



The Right Cropload, Precision Apple Thinning

Philip Schwallier

**District Horticulture Agent
Clarksville Research Center**





Precision Orchard Management





Precision Cropload Management

n Adjusting cropload is most important practice.

n Predicting Fruitset Model

Precision Crop Load Management

It is a Strategy to achieve a IDEAL number of fruit/tree by using information and orchard practices.

- Use pruning
- Use chemical thinning
- **Gather & use information**
- Use predictive models, **Predicting Fruitset.**
- Use hand thinning.

Prune to a 1.5x budload of target fruit/tree



Precision Crop Load Management

| Steps | Example Tall Spindle Apples/tree |
|--------------------------------------|---|
| Determine the IDEAL cropload. | 100 |
| Dormant prune to a specific budload. | 150 (1.5x) |
| Michigan's Target Budload | 2x or 200 |

Precision Thinning

- Initial Flower Load clusters/tree 400
- Target Cropload, MI 100 fruit/tree
- Prune bud Load to **2x** target buds/tree 200
- **WA= 1x, NY= 1.5x**

Statewide Precision Thinning

| | |
|---------------------|-------------------|
| Initial Flower Load | 400 clusters/tree |
| Target Cropload, MI | 100 fruit/tree |
| Therefore Target | 1.5x |
| 70% Underpruned | 2x to 3x (5x) |
| 30% Pruned close | 1x to 1.25x |
| Chem Application | 1 to 3 Apps |
| Hand Thinning | 30% |

A fruit bud



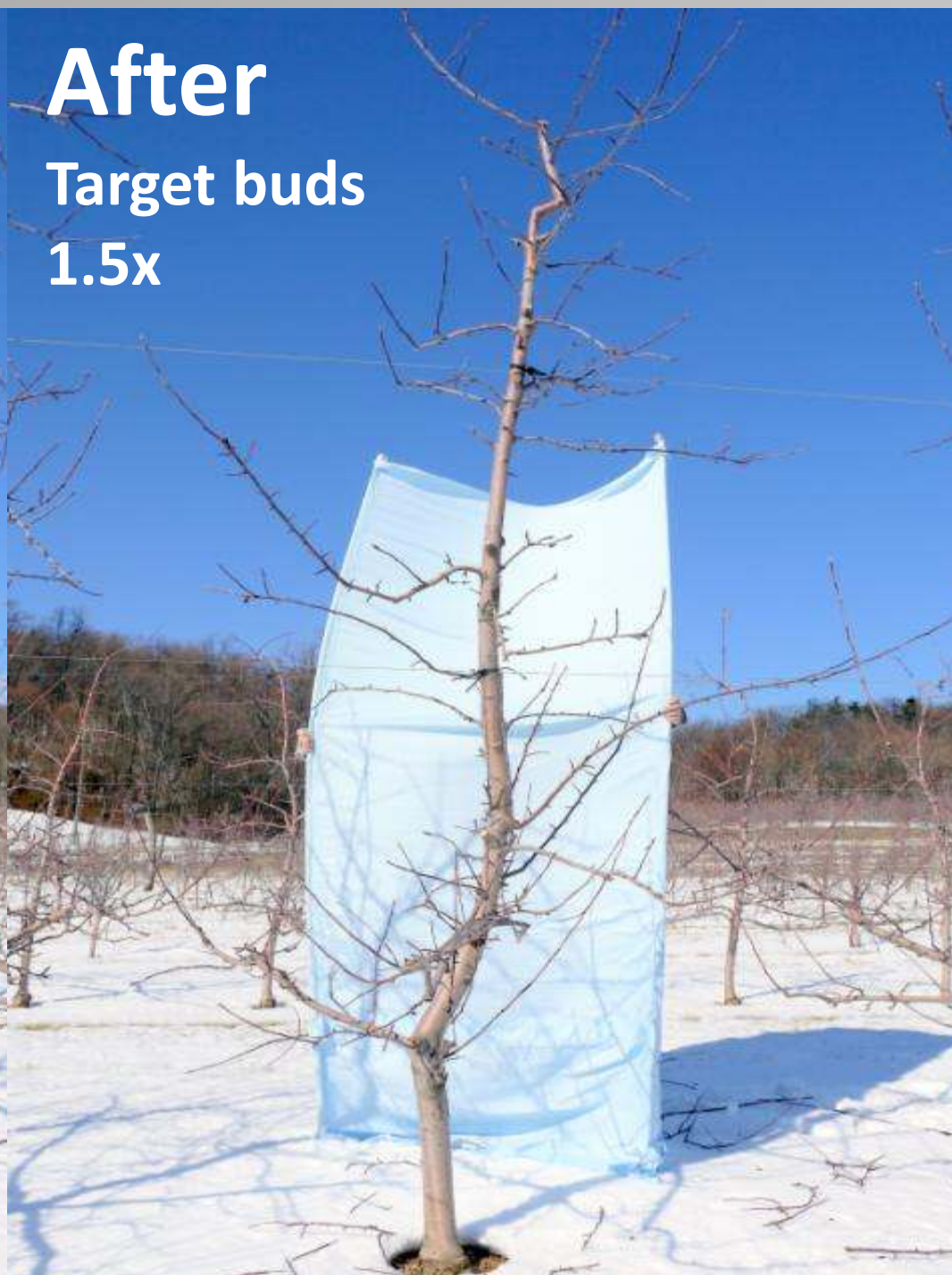
Before

Target 100/tree
500 clusters



After

Target buds
1.5x



Mark Clusters

- n 15 clusters/tree on 5 trees
- n 75 total clusters
- n Pink to bloom
- n Representative clusters
- n Not high not low



