

# Apple Chemical Thinning 2017

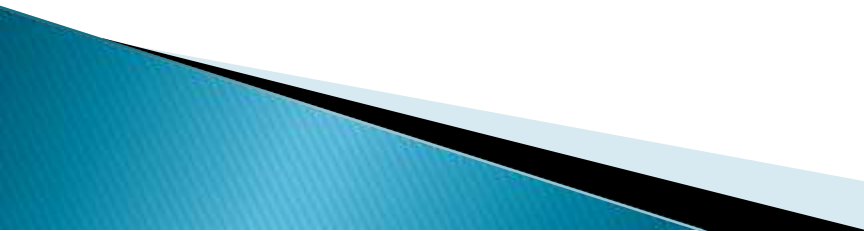
Trials and Tribulations

Jim Schupp  
Penn State FREC

Trial

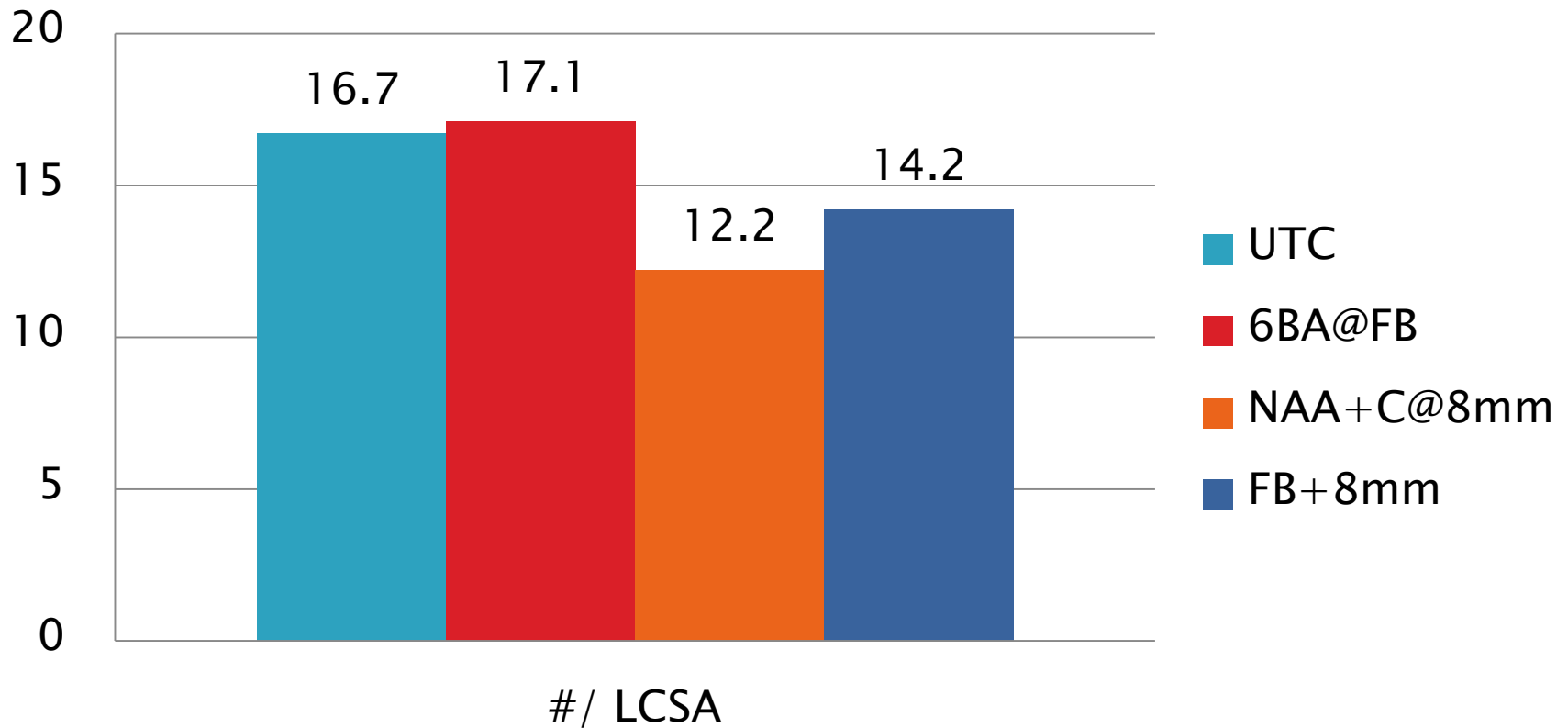


# Does 6BA at FB “Pre-select” Fruits to Respond to Post-bloom Thinners?

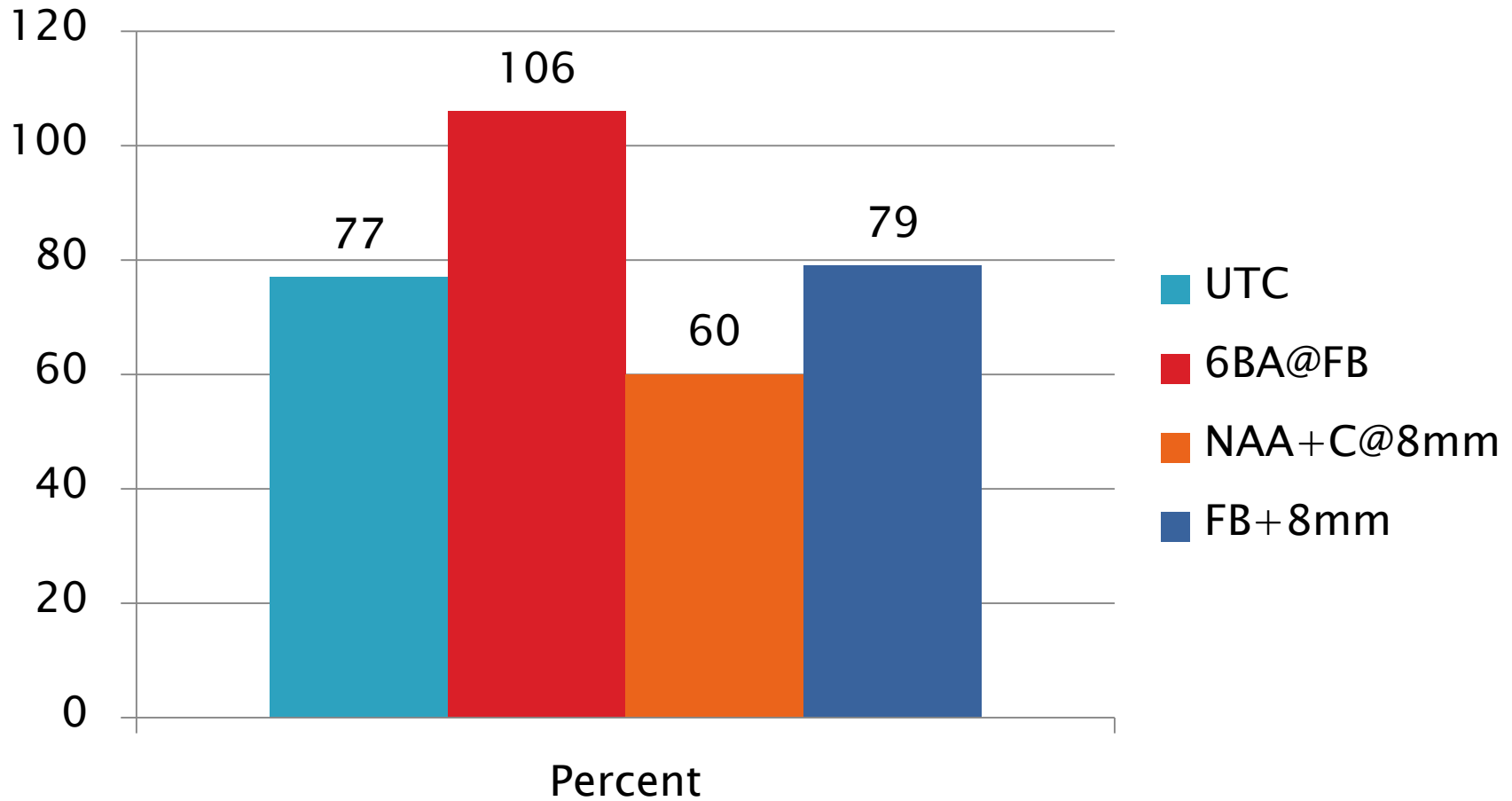
- ▶ Buckeye Gala / M.9 Tall Spindle trees
  - ▶ 100 ppm 6BA applied at 80% open bloom
  - ▶ 7.5 ppm NAA + 1 pt. carbaryl applied at 8 mm
  - ▶ Fruit set evaluated on 2–3 limbs / tree
  - ▶ All fruits tagged on 10 spurs per tree and diameter measured weekly
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# Gala Fruit Set, 2017

