# Precision Chemical Thinning - 2014

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# Precision Crop Load Management

PCLM is a strategy to manage the number of fruit per tree to a specific pre-determined target:

1. Prune to a specific flower bud number
2. Chemically thin to a specific fruit number
3. Hand thin to a specific fruit number

Precision Thinning is a strategy to manage the chemical thinning process better by:

1. Identifying a target number of fruit per tree
2. Using the carbohydrate model to predict thinning response
3. Using multiple applications of chemical thinners
4. Assessing results using the fruit growth rate model
5. Re-applying chemical thinners if needed.

# Calculation of Desired Fruit Number (Tall Spindle Examples)

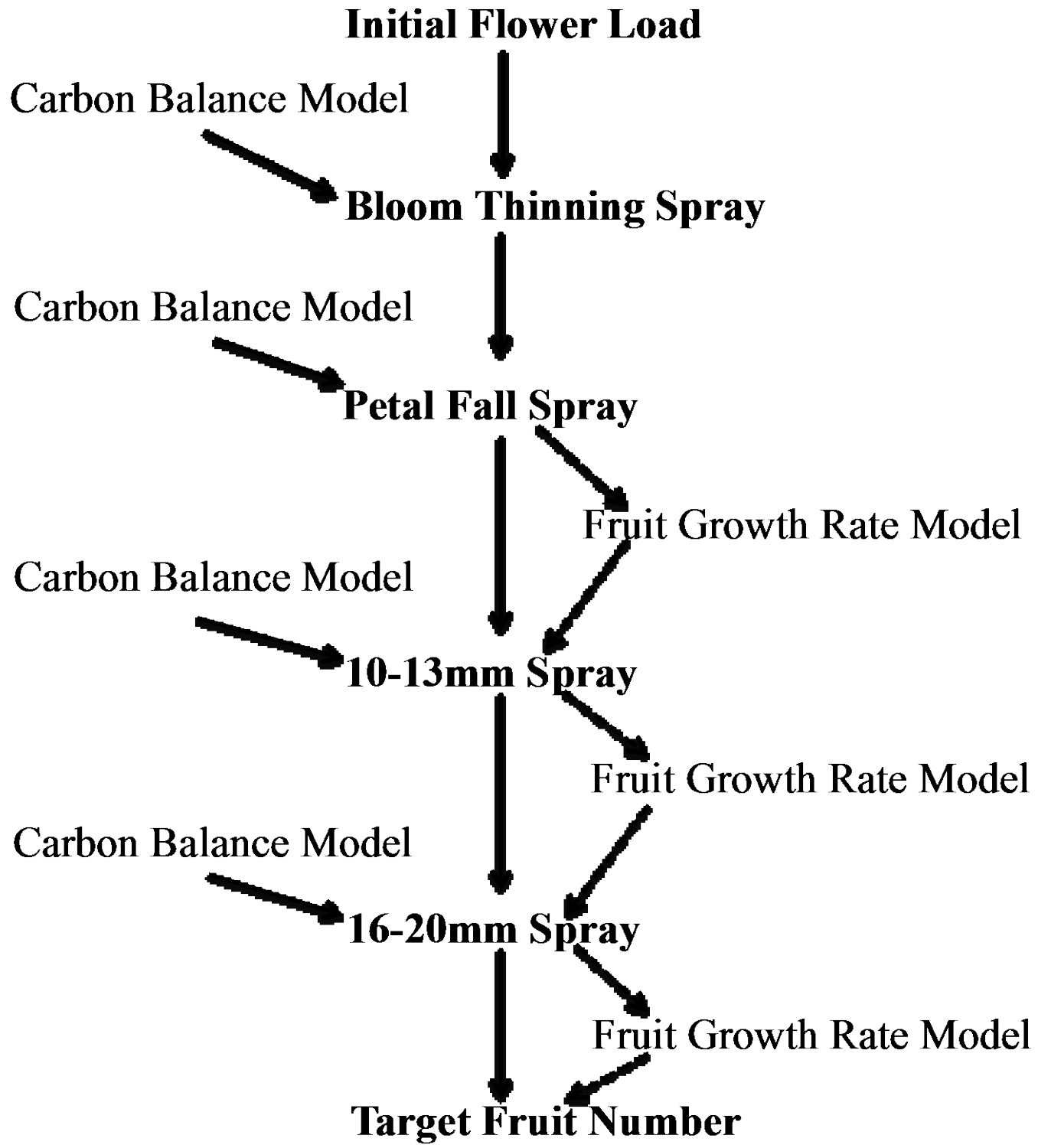
Determine desired yield/acre
Determine the desired fruit size acre

1500 bu/acre * 100 fruits/bu = 150,000 fruits/acre / 1210 trees/acre = 124 fruits/tree

If target yield is 1000 bu/acre then target fruit number = 83 fruits/tree

If target yield is 2000 bu/acre then target fruit number = 165 fruits/tree

# Steps in Precision Thinning



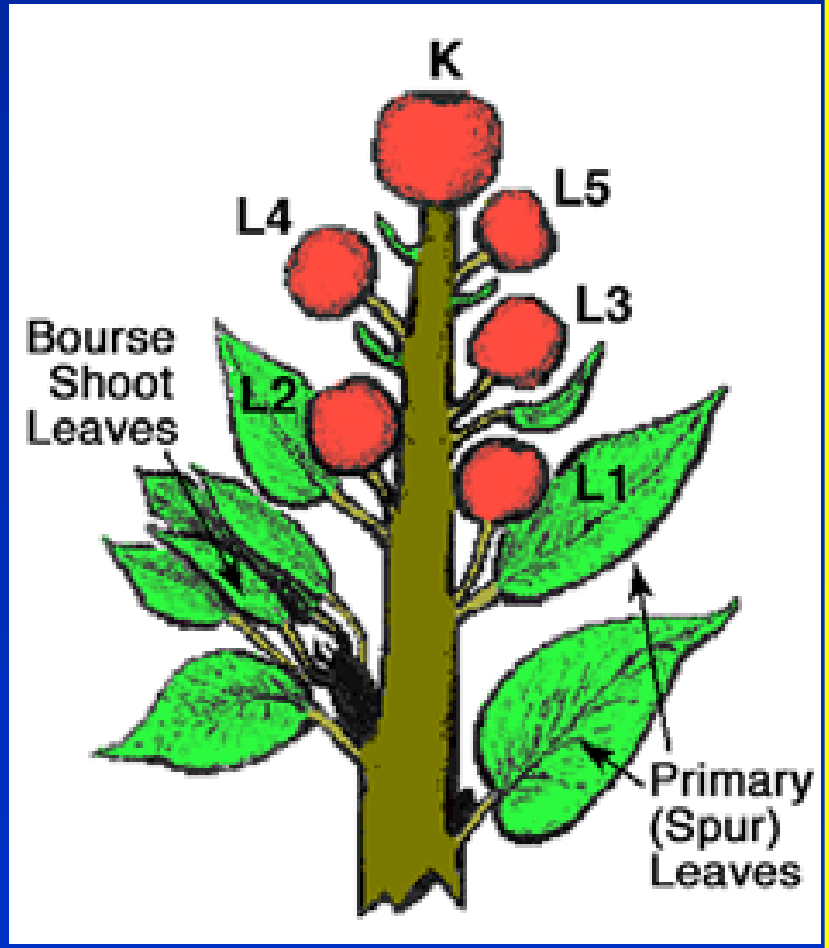
# Thinning Windows

- Bloom
  - Ammonium Thiosulfate (ATS) (2-2.5%)
  - Lime Sulfur (2-2.5%) and Fish Oil or Damoil (2%)  or Soybean oil (2%)
  - Promalin (2pt/acre)
  - Maxcel (64-128oz/acre)
  - NAA (4-8oz/acre)
- Petal Fall (fruits at 5-6mm)
  - Sevin (2pt/acre)
  - Maxcel (64-128oz/acre) + Sevin (2pt/acre)
  - NAA (4-8oz/acre) + Sevin (2pt/acre)
  - Maxcel + NAA
- Fruits at 10-13 mm
  - NAA (4-8oz/acre) + Sevin (2pt/acre)
  - Maxcel (64-128oz/acre)+ Sevin (2pt/acre)
  - Maxcel (64-128oz/acre) + NAA (3oz/acre)
- Fruits at 16-18 mm
  - NAA (4-8oz/acre) + Sevin (2pt/acre)+Regulaid (1pt/100gal)
  - Maxcel (64-128oz/acre)+ Sevin (2pt/acre) + Oil (1qt/100gal)
  - Ethrel (2-3pt/acre) + Oil (1qt/100gal)