Kim Kropf



Bethany Blattner

Jill Blattner

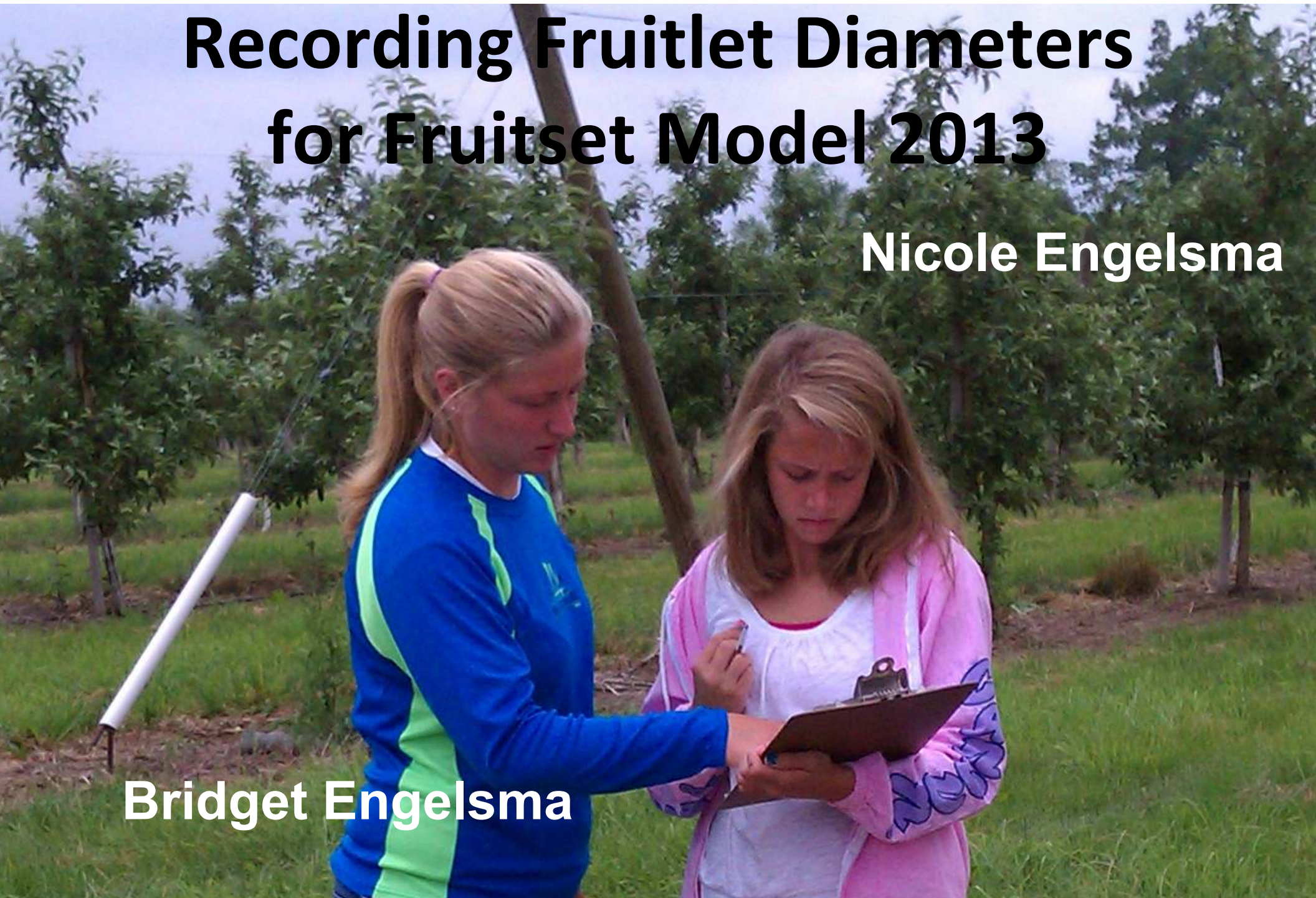




Recording Fruitlet Diameters for Fruitset Model 2013

Nicole Engelsma

Bridget Engelsma







0 0 11

デジタルメーター

MM
5.78
SET



in/mm

9.6 mm

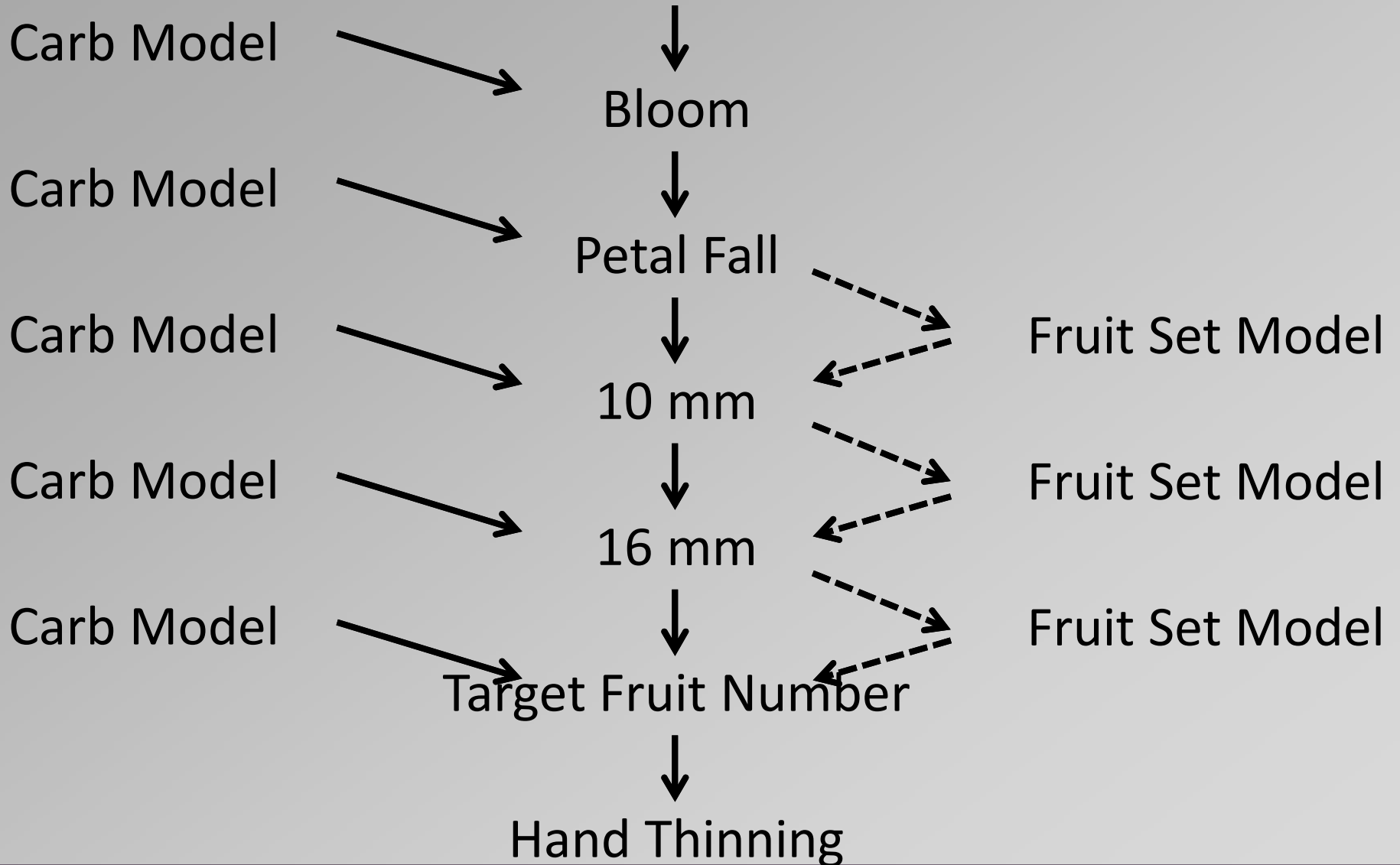
OFF

ON

ZERO

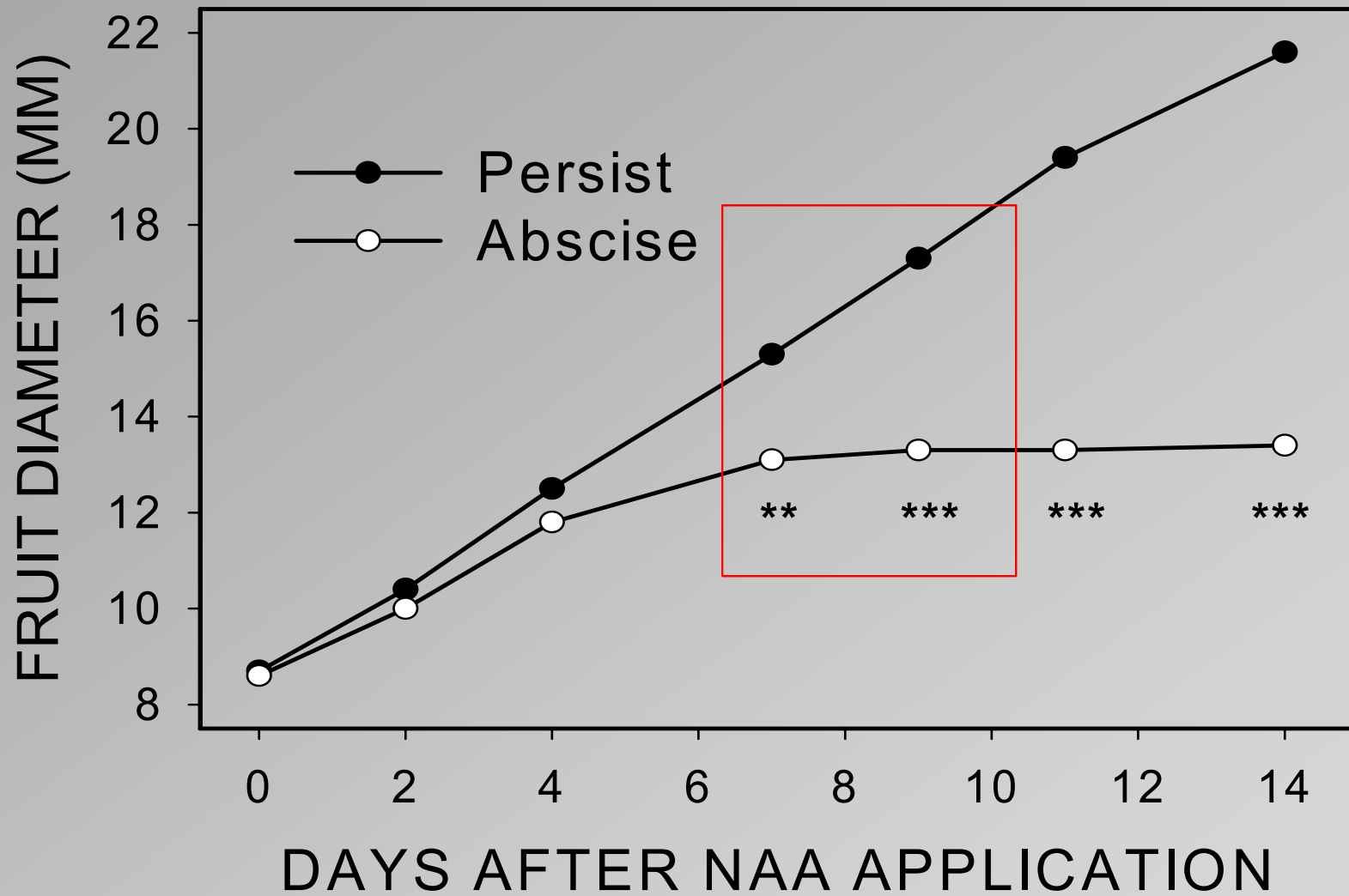
Precision Cropload Flow Chart

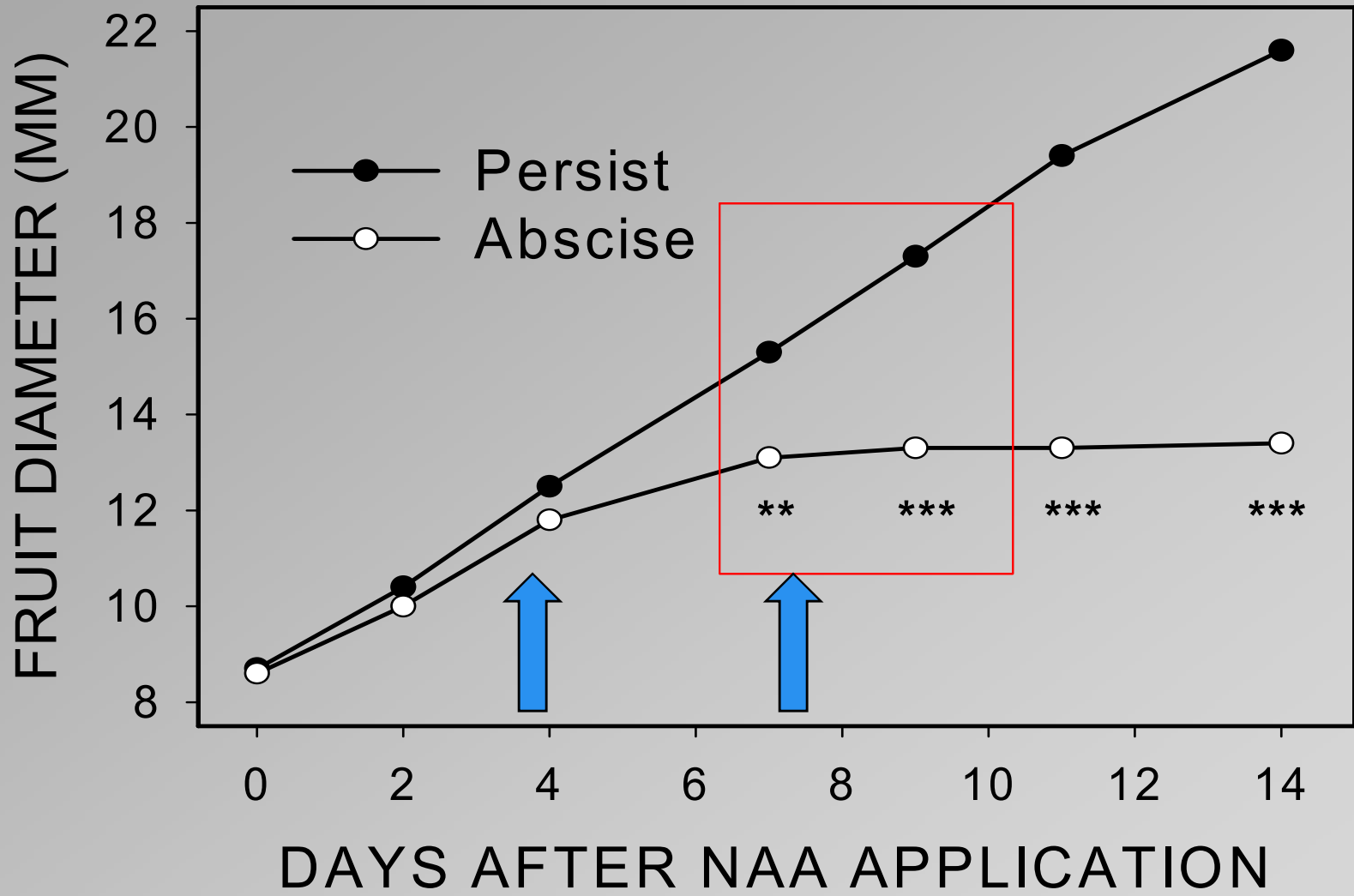
Initial Flower Load



Predict if a Fruit Will Persist or Abscise

- Persist: A fruit was predicted to persist if the growth rate over the measurement period was at least **50% or greater** of the fastest growing fruit.
- Abscise: A fruit was predicted to abscise if the growth rate of the fruit **slowed to 50%** or less of the growth rate of the fastest growing fruit.





Predicting Percent Fruitset

Table 4. Predicting Percent Fruitset Summary Sheet Example.

| Summary Sheet | | | Farm: TestData Farm Block: Test Block | | | | | | | | |
|---------------------|------|---------------------------|---------------------------------------|-----------------------|--|-------------------------------|-----------------|-------------------|----------|---------------------|----|
