

# Using the Pollen Tube Growth Models on NEWA

- <http://ptgm.newa.cornell.edu/>
- OR --
- <http://newa.cornell.edu/> and select “Apple Pollen Tube Growth” under “Crop Management”

The screenshot displays the NEWA website interface. At the top, a blue navigation bar contains the following links: Weather Data, Pest Forecasts, Station Pages, Crop Management, Crop Pages, and Weather S. The 'Crop Management' link is highlighted, and a dark brown dropdown menu is open, listing the following options: Apple Carbohydrate Thinning, Apple Irrigation, Apple Evapotranspiration, Apple Frost Risk, Growing Degree Days, Degree Day Calculator, Turf Evapotranspiration Map, Soil Temperature Map, Other Crop Tools, and Apple Pollen Tube Growth. The 'Apple Pollen Tube Growth' option is highlighted with a red rectangular box. On the left side of the page, there is a section for the National Weather Service Forecast, featuring the NWS logo and a form to enter a city, state, or zip code. Below this is an 'About NEWA' section with a link to 'About NEWA'. A 'Map' button is also visible in the lower center of the page.

+ Block

Blocks 2

1

Block List

## Step 1: Select “+ Block” to create a site specific model

The **pollen tube growth model (PTGM)** was developed at Virginia Tech. It is based on apple pollen tubes growth rates that were empirically derived under controlled temperature conditions. Model validation has been conducted in Washington, Virginia, and New York orchards.

The PTGM begins when the desired number of king bloom flowers are in full bloom (that is, when the petals no longer cover the reproductive organs thus allowing for cross-pollination). The desired number of open king bloom flowers is equal to the desired crop load and is determined by counting the number of open king bloom flowers per tree or by visual assessment of full bloom density in the orchard. Average style length is measured at this time and is used as a variable in the model.

Hourly temperatures recorded in or near the orchard are used with the pollen tube growth rate equations to calculate cumulative pollen tube growth. Chemical bloom thinning applications are made when the pollen tube lengths are equivalent to average style length. The supposition is that fertilization has occurred at this point.

Assuming that pollen tubes must grow the entire average style length on flowers that reached full bloom after an application of a bloom thinner, the model is reset after the bloom thinning application is made. Additional bloom thinning applications occur before pollen tubes grow to the end of the style to prevent additional fertilization. Applications cease at the end of bloom. Typically, two chemical thinning applications are necessary each year. Occasionally, a third application is necessary.

### References

Yoder, K.S., G.M. Peck, L.D. Combs, and R.E. Byers. 2013. Using a pollen tube growth model to improve bloom thinning for organic production. *Acta Horticulturae* 1001:207-214.  
<https://doi.org/10.17660/ActaHortic.2013.1001.23>

Peck, G.M., L.D. Combs, C. DeLong, and K.S. Yoder. 2016. Precision Apple Flower Thinning using Organically Approved Chemicals. *Acta Horticulturae* 1137:47-52.  
<https://doi.org/10.17660/ActaHortic.2016.1137.7>

Peck, G.M., C.N. DeLong, L. Combs, and K.S. Yoder. 2017. Managing Apple Crop Load and Diseases with Bloom Thinning Applications in an Organically Managed 'Honeycrisp'/'MM.111' Orchard. *HortScience* (523):377–381.  
<https://doi.org/10.21273/HORTSCI11412-16>

- Create Block

Click on the '+ Block' button in the upper left to create a new block.

- Insert either style length or start date

- Set start date

You need to provide a date and time.

- Set style length

There are two options: The first option is to insert the average style length. The second option is to insert the style length measurements, the software in this case will calculate the average.

## Step 2:

- Add a descriptive name for the block that you plan to monitor
- Using the “Variety” drop-down menu, select the appropriate cultivar
- Select the appropriate state
- Select a NEWA weather station that is in close proximity to the block you plan monitor
- Once all fields have been filled, select “Add Block”

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NEWA

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### New Block

Insert block name (min. 3 letters)

Select apple variety

Select state

Select Station

Cancel Add Block

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The PTGM began longer cover the bloom flowers flowers per tree this time and i

Hourly temperature calculate cumulative lengths are eq

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- Create Block  
Click on the '+ Block' button in the upper left to create a new block.
- Insert either style length or start date
- Set start date  
You need to provide a date and time.
- Set style length  
There are two options: The first option is to insert the average style length. The second option is to insert the style length measurements, the software in this case will calculate the average.