# Using the Carbohydrate Model

## The Carbohydrate Theory of Thinning:

1. Fruitlets need carbohydrates to grow.
2. The tree allocates carbohydrates first to the shoot then to the fruits.
3. Weather conditions that result in low carbohydrate production often create a shortage of carbohydrates to support the growth of the fruits.
4. The weakest fruits do not receive enough carbohydrates and stop growing and begin to abscise.
5. Chemical thinners magnify the carbohydrate deficit and thus are more effective when applied during periods of natural shortage and are less effective when applied during periods of ample carbohydrate supply.



# Web version of Carbohydrate Model

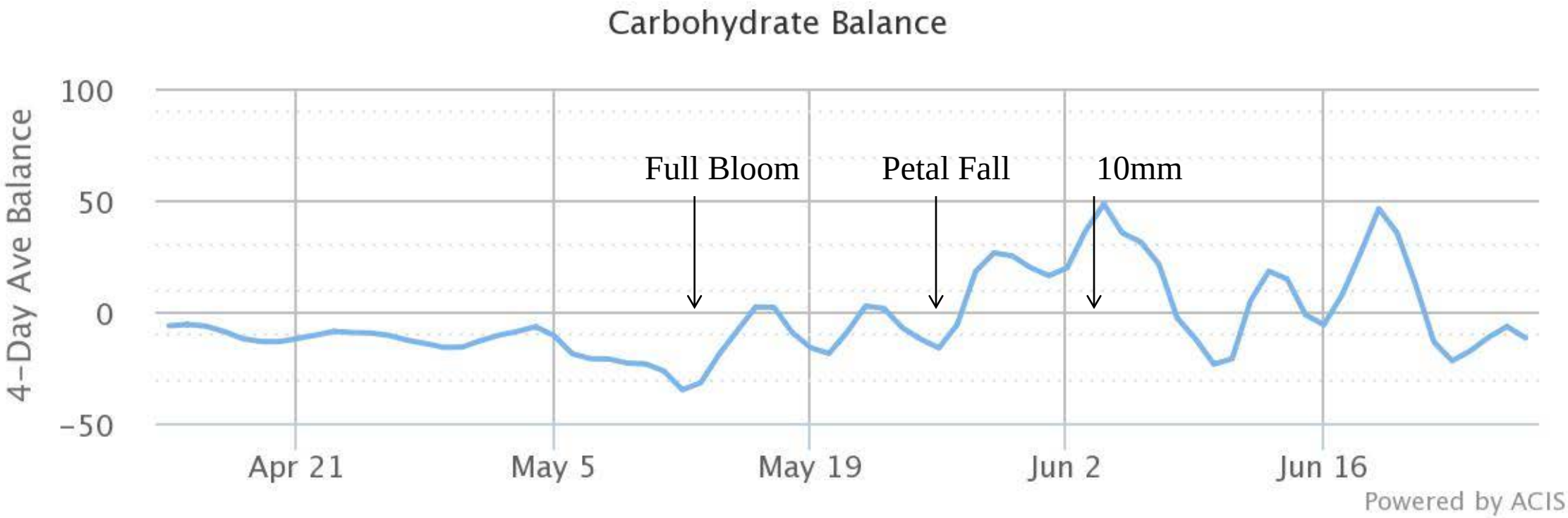
http://newa.cornell.edu

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 5/22 | 84 | 54 | 19.2 | 61.49 | 93.99 | -32.50 | 4.37 | Increase chemical thinner rate by 30% |
| 5/23 | 75 | 49 | 12.9 | 54.73 | 70.94 | -16.21 | 27.3 | Increase chemical thinner rate by 30% |
| 5/24 | 50 | 40 | 7.7 | 39.36 | 27.10 | 12.26 | 42.15 | Increase chemical thinner rate by 30% |
| 5/25 | 56 | 44 | 25.1 | 93.50 | 39.57 | 53.93 | 34.88 | Increase chemical thinner rate by 30% |
| 5/26 | 61 | 41 | 27.5 | 102.02 | 42.80 | 59.22 | 10.59 | Increase chemical thinner rate by 30% |
| 5/27 | 69 | 45 | 27.4 | 103.73 | 60.54 | 43.20 | -19.91 | Apply standard chemical thinner rate |
| 5/28 | 62 | 44 | 6.6 | 33.54 | 50.37 | -16.83 | -45.19 | Decrease chemical thinner rate by 30% |
| 5/29 | 80 | 59 | 14.5 | 58.79 | 102.04 | -43.25 | -51.49 | Decrease chemical thinner rate by 30% |
| 5/30 | 90 | 67 | 23.9 | 71.26 | 134.04 | -62.78 | -36.33 | Decrease chemical thinner rate by 15% |
| 5/31 | 93 | 65 | 23.2 | 68.42 | 126.34 | -57.92 | -4 | Apply standard chemical thinner rate |
| 6/1 | 88 | 67 | 20.2 | 65.97 | 108.00 | -42.02 | 28.36 | Increase chemical thinner rate by 30% |
| 6/2 | 77 | 57 | 20.7 | 89.22 | 71.82 | 17.41 | 50.57 | Increase chemical thinner rate by 30% |
| 6/3 | 62 | 51 | 26.5 | 114.18 | 47.65 | 66.53 | 34.17 | Increase chemical thinner rate by 30% |
| 6/4 | 67 | 46 | 27.2 | 119.36 | 47.84 | 71.52 | 6.75 | Increase chemical thinner rate by 30% |
| 6/5 | 67 | 52 | 22.1 | 102.98 | 56.18 | 46.80 | | |
| 6/6 | 58 | 54 | 2.3 | 0.59 | 48.77 | -48.18 | | |
| 6/7 | 60 | 55 | 3.8 | 12.10 | 55.24 | -43.15 | | |

