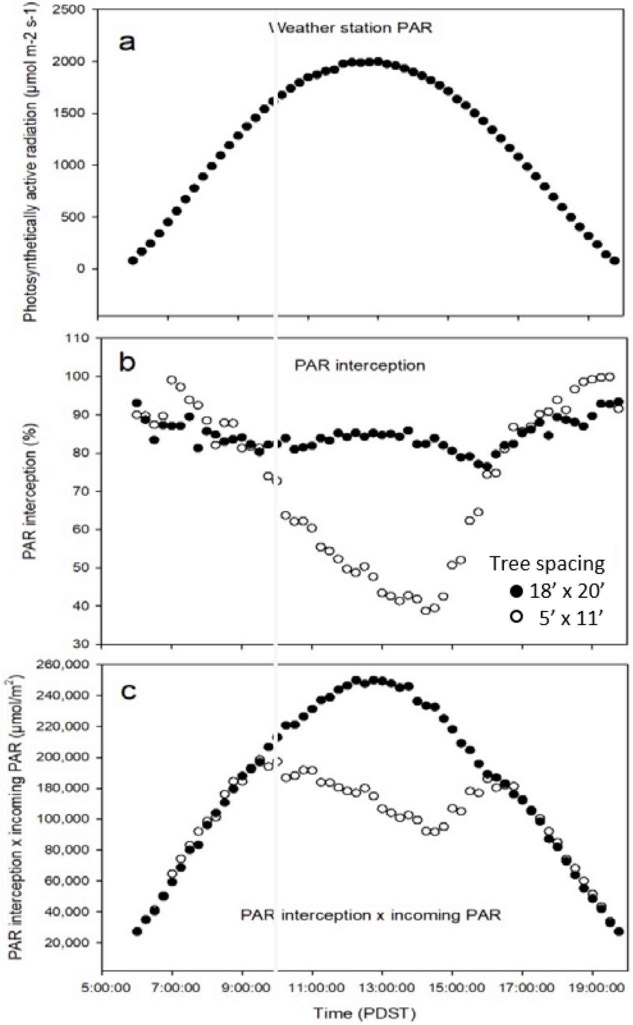
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Weather station PAR
Photosynthetically active radiation (µmol m-2 s-1)
2500
2000
1500
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0
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PAR interception
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40,000
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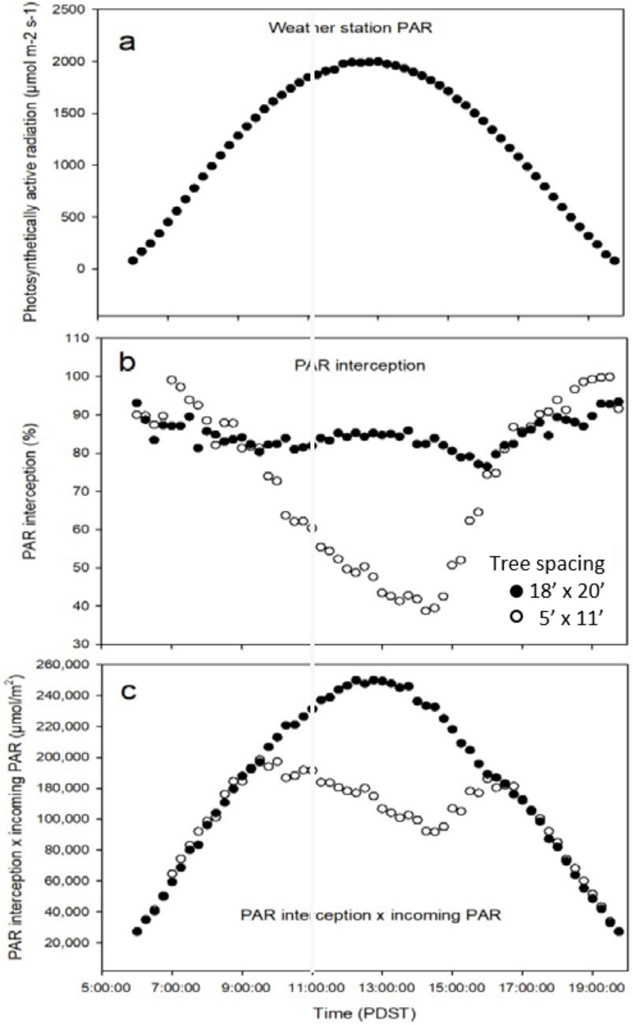
13:00:00
15:00:00
17:00:00
19:00:00
Time (PDST)