+ Block   Blocks 3   ⓘ

Greene Test: Nix Fuji: Church Block

Greene Test: Nix Fuji: Church Block	Fuji	Edneyville (Apple Wedge), NC	✎   🗑
Start Date			Style Length

### Step 3:

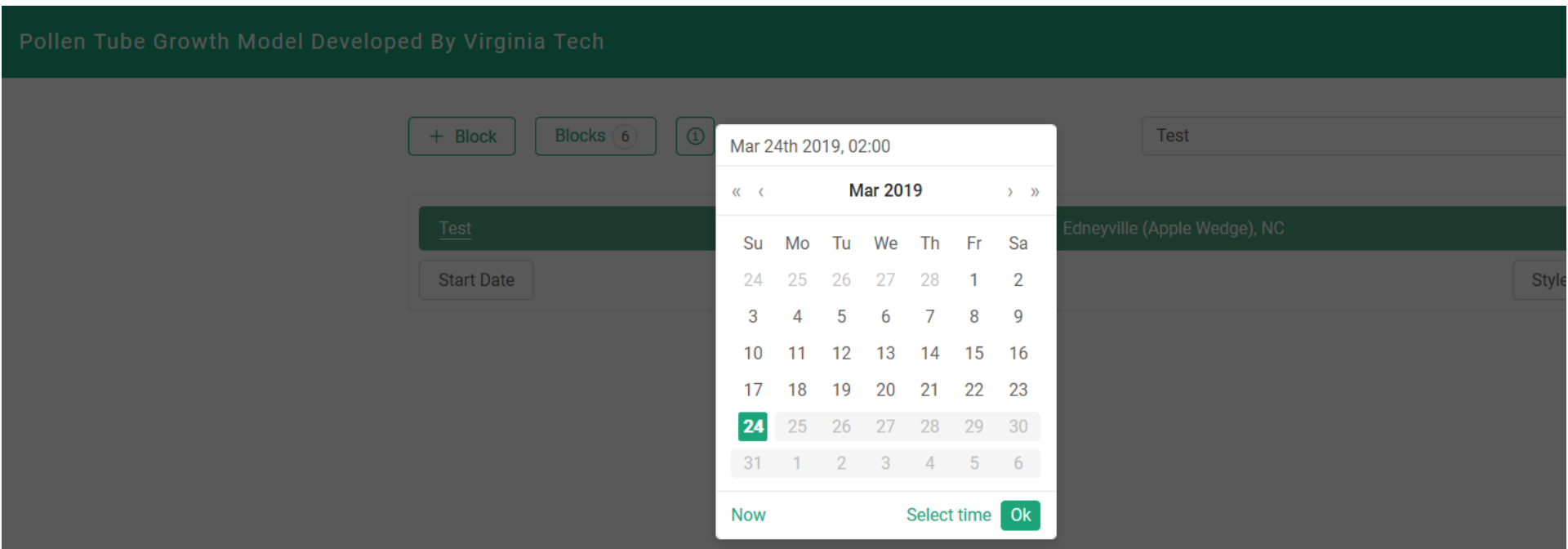
- When appropriate, add the **start date** (i.e. timing of model initiation) and average **style length** by selecting each of the icons to input this information.

# When should you initiate the model?

- The model should be initiated once the number of open blossoms is equivalent to your target crop load
- Can be determined using visual estimates or by counting the number of open blossom on whole trees or limbs
- In a warm spring, frequent monitoring will be required, due to rapid bud development
- Once the number of open blossoms meets the target, the model is initiated