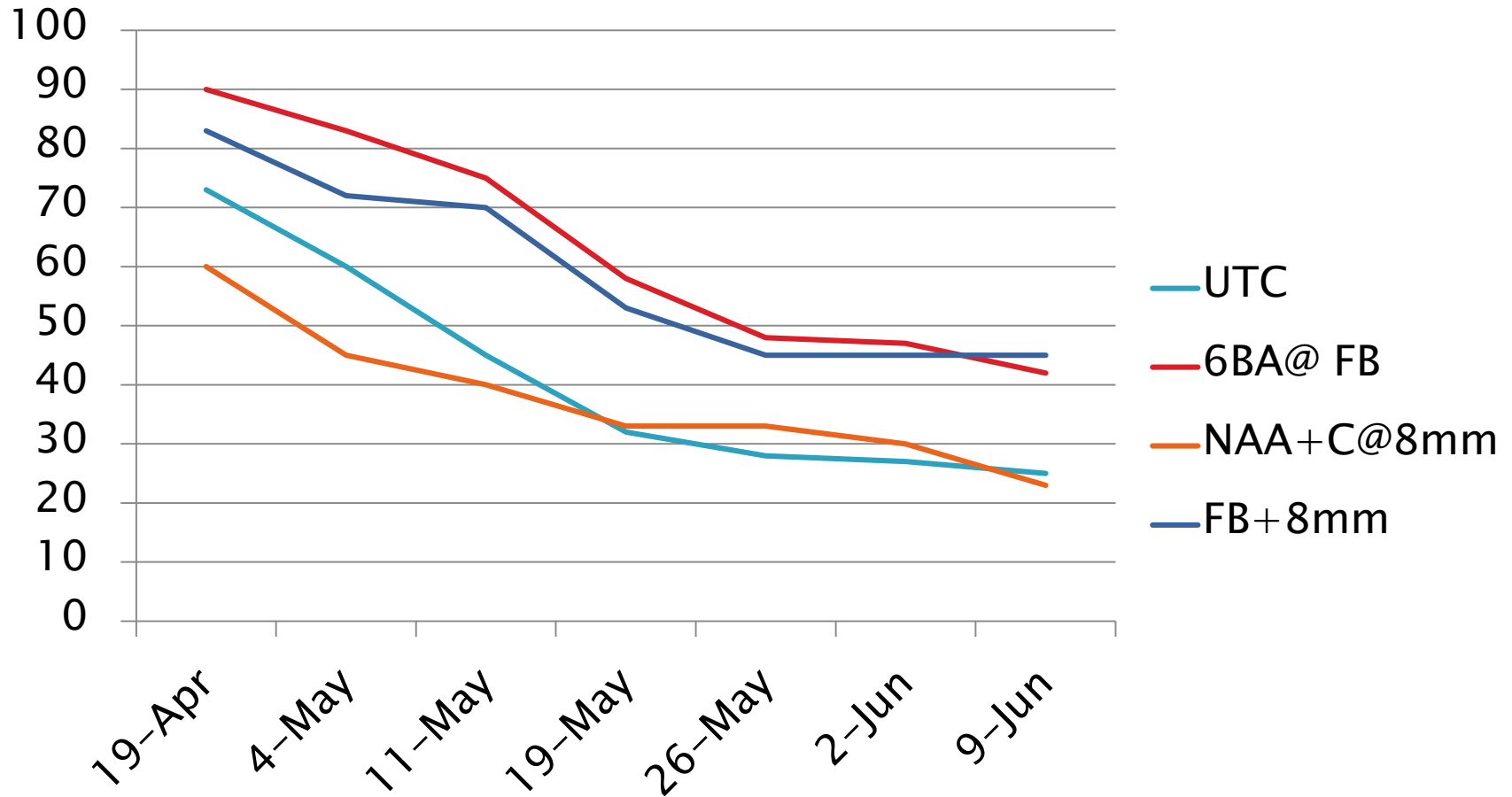
## Crop Density




# Fruit Set (# / 100 clusters)



# King Fruit Set “Occupancy Rate”



# Gala Fruit Set


- ▶ Bloom 6BA increased fruit set / 100 clusters
  - ▶ NAA+C at 8 mm thinned
  - ▶ NAA+C at 8mm reduced crop density
  - ▶ 6BA did not affect crop density
  - ▶ 6BA at bloom did not increase likelihood of fruits thinning – it decreased it!
  - ▶ Unusual season– unusual result?
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# Yield Effects

| Trt          | Trt  | Fruit no. | Yield per tree | Avg fruit wt. |
|--------------|------|-----------|----------------|---------------|
| <b>Bloom</b> | 8 mm | # / tree  | (lb)           | (g)           |