WINGSCAPES
67°F
BILL NP KEST
12 JUN 2017 11:00 am


WINGSCAPES
80°F
HIGHDENS ALM
12 JUN 2017 11:00 am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2500
2000
1500
1000
500
0
b
PAR interception
PAR interception (%)
110
100
90
80
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Tree spacing
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5' x 11'
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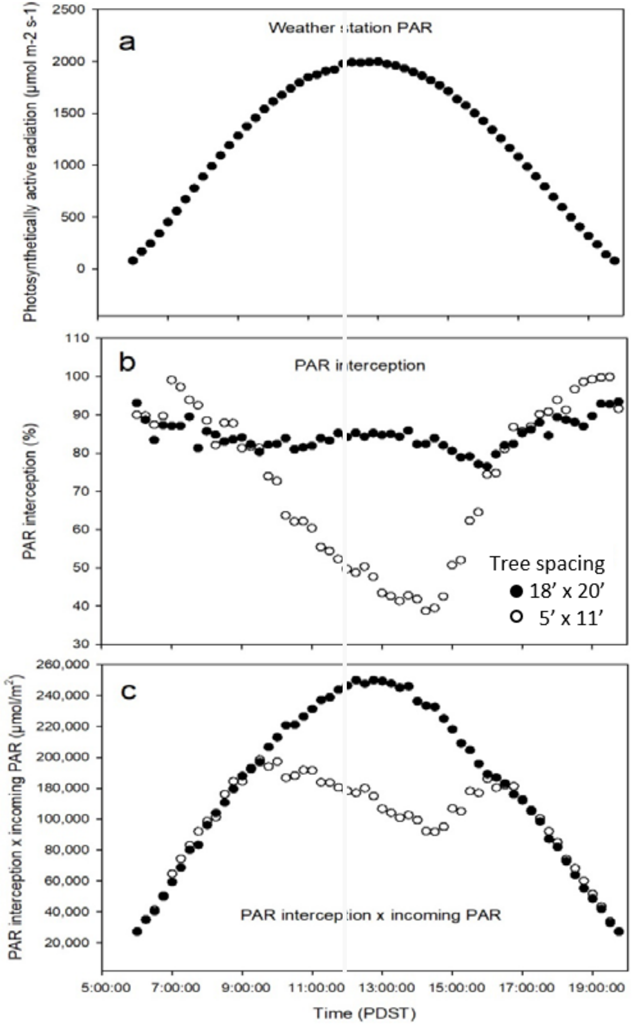
PAR interception x incoming PAR
PAR interception x incoming PAR (µmol/m2)
260,000
240,000
220,000
200,000
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
5:00:00
7:00:00
9:00:00
11:00:00
13:00:00
15:00:00
17:00:00
19:00:00
Time (PDST)


WINGSCAPES
69°F
BILL NP KEST
12 JUN 2017 12:00 pm


WINGSCAPES
89°F
HIGHDENS ALM
12 JUN 2017 12:00 pm


a
Weather station PAR
Photosynthetically active radiation (µmol m-2 s-1)
2500
2000
1500
1000
500
0
b
PAR interception
PAR interception (%)
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100
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PAR interception x incoming PAR (µmol/m²)
260,000
240,000
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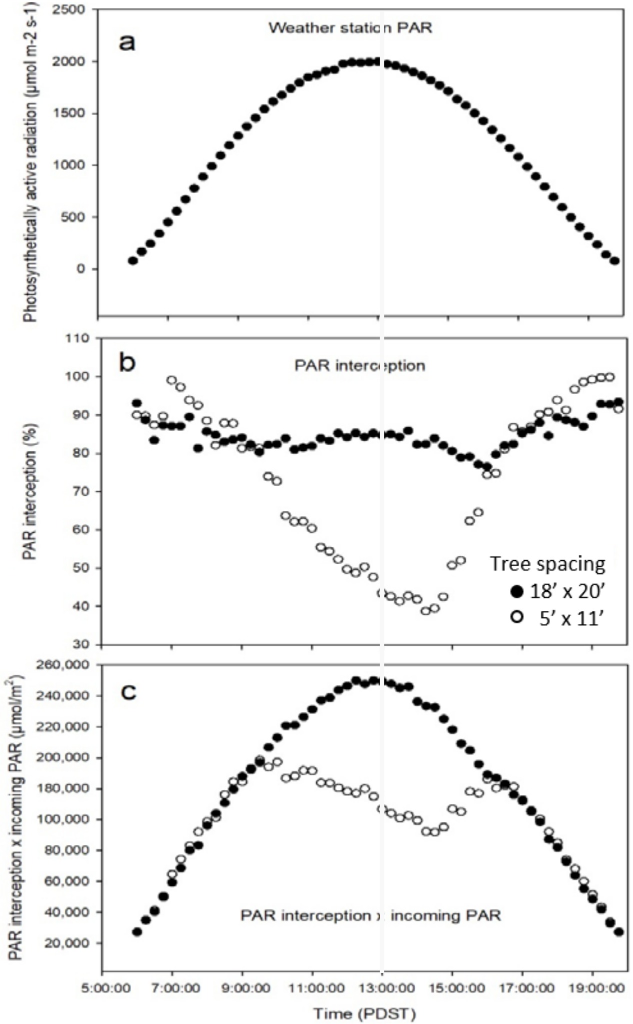
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
5:00:00
7:00:00
9:00:00
11:00:00
13:00:00
15:00:00
17:00:00
19:00:00
Time (PDST)