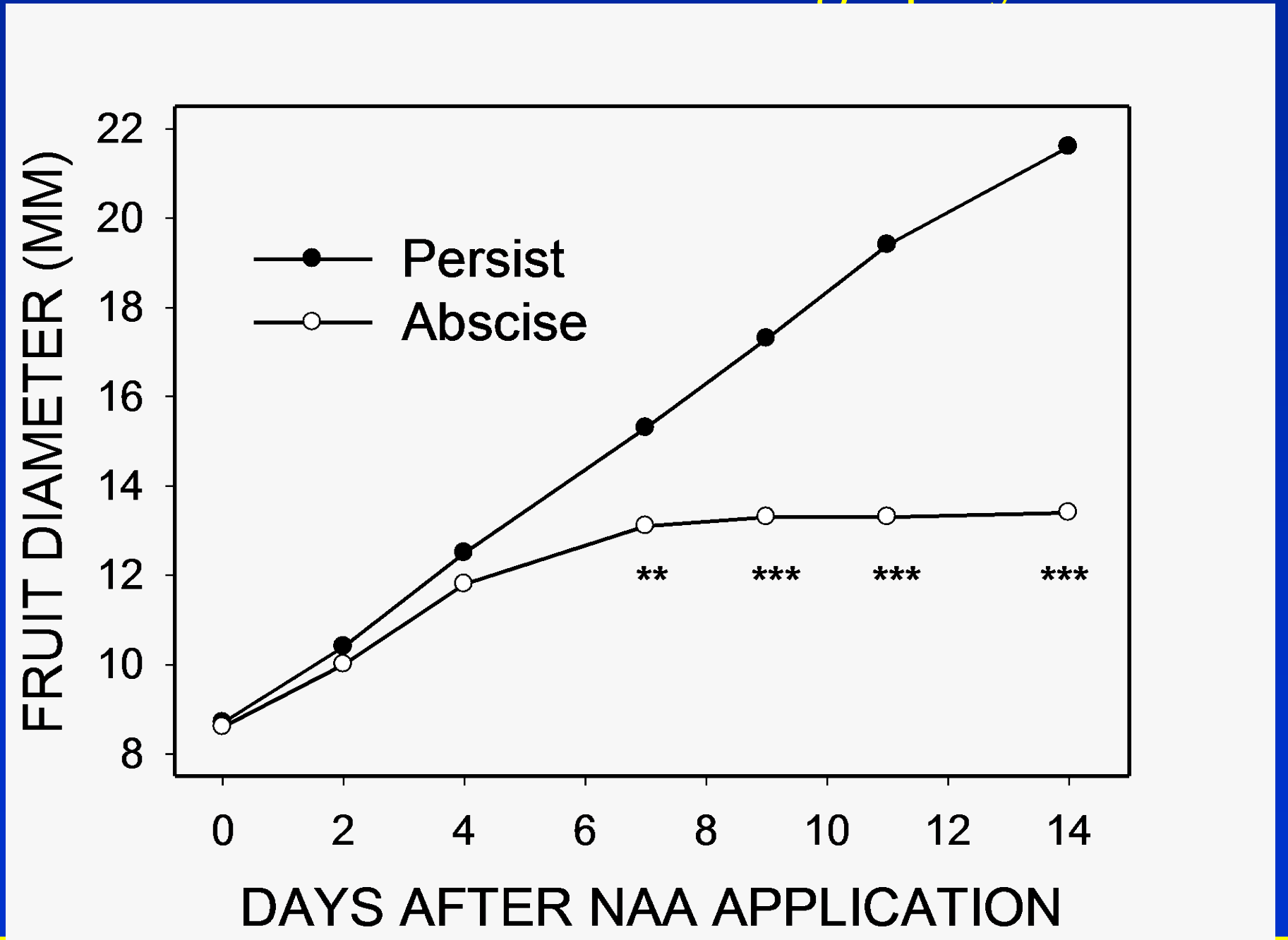
# Decision Rules We Use to Make Recommendations with the Carbohydrate Model

| 4-Day Av. Carb. Balance | Thinning Recommendation |
|---|---|
| +20g/day to +40g/day | Increase Chemical Thinning Rate by 30% |
| +20g/day to 0g/day | Increase Chemical Thinning Rate by 15% |
| 0g/day to -20g/day | Apply Standard Chemical Thinning Rate |
| -20g/day to -40g/day | Decrease Chemical Thinning Rate by 10% |
| -40g/day to -60 g/day | Decrease Chemical Thinning Rate by 20% |
| -60g/day to -80 g/day | Decrease Chemical Thinning Rate by 30% |
| < than -80g/day | Do not thin (many fruits will fall off naturally) |

# Medina Carbohydrate Balance 2014



# Use The Fruit Growth Model to Accurately Assess the Effect of a Thinning Spray



# Tagging Spurs and Measuring Fruit Diameter

1. At pink, select and tag 15 representative spurs per tree
   -Location of spurs must represent where the fruit is (top, middle and bottom of tree)
   -Do not tag flowering clusters on 1 year wood
   -Use a strip of orange ribbon and label for easy identification later (spur 1-15)
2. At exactly 3 days after each spray, label each fruit in each cluster with a number (1-5) using a permanent marker.
3. Measure and record diameter of each fruitlet with a digital caliper on day 3 after application
4. Re-Measure diameter of each fruitlet 5 days later on day 8 after application


# WNY Participants in Precision Thinning Group Effort 2014

Abbott
Buhr
Cahoon
Coene
Dominguez
Farrow
Furber
Hance
Oaks
Reisinger
Russell
Smith
Vandewalle

# Two Options in 2014 for Precision Thinning of Gala

Option 1

1. Apply a Bloom Spray
   - NAA (8oz/acre)
2. Apply a Petal Fall Spray (6mm)
   - NAA (6oz/acre) + Sevin (2pt/acre)
3. Apply a 12 mm Spray
   - Maxcel (96oz/acre) + Sevin (2pt/acre)
4. Apply an 18 mm spray (if needed)
   - Maxcel (96oz/acre) + Sevin (2pt/acre + Oil (1pt/100gal) (directed to the upper part of the tree)

Option 2

1. Apply a Petal Fall Spray (6mm)
   - NAA (6oz/acre) + Sevin (2pt/acre)
2. Apply a 12 mm Spray
   - Maxcel (96oz/acre) + Sevin (2pt/acre)
3. Apply an 18 mm spray (if needed)
   - Maxcel (96oz/acre) + Sevin (2pt/acre + Oil (1pt/100gal) (directed to the upper part of the tree)

# Two Options in 2014 for Precision Thinning of Honeycrisp

Option 1

1. Apply a Bloom Spray
    1. NAA (8oz/acre)
2. Apply a Petal Fall Spray (6mm)
    - NAA (8oz/acre) + Sevin (2pt/acre)
3. Apply a 12 mm Spray
    - NAA (6oz/acre) + Sevin (2pt/acre)
4. Apply an 18 mm spray (if needed)
    - Sevin (2pt/acre + Oil (1pt/100gal) (directed to the upper part of the tree)