| Target Fruit Number | | | | 35 | | | | Target % Fruitset | | | 7% |
| Sampling | | | Diameter (mm) | | Diameter Growth (mm) | | Number of Fruit | | | Predicted % Setting | |
| Number | Date | Days between sample dates | Mean of 20 largest fruitlets | Mean of all fruitlets | Mean of up to 20 fastest growing fruitlets | 50% fastest growing fruitlets | >50% fastest | <50% fastest | Measured | Based on Original | |
| | | | | | | | | | | # of Fruit | |
| 1 | 5/1 | 0 | 10.05 | 7.04 | | | | | 505 | | |
| 2 | 5/4 | 3 | 13.21 | 7.55 | 3.54 | 1.77 | 64 | 419 | 483 | 12.7 | |
| 3 | 5/7 | 3 | 15.98 | 8.27 | 3.32 | 1.66 | 50 | 368 | 418 | 9.9 | |
| 4 | 5/10 | 3 | 17.56 | 8.89 | 1.88 | 0.94 | 43 | 329 | 372 | 8.5 | |
| 5 | 5/13 | 3 | 19.88 | 10.60 | 2.72 | 1.36 | 38 | 173 | 211 | 7.5 | |
| 6 | 5/16 | 3 | 21.31 | 12.13 | 1.68 | 0.84 | 41 | 112 | 153 | 8.1 | |
| 7 | 5/19 | 3 | #DIV/0! | #DIV/0! | #DIV/0! | #DIV/0! | 0 | 0 | 0 | 0.0 | |

Predicted number of fast growing fruit

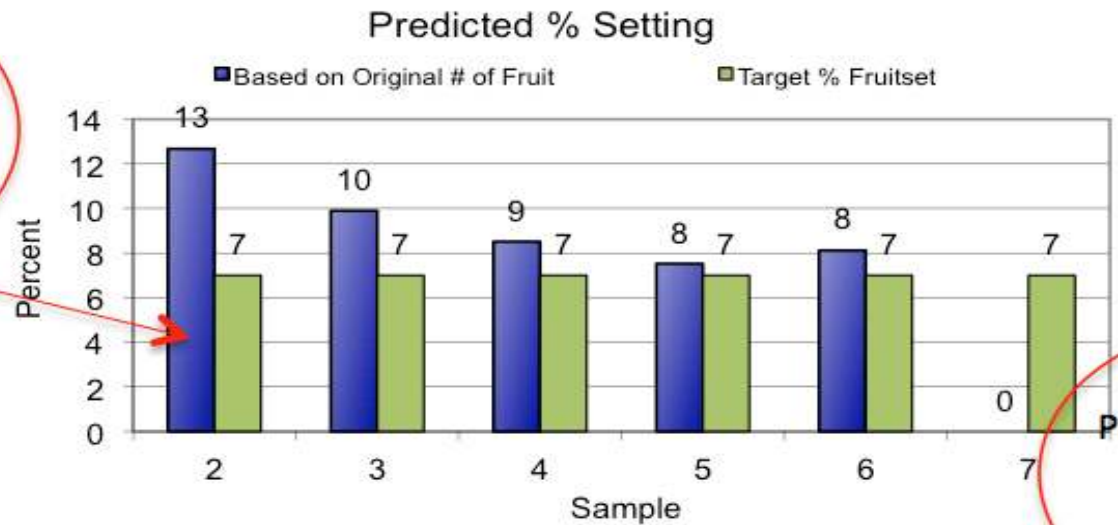
Target number of fruit and target percent.