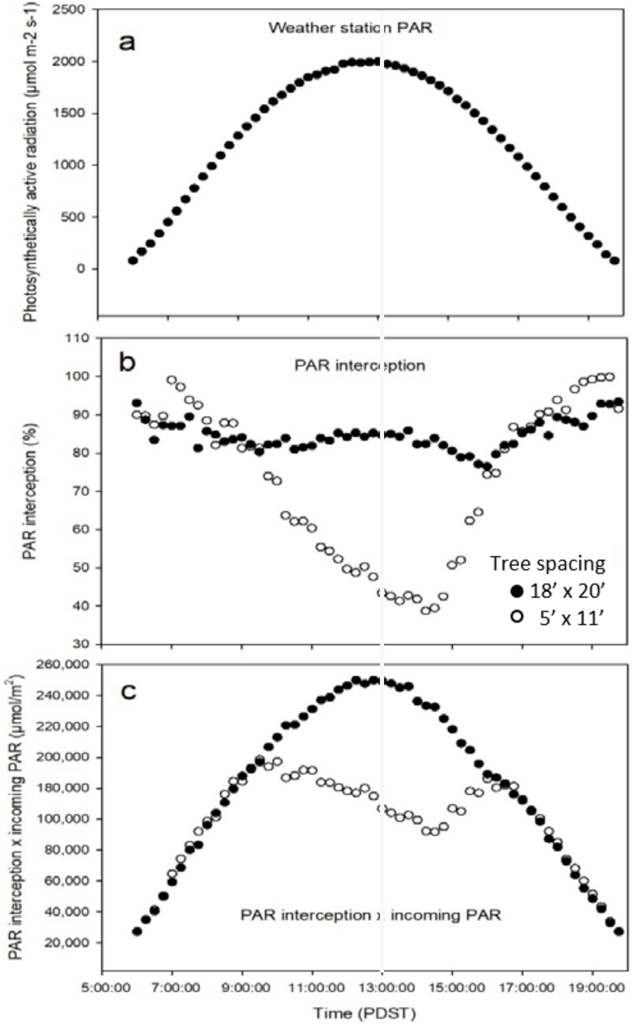

WINGSCAPES
72°F
BILL NP KEST
12 JUN 2017 01:00 pm


WINGSCAPES
93°F
HIGHDENS ALM
12 JUN 2017 01:00 pm


a
Weather station PAR
Photosynthetically active radiation (µmol m-2 s-1)
b
PAR interception
PAR interception (%)
Tree spacing
18' x 20'
5' x 11'
c
PAR interception x incoming PAR
PAR interception x incoming PAR (µmol/m2)
Time (PDST)

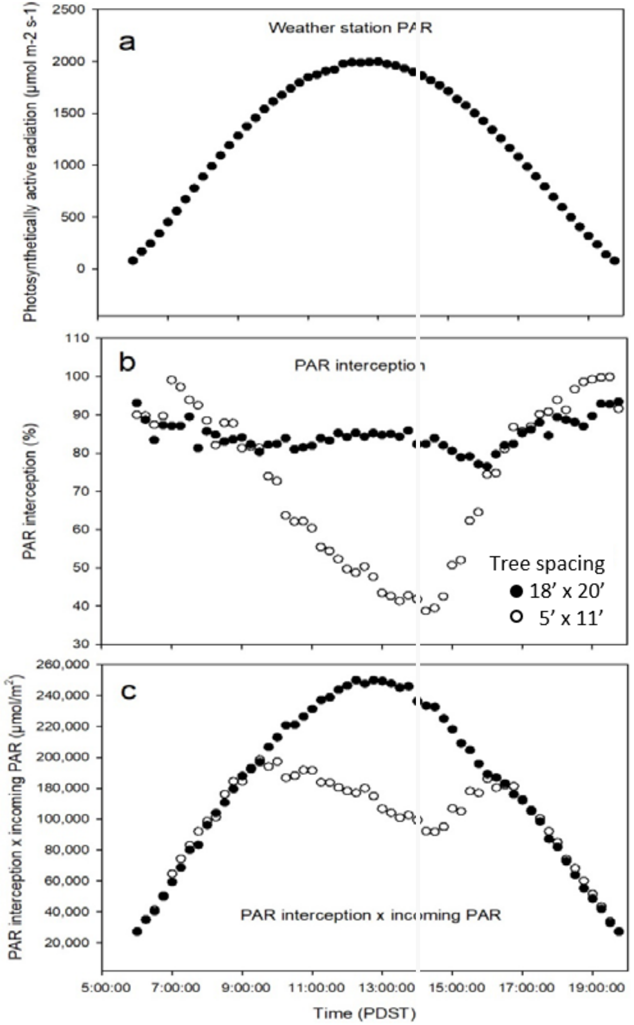

WINGSCAPES
72°F
BILL NP KEST
12 JUN 2017 01:00 pm


WINGSCAPES
93°F
HIGHDENS ALM
12 JUN 2017 01:00 pm


a
Weather station PAR
Photosynthetically active radiation (µmol m-2 s-1)
b
PAR interception
PAR interception (%)
Tree spacing
18′ x 20′
5′ x 11′
c
PAR interception x incoming PAR
PAR interception x incoming PAR (µmol/m²)
Time (PDST)
5:00:00
7:00:00
9:00:00
11:00:00
13:00:00
15:00:00
17:00:00
19:00:00