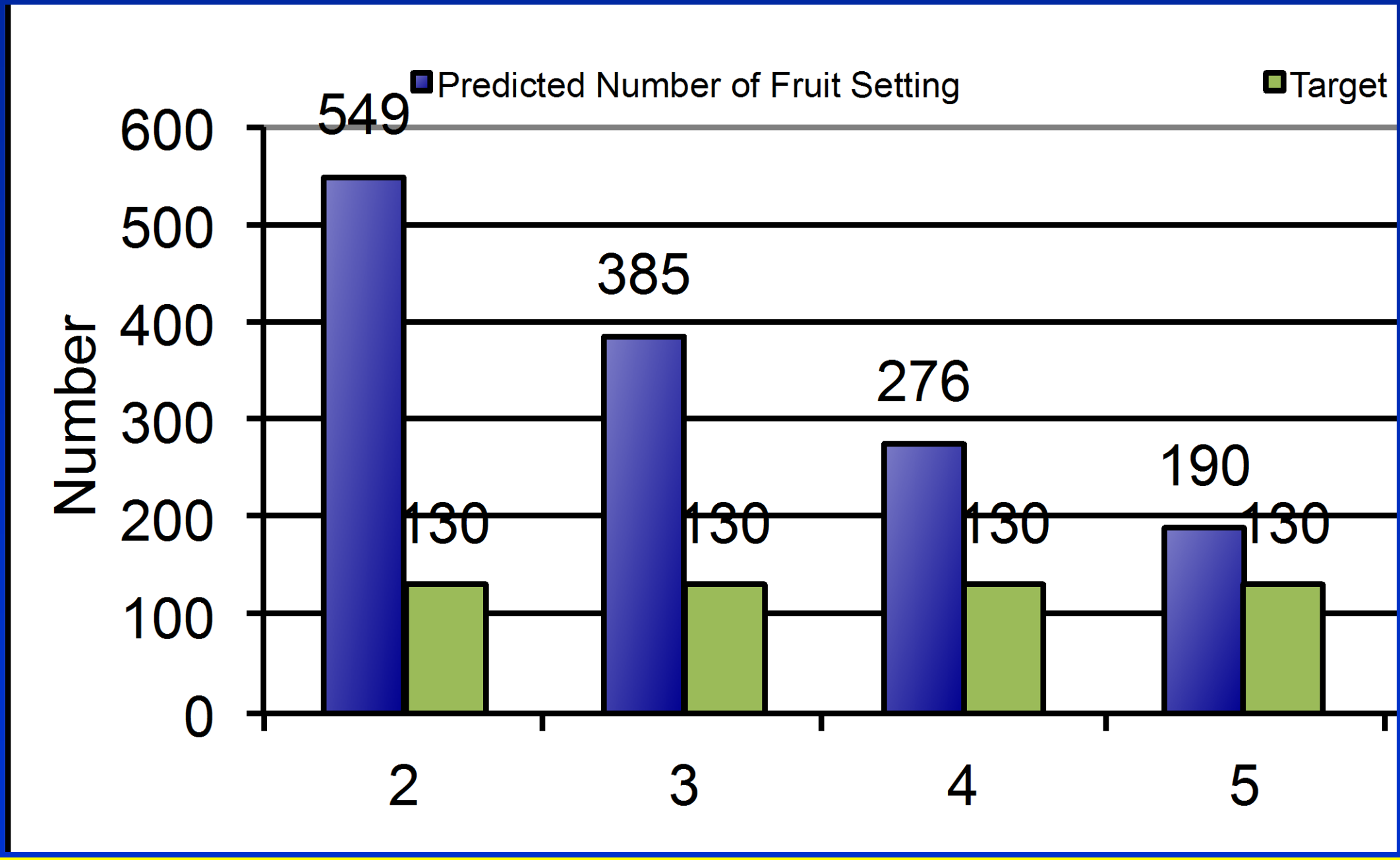
Option 2

1. Apply a Petal Fall Spray (6mm)
    - NAA (8oz/acre) + Sevin (2pt/acre)
2. Apply a 12 mm Spray
    - NAA (6oz/acre) + Sevin (2pt/acre)
3. Apply an 18 mm spray (if needed)
    - Sevin (2pt/acre + Oil (1pt/100gal) (directed to the upper part of the tree)

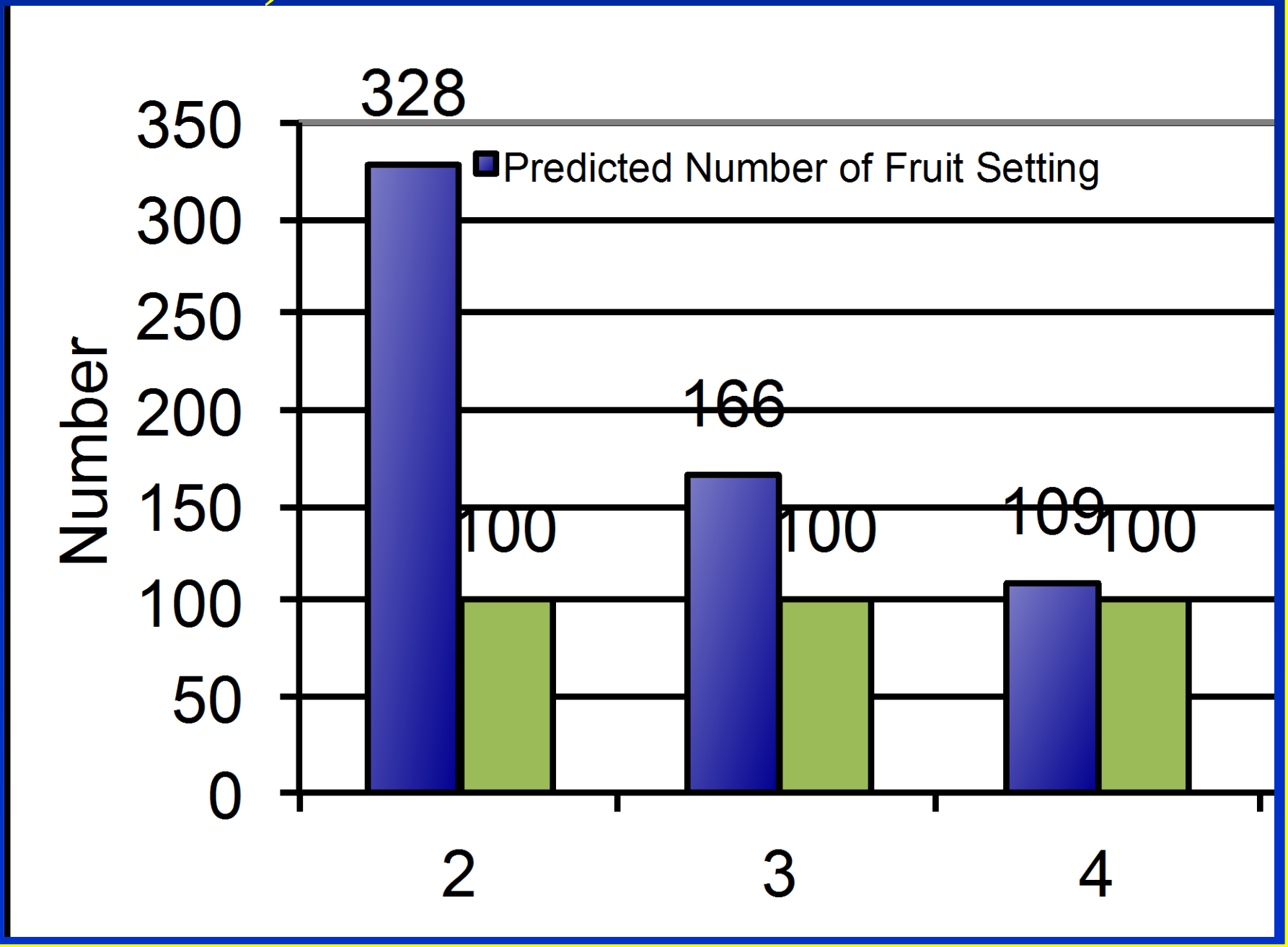
# Results of the Precision Thinning Protocol in 2014

| Orchard | Variety | Flower Buds | Target Fruit Number | Number of Fruits after 2-3 applications | Number of Extra Fruits | Recomendation |
|---|---|---|---|---|---|---|
| Cahoon | Gala | 276 | 185 | 500 | 315 | Need another full spray of Maxcel+Sevin |
| Geneva | Gala | 260 | 130 | 276 | 146 | Need another 1/2 dose spray of Maxcel+Sevin |
| Jeff Smith | Gala | 451 | 290 | 698 | 408 | Need another full spray of Maxcel+Sevin |
| Lamont | Gala | 94 | 65 | 152 | 87 | Need another 1/2 dose spray of Maxcel+Sevin |
| Reisinger | Gala | 426 | 193 | 562 | 369 | Need another full spray of Maxcel+Sevin |
| Vandewalle | Gala | 292 | 150 | 662 | 512 | Need another full spray of Maxcel+Sevin |
| Vandewalle | Gala | 400 | 150 | 909 | 759 | Need another full spray of Maxcel+Sevin |
| Vandewalle | Gala | 247 | 88 | 369 | 281 | Need another full spray of Maxcel+Sevin |
| Vandewalle | Gala | 519 | 160 | 1045 | 885 | Need another full spray of Maxcel+Sevin |
| Buhr | HC | 230 | 100 | 98 | -2 | **Thinning is done. Congratulations** |
| Cahoon | HC | 454 | 185 | 424 | 239 | Need another full spray of NAA+Sevin |
| Geneva | HC | 260 | 100 | 114 | 14 | **Thinning is done. Congratulations** |
| Hance | HC | 385 | 130 | 246 | 116 | Need another 1/2 dose spray of NAA+Sevin |
| Jeff Smith | HC | 906 | 177 | 411 | 234 | Need another full spray of NAA+Sevin |
| Lamont | HC | 83 | 35 | 95 | 60 | Need another 1/2 dose spray of NAA+Sevin |