Number of fruit originally marked and measured.

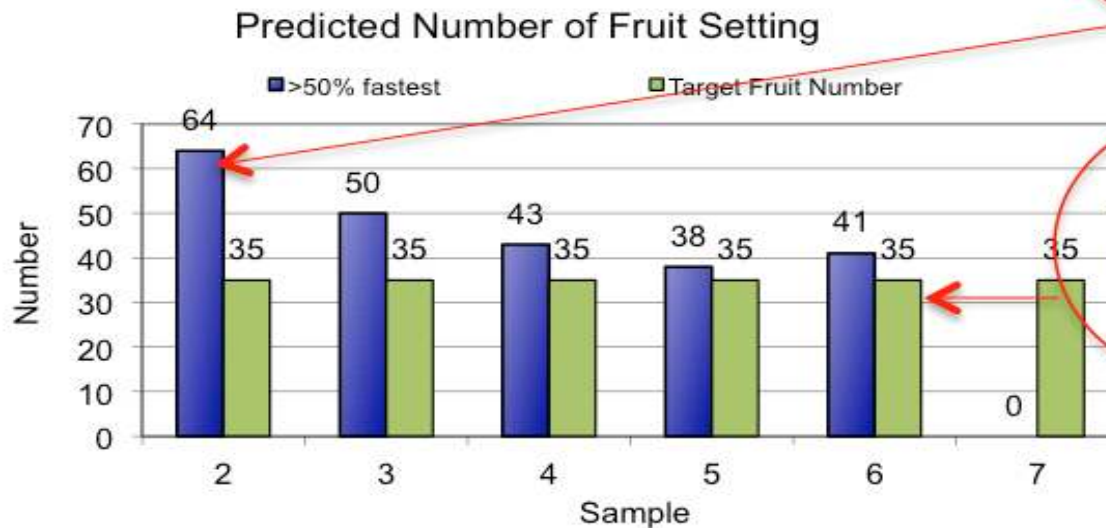
Predicted % fruitset of the original measured fruitlets.

Predicting Percent Fruitset

Predicted % fruitset of the original measured fruitlets (blue bar).



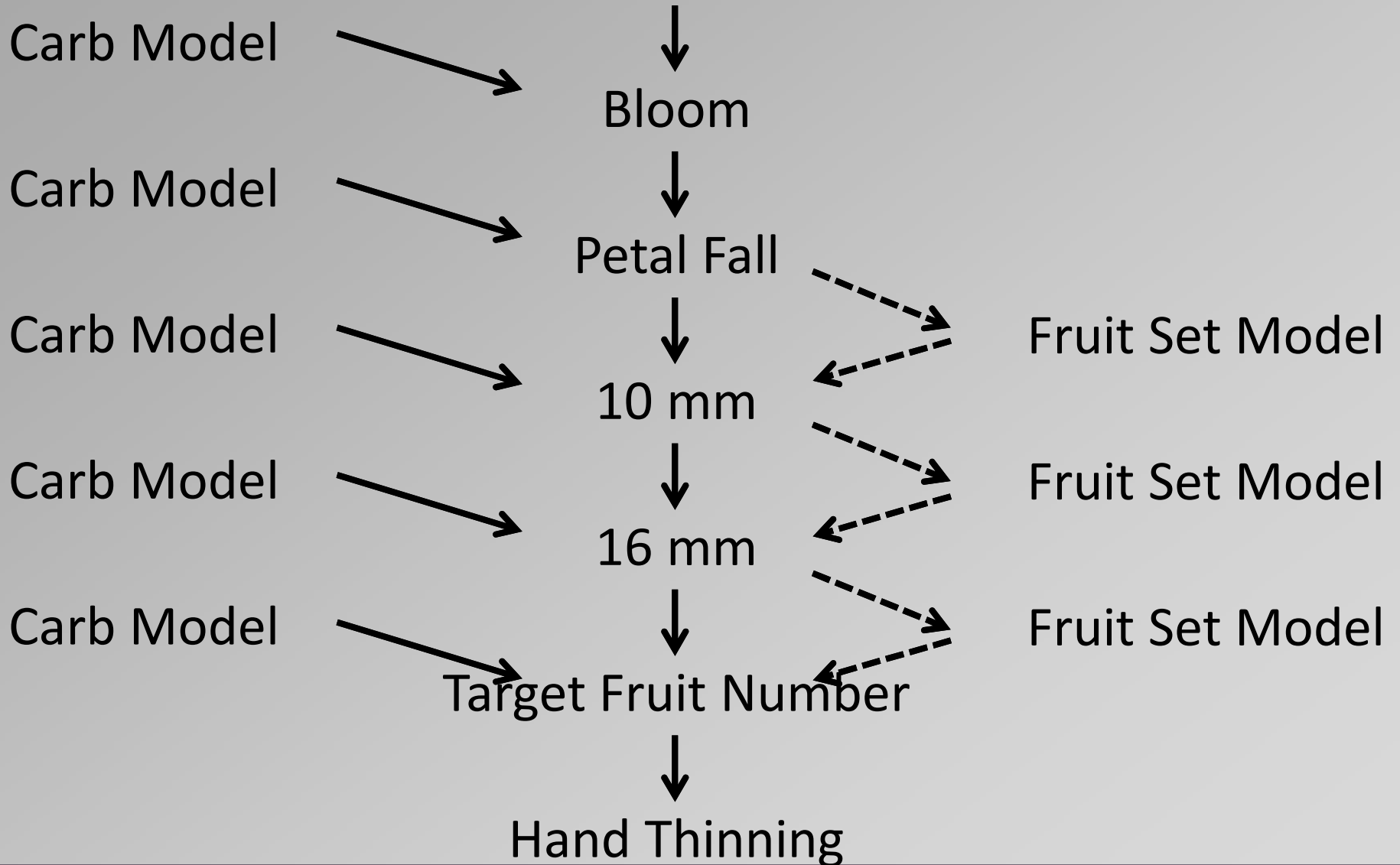
Predicted number of fruit setting (blue bar).



Target number of fruit (green bar).

Precision Cropload Flow Chart

Initial Flower Load



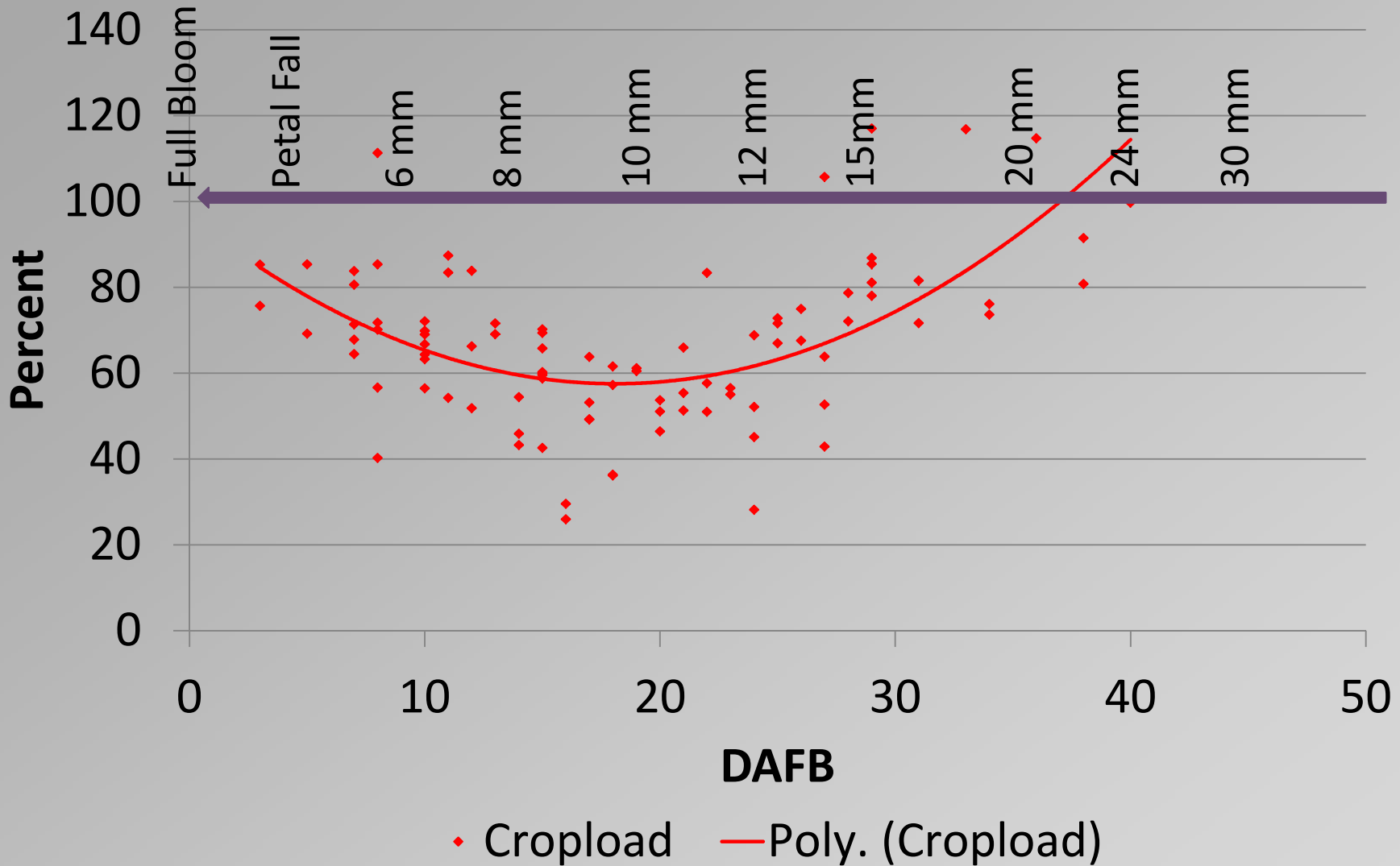
Natural Apple Background Sensitivity to Thinning