WINGSCAPES
74°F
BILL NP KEST
12 JUN 2017 02:00 pm


WINGSCAPES
96°F
HIGHDENS ALM
12 JUN 2017 02:00 pm


a
Weather station PAR
Photosynthetically active radiation (µmol m-2 s-1)
2500
2000
1500
1000
500
0
b
PAR interception
PAR interception (%)
110
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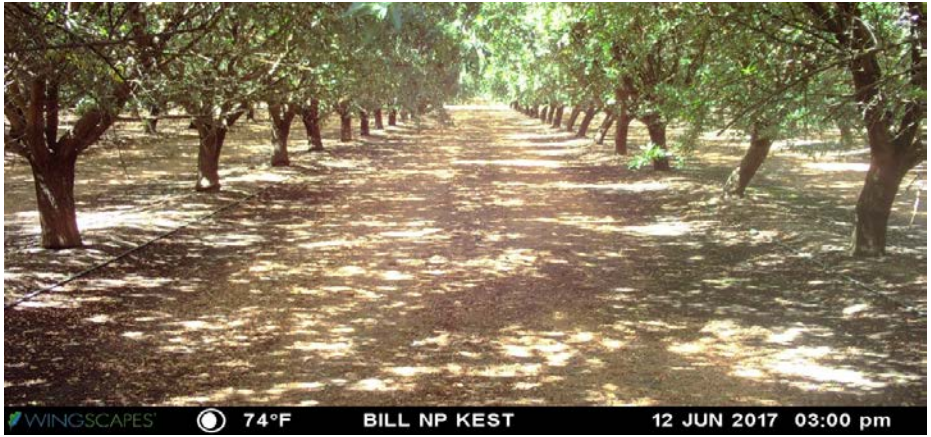
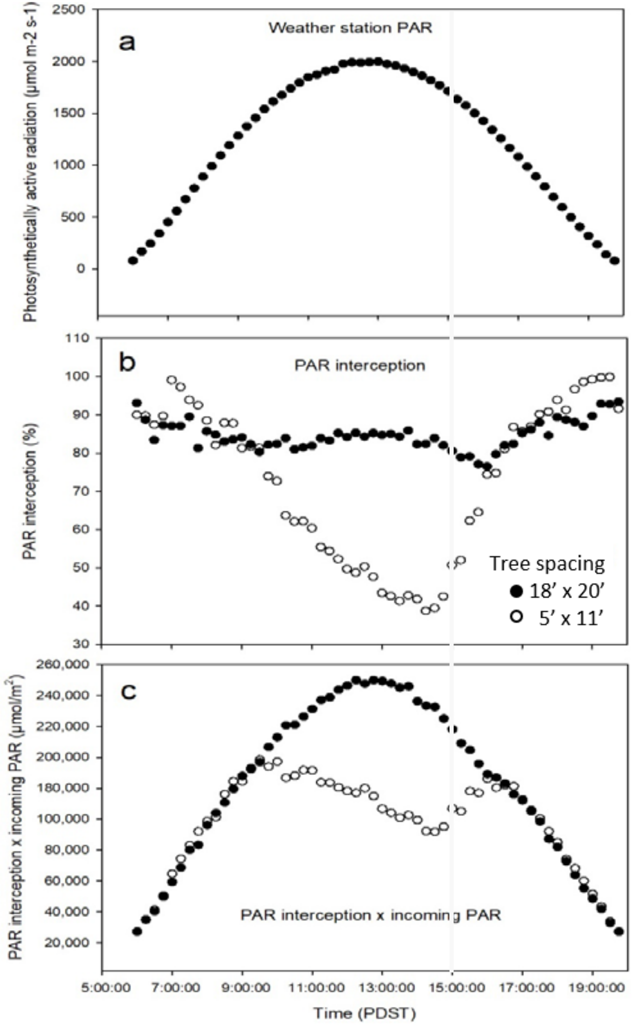
30
Tree spacing
18′ x 20′
5′ x 11′
c
PAR interception x incoming PAR
PAR interception x incoming PAR (µmol/m²)
260,000
240,000
220,000
200,000
180,000
100,000
80,000
60,000
40,000
20,000
5:00:00
7:00:00
9:00:00
11:00:00
13:00:00
15:00:00
17:00:00
19:00:00
Time (PDST)


WINGSCAPES
74°F
BILL NP KEST
12 JUN 2017 03:00 pm


WINGSCAPES
95°F
HIGHDENS ALM
12 JUN 2017 03:00 pm


a
Weather station PAR
Photosynthetically active radiation (µmol m-2 s-1)
2500
2000
1500
1000
500
0
b
PAR interception
PAR interception (%)
110
100
90
80
70
60
50
40
30
Tree spacing
18' x 20'
5' x 11'
c
PAR interception x incoming PAR
PAR interception x incoming PAR (µmol/m²)
260,000
240,000
220,000
200,000
180,000
160,000
140,000
120,000
100,000
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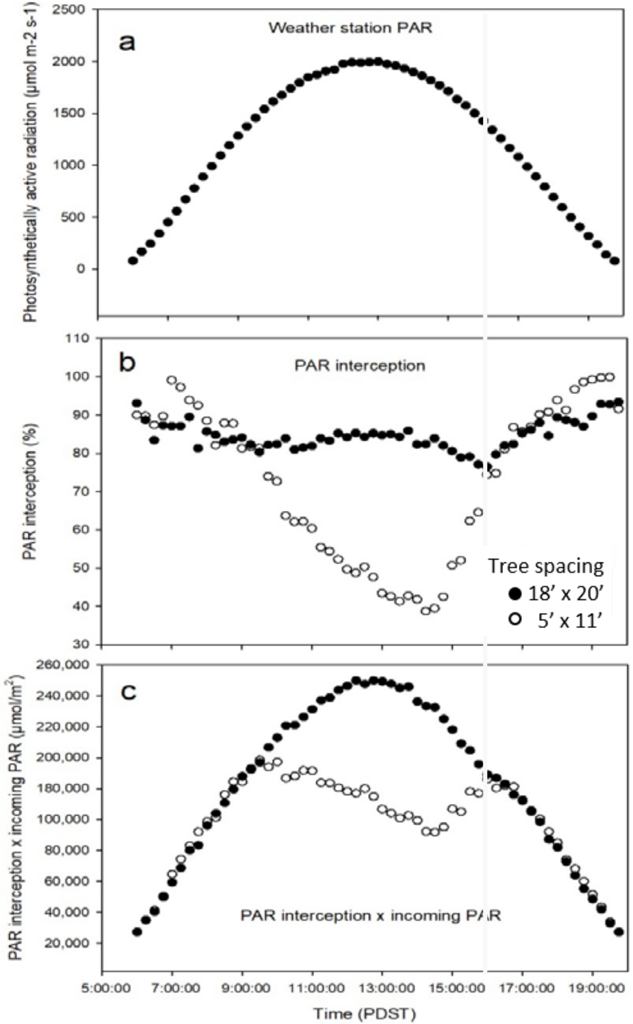
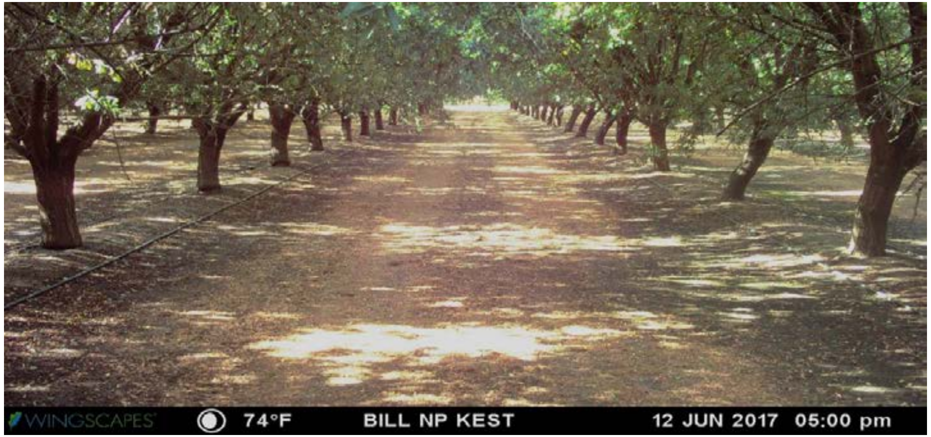
60,000
40,000
20,000
5:00:00
7:00:00
9:00:00
11:00:00
13:00:00
15:00:00
17:00:00
19:00:00
Time (PDST)