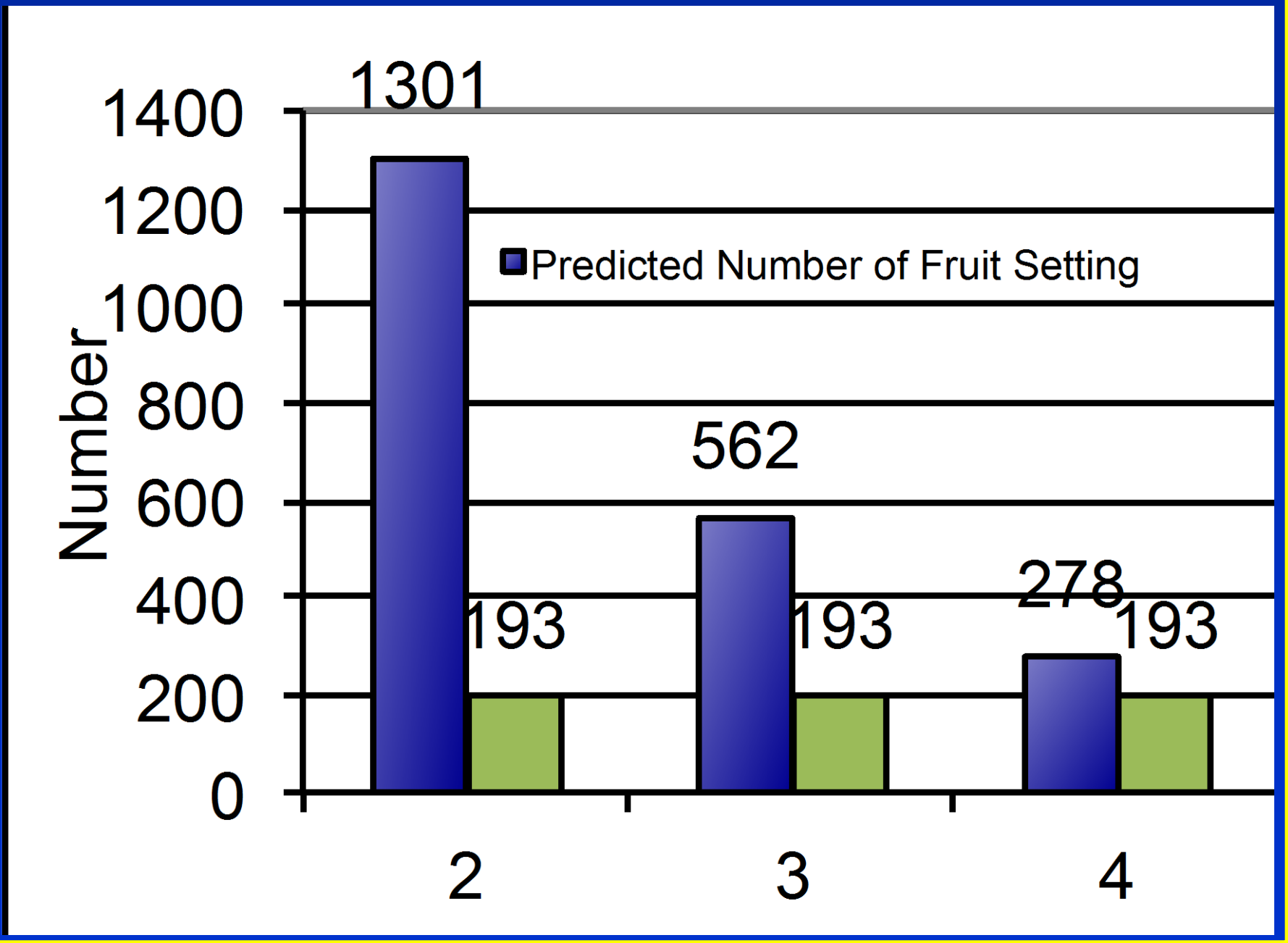
# Gala fruit set at Geneva after 4 sprays with an initial bud load of 2 (1300 flowers)



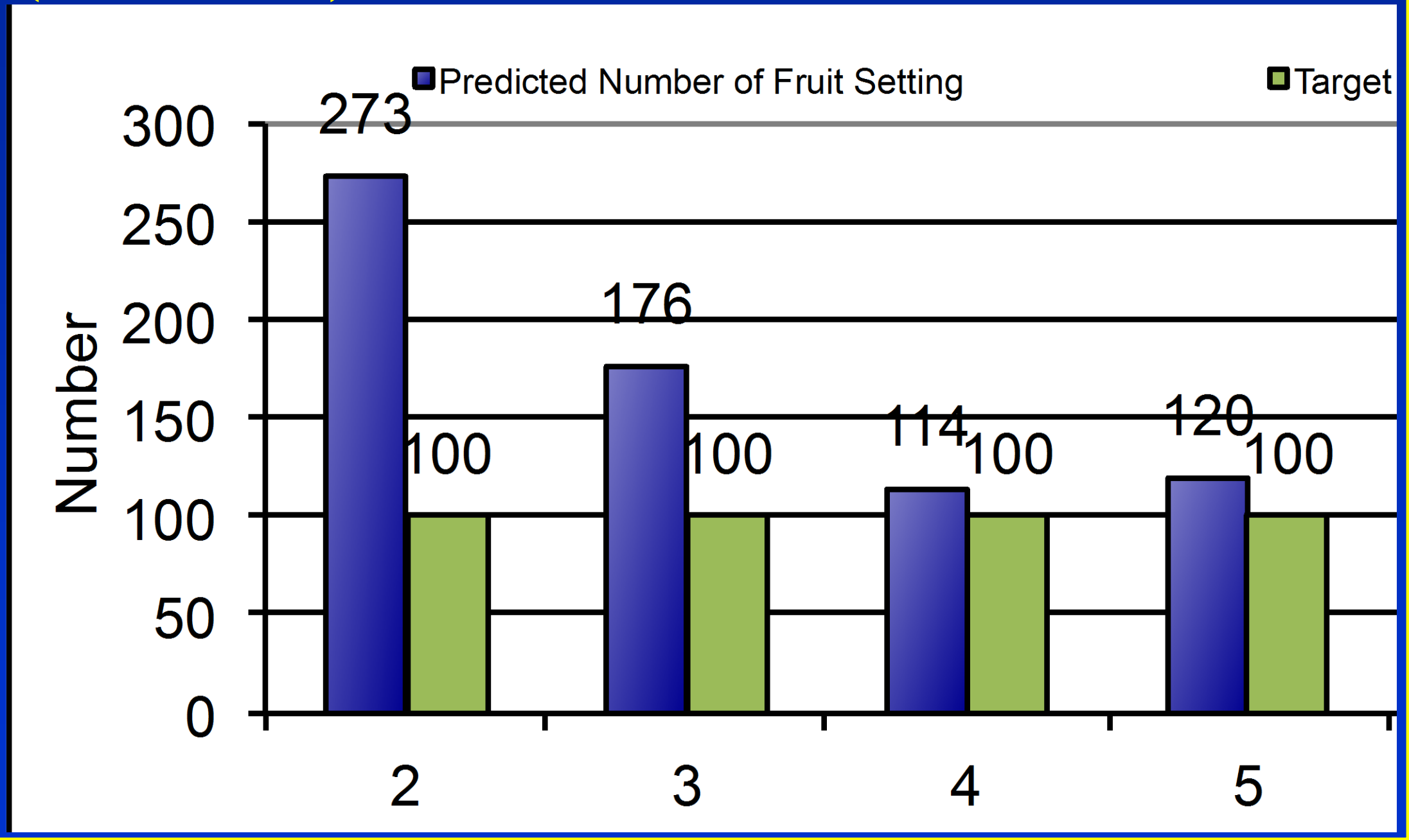
# Gala fruit set at Lyndonville after 3 sprays with an initial bud load of 1.38 (690 flowers)