We applied **S+M** and **S+N** every 3.5 days to determine when thinning occurred.

Started at PF and ended 28 days later

To Gala for 8 years.

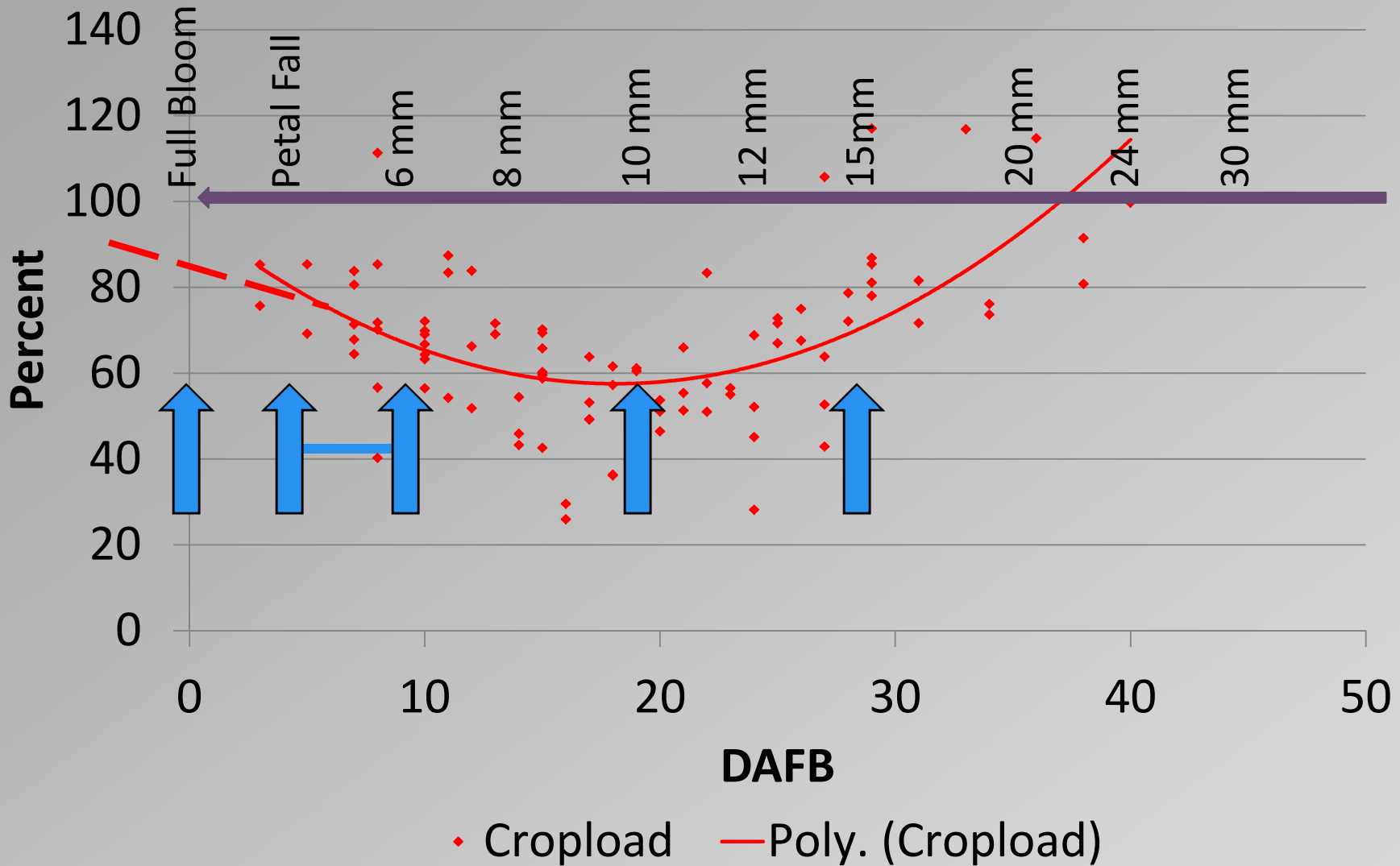
Natural Apple Background Sensitivity to Thinning



CROPLOAD = % FRUIT/TREE OF UTC

DAFB=Days After Full Bloom

Natural Apple Background Sensitivity to Thinning



CROPLOAD = % FRUIT/TREE OF UTC

DAFB=Days After Full Bloom

Nibble or Precision Thinning Concept

Precision Thinning

- Start thinning early
- Plan multiple sprays.



Precision Cropload Flow Chart

Initial Flower Load



Bloom

0 to 5%



Petal Fall

10 to 20%



10 mm

35%



16 mm



Target Fruit Number



Hand Thinning

5%

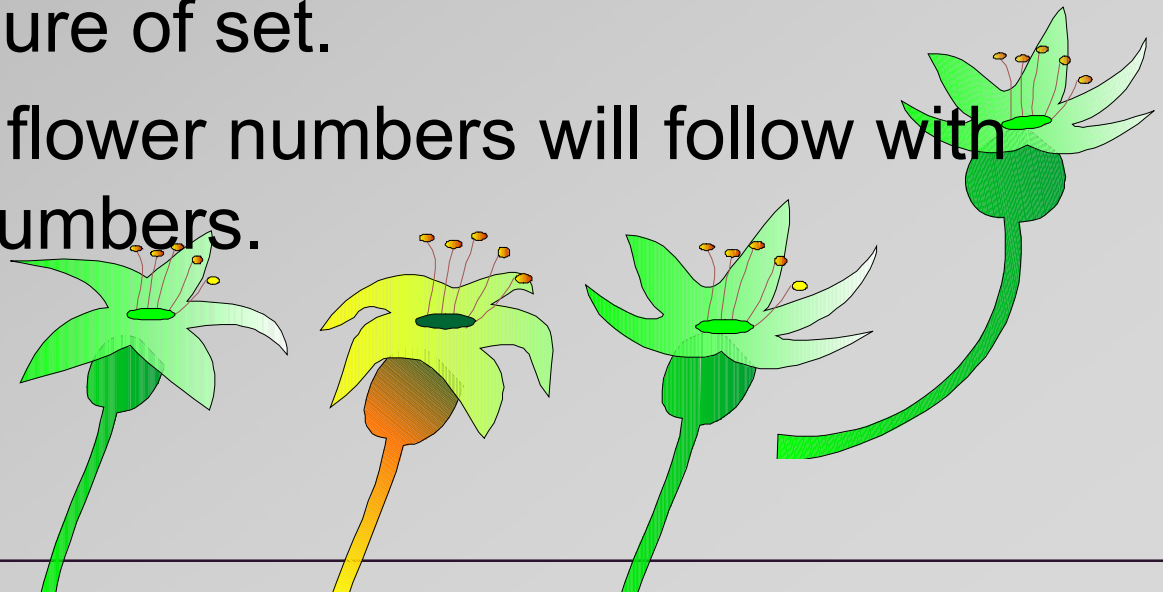
100 Apple/tree Target
Yet 400 cluster/tree or 2000 flowers/tree



Precision Thinning

We will often let the early thinning window go by because we are unsure of fruit set.