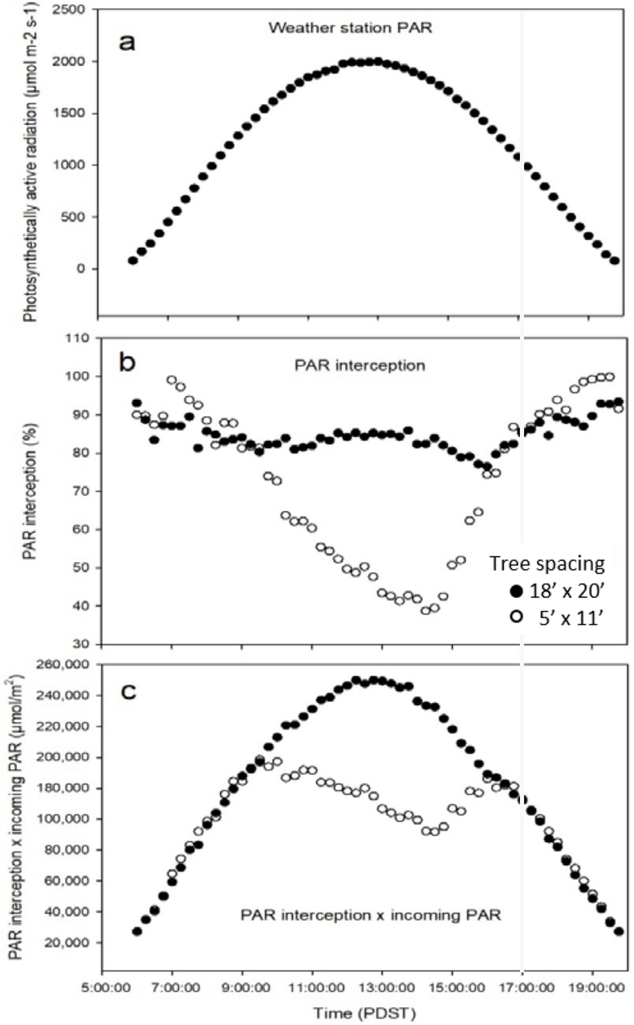

WINGSCAPES
74°F
BILL NP KEST
12 JUN 2017 04:00 pm


WINGSCAPES
91°F
HIGHDENS ALM
12 JUN 2017 04:00 pm


a
Weather station PAR
Photosynthetically active radiation (µmol m-2 s-1)
b
PAR interception
PAR interception (%)
Tree spacing
18' x 20'
5' x 11'
c
PAR interception x incoming PAR
PAR interception x incoming PAR (µmol/m²)
Time (PDST)
5:00:00
7:00:00
9:00:00
11:00:00
13:00:00
15:00:00
17:00:00
19:00:00