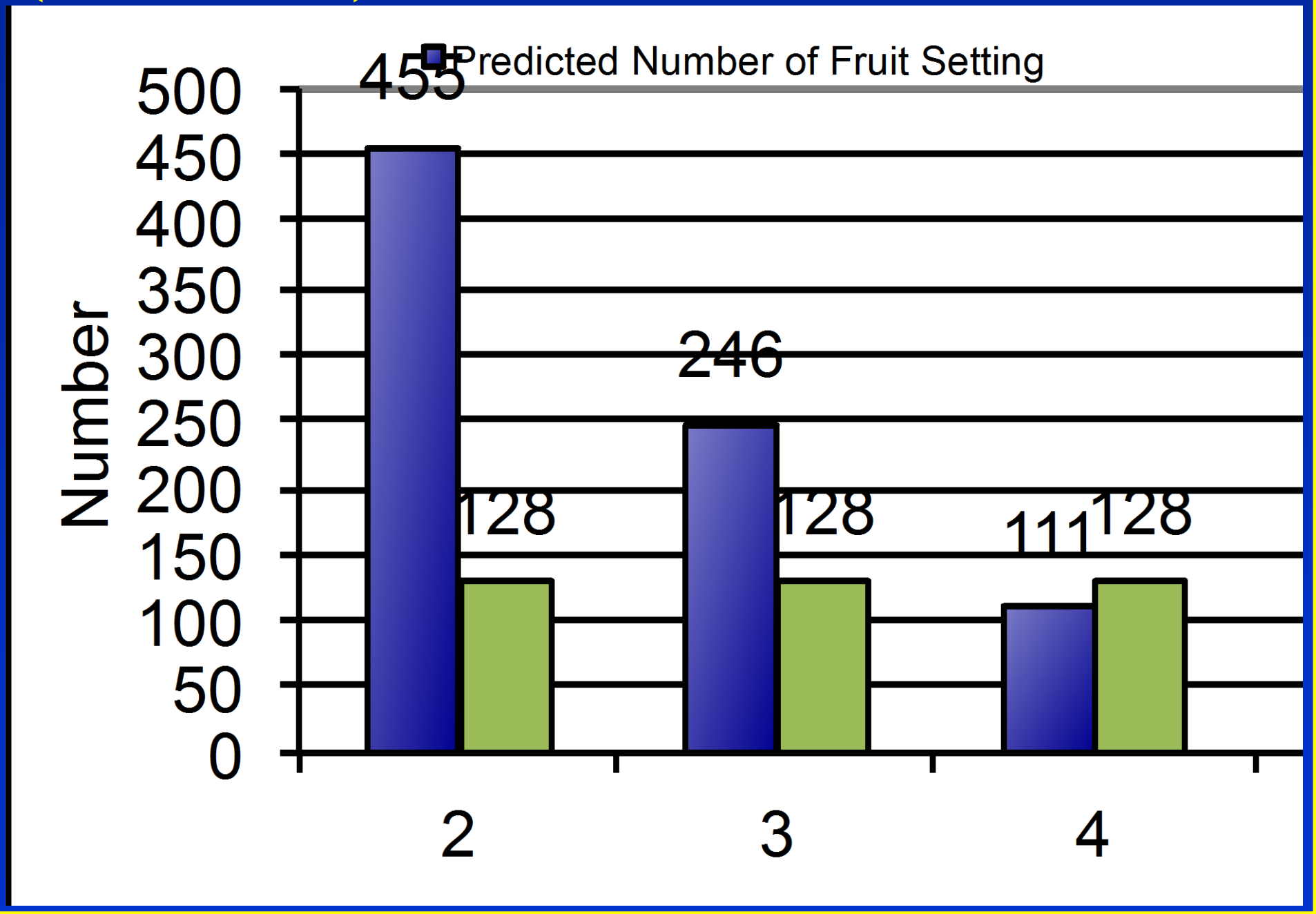
# Gala fruit set in CNY after 3 sprays with an initial bud load of 2.2 (2130 flowers)