- Trees and fruits are resilient
- Frost, bee activity, pollination, fertilization is unknown.
- All make us unsure of set.
- Abundant initial flower numbers will follow with abundant fruit numbers.



Precision Thinning

Lets thin a little at every opportunity

Less Risk

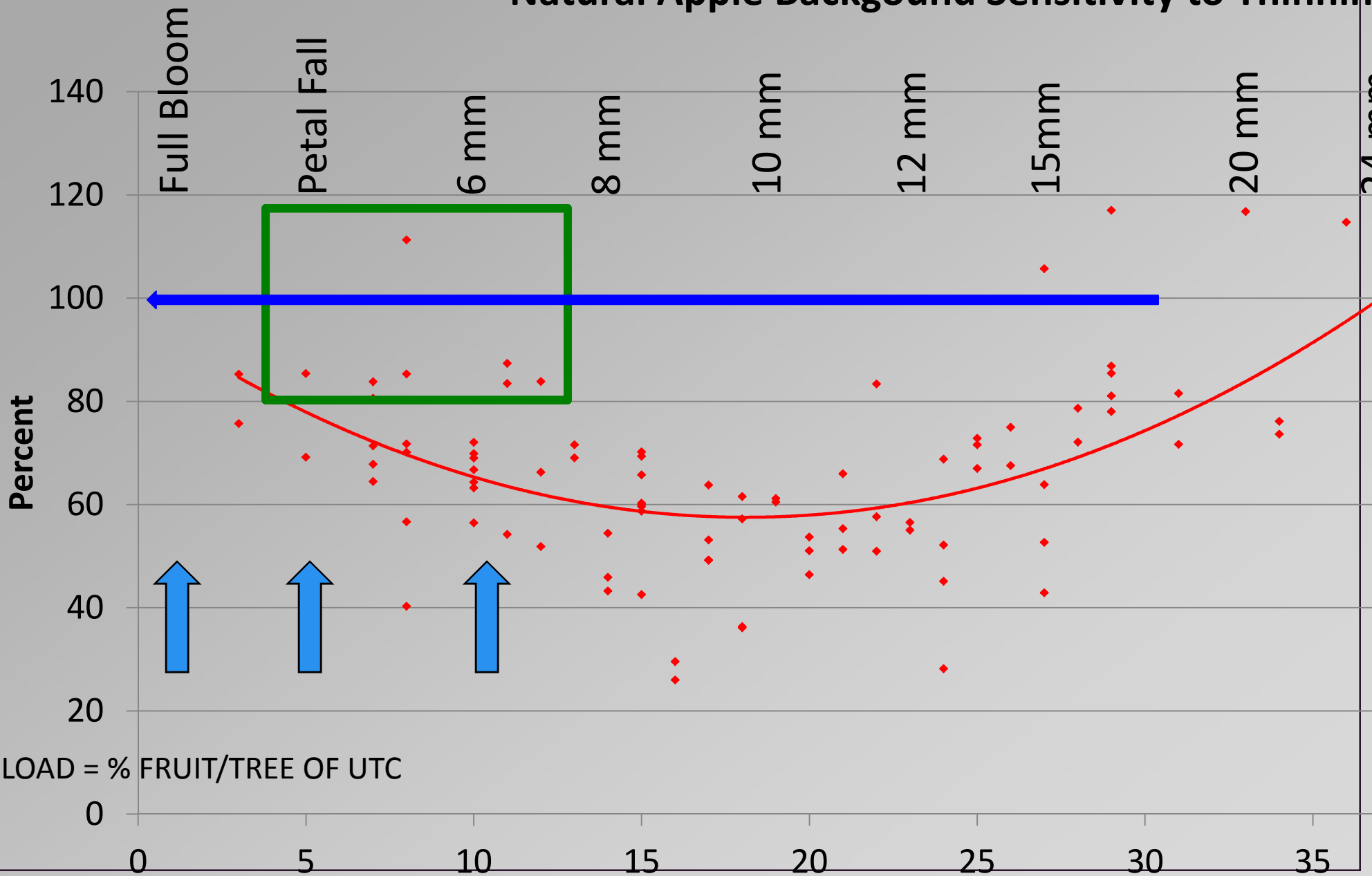
More Success

More Confidence



Precision Thinning

Natural Apple Background Sensitivity to Thinning



Predicting Fruitset Project 2014



Kim Kropf

- 
- A close-up photograph of a branch with several green apple buds. The buds are in various stages of development, some showing small dark spots. The background is filled with green leaves, some of which are slightly out of focus. The text is overlaid on the left side of the image.
- n Start dormant, set target
 - n Prune to correct budload
 - n Thin early, Full Bloom and Petal Fall

Precision Cropload Management

- 
- A close-up photograph of several green apple buds on a branch. The buds are small, round, and covered in fine hairs. Some buds have black markings on them. The background is filled with green leaves and branches, creating a natural, agricultural setting.
- n Nibble the cropload down
 - n Use **models** and Information
 - n Re-thin where needed.

Precision Cropload Management

Mark Clusters

- n 15 clusters/tree on 5 trees
- n 75 total clusters
- n Pink to bloom
- n Representative clusters
- n Not high or low in tree



Bethany Blattner

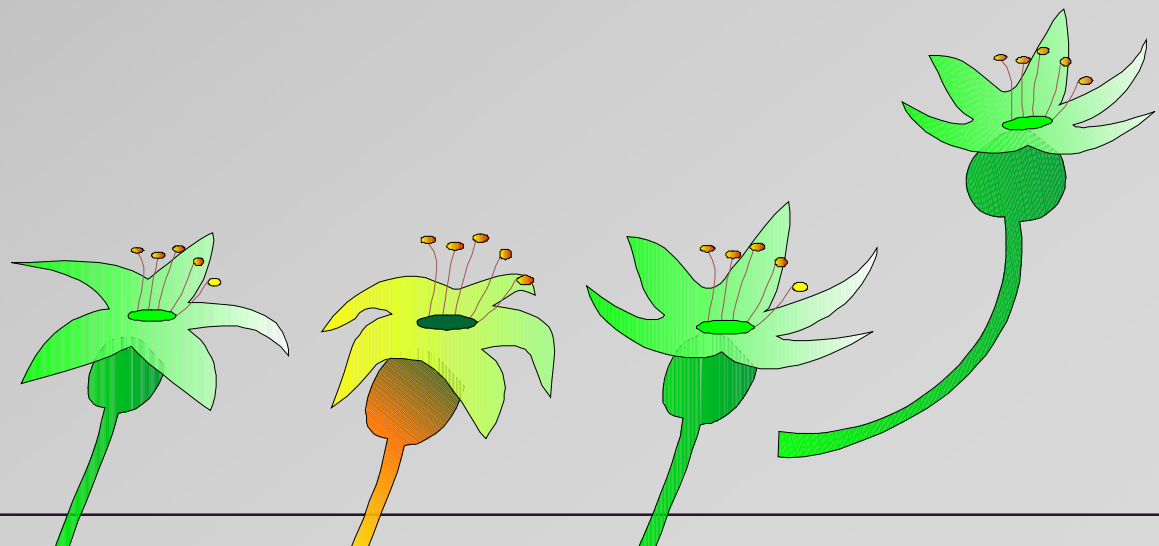
Jill Blattner



Predicting Fruitset Project 2014

Theory of Fruitset

- Temperature affect **demand of energy** (carbon) from fruit and other tree growth.
- When fruitlets demand energy that exceeds supply, the **weakest fruitlets drop**.
- When energy is abundant, **fruitlets set and resist thinning**.