WINGSCAPES
74°F
BILL NP KEST
12 JUN 2017 05:00 pm


WINGSCAPES
86°F
HIGHDENS ALM
12 JUN 2017 05:00 pm


a
Weather station PAR
Photosynthetically active radiation (µmol m-2 s-1)
2500
2000
1500
1000
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0
b
PAR interception
PAR interception (%)
110
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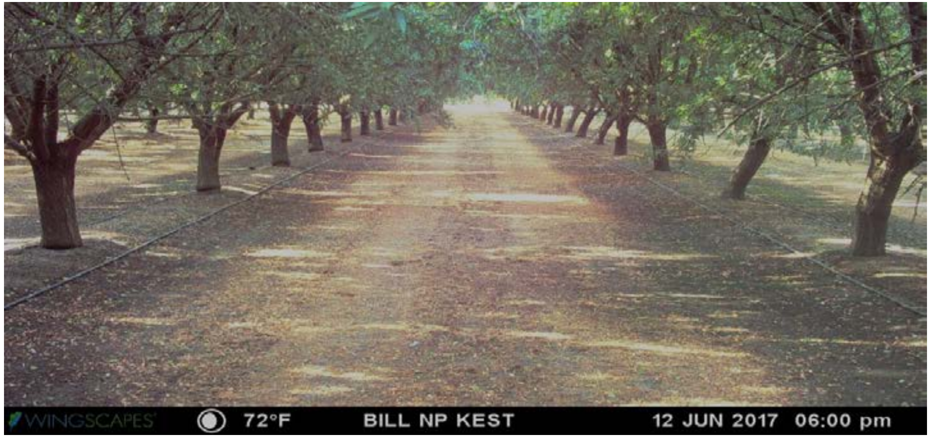
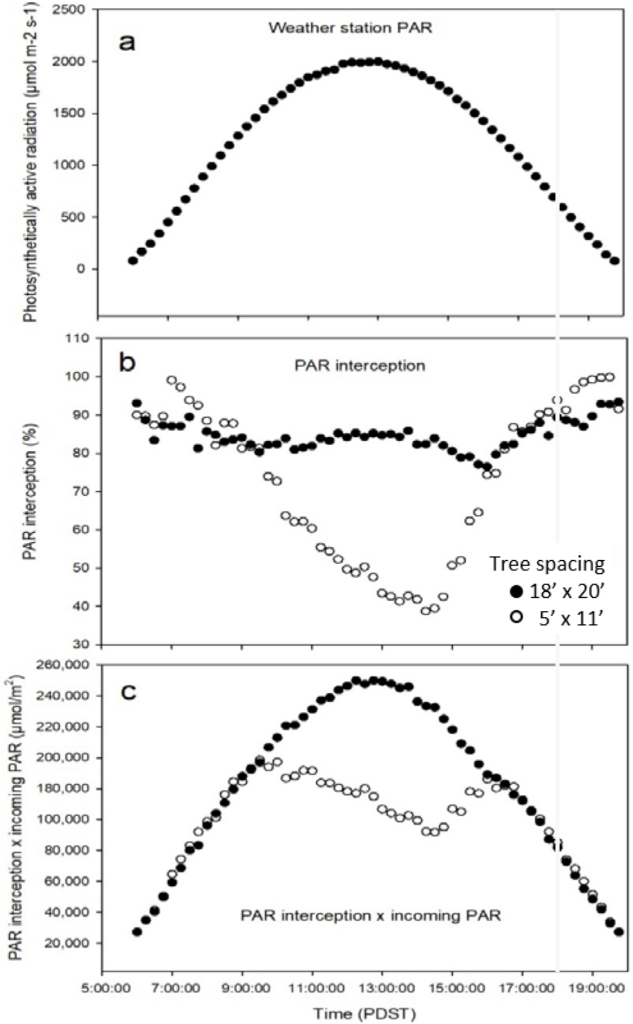
120,000
100,000
80,000
60,000
40,000
20,000
PAR interception x incoming PAR
5:00:00
7:00:00
9:00:00
11:00:00
13:00:00
15:00:00
17:00:00
19:00:00
Time (PDST)


WINGSCAPES
72°F
BILL NP KEST
12 JUN 2017 06:00 pm


WINGSCAPES
83°F
HIGHDENS ALM
12 JUN 2017 06:00 pm


a
Weather station PAR
Photosynthetically active radiation (µmol m-2 s-1)
2500
2000
1500
1000
500
0
b
PAR interception
PAR interception (%)
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Tree spacing
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60,000
40,000
20,000
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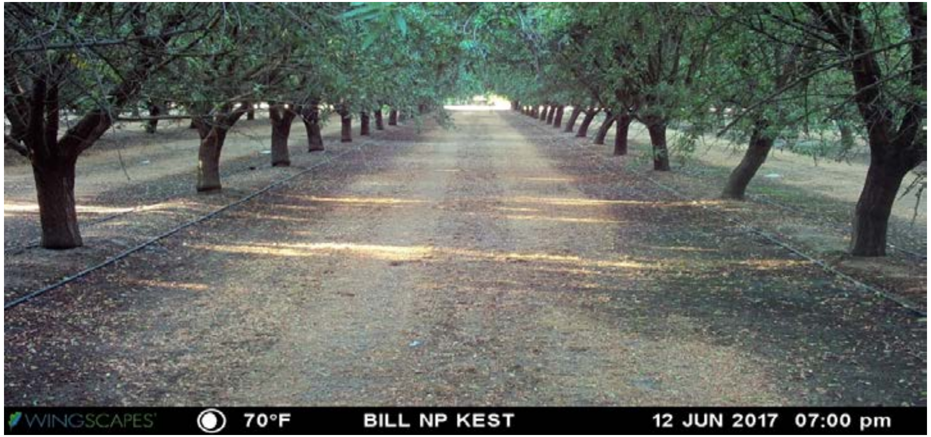
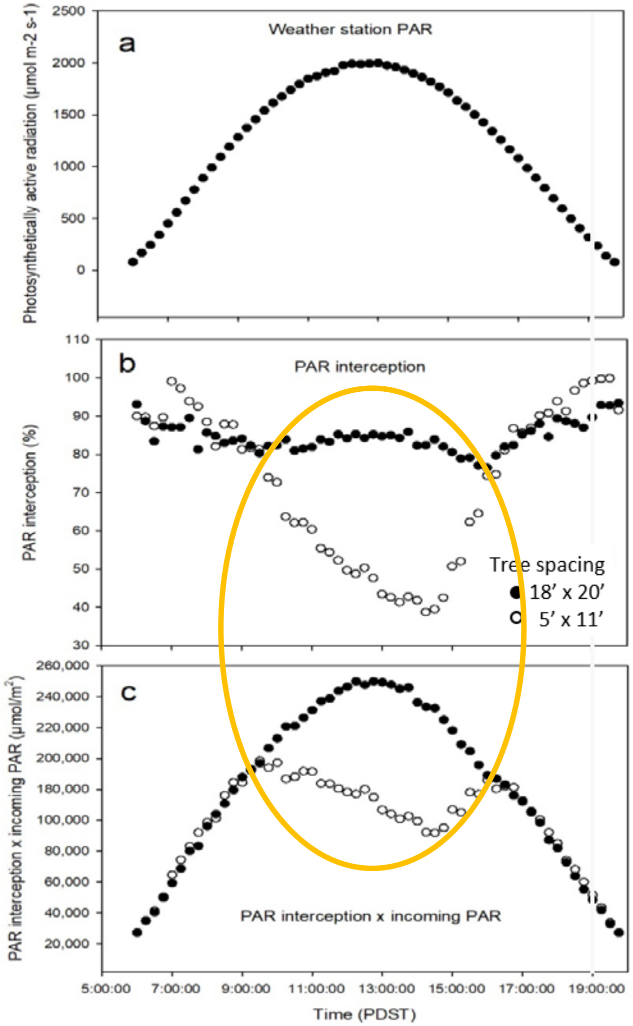
9:00:00
11:00:00
13:00:00
15:00:00
17:00:00
19:00:00
Time (PDST)