| <b>None</b>  | None | 341       | 81             | 108           |
| <b>None</b>  | NAA  | 334       | 85             | 115           |
| <b>6BA</b>   | None | 369       | 94             | 116           |
| <b>6BA</b>   | NAA  | 241       | 71             | 134           |



# 6BA at Bloom

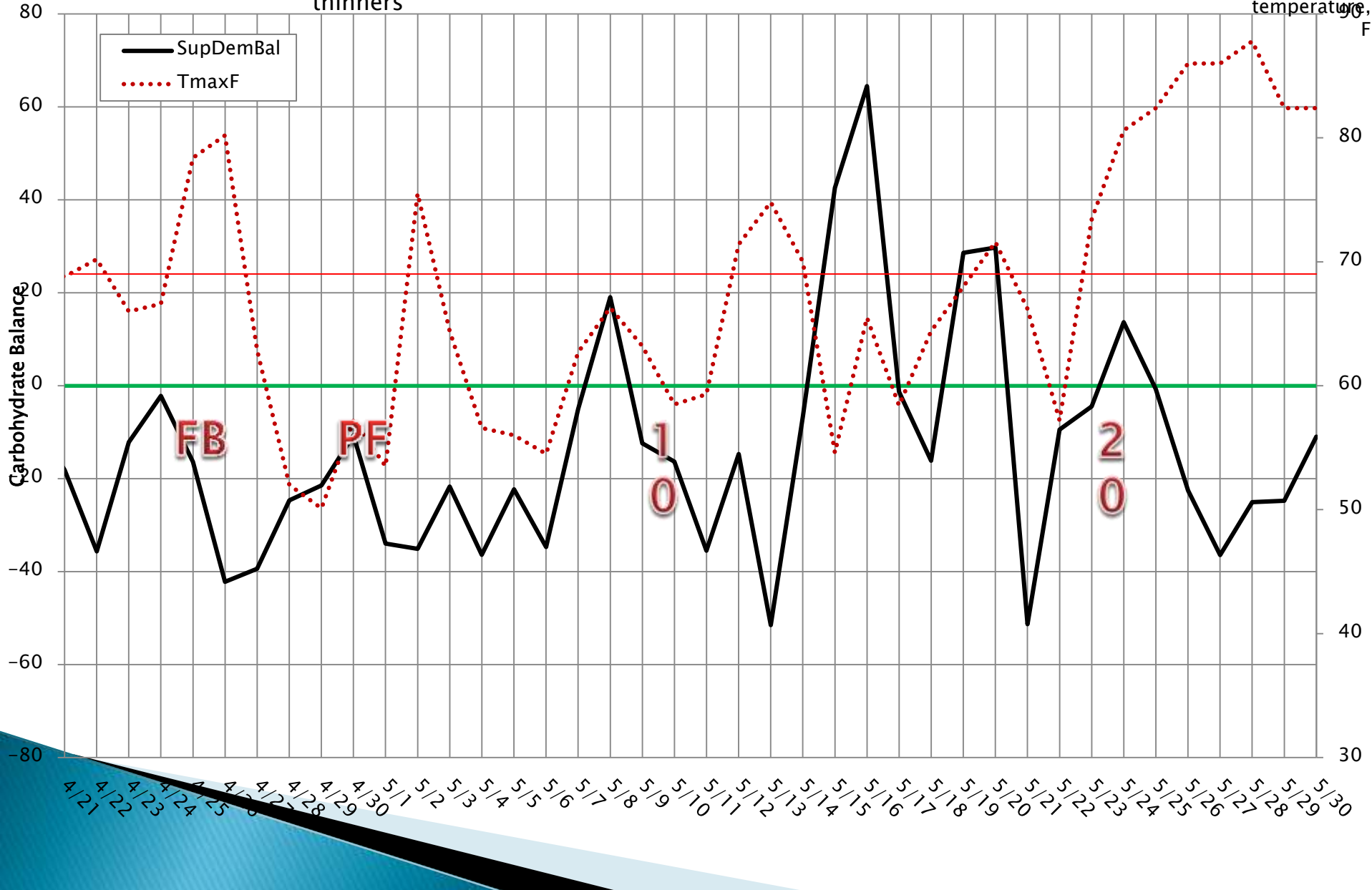
- ▶ Increased the set of kings in 2017
    - Evident before & after 8 mm thinner treatment
  - ▶ “Occupancy rate” at side flower positions: NS
  - ▶ Increased set of kings explains increased fruit set on whole-tree basis
  - ▶ 6BA at bloom is “active”
  - ▶ May get a different response in “normal” year
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# Tribulations