MaluSim Carbohydrate Model

n Carbohydrate Model of Cornell University

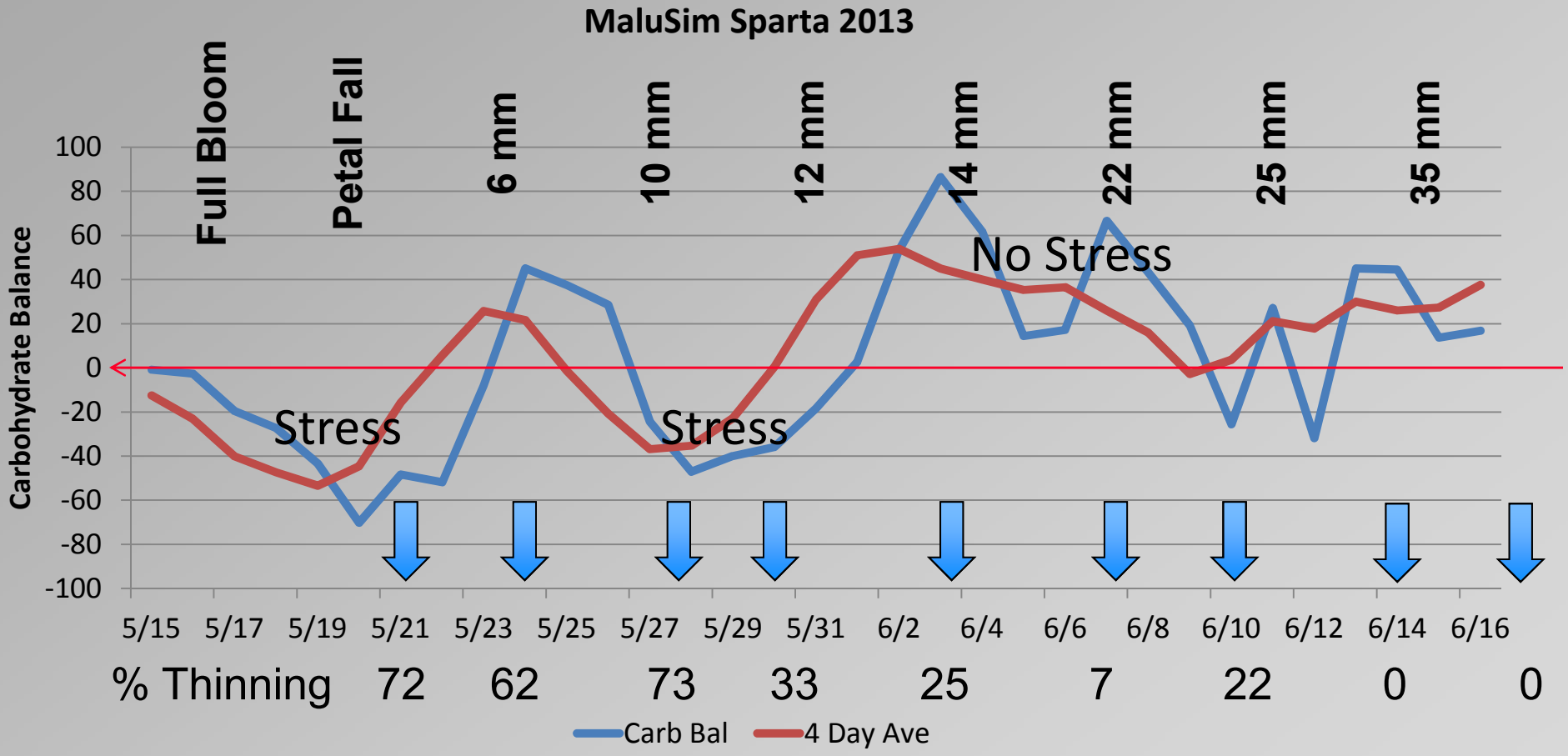
- Alan Lakso
- Terence Robinson



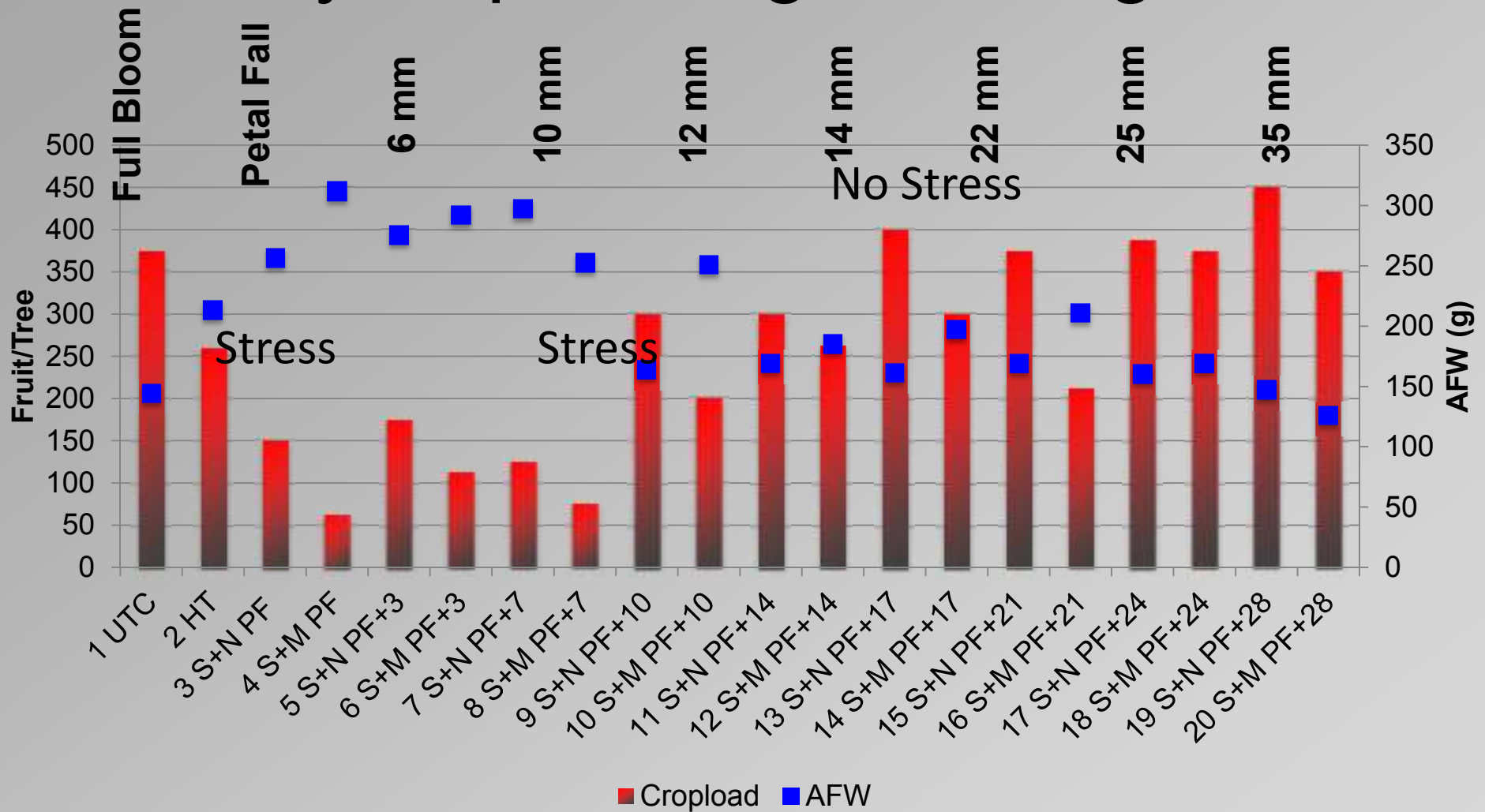
n Predicts Tree Carb Balance

- Max, Min, Solar Radiation, Latitude

MaluSim Sparta Carbohydrate Model 2013

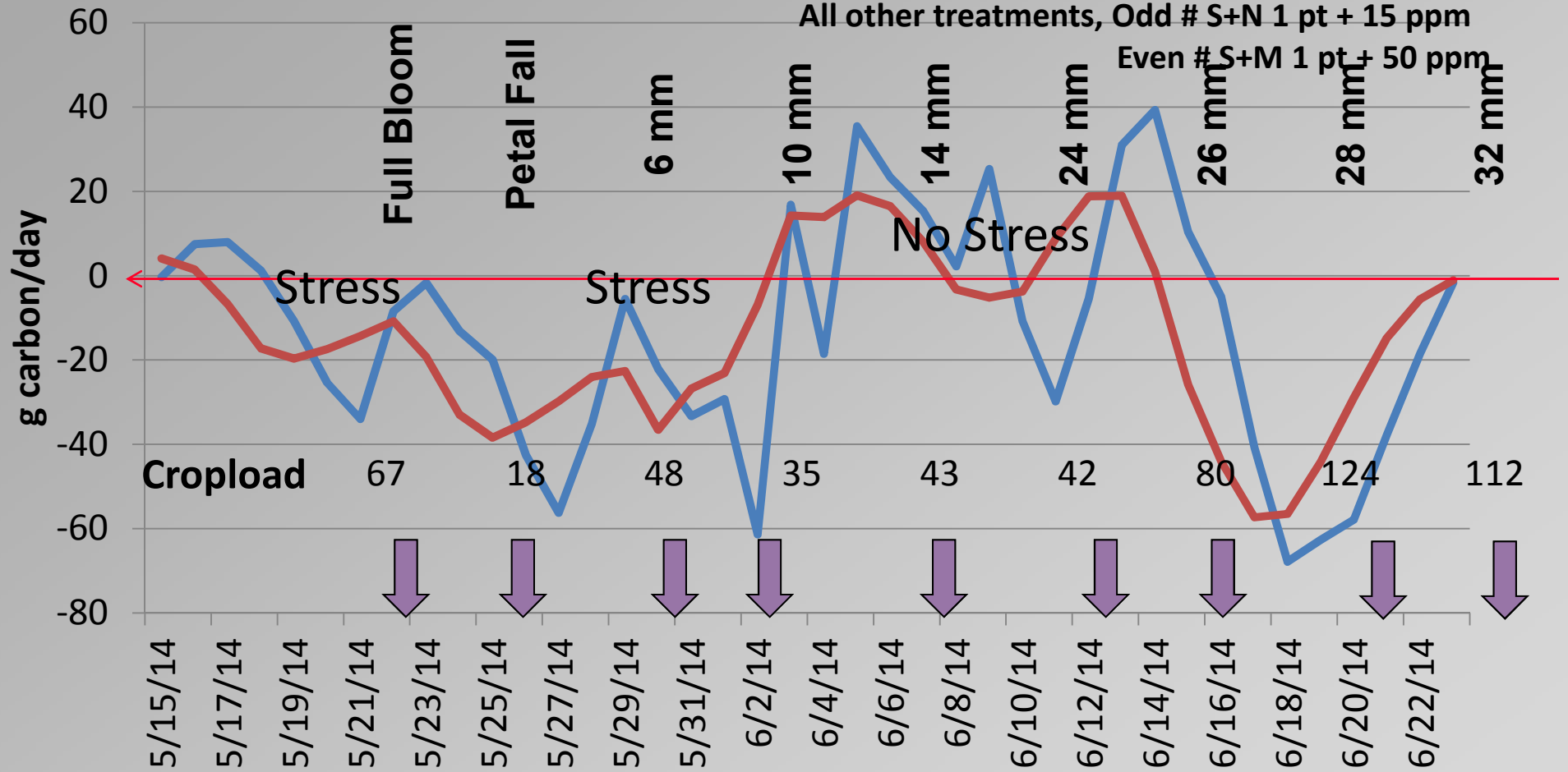


Honeycrisp Timing Thinning 2013



Sparta Carb 2014 6-17-14

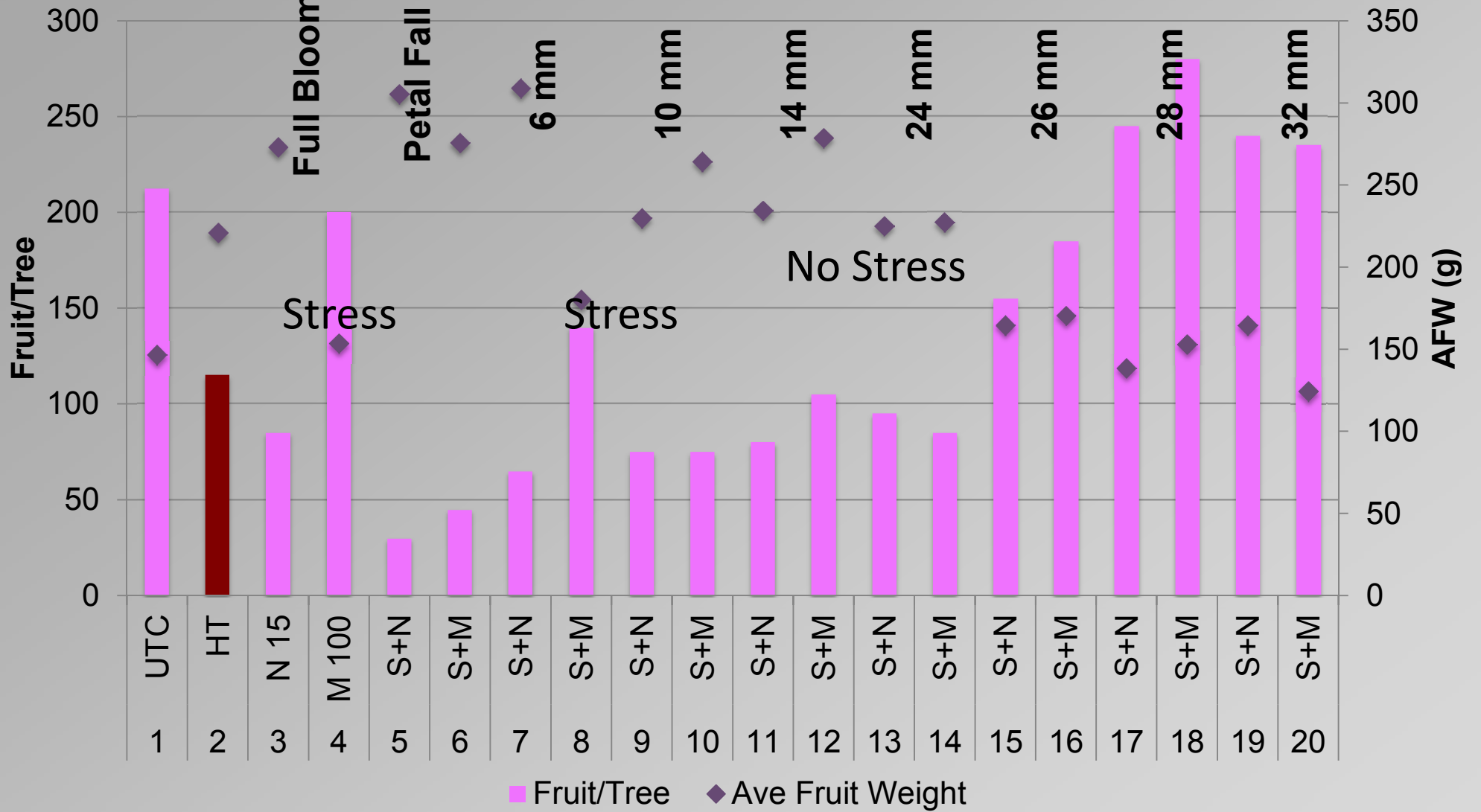
Full Bloom, #3 NAA 15 ppm, #4 Maxcel 100 ppm
 All other treatments, Odd # S+N 1 pt + 15 ppm
 Even # S+M 1 pt + 50 ppm



Thinning applications.

Balance 4 Day Ave

Honeycrisp Timing Thinning 2014



NAA 15 ppm Full Bloom Honeycrisp



MaxCel 100 ppm Full Bloom Honeycrisp



What is Precision Cropload Management?

1. Set a Target Cropload/Tree.
2. Prune to a Precise Budload/Tree.
3. Start Chemical Thinning Early.
4. Use Models to Predict Set.
5. Repeat Chemical Thinning as needed.
6. Hand Thin

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[Spring tree fruit meeting April 10 in Flint](#) 

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deficiencies or excesses of some elements are similar and symptoms may vary in the field. Diagnoses are further complicated when crops are deficient in more than one element at the same time. A limitation of managing apple nutrition based on symptoms and plant tree appearance is that symptoms indicate a problem already exists—reductions in growth, yield or fruit quality may have already occurred. The goal in fertilizing is to avoid nutritional problems. Symptoms of the nutrient disorders commonly seen in Michigan fruit plantings are described in “[Apple Nutrition \(pdf\)](#)” by Eric Hanson, MSU Department of Horticulture.

Varieties

For a list of apple varieties with pictures, see the [2011 Apple Variety Showcase \(pdf\)](#).

Pollination

See our [Pollination page](#) for information on apple pollination, pollinators, and pesticide use.

Thinning

[PGRs and Thinning Strategies \(pdf\)](#) - Thinning is the most difficult and important practice, yet necessary for a grower to perform each year. Making a mistake will compromise both this and next year’s crop, but today with a more scientific approach to thinning, we can achieve successful and consistent annual croploads.


[Predicting Fruitset 2014 \(xls\)](#) - This spreadsheet tool allows growers to evaluate ongoing fruitset and helps to access the effectiveness of their chemical thinning applications. Read more about [how to use the Predicting Fruitset spreadsheet \(pdf\)](#).



See Cherries



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Summary

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- Use chemical thinning
- **Gather & use information**
- Use predictive models, **Predicting Fruitset.**
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