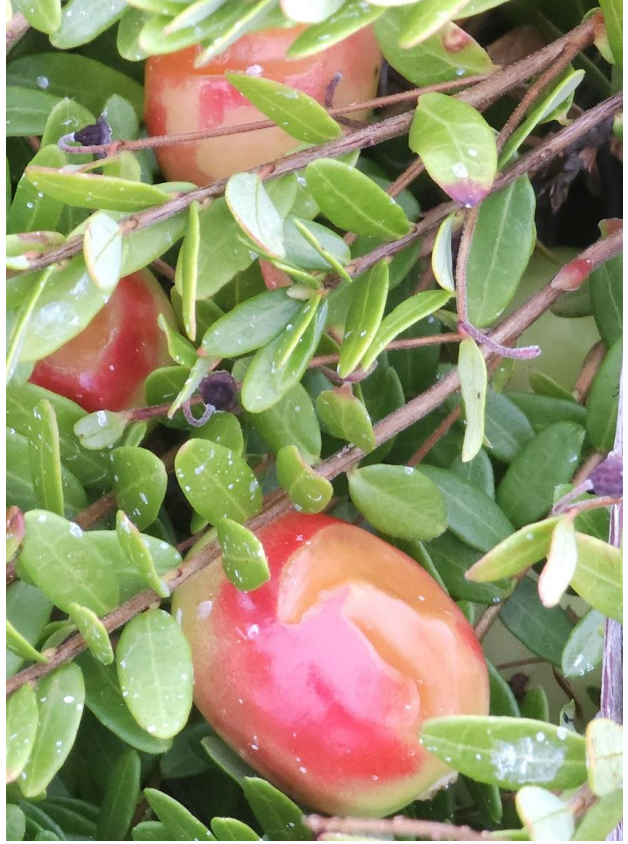



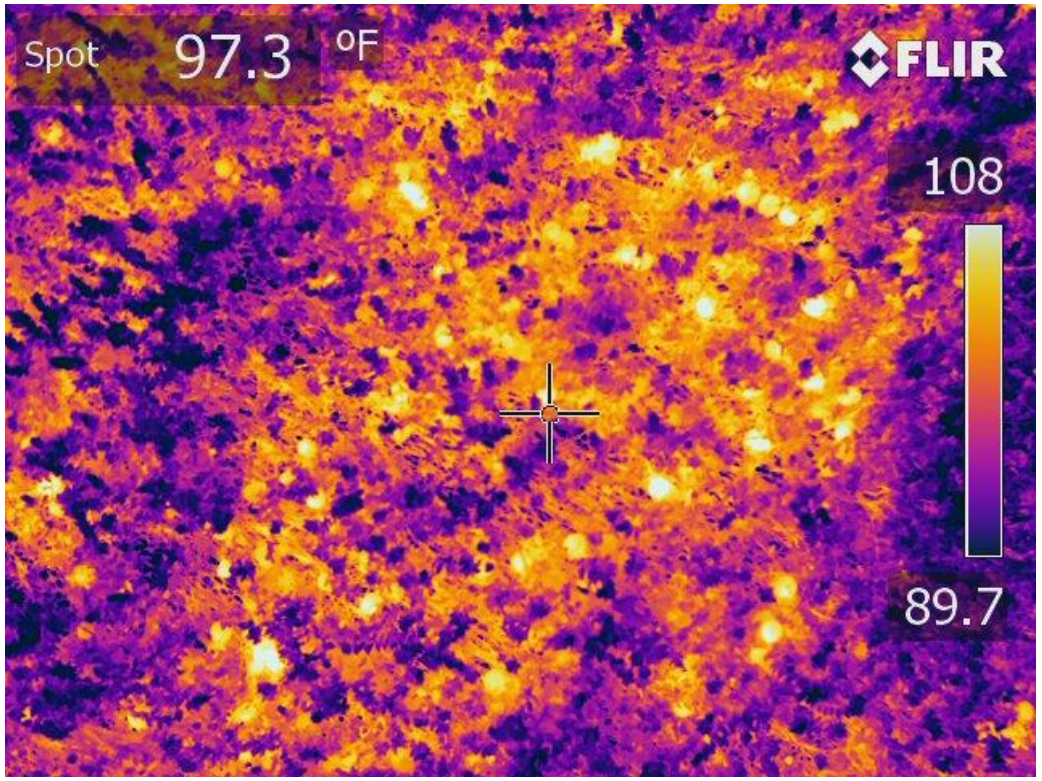
RUTGERS
New Jersey Agricultural Experiment Station

Overheating in (cran)Berry Crops

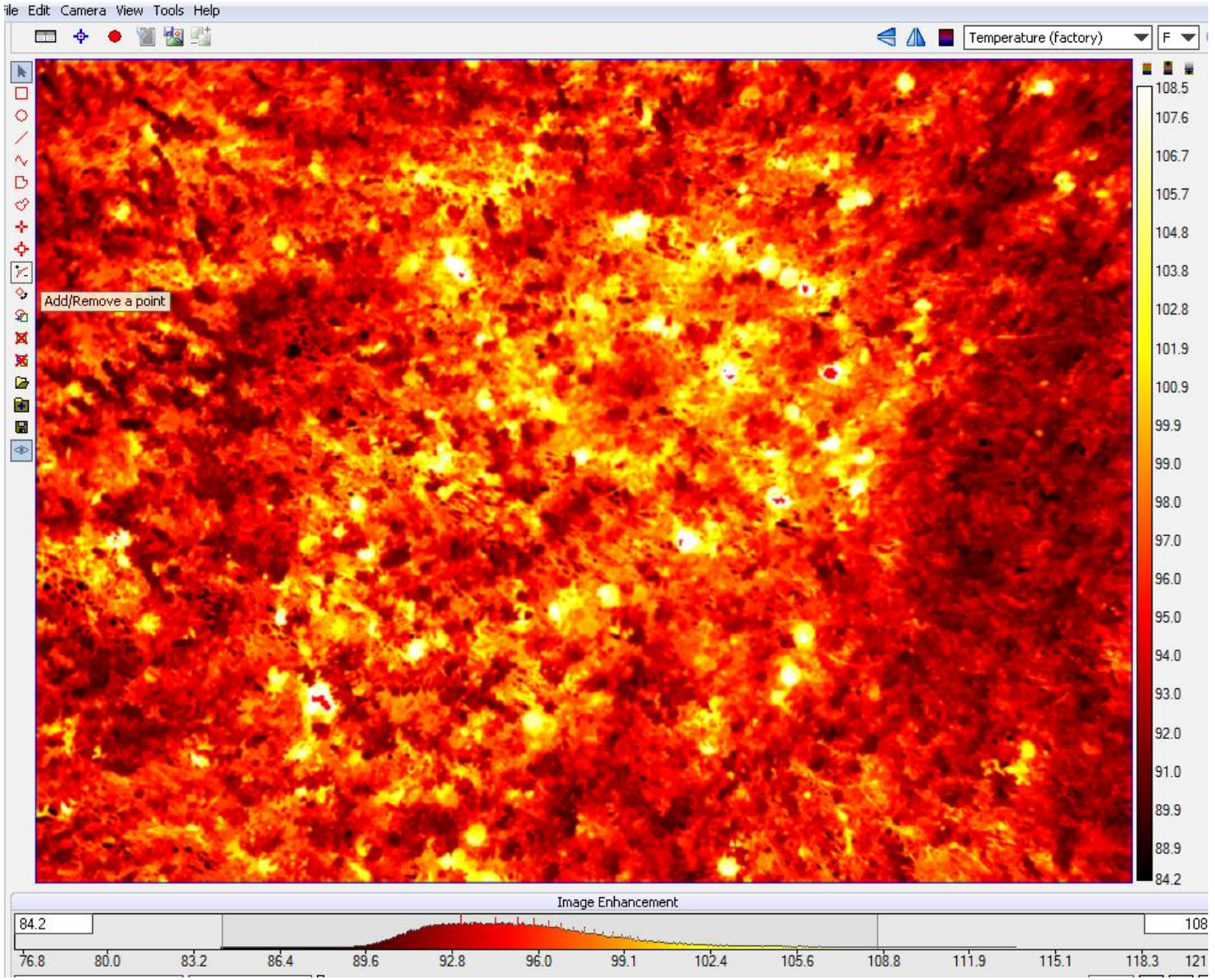
Peter Oudemans

Visible versus Thermal Imagery

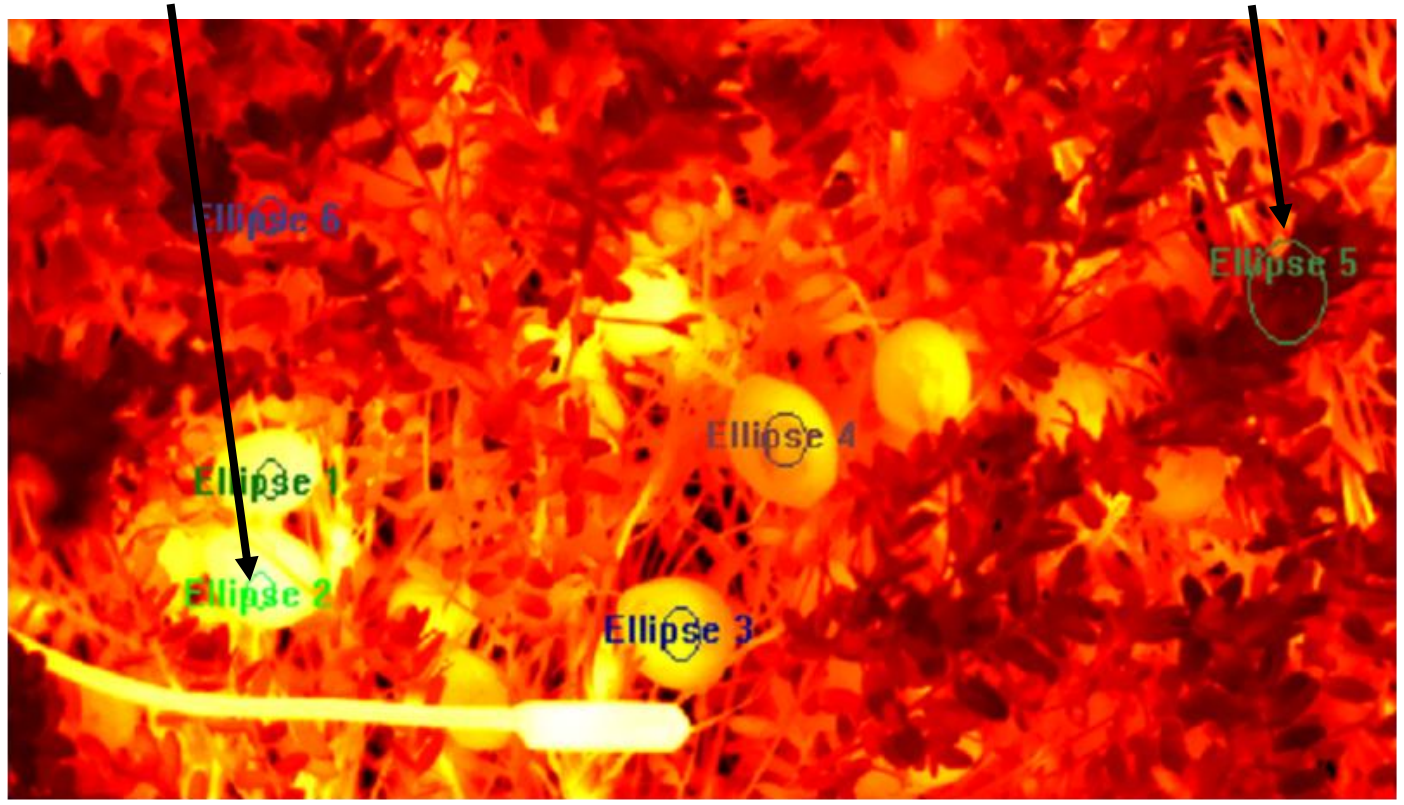
Fruit temperature is higher than canopy temperature