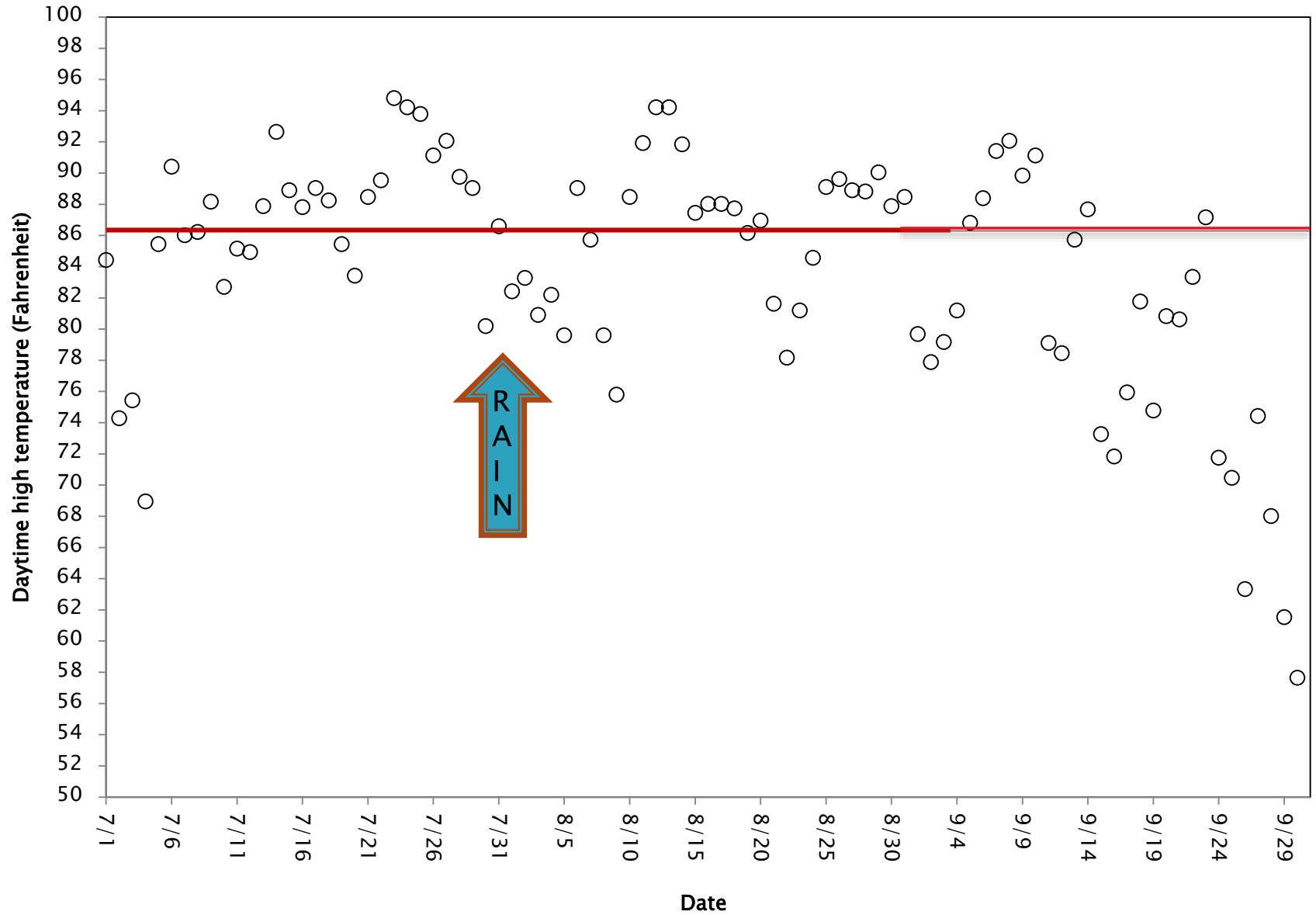


# 2016 Apple Chemical Thinning Season

- **RED** text indicates bloom stage or fruit growth stage
- Solid red line indicates approximate minimum temperature for activity of most chemical thinners



# 2016 Growing Season, July – September



# 2016: A Year to Forget?

- ▶ May in March, March in April, April in May;
  - 18 –74 % flower mortality
  - Uncertain set strength
  - Difficult to thin adequately
- ▶ Mid-June to Mid-Sept: Heat & drought
  - 1 good rainfall;
  - July- Sept: 46 days  $\geq$  86°F (50%)



# 2017 Green Tip: February 28!

| Date   | High (°F) | Low (°F) | GDD  |
|--------|-----------|----------|------|
| 18 Feb | 68        | 29       | 8.3  |
| 19 Feb | 67        | 55       | 19.6 |
| 20 Feb | 61        | 44       | 21.9 |
| 21 Feb | 53        | 33       | 21.9 |
| 22 Feb | 63        | 41       | 23.9 |
| 23 Feb | 74        | 46       | 33.4 |
| 24 Feb | 74        | 52       | 46.4 |
| 25 Feb | 67        | 40       | 49.8 |
| 28 Feb | 61        | 38       | 57.5 |

# 2017 March Cold

| Date     | Low (°F) |
|----------|----------|
| 5 March  | 13.5     |
| 12 March | 17.8     |
| 13 March | 16.1     |
| 15 March | 16.5     |

## GT Critical

### Temps:

10% kill: 18°F

90% kill: 10°F

# Pre-Bloom Factors 2017

- ▶ Heat and drought stress in 2016
- ▶ Early start of growing season
- ▶ Coldest weather of the winter: March
  - Many “king” flowers were damaged
- ▶ 7 weeks from GT to FB
  - Long interval despite early bloom date