# HC fruit set at Geneva after 4 sprays with an initial bud load of 2.6 (1300 flowers)

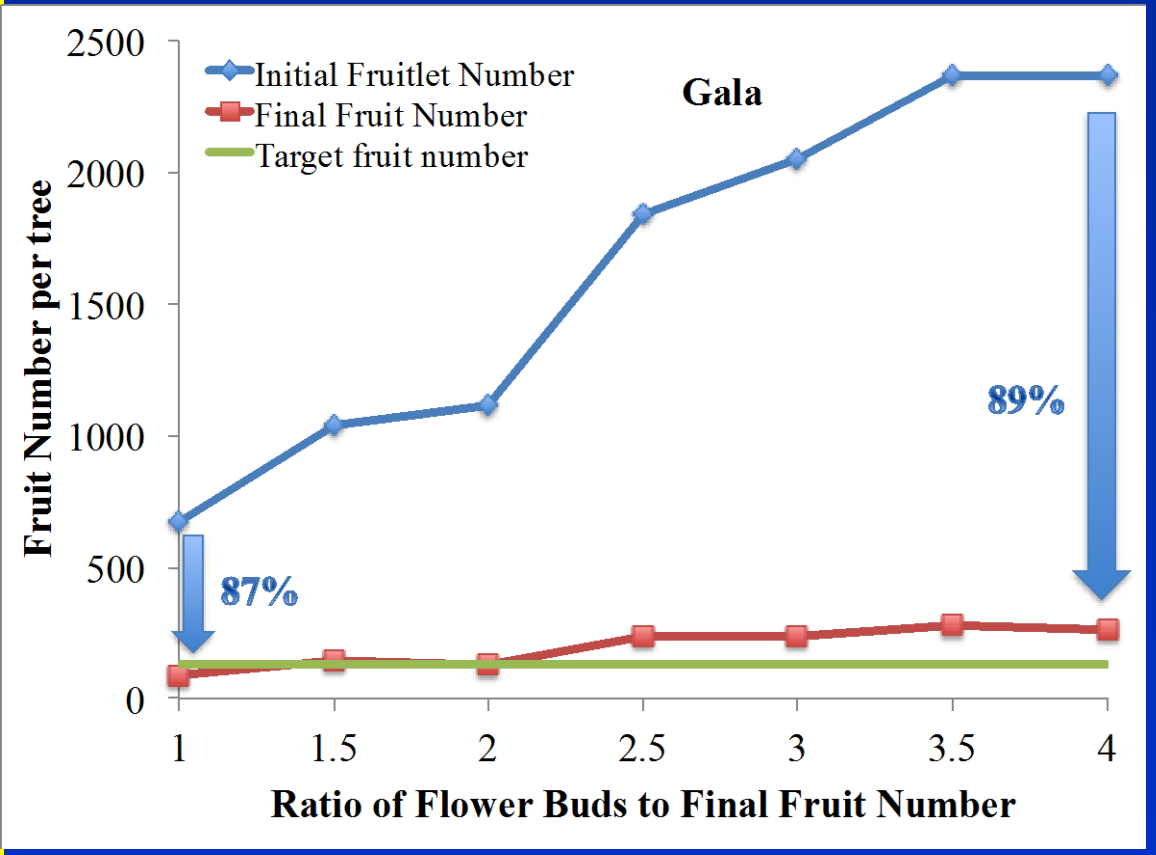


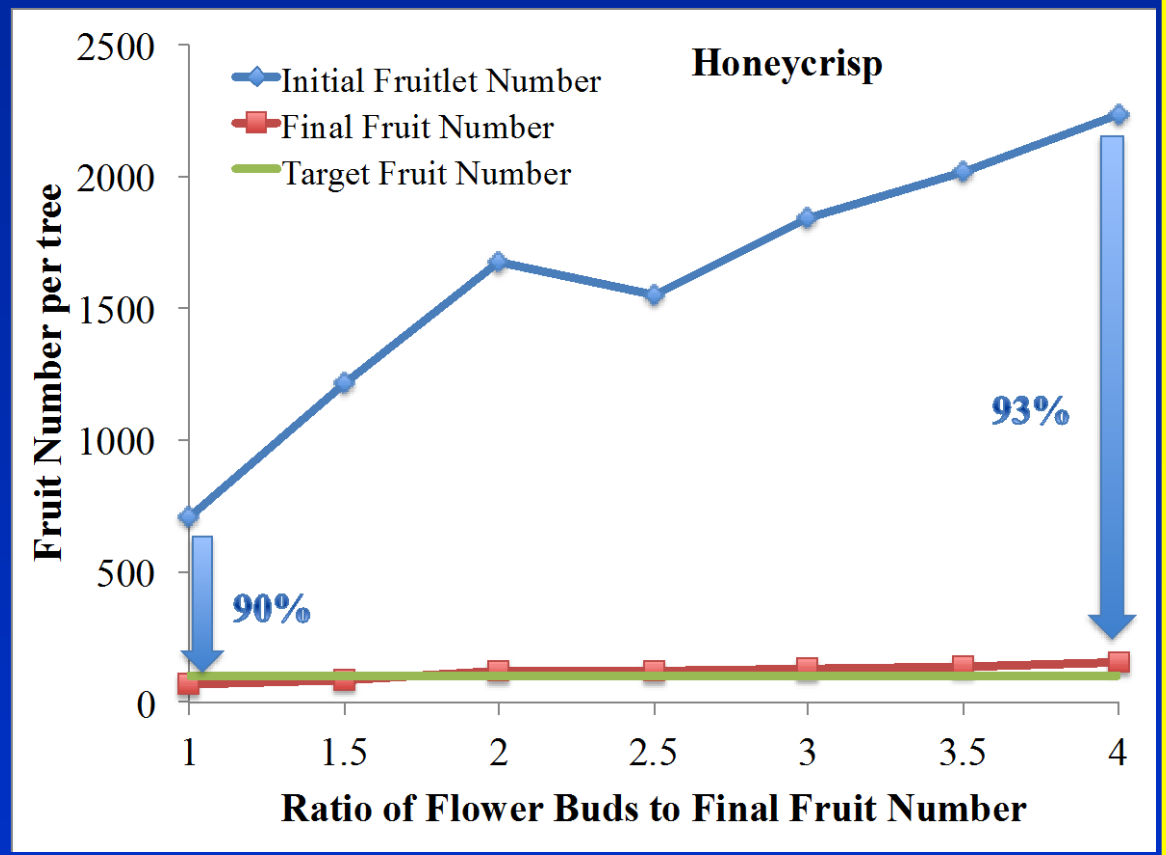
# Honeycrisp fruit set in CNY after 3 sprays with an initial bud load of 1.8 (1185 flowers)