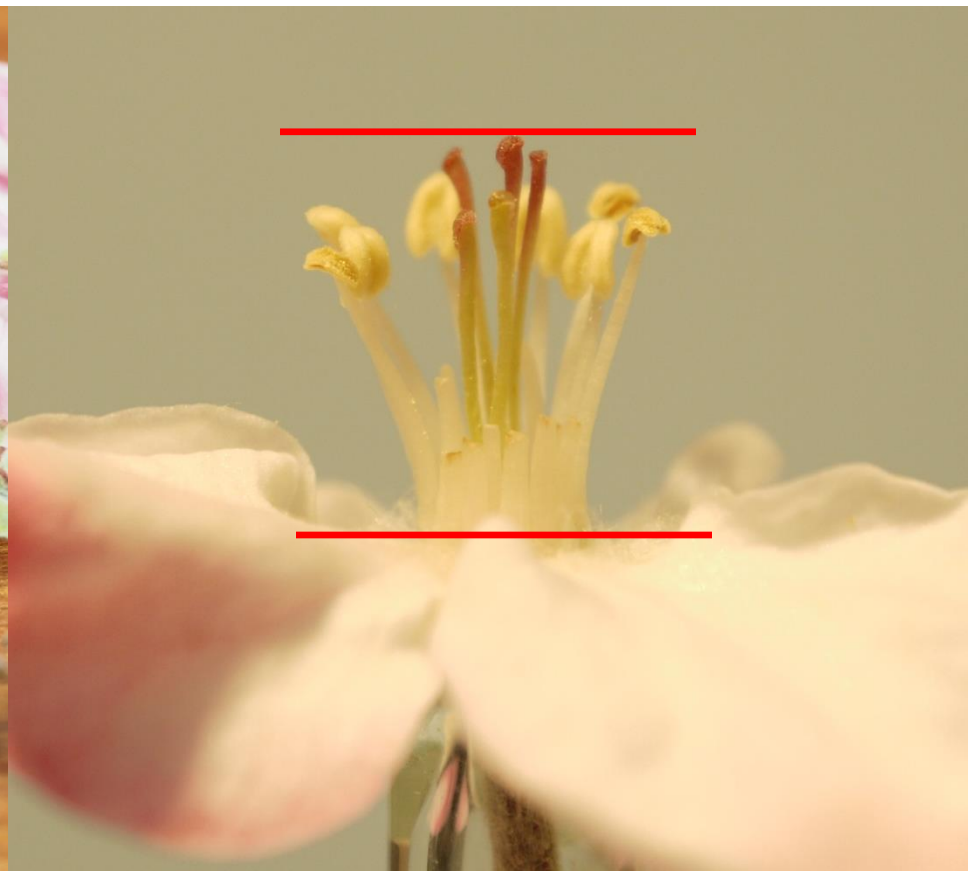
# Selecting Model Start Date: PTGM on NEWA

- Select “Start Date”
- Click the model start date date on the calendar
- Click “Select Time” and add the model start time to the nearest hour



# Estimating average style length

- Watch <https://www.youtube.com/watch?v=wqEgpPOs0r0>
- 25 to 50 king blossoms at late balloon stage are sampled per block
- Styles are detached with a razor blade. For each sampled flower, measure the length of the longest style with a set of digital calipers. Record all values.

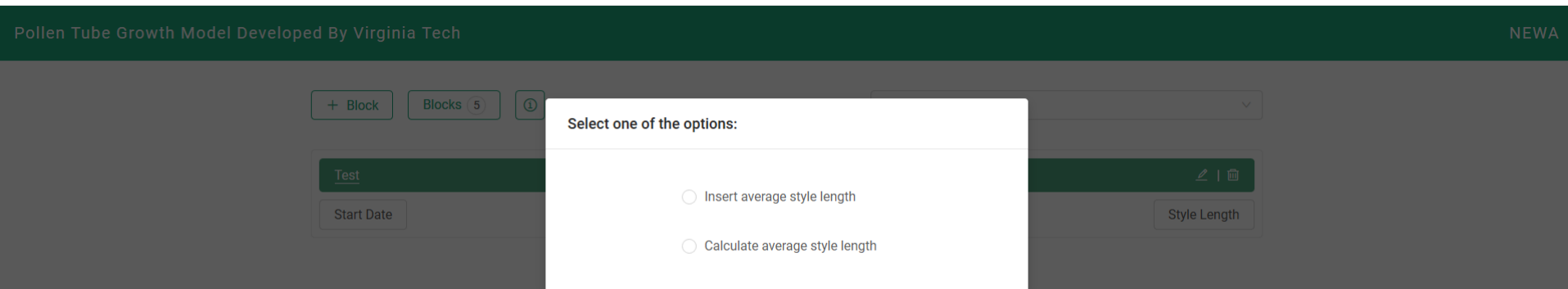


# Entering Style Length: PTGM on NEWA

- Average style length can be entered by selecting “Insert average style length”

-----OR-----

- The second option is to insert the style length measurements, and software will calculate the average. In this case, select “Calculate average style length.”