# Cornell Carbon Balance 2017

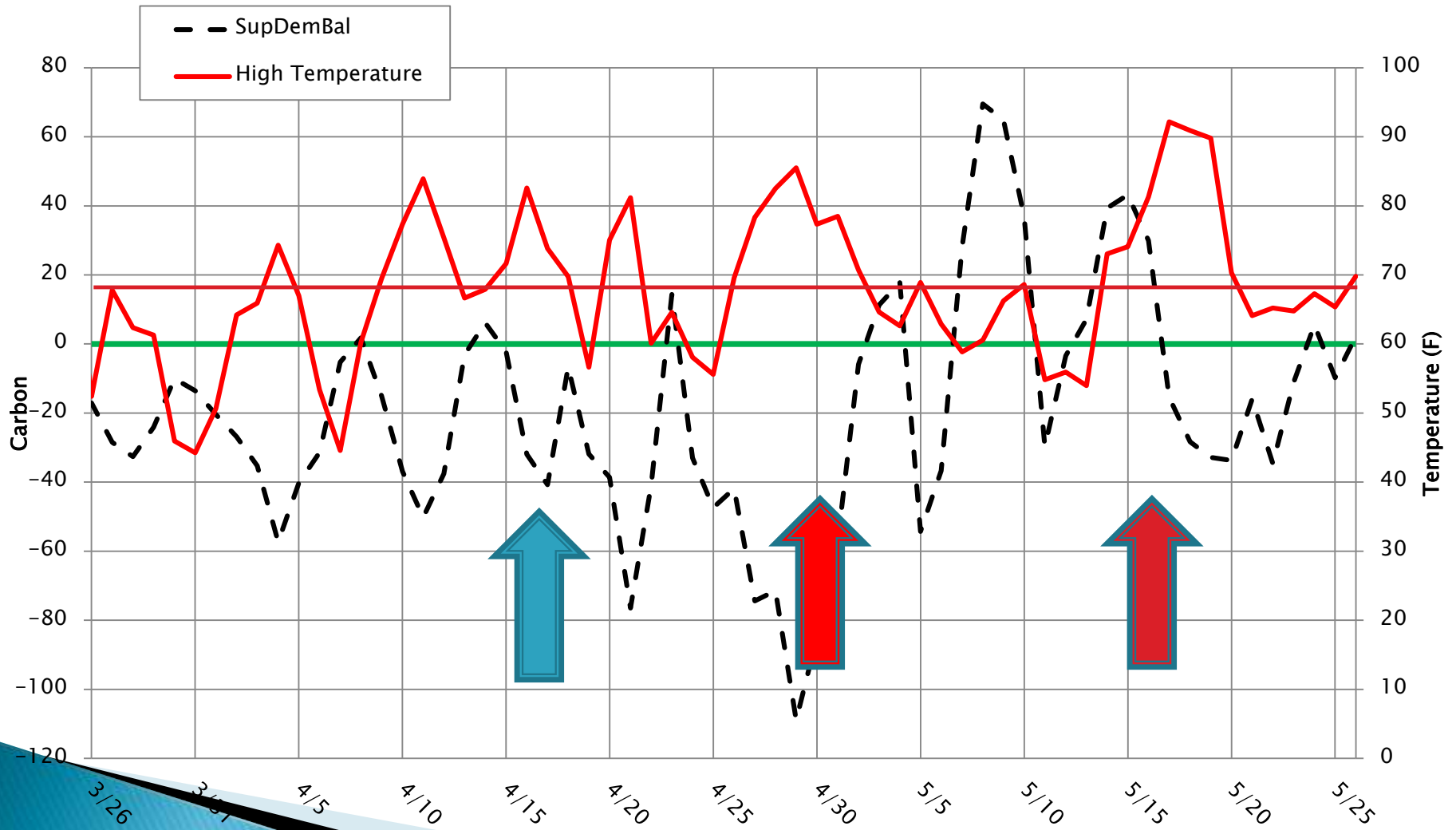
## **Note of caution from the model developer (May 11, 2017):**

- The apple carbohydrate model assumes that the trees are healthy, normal vigor, have no significant stress (frost, drought, nutrient) and no significant carry-over effects from previous years that might change the tree response to the weather. With the severe drought in 2016, there may be orchards that will have a weakened state coming into 2017 which would likely make the tree abnormally sensitive to thinners. So in those cases the model may suggest a stronger thinner concentration than is appropriate. Conversely, if irrigated last year, with the warm season and lots of sun, those trees may be in better than normal condition and harder to thin.
- **With the current cold period, flowering, pollination, initial set and early fruit growth may not be very well modeled as we did not have much data under these very cold (or also excessively hot) conditions when the model was developed.**


For all these reasons, you should have less confidence in the model this year. Use your experience with your unique situation.