WINGSCAPES
70°F
BILL NP KEST
12 JUN 2017 07:00 pm


WINGSCAPES
77°F
HIGHDENS ALM
12 JUN 2017 07:00 pm


a
Weather station PAR
Photosynthetically active radiation (µmol m-2 s-1)
2500
2000
1500
1000
500
0
b
PAR interception
PAR interception (%)
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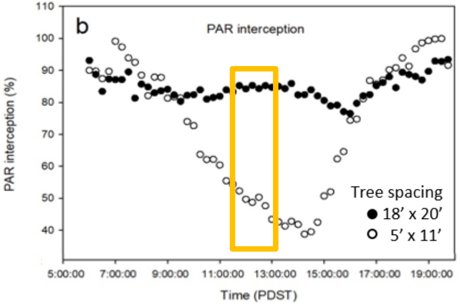
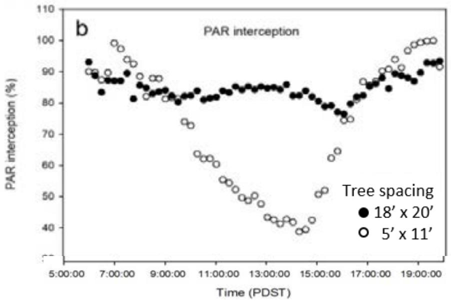
15:00:00
17:00:00
19:00:00
Time (PDST)

Midday



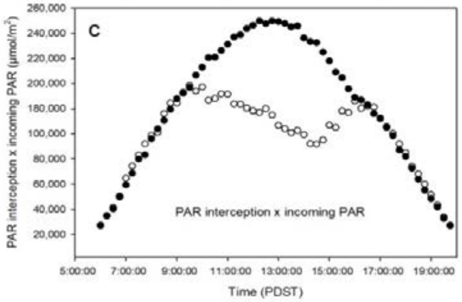
45%

Diurnal PAR



86%

Diurnal summed



76%

Yield potential based on midday PAR interception

Planting	PAR int. (%)	Yield potential (kernel lb/ac)	Actual yield (kernel lb/acre)
5’ x 11’	44	2200	1324
18’ x 21’	83	4150	~3600

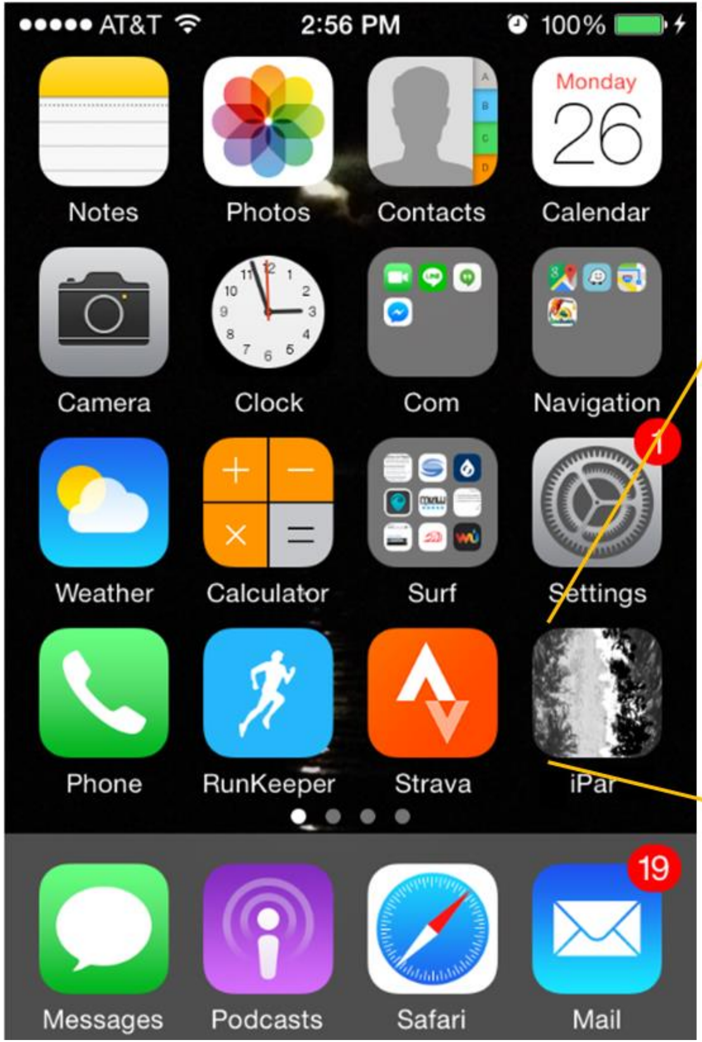
Conclusions

- The most productive almond orchards in our studies can produce about 50 kernel lb/ac (and the average about 40)