# Pruning to Reduce Bud Load
# Target 1.5 flower buds : 1 final fruit

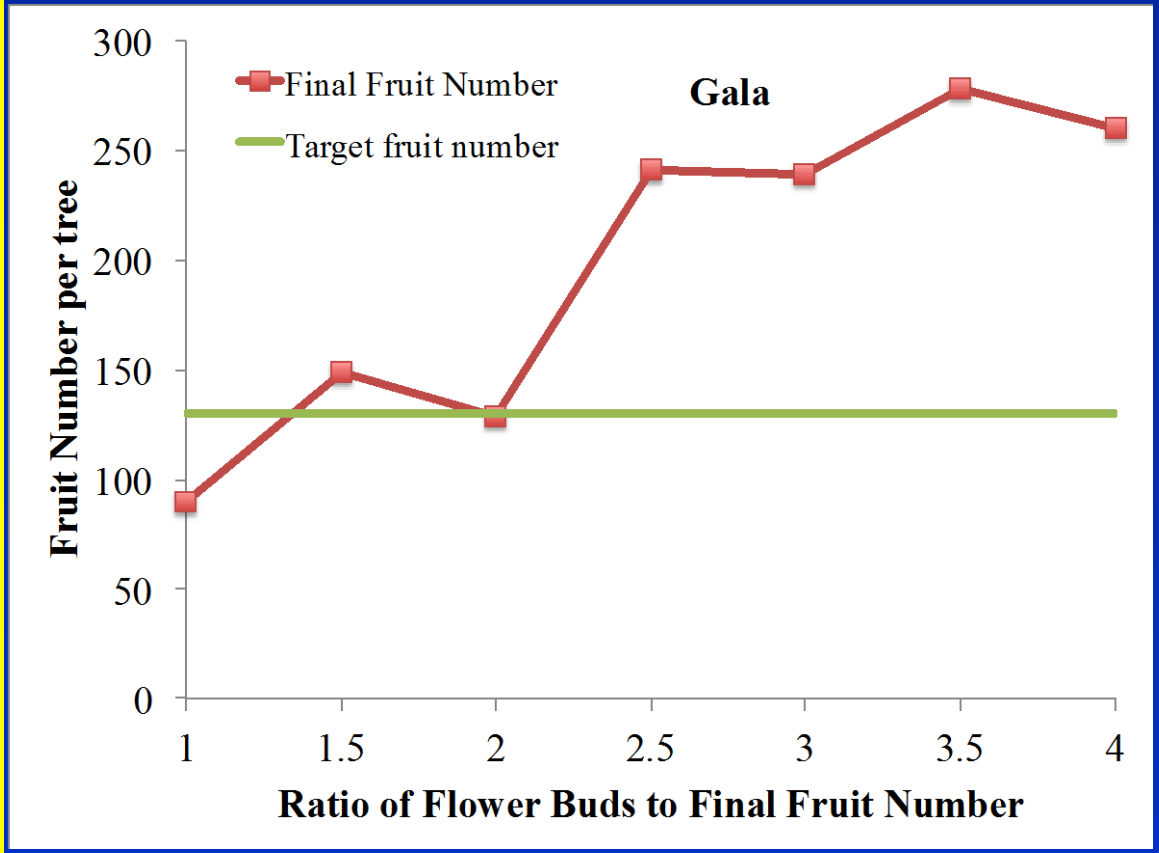
# Gala and Honeycrisp Bud Load Study

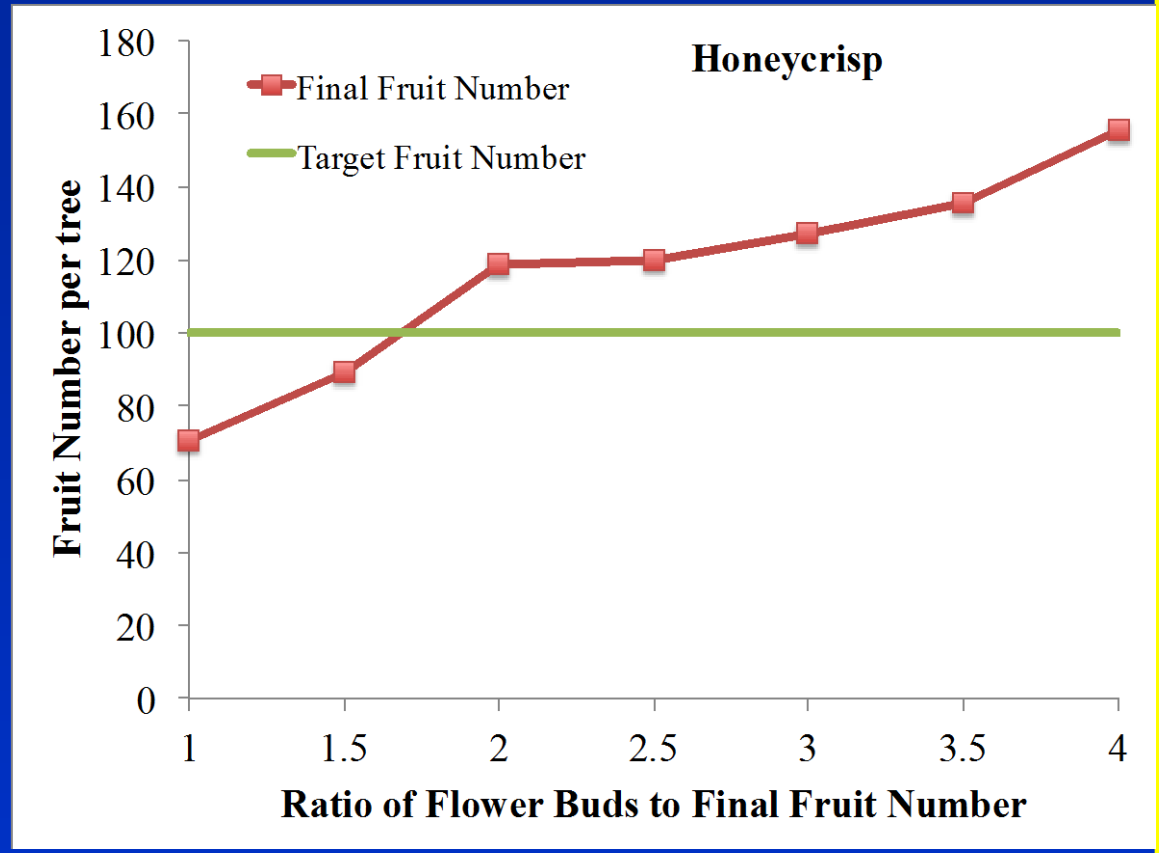



- Leaving more buds resulted in more final fruit/tree
- The percent reduction in fruit numbers with and aggressive thinning program was quite similar regardless of initial flower bud load.

# Gala and Honeycrisp Bud Load Study




- Leaving more than 2 buds : final fruit resulted in a large job of hand thinning
- Was my target right?

# Conclusions from the Group Precision Thinning in 2013 and 2014

1. Both Gala and Honeycrisp needed more pruning to reduce bud load to 1:1.5
2. Most Gala blocks did not thin enough in both 2013 and 2014 and had significantly more fruit than the target fruit number
   - This required significant hand thinning
3. Most Honeycrisp blocks did not thin enough in 2013 but some slightly overthinned in 2014
4. Bloom thinning sprays were quite effective in 2013 but not in 2014
   - Bloom sprays of Maxcel did a nice job
5. The 10-12mm spray was not effective in 2013 but gave good thinning in 2014
6. The sequential sprays gave excellent crop load control.

# Precision Thinning Group Effort in 2015

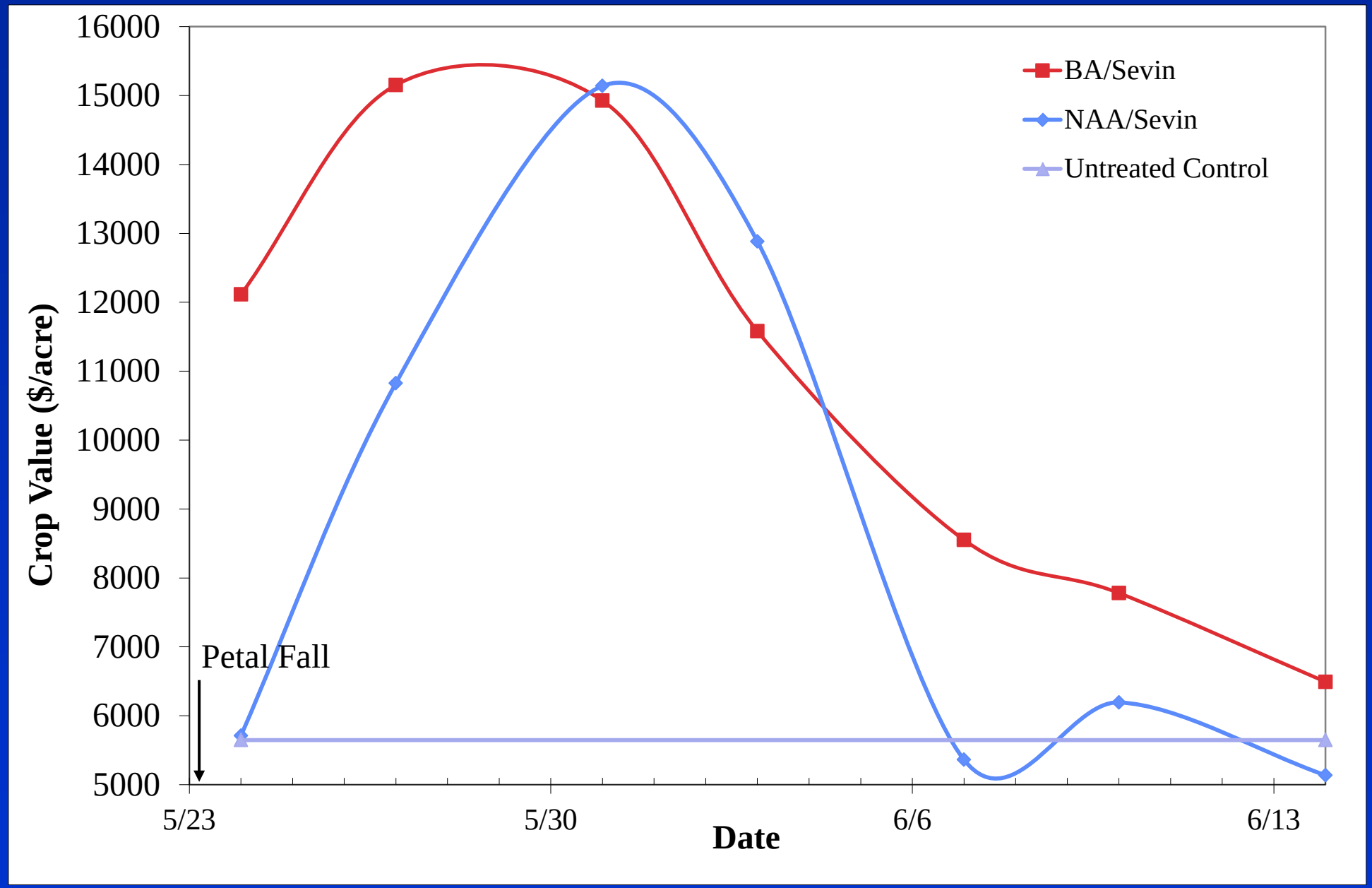
Protocol for group effort of willing participants in 2015

1. Select a mature orchard of either Gala or Honeycrisp.
2. Count flowering clusters on 5 representative trees at pink.
3. Calculate target fruit number for a high yield.
4. Tag 15 spurs per tree on each of 5 representative trees (75 total spurs) at pink.
5. Apply one of two spray protocols of thinning sprays
6. Use the carbohydrate model to adjust rates up or down based on model recommendations
7. Measure fruit diameters on 75 spurs 4 times (3 and 8 days after petal fall spray, 8 days after 12mm spray and 8 days after 18 mm spray)
8. Send the data within 24 hours after each 8 day measurement to Terence Robinson
9. Get back an assessment within 24 hours of thinning progress before next spray

# Take-Home Plan to Manage Crop Load in 2014:

1. Precision Prune
    1. Count flower buds on 5 representative trees per variety.
    2. Prune to 1.5 buds per desired fruit number by removing 1-3 of the larger limbs
    3. Columnarize (simplify) all remaining branches
2. Chemically thin using the “Precision Thinning Program”
    1. Begin with a full bloom spray
    2. Apply a petal fall thinning spray
    3. Assess response
    4. If necessary, apply a thinning spray at 10-13mm
    5. Re-assess response
    6. If necessary apply a thinning spray at 18-20mm
3. Hand thin with Precision Hand Thinning
    - Count number of fruits per tree
    - Calculate target fruit number
    - Zone thin using multi-level platform with each person removing his assigned number of fruits.

# Is Precision Thining Worth the Effort?




Thank You for Your Attention
Questions?
Plan to attend:
• Pruning workshop Feb. 12, 2015 Orleans County
• Precision Thinning Training in Early May 2015