Fruit temperature is higher than canopy temperature

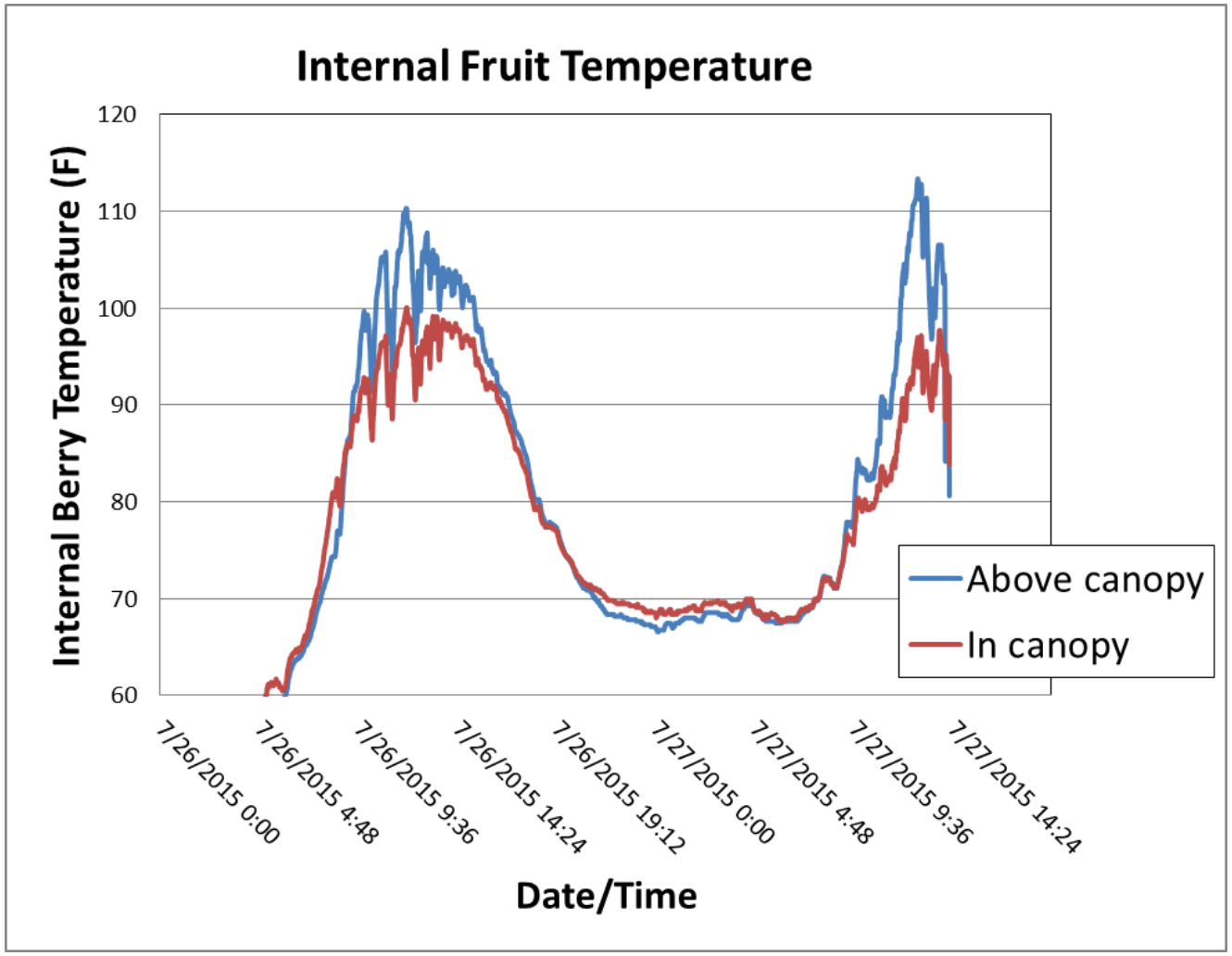


The Problem

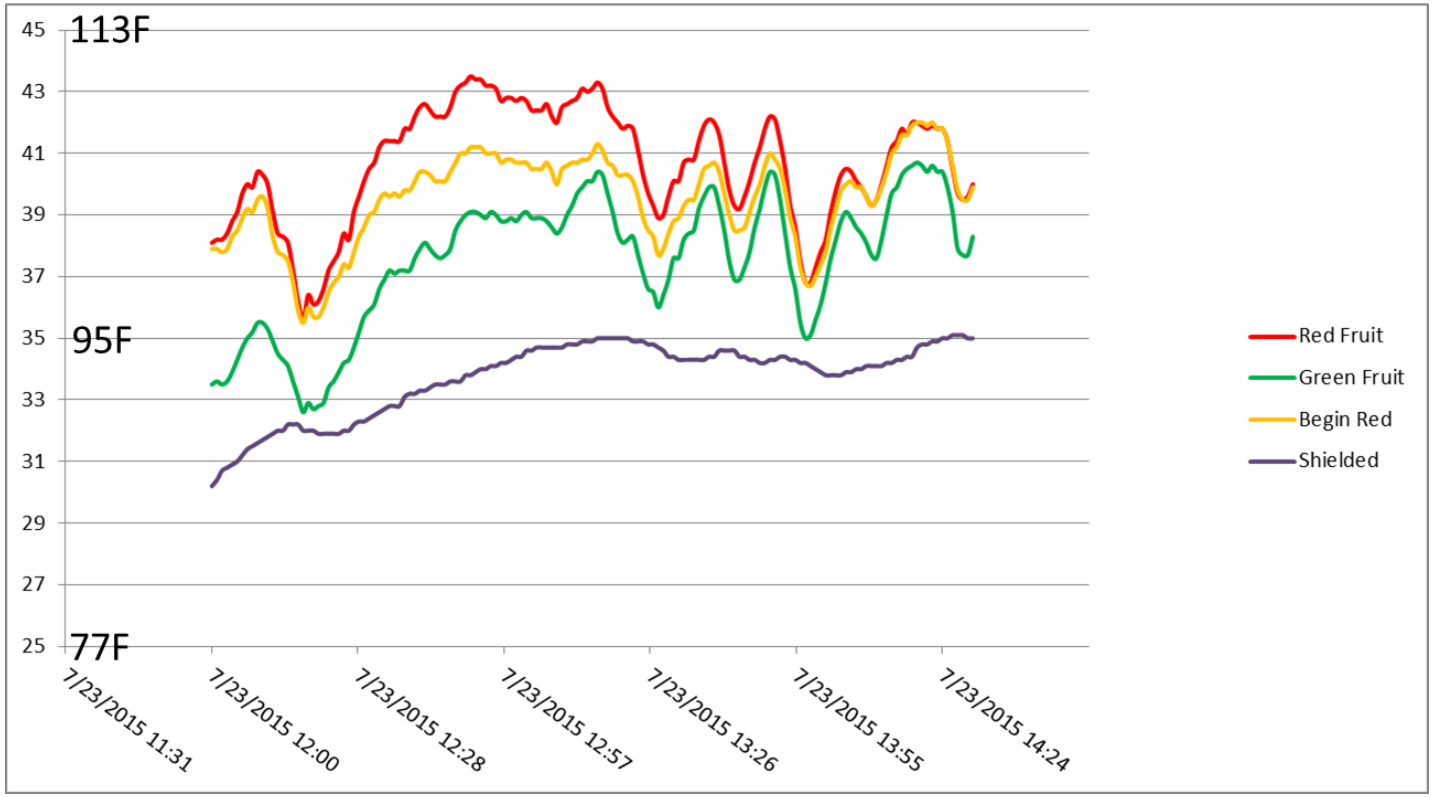


Statistic [units]	Ellipse 1	Ellipse 2	Ellipse 3	Ellipse 4	Ellipse 5	Ellipse 6
Mean [°F]	111.3	113.9	105.4	102.0	89.0	94.2
Std. Dev. [°F]	0.7	0.9	1.0	1.0	2.5	0.7
Center [°F]	(128.0, 253.0) 110.9	(124.0, 293.5) 114.3	(283.0, 309.5) 106.4	(322.5, 238.5) 102.9	(512.5, 184.5) 87.7	(127.5, 156.5) 94.4
Maximum [°F]	(132, 255) 112.3	(127, 292) 115.2	(280, 316) 107.2	(325, 230) 104.6	(511, 167) 100.5	(127, 151) 96.6
Minimum [°F]	(124, 252) 110.0	(120, 296) 111.7	(289, 313) 103.4	(317, 244) 99.3	(512, 179) 86.7	(126, 159) 93.2