# Carbon Balance Model, 2017



# Effect of Temperature and Light on Thinning in 2017

- ▶ Long periods of carbon stress were predicted
  - ▶ PF & Post-B thinner often only mildly effective
    - Thinning was slow to show
  - ▶ Temperatures sub-optimal for thinner activity
  - ▶ March freeze after GT reduced competition within cluster.
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# No Control: The Weather

- ▶ Weather affects the susceptibility of the tree to chemical thinners
  - Carbohydrate supply and demand
- ▶ Thinning season:
  - Strong demand ( $R_d$ ) – fruits, shoots, leaves, cambium, roots
  - Carbon reserves at seasonal low
  - Supply is current photosynthesis ( $P_n$ )
    - Spur leaves
    - New shoots are competitors until 7–8 fully expanded leaves

# Thinning & Weather

- ▶ Weather can affect the spray directly
  - Spray deposit drying time
  - Leaf absorption
  - UV degradation
  - Wash-off / re-wetting
- ▶ Thinners must interact with the tree's metabolic processes to cause thinning response
  - Too cold: tree not metabolically active = little thinning
  - Too hot: tree highly active = **STRONG** thinning

# Thinning & Weather

- ▶ Chemical thinning will always carry risk, due to inability to predict or control weather.
  - Temperature forecast – getting better
  - Sunlight... Not so much!
- ▶ Weather monitoring should be the primary focus during thinning window.
  - Adjust timing, rates, and chemicals to account for weather.
- ▶ “2 X 4”
  - The 2 days before thinner spray and the 4 days after are the most critical.

# 2017 Lessons:

- ▶ Carbon deficit  $\neq$  thinner will work
- ▶ Carbon deficit only shows if tree is susceptible to thinning
- ▶ Sub-optimal temps = sub-optimal thinning
- ▶ **When you're hot – you're hot!**
- ▶ **When you're not –you're not!**  
Jerry Reed, Country Legend  
& Thinning Guru



# Effective Thinner

UV Degradation, Spray Deposition, Drying time, Leaf Cuticle thickness, Wash-Off, Re-Wetting, Frost, etc.

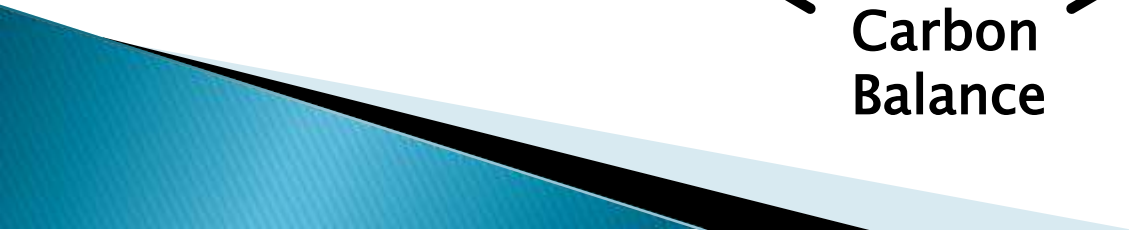
Mode of Action, Rate, Timing, Spray Volume, Water pH / Hardness, etc.

Variety, Initial Set, Tree Age, Cropping History, Tree Vigor, Pruning, etc.

**Weather**

**Susceptible Fruitlet**

Carbon Balance





# Remember Previous Year!

- ▶ Heavy Crop?
  - Did you use return bloom sprays?
- ▶ Stressful growing season?
  - Heat, drought, mite pressure
  - Potential factors affecting set this year

# Recommendations:

- ▶ Key in on initial set: what % of full crop?
    - Choose thinners and set strength of dose
  - ▶ Monitor daily light and temps for “2X4”
  - ▶ 8 mm–on: apply thinner ahead of a favorable forecast
  - ▶ Adjust dose / timing for fruit growth and forecast
  - ▶ Be prepared to re–thin at 20 mm
  - ▶ Use return bloom sprays on AB varieties
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