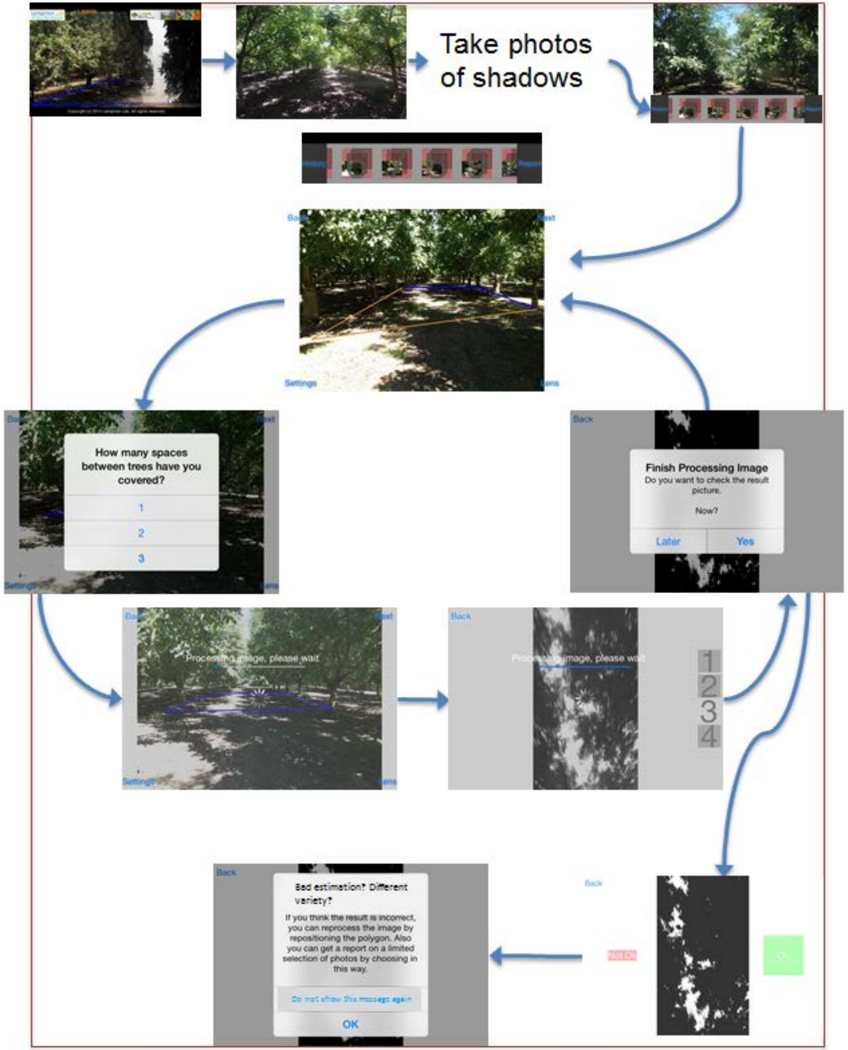
- Across the range of planting densities in our studies (80-202 trees per acre) at maturity there do not appear to be any clear density related differences in production potential

- There is some indication that higher density plantings than those in our study may potentially be able to intercept more PAR over the course of the day for a given level of midday PAR interception

- However, keeping productivity up at this density will require breeding and training work to create smaller tree structures that do not require continual hedging or training to keep trees within size range of over the row harvesters as well as new machinery for harvest and field operations



Available in the Apple Store


Take photos of shadows
How many spaces between trees have you covered?
1
2
3
Finish Processing Image
Do you want to check the result picture.
Now?
Later
Yes
Processing image, please wait
1
2
3
4
Bad estimation? Different variety?
If you think the result is incorrect, you can reprocess the image by repositioning the polygon. Also you can get a report on a limited selection of photos by choosing in this way.
Do not show this message again
OK

Done Report

Lampinen Lab
UC Davis Plant Sciences

UCDAVIS
DEPARTMENT OF PLANT SCIENCES
College of Agricultural and Environmental Sciences

UCDAVIS
FRUIT & NUT
RESEARCH & INFORMATION

Field name: **Yolo County Almond Rootstock Trial**

Date: **July 24, 2017**

Crop: **Almond**

Start Time : **11:49 AM**

Number of Measurements: **12**

Average PAR: 70%
Yield potential: 2450-3500 lbs/ac
Estimated nitrogen needs: 166-237 lbs N/ac


Questions?
Thanks to the Almond Board of California for supporting this work

CEUS – NEW PROCESS

Certified Crop Advisor (CCA)

- Sign in and out of each session you attend.
- Pickup verification sheet at conclusion of each session.
- *Sign in sheets are located at the back of each session room.*

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

- Pickup scantron at the start of the day at first session you attend; complete form.
- Sign in and out of each session you attend.
- Pickup verification sheet at conclusion of each session.
- Turn in your scantron at the end of the day at the last session you attend.

Sign in sheets and verification sheets are located at the back of each session room.

What’s Next

Wednesday, December 6 at 12:00 p.m.

- Luncheon Presentation – Hall C

  The Future of Agriculture: Innovation, Ingenuity, Perseverance
  Speaker: Steve Forbes

Luncheon is ticketed and is sponsored by Yosemite Farm Credit