Position in Canopy

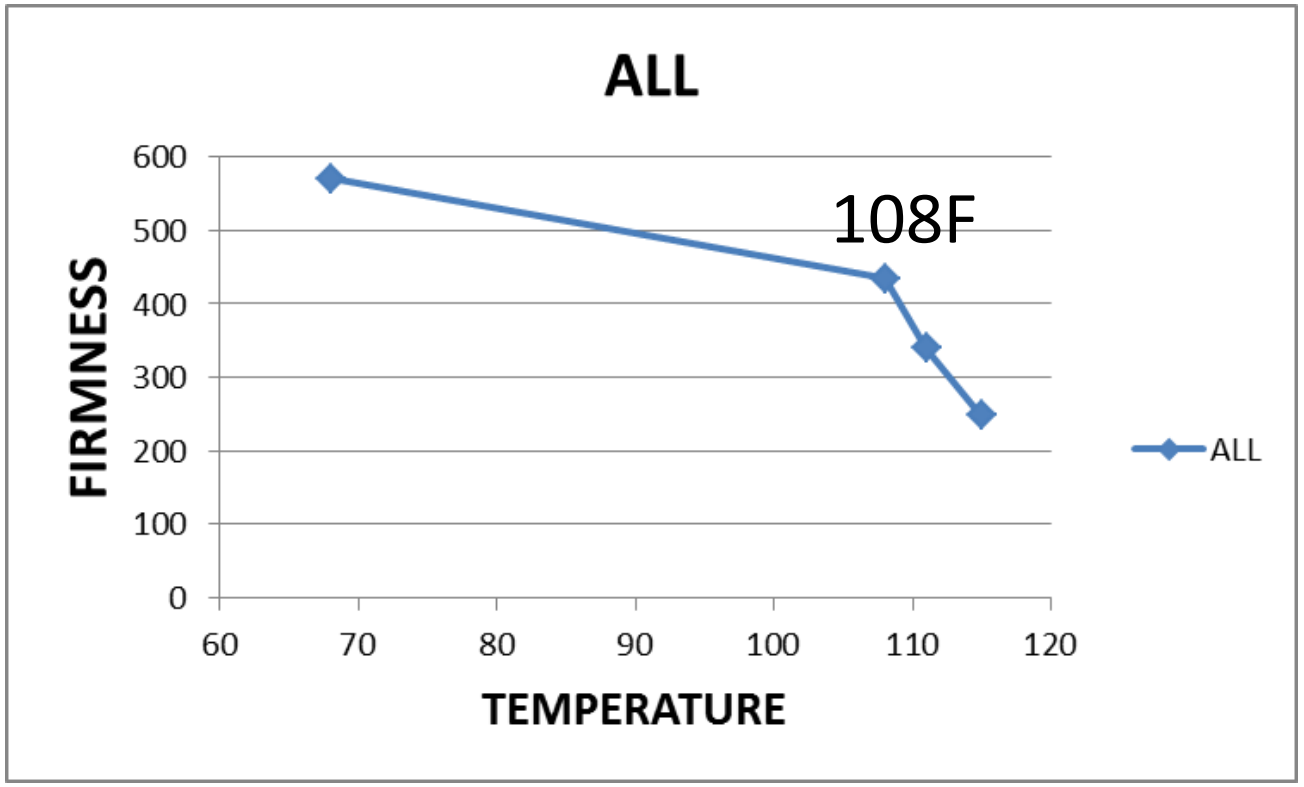


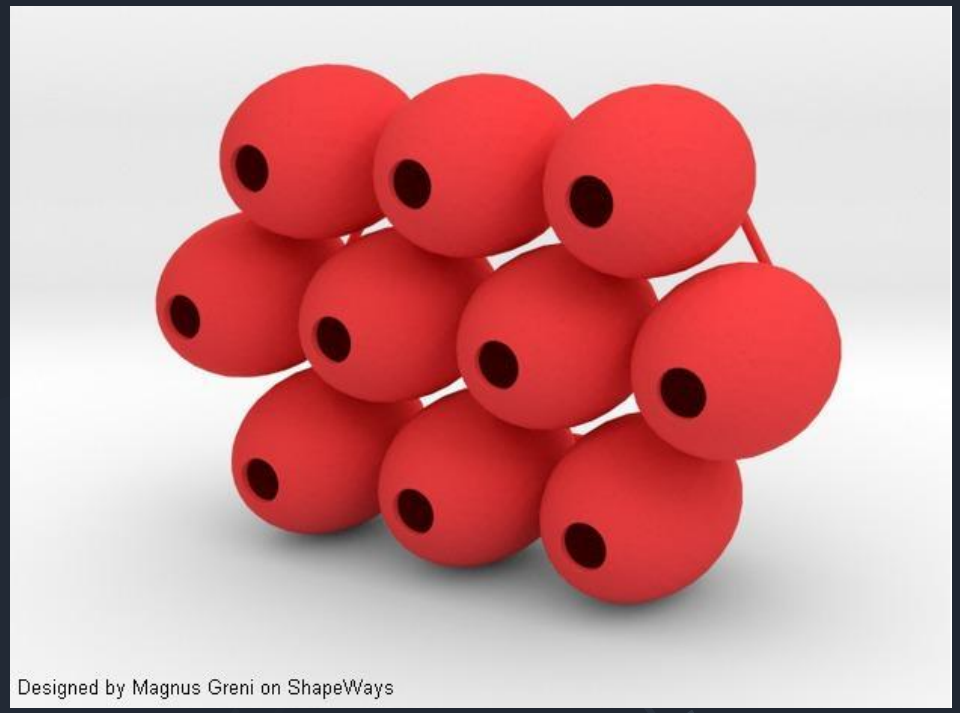
Fruit color or maturity effects

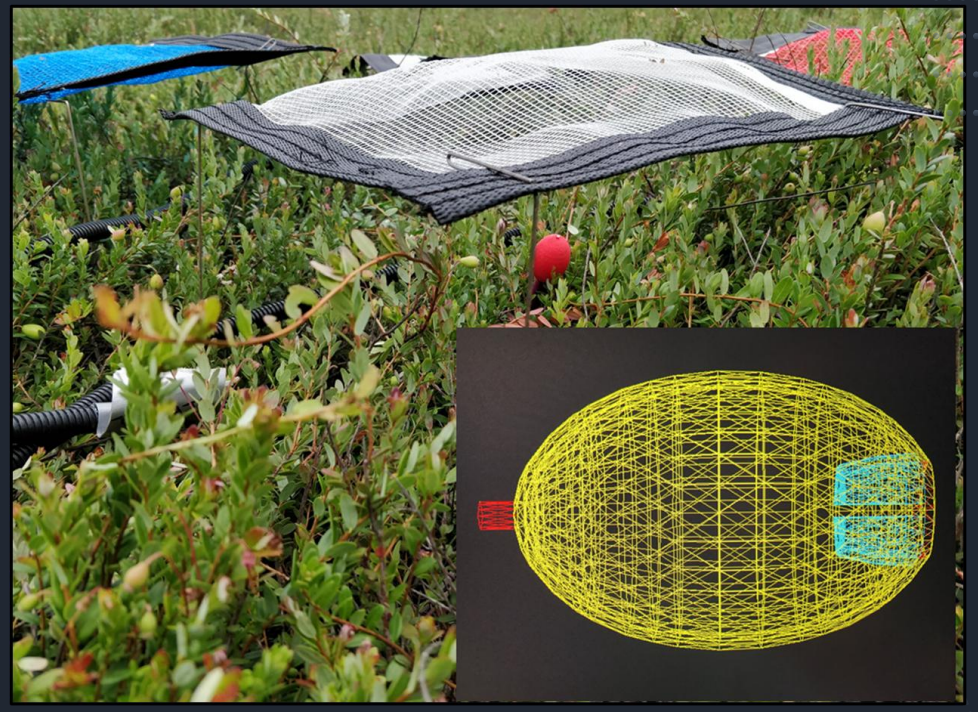


108F 111F 115F 118F

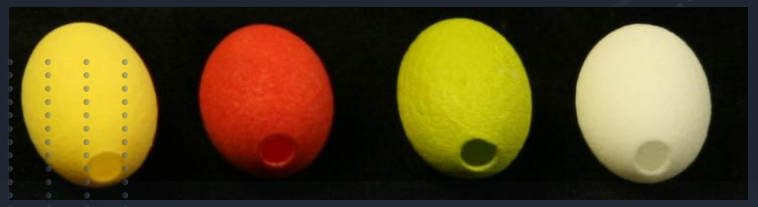
ESTABLISHING A THRESHOLD





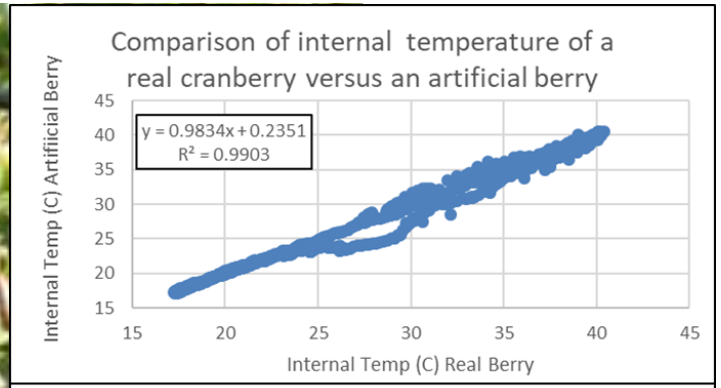


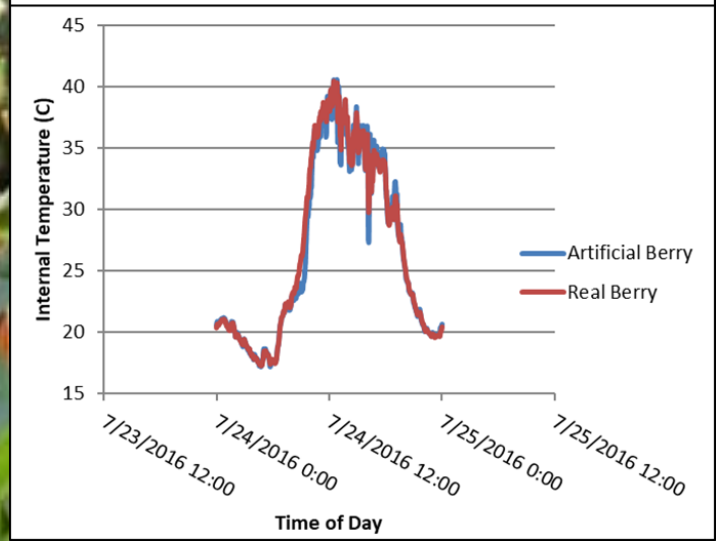
Artificial Berries



- Used a 3-D Printer
- Place a temperature probe inside
- Do not degrade as fast as berries

Monitoring Overheating: Building an Artificial Berry





WatchDog 1650 Micro Station -
w/4 External Ports
3688WD1 $475.00

Heat Monitoring

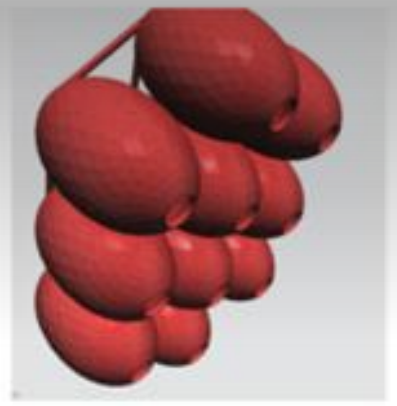
Simple, low cost system

LightScout Silicon
Pyranometer
3670I
$269.00

Leaf Wetness Sensor
3666 $99.00

Temperature (Micro) Sensor
NTC thermistor
(10K4A1B)
3667S $85.00

Radiation Shield
3663A $90.00



Cranberry-22,5-15-T0,7
$23.54
Shapeways.com

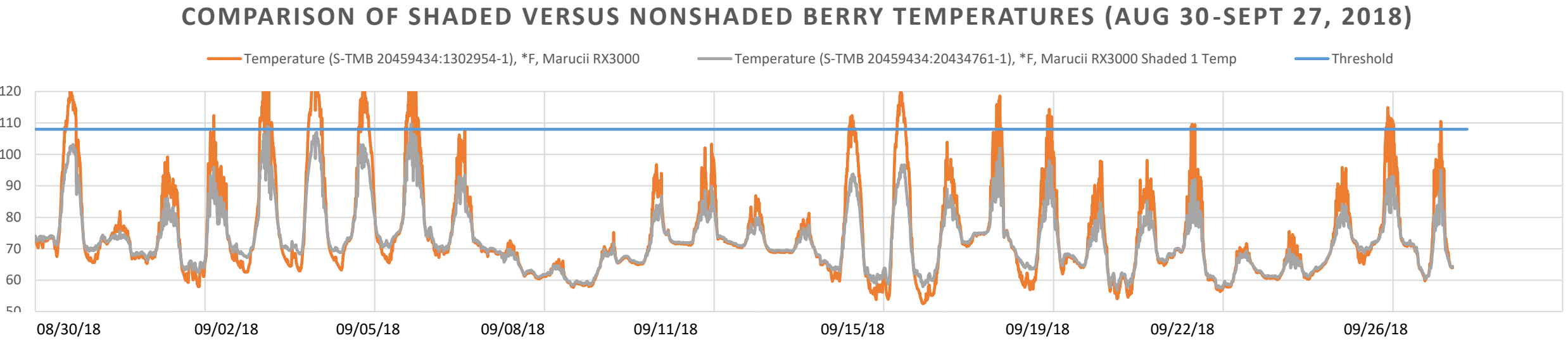
Cranberry Fruit Overheating

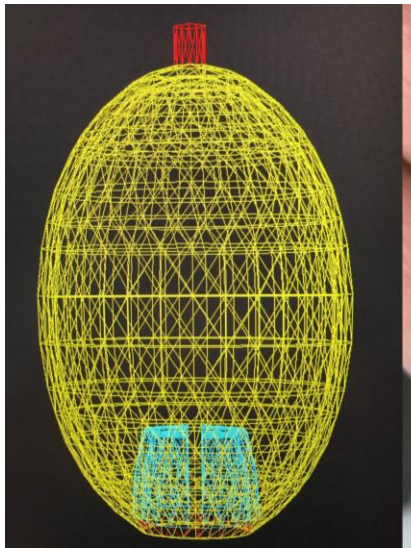
Peter Oudemans

Dept. Plant Biology

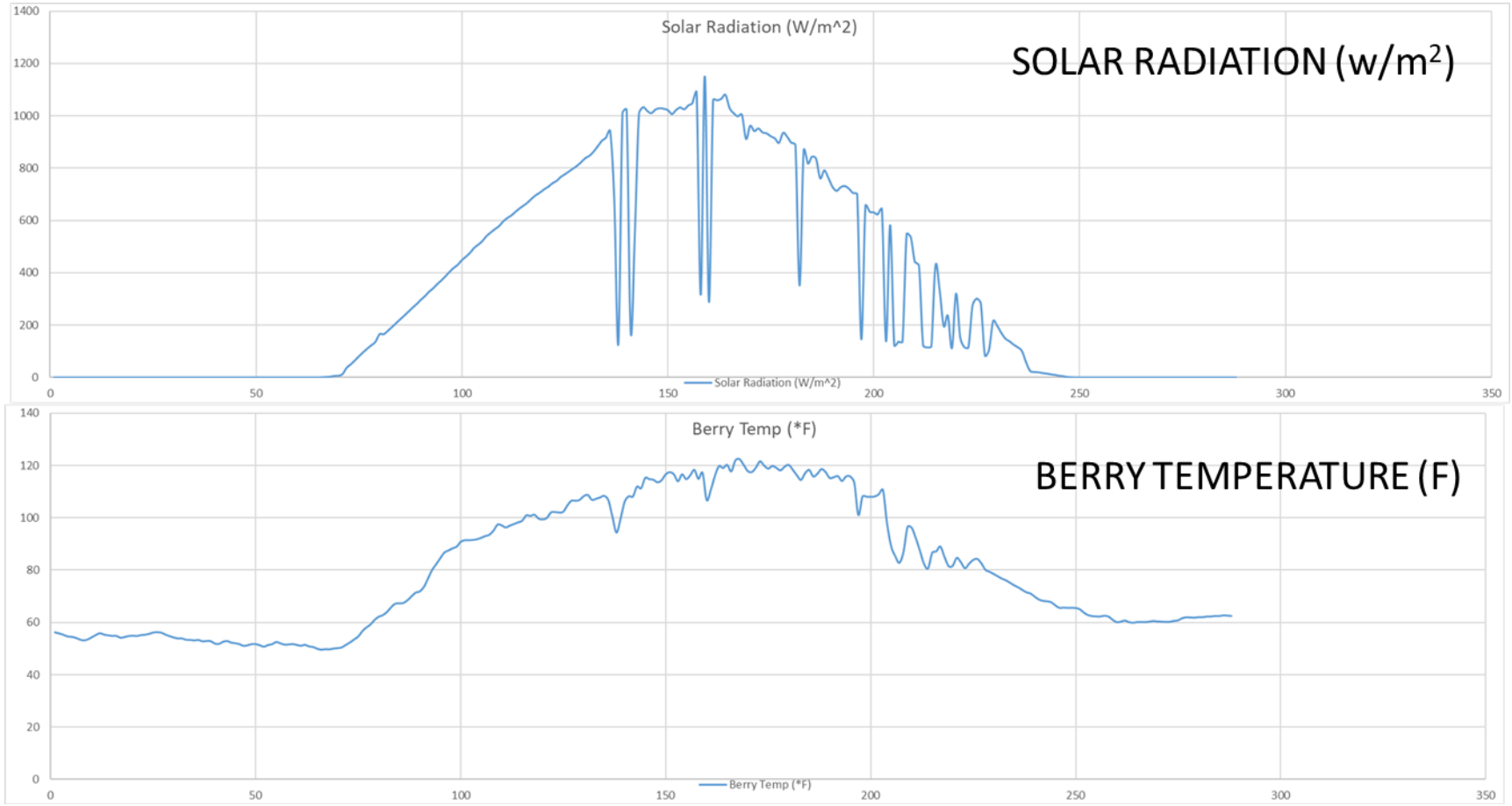
Rutgers, The State University

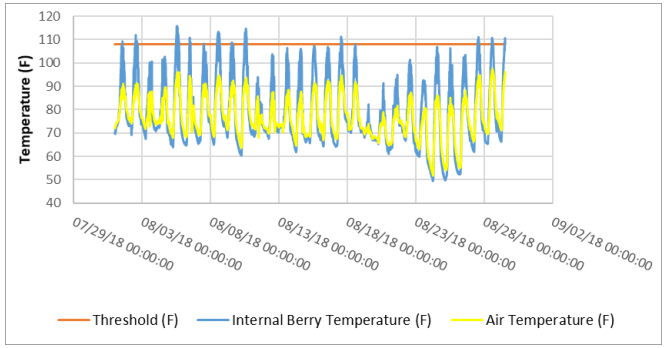
How hot do they get???



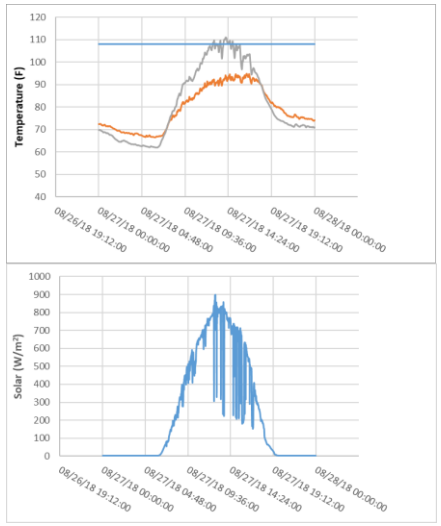


Conditions leading to overheating

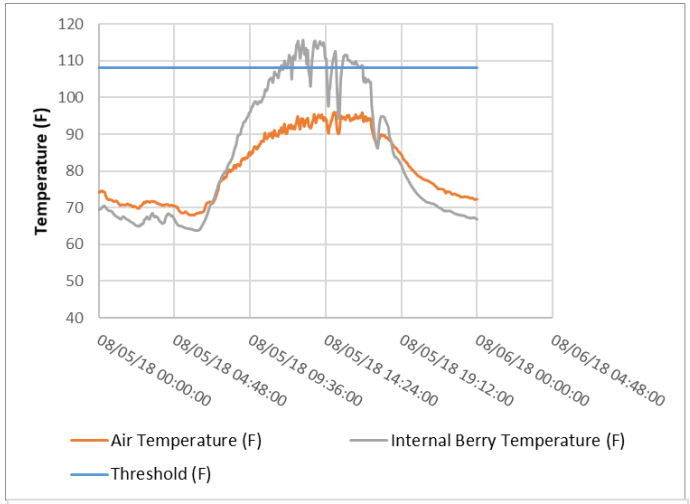


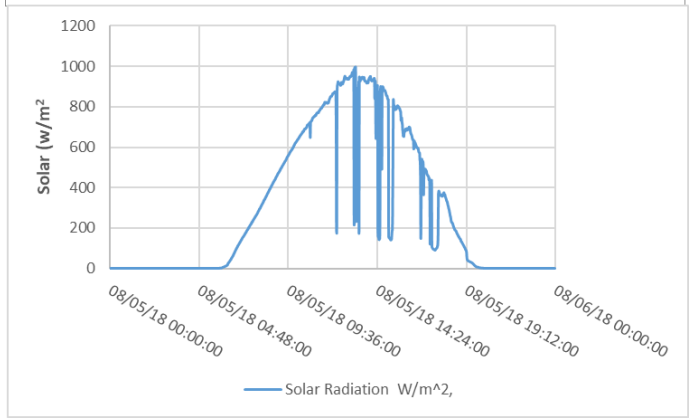


Non conducive days
Low ambient temperature
High cloud cover

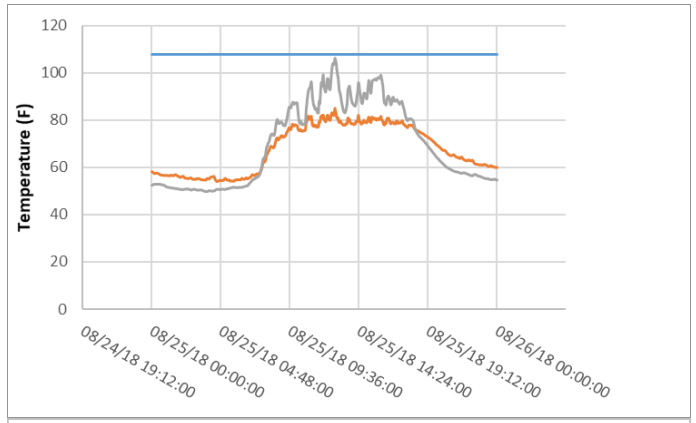


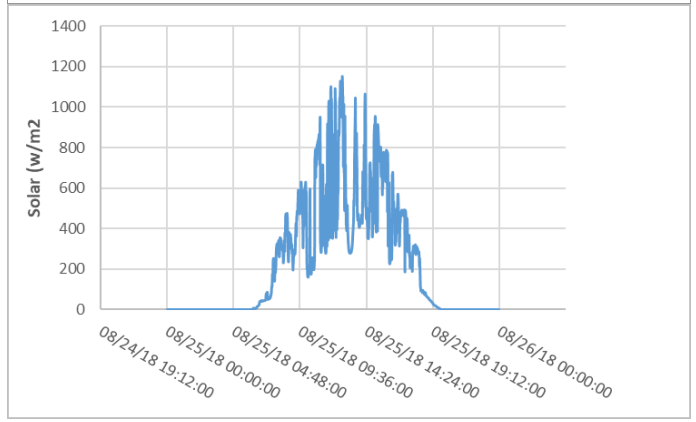
Conducive days
High ambient temperature
Minimal cloud cover





Non conducive days
Low ambient temperature
High cloud cover





FACT SHEET

Scald in Cranberry Fruit: Part 1 Understanding Causes

Peter Oudemans, Extension Specialist in Blueberry and Cranberry Pathology

Giverson Mupambi, Extension Assistant Professor, Cranberry Physiology, University of Massachusetts Amherst

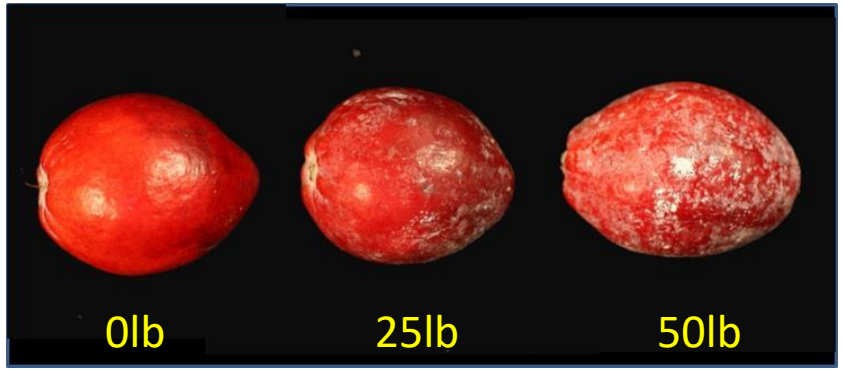
https://njaes.rutgers.edu/fs1363/

Treatments for Reducing Over-heating

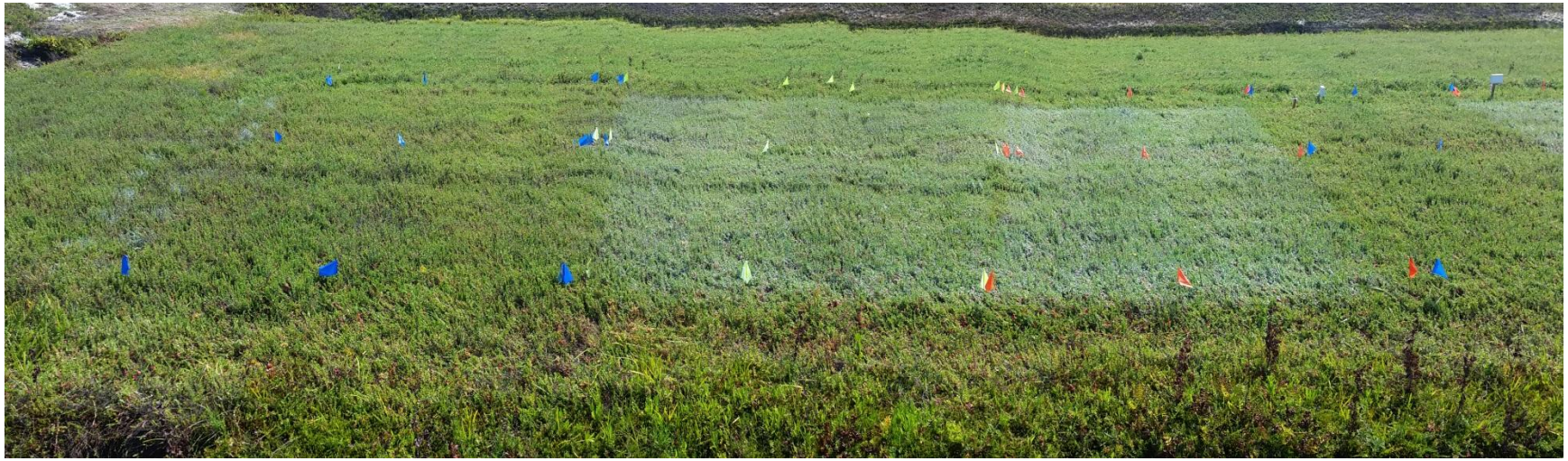
- Shade cloth (Red) can reduce solar radiation and berry temperature.
- Raynox Plus (Green) is a wax designed to prevent sunburn in apples
- Vapor Guard (Yellow) is a material designed to reduce evapotranspiration
- Parka (Pink) is a phospholipid designed to enhance the cuticle
- Surround (Orange) Kaolinite clay designed to increase albedo
- Reflections (White) Calcium carbonate to
- UTC (Blue)

Surround (Kaolin Clay)

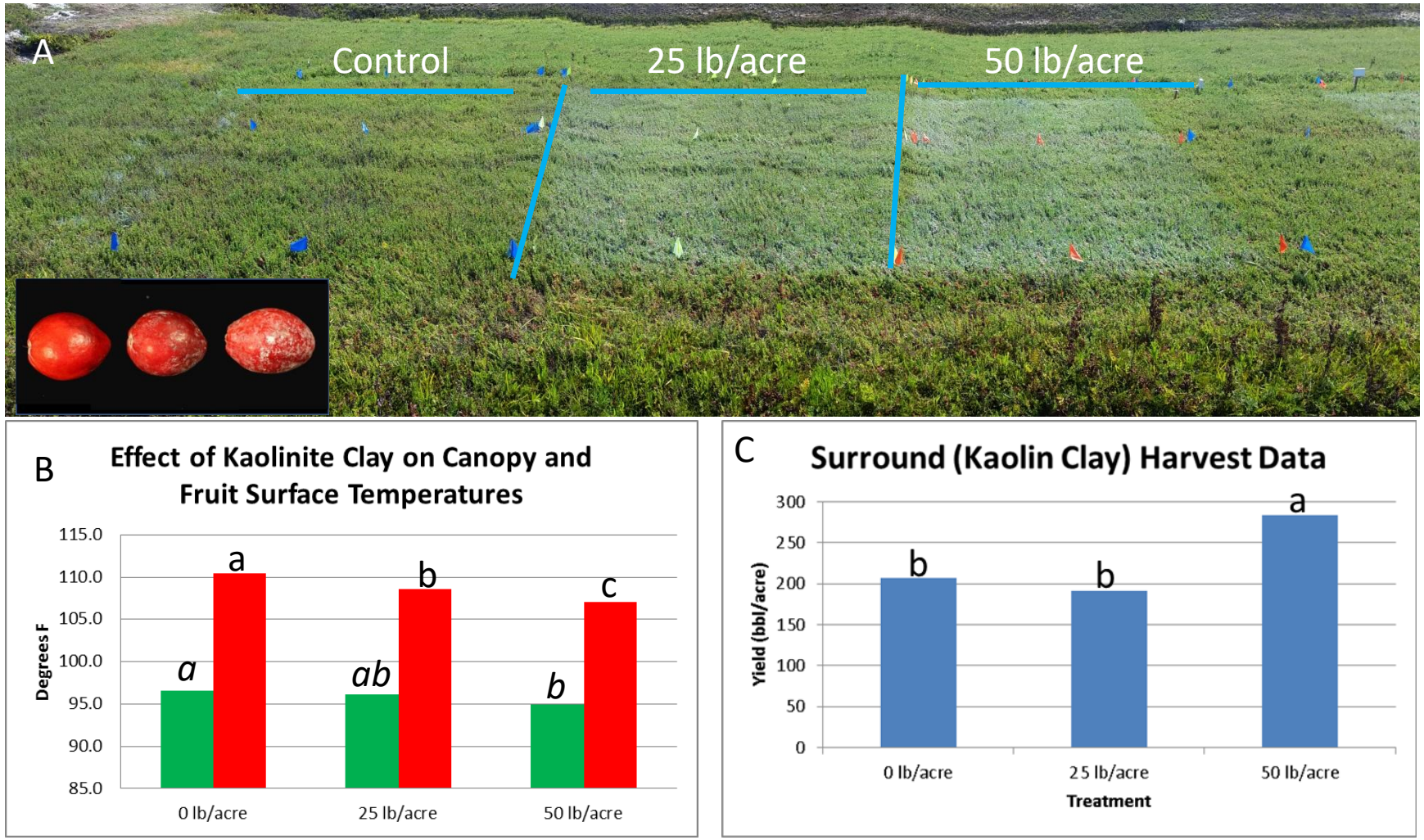
- Labelled for cranberry
- Protection from sunburn
- 25-50lb/acre



Surround (Kaolinite Clay)

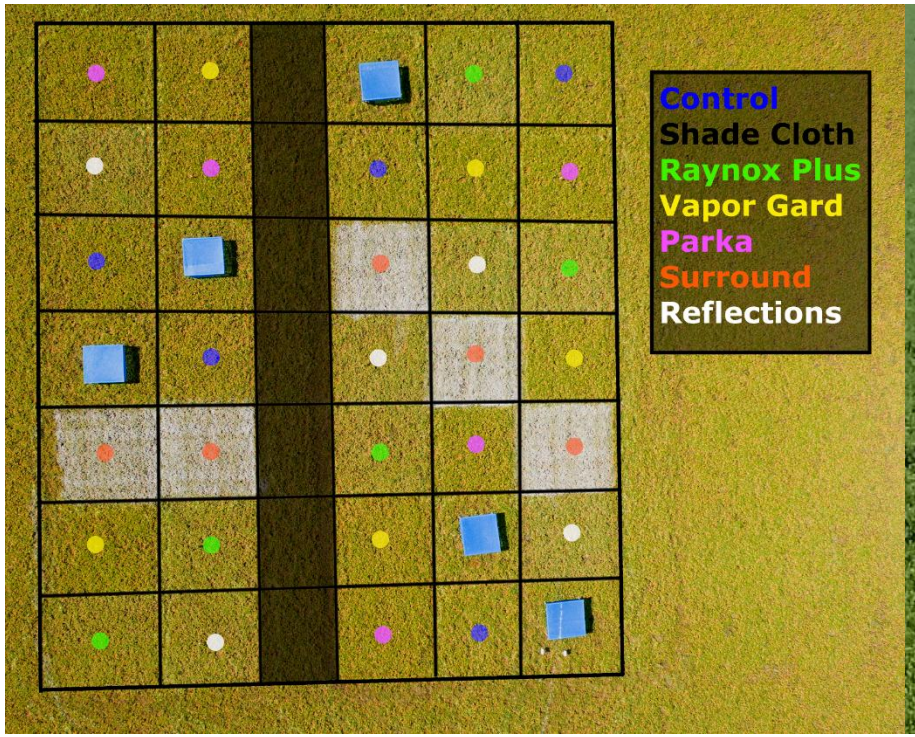


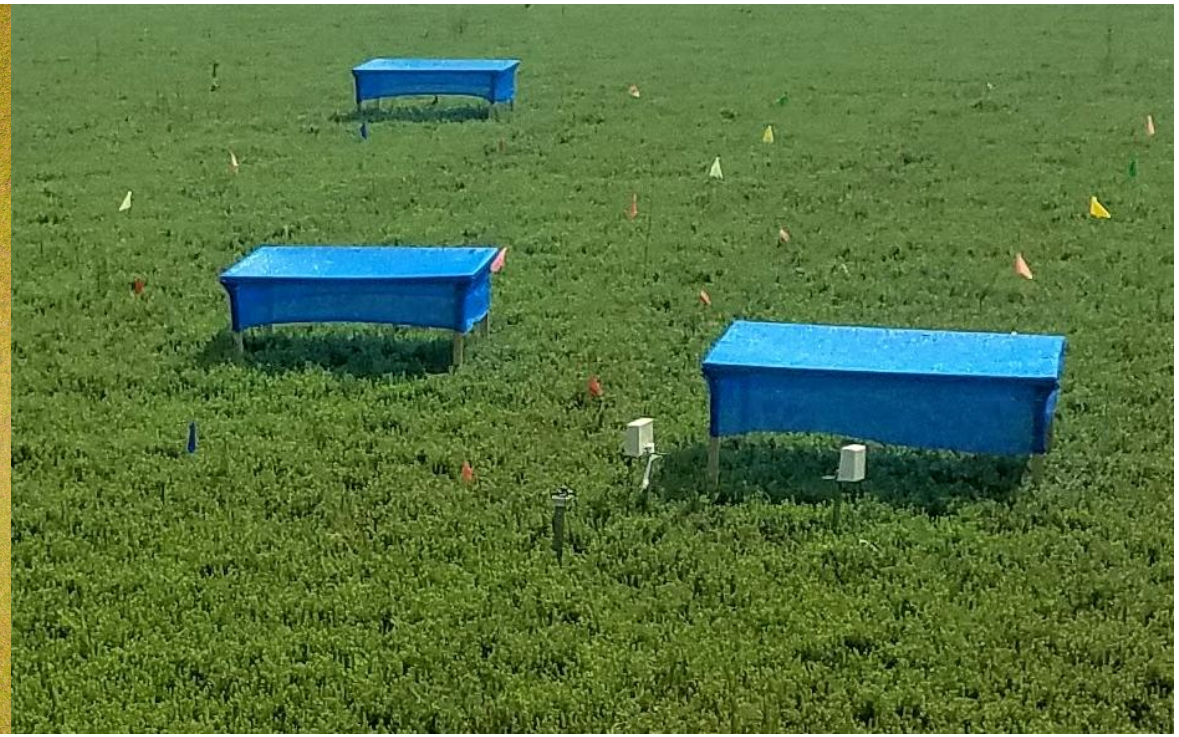
Trial	Trt #	Trt Code	8/12/2015	8/19/2015	8/26/2015	9/2/2015
1	1	50lb/A	X	-	X	-
1	2	25lb/A	X	-	X	-
1	3	UTC	X	-	X	-
2	1	50lb/A	-	X	-	X
2	2	25lb/A	-	X	-	X
2	3	UTC	-	X	-	X



Use of kaolin clay (Surround on cranberry fruit. A) Field trial with clay applications. (inset fruit showing white residue). B) Impact on fruit and canopy temperatures during peak sunlight. C) Impact on yield of sound fruit.

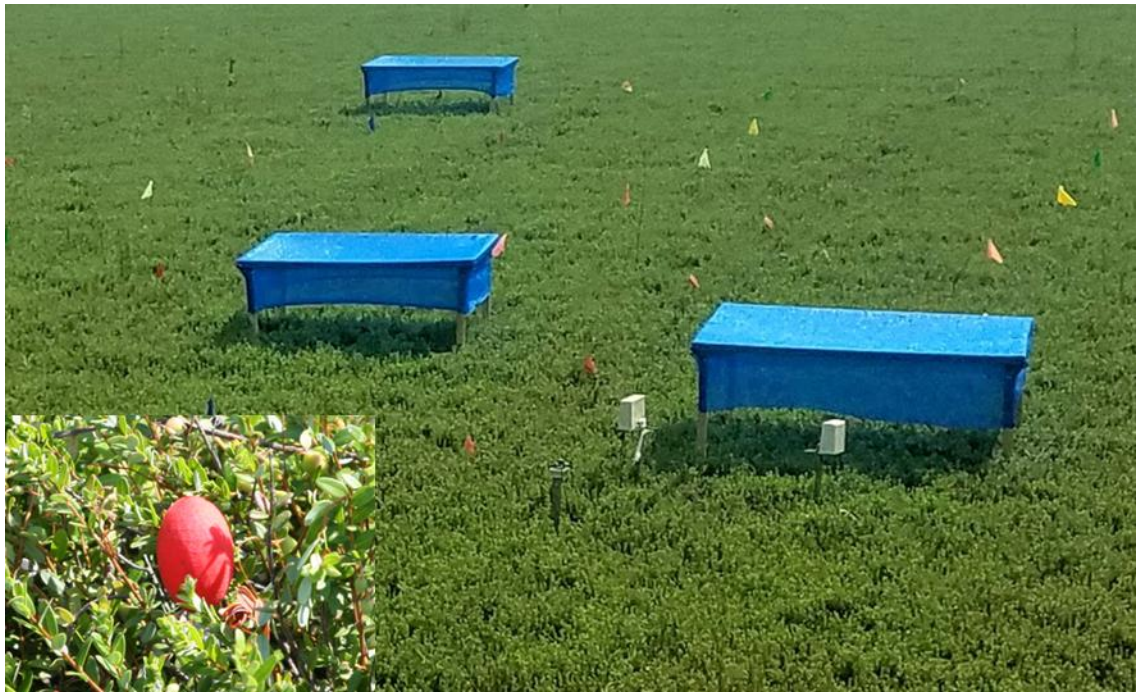
Research Plots: Overheating Management

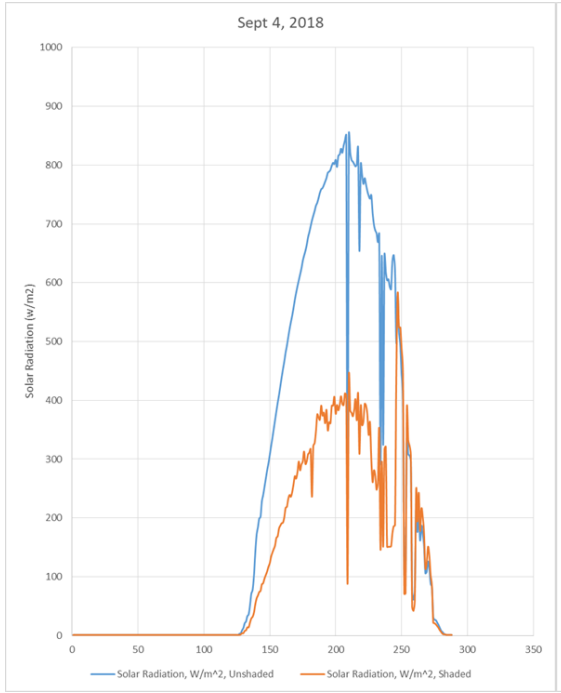


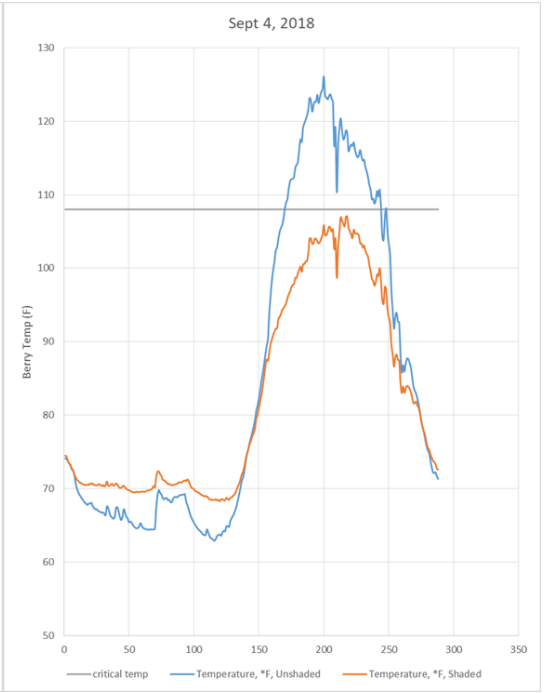


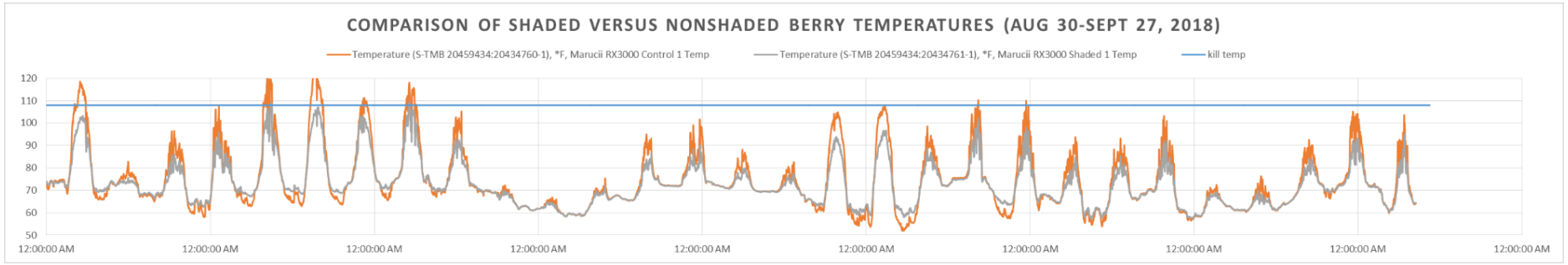
Overheating Management

Effect of shading on internal berry temperature

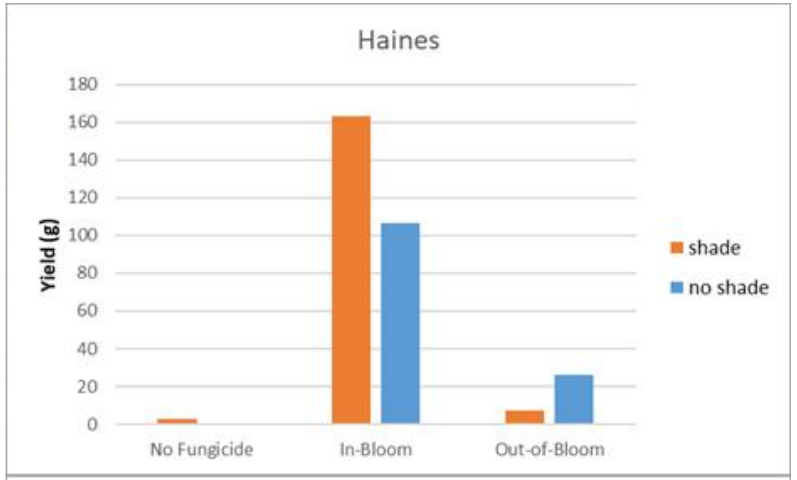


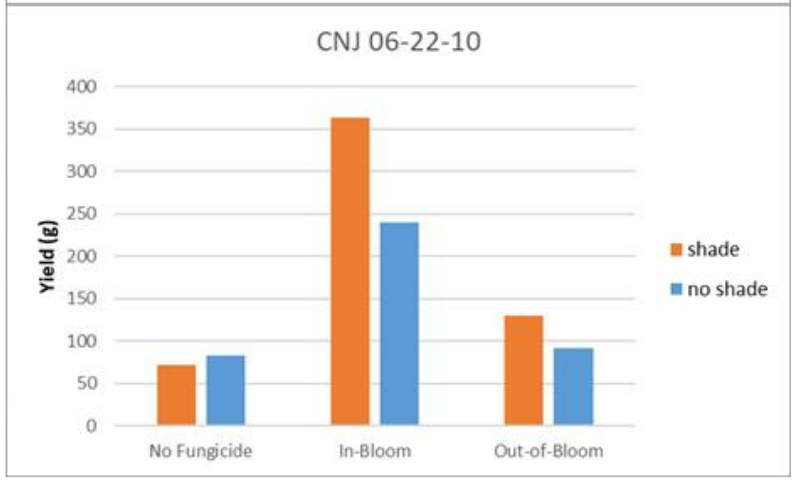




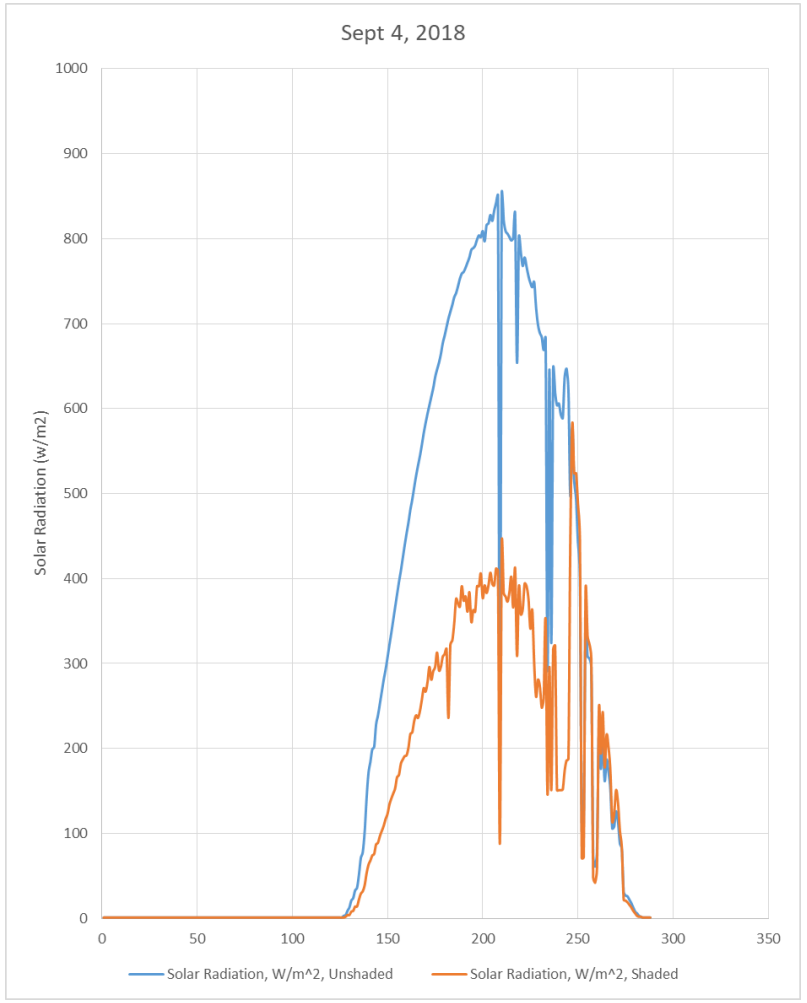


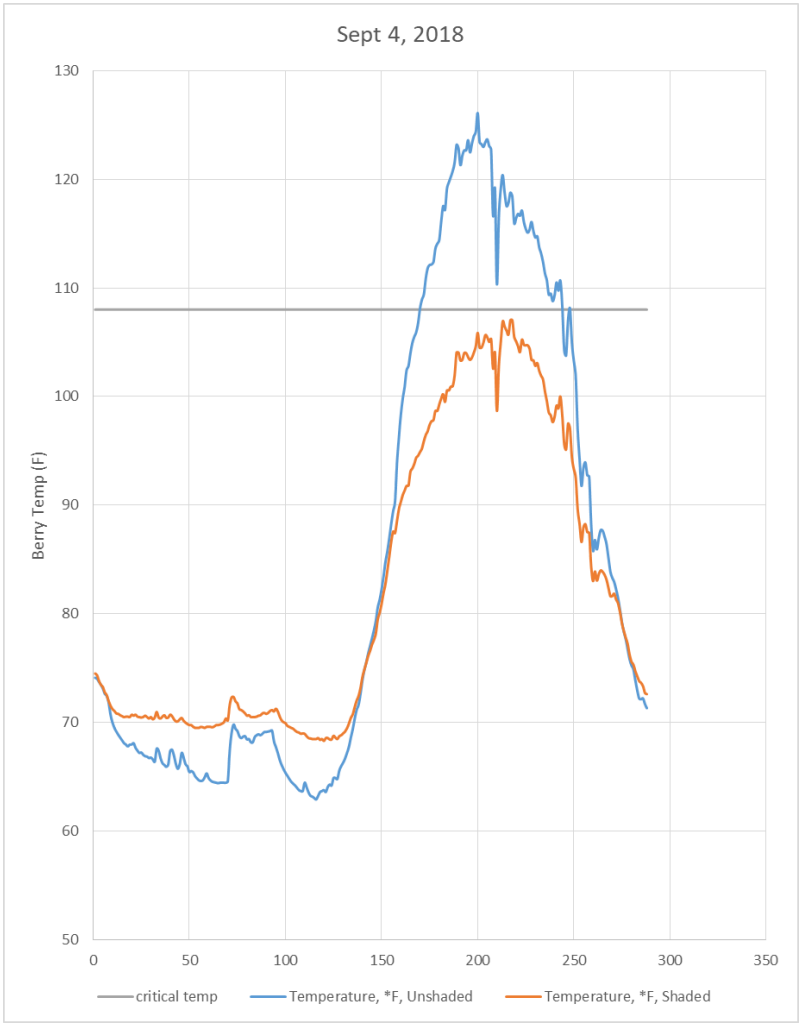
Preliminary results on the interaction of overheating with fruit rot





Preliminary trial investigating the effect of shade (after mid August) on cranberry yield.

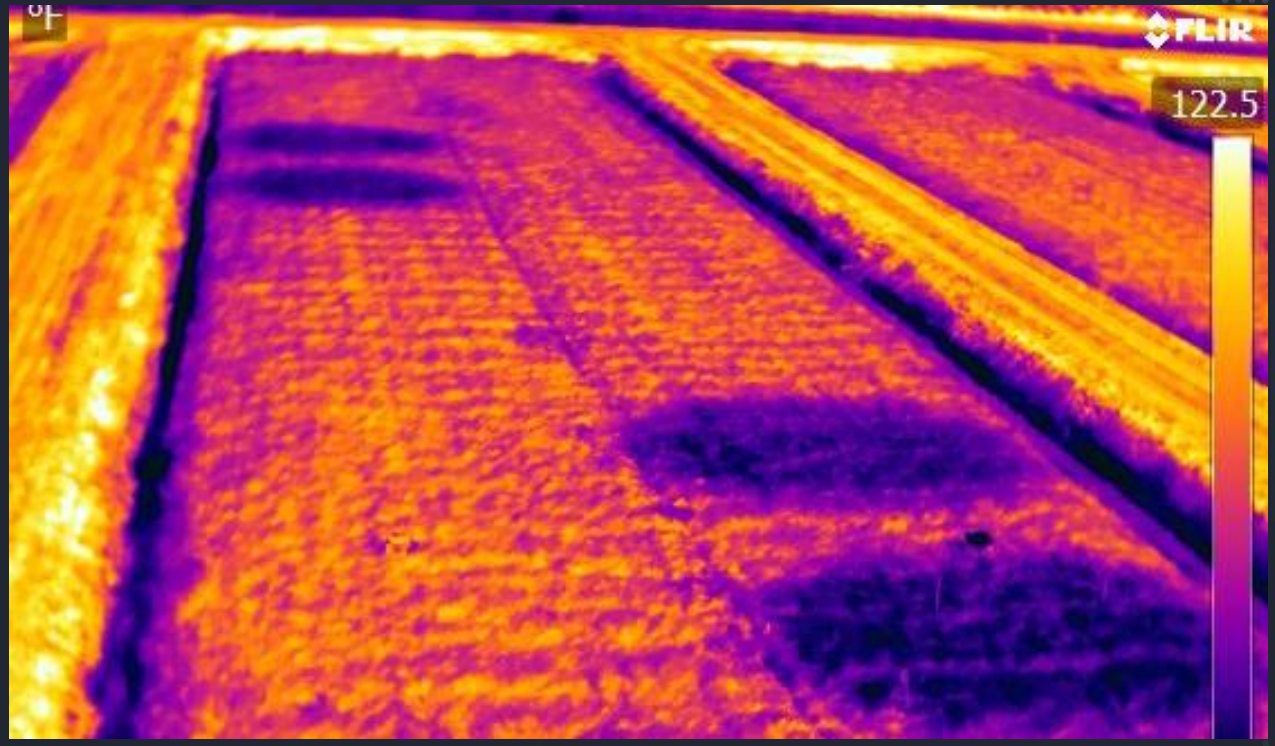




Effect of shading on internal berry temperature

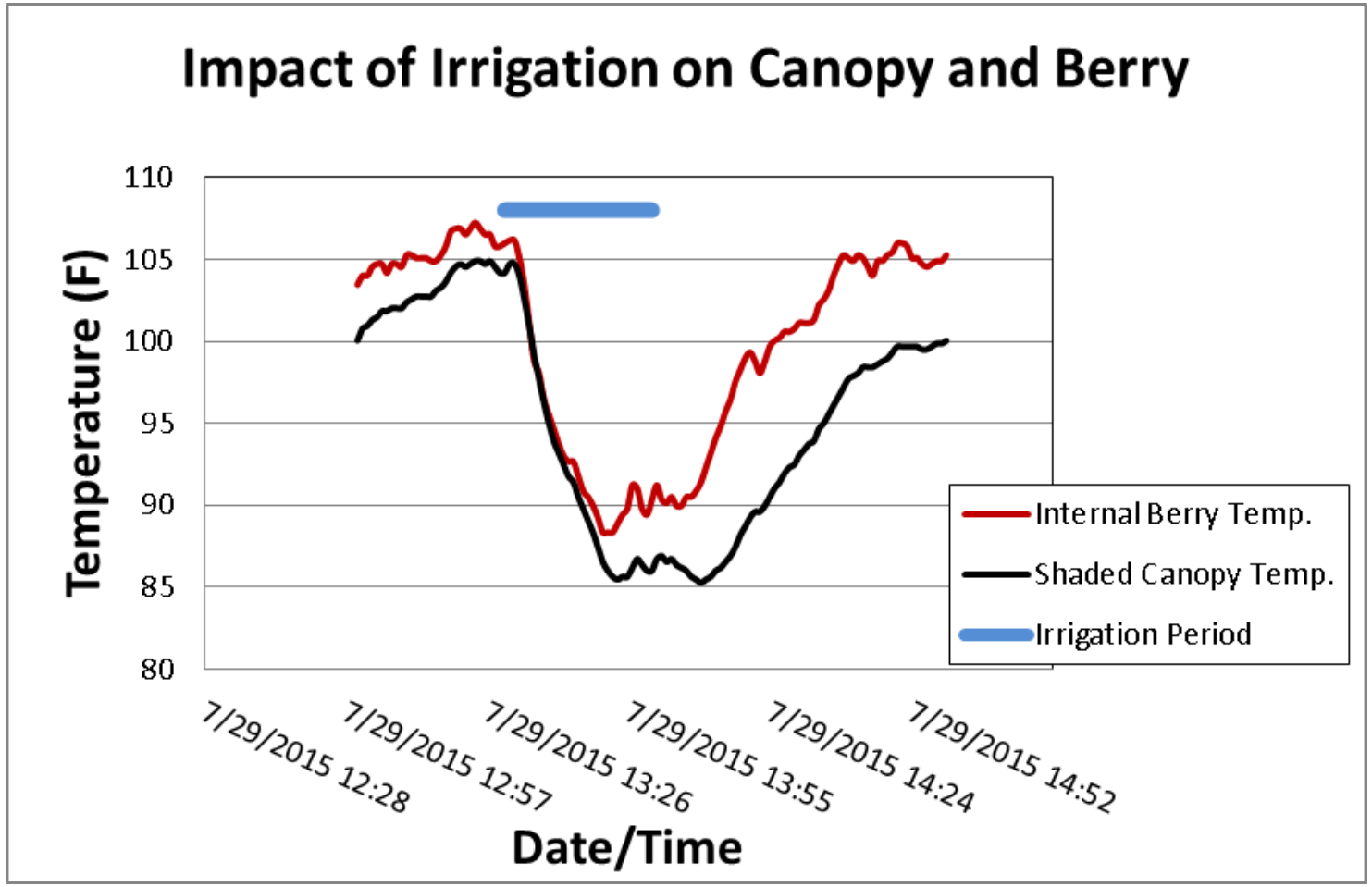
Blue shade cloth reduced both solar radiation by 50%

Larger Scale Studies



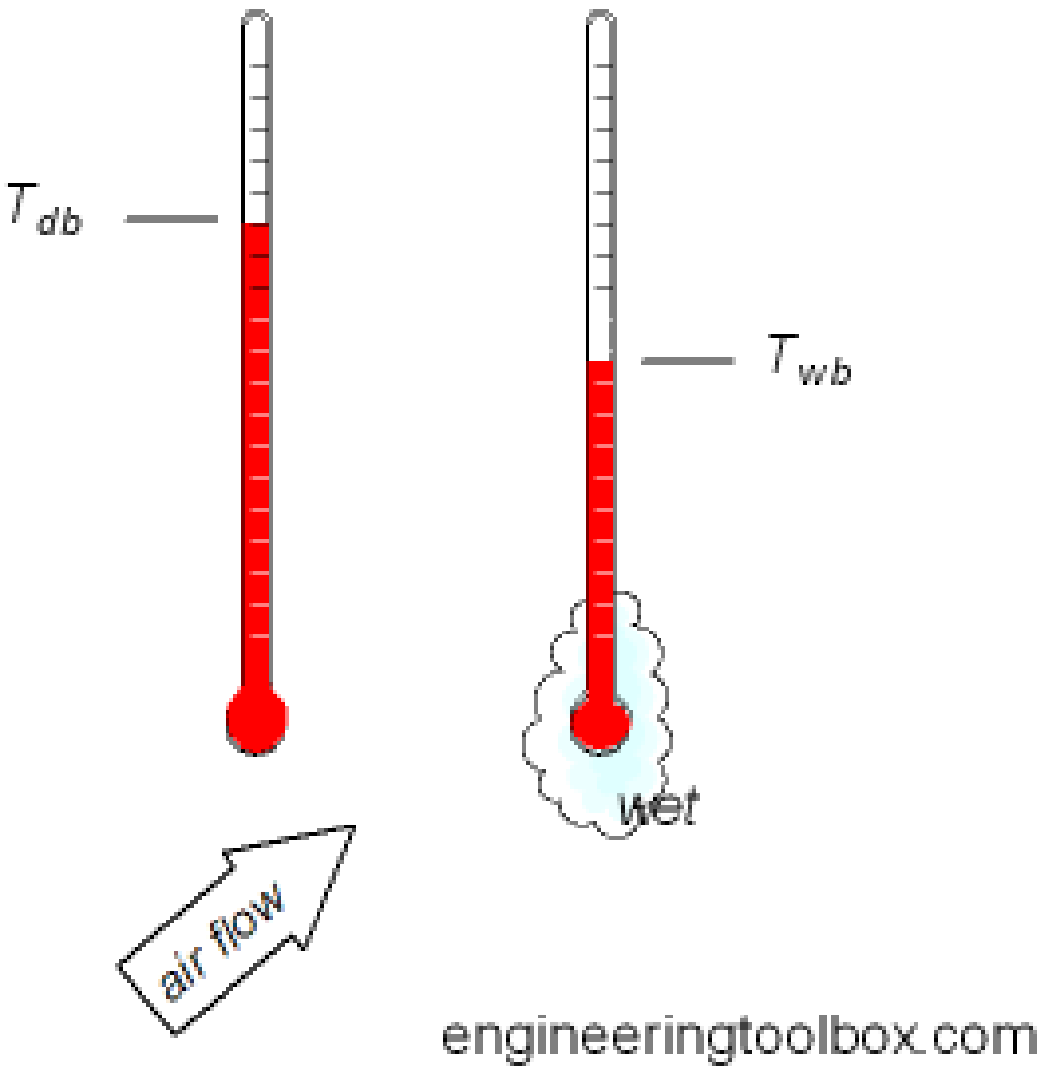
Evaporative Cooling

Impact of Irrigation



Irrigation

- **Convective cooling**
- **Evaporative cooling**
  - **Conditions**
  - **Wet bulb depression**
- **Negative effects**
  - **Increased rot**
- **Need for guidance**
  - **Threshold**
  - **Duration**



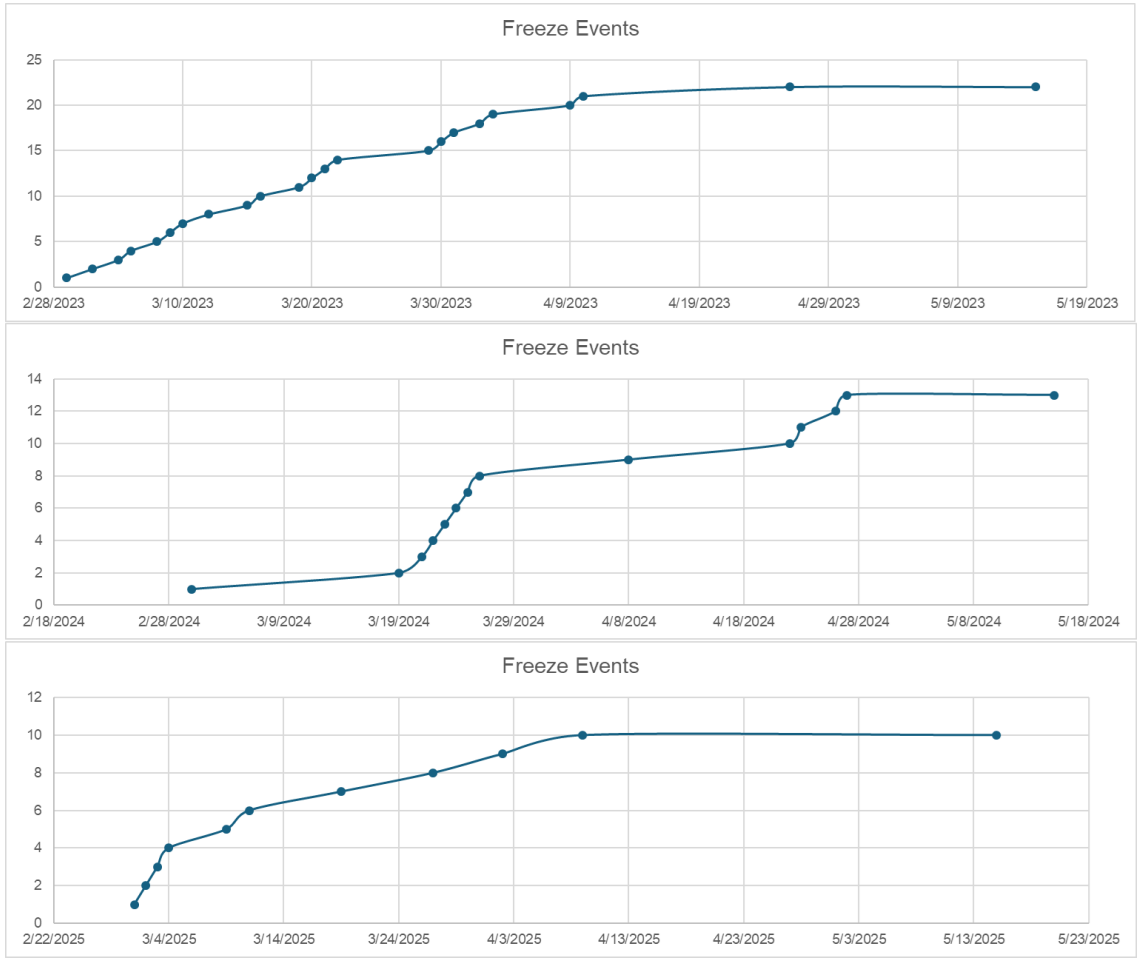

Over-irrigation
Increased fruit rot
Leaf drop
Over-heating
Soft fruit
Increased fruit rot

Climate, Loss and Disease Management

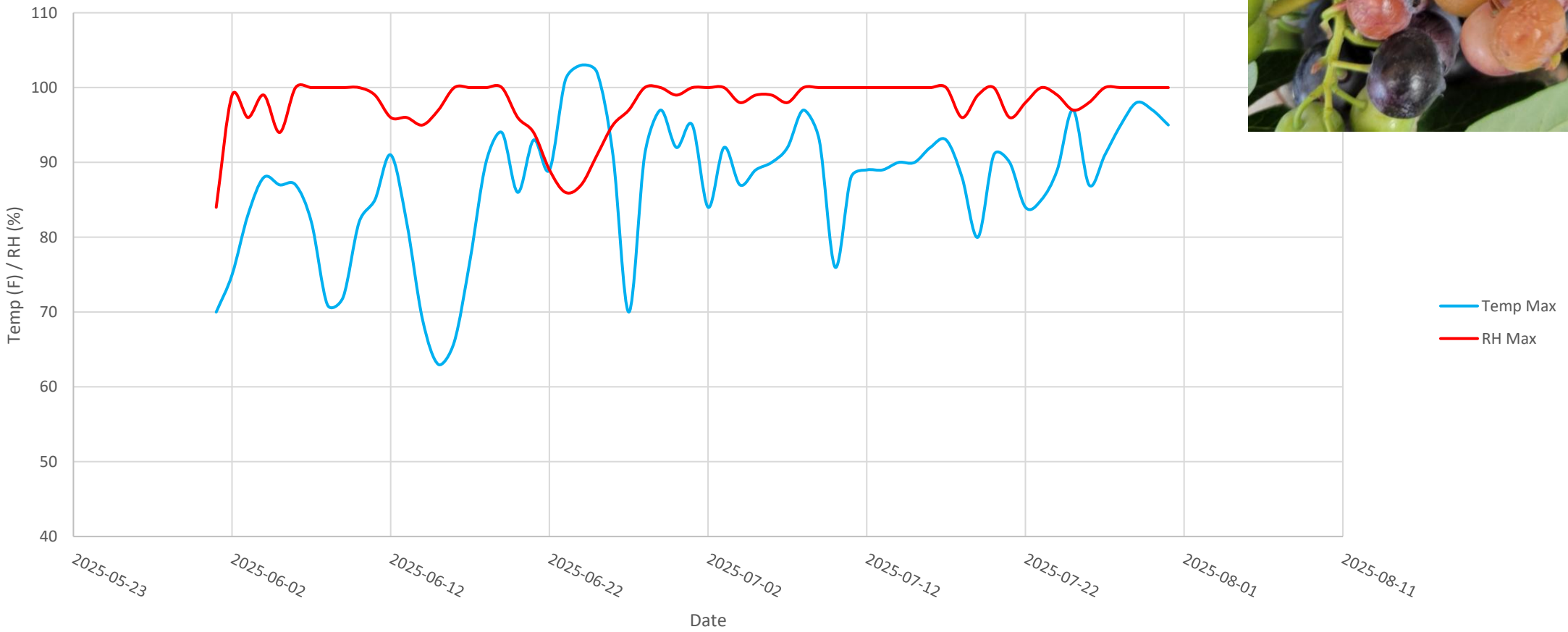
Pollination

Overheating

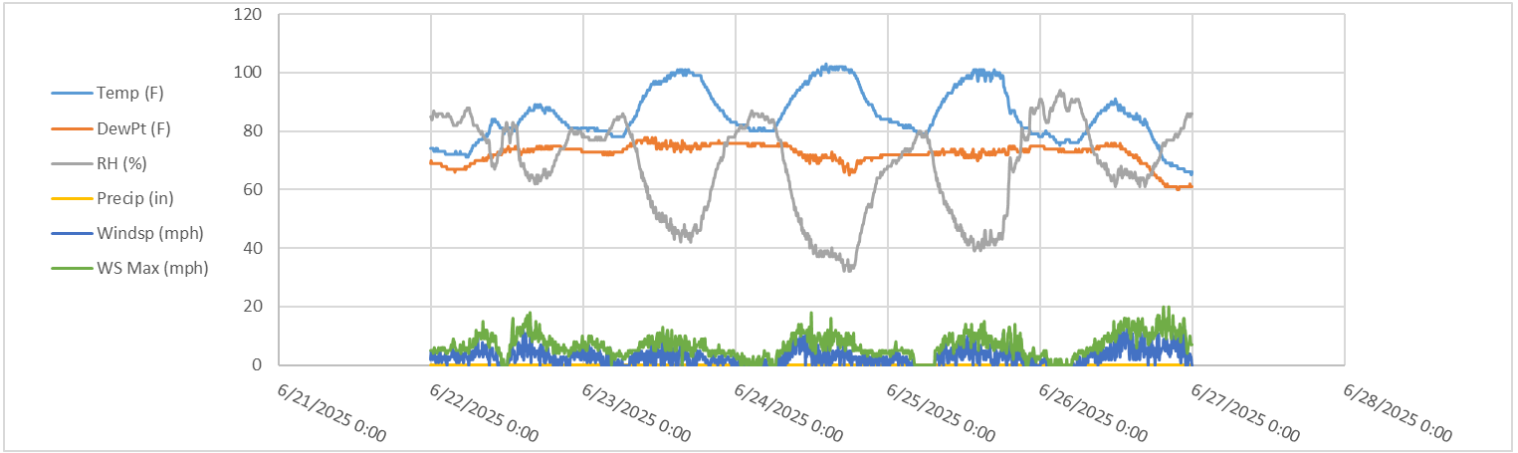
Freeze Events and Pollination

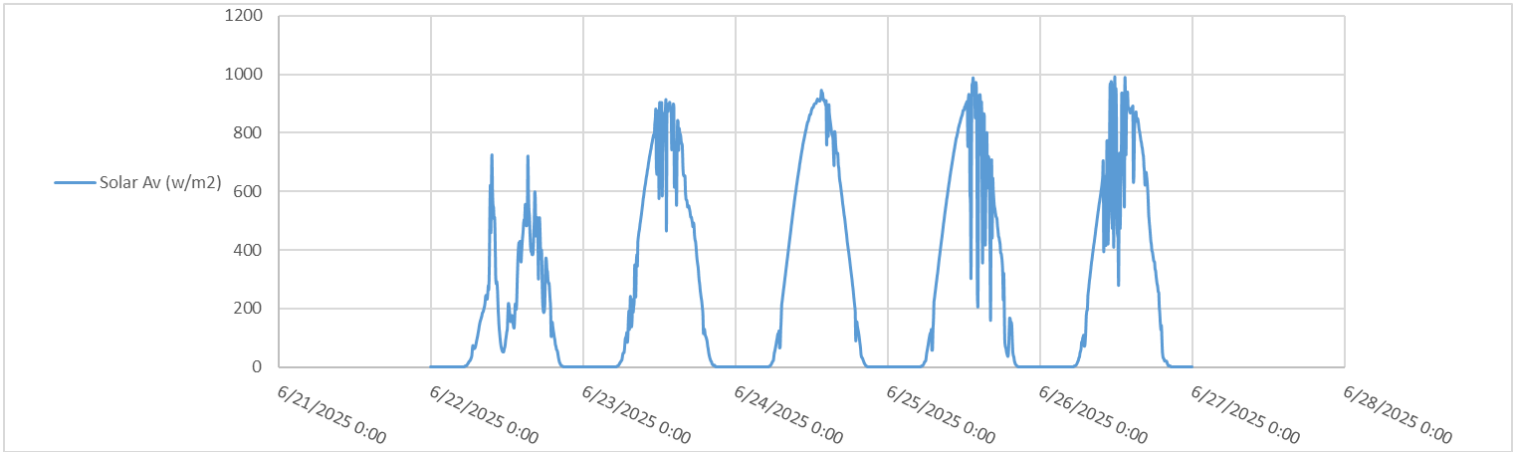


Harvest Season 2025

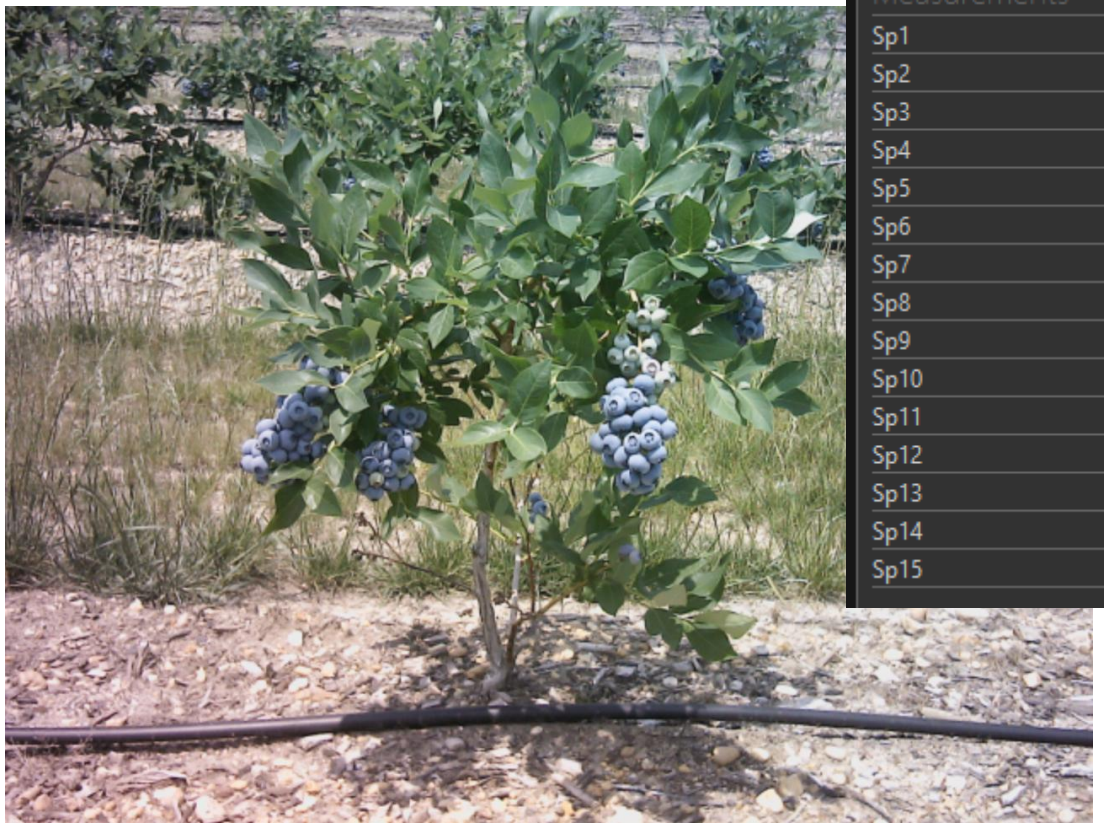


Days leading to loss





Complicating Factors in Fruit Quality



Measurements	
Sp1	105.2 °F
Sp2	92.5 °F
Sp3	96.0 °F
Sp4	105.2 °F
Sp5	85.5 °F
Sp6	100.0 °F
Sp7	130.9 °F
Sp8	135.4 °F
Sp9	84.5 °F
Sp10	98.3 °F
Sp11	119.2 °F
Sp12	102.9 °F
Sp13	90.9 °F
Sp14	120.8 °F
Sp15	120.6 °F

Pacific Northwest Heat Dome

Beat the Heat: Protecting Northern Highbush Blueberry from Extreme Heat

Authors:
Lisa Wasko DeVetter, Supriya Savalkar, Bhupinderjeet Singh, Micah Evalt, Pedro Rojas-Barros, David R. Bryla, Kirti Rajagopalan

SKU: FS406E | **Published:** November 2025

Watering
Shade
Harvest Adjustment
Fungicides

AMERICAN CRANBERRY GROWERS association

The CRANBERRY INSTITUTE™

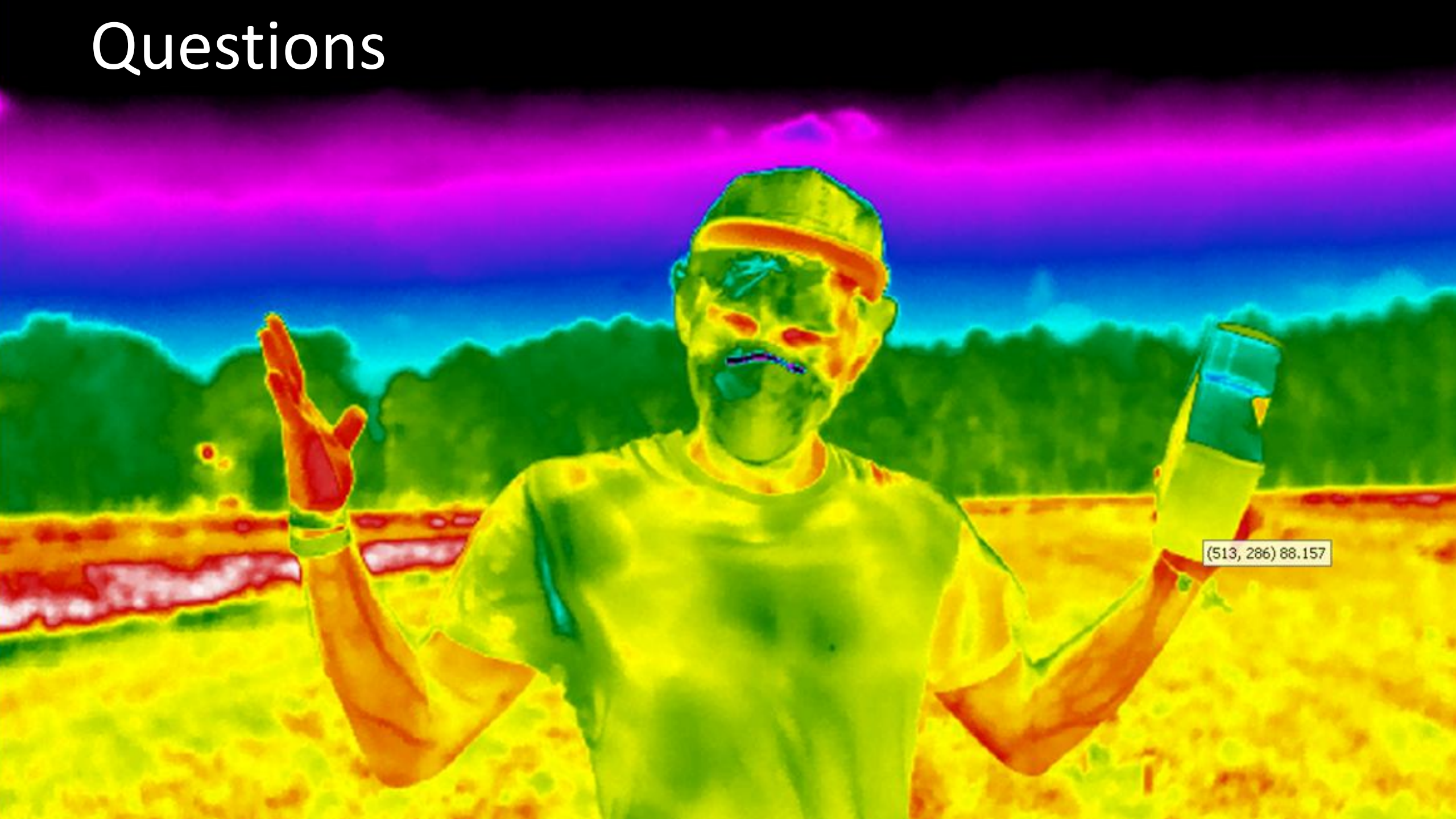
NEW JERSEY BLUEBERRY CRANBERRY RESEARCH COUNCIL

MASSACHUSETTS CRANBERRIES

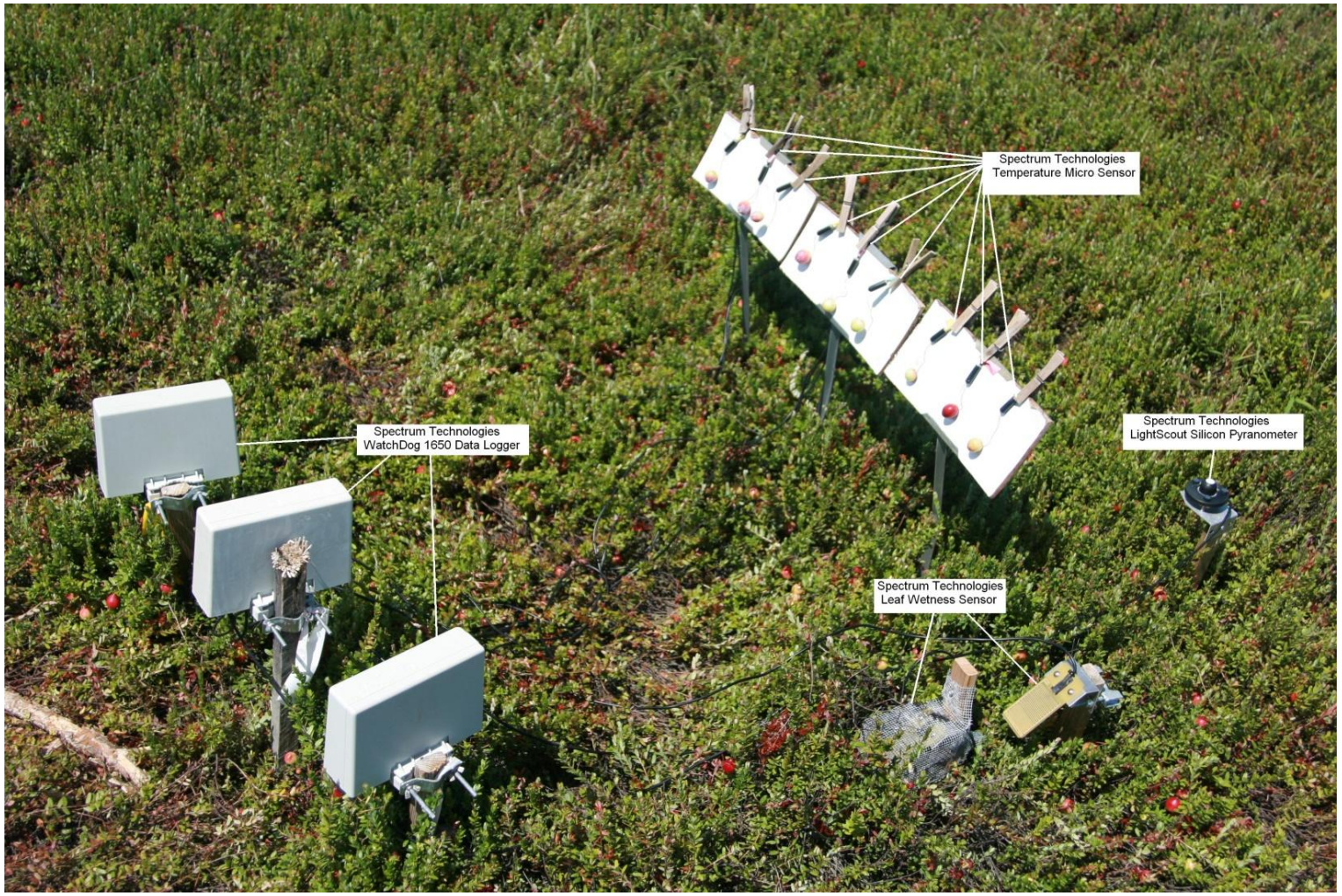
Ocean Spray

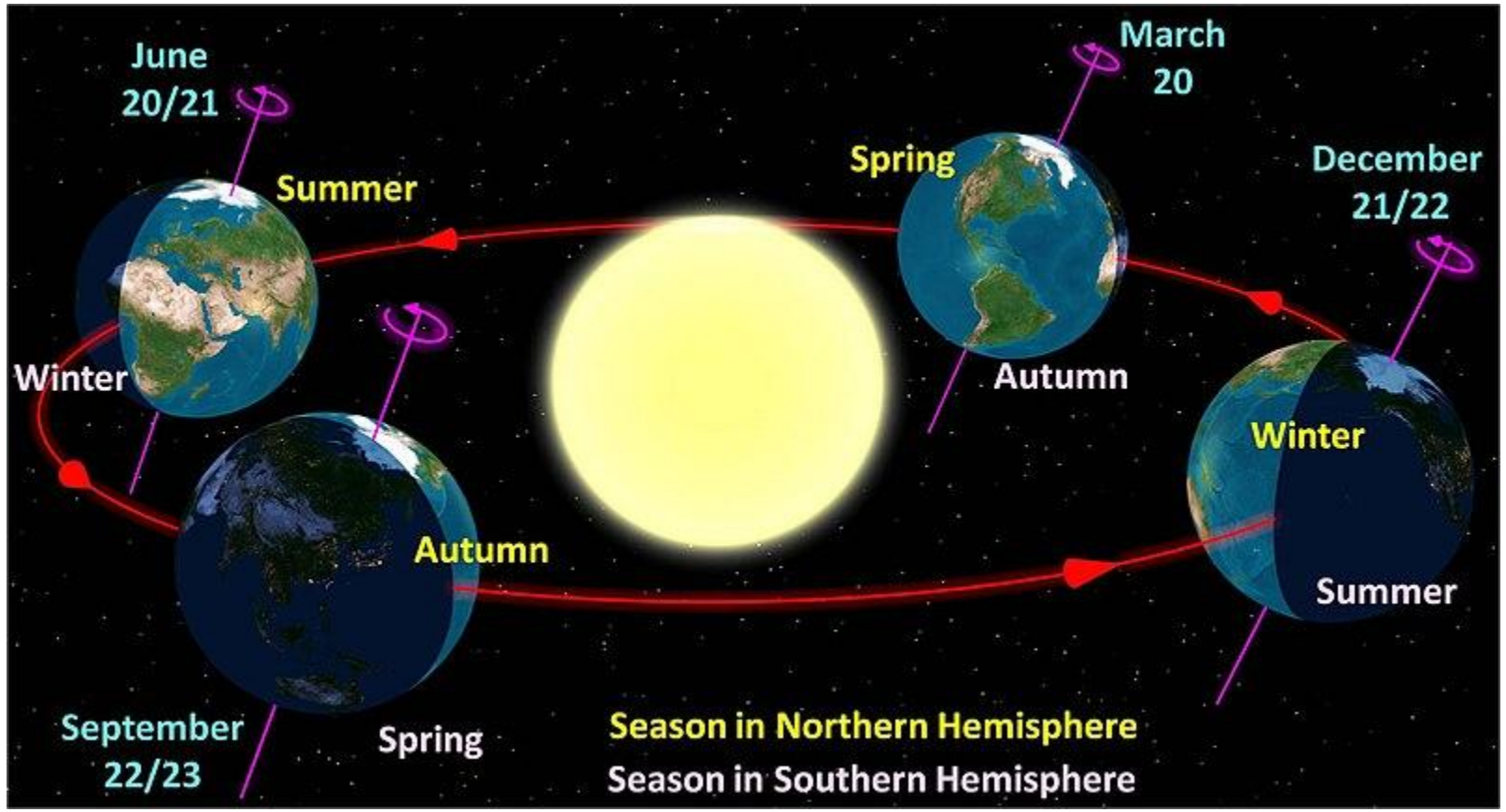
Funding and Collaboration!!! Thank you!