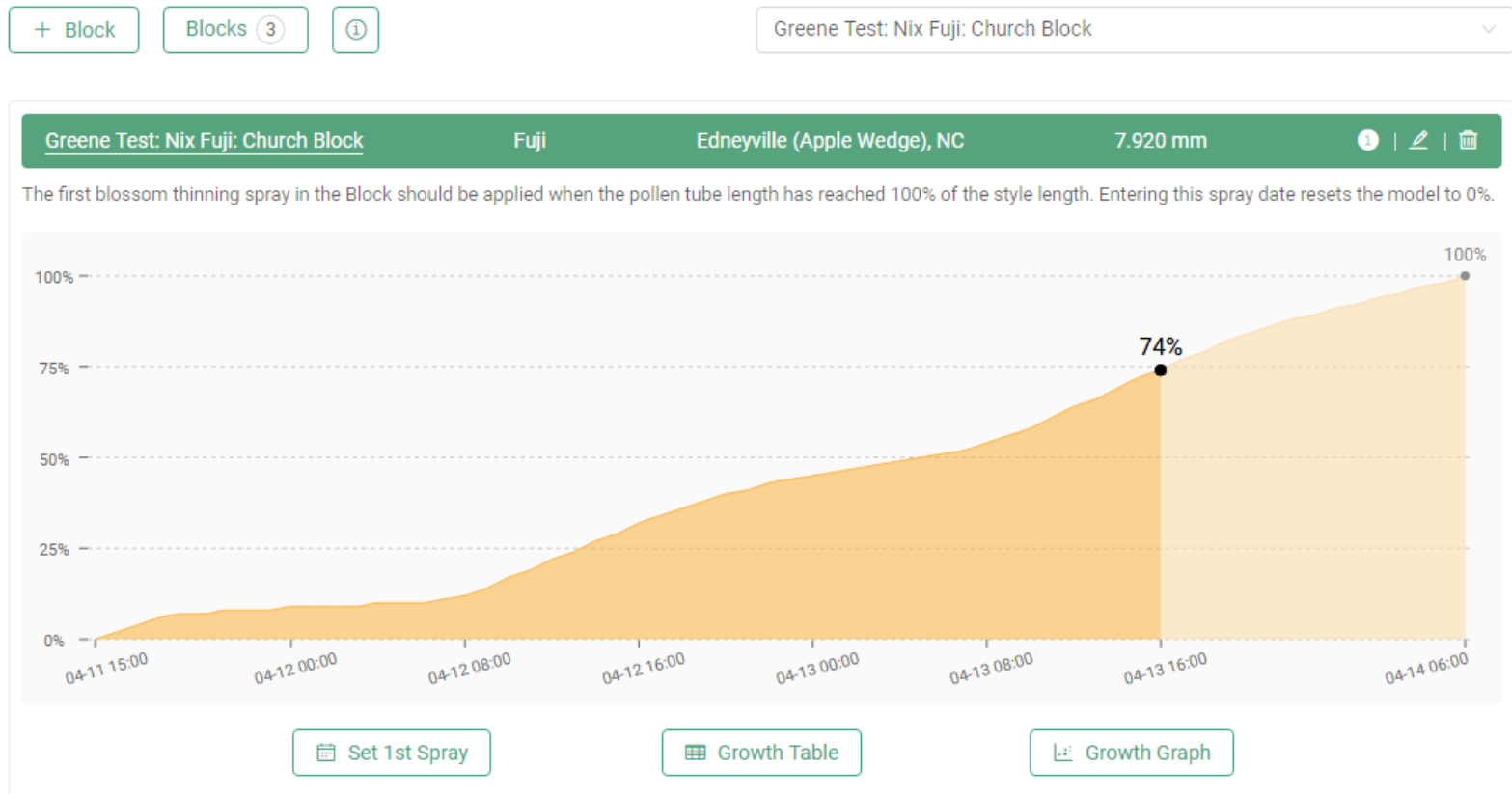




## Step 4:

- Once model start date/time and style length are added, you can observe estimated pollen tube growth rates.
- Also, you can see the estimated date of your 1<sup>st</sup> application (when pollen tube growth is ~100% of the average style length)

Developed By Virginia Tech



# Step 5: Set the timing of your 1<sup>st</sup> spray

- Ideally this should occur when pollen tubes are estimated to be equivalent to the average style length of 100%
- In this example, LS + oil should be applied ~ 6 am on 4/14
- The model does not account for environmental conditions at the time of application
- From a practical perspective, try to make the 1<sup>st</sup> spray between 100 – 110%

# Step 6: Set the timing of your 2<sup>nd</sup> spray

- Once the 1<sup>st</sup> application is made, add the date and time of the application to the block (to the nearest hour)
- Apply your 2<sup>nd</sup> application at **50 to 60%** estimated pollen tube growth rates relative to style length
- If you wait to apply at 100% on the 2<sup>nd</sup> application, then you are at risk of thinning too late. Applying at 100% would allow pollen tubes have the opportunity to growth the length of the style and will likely reduce thinner efficacy.

# Model Limitations / Practical Considerations

- The model does not account for:
  - weather conditions at the timing of application
  - pollinator activity
  - frost/freeze damage
- For 1<sup>st</sup> use:
  - Work with the model and get comfortable before thinning season
  - Try the model on a small block
  - Be sure to leave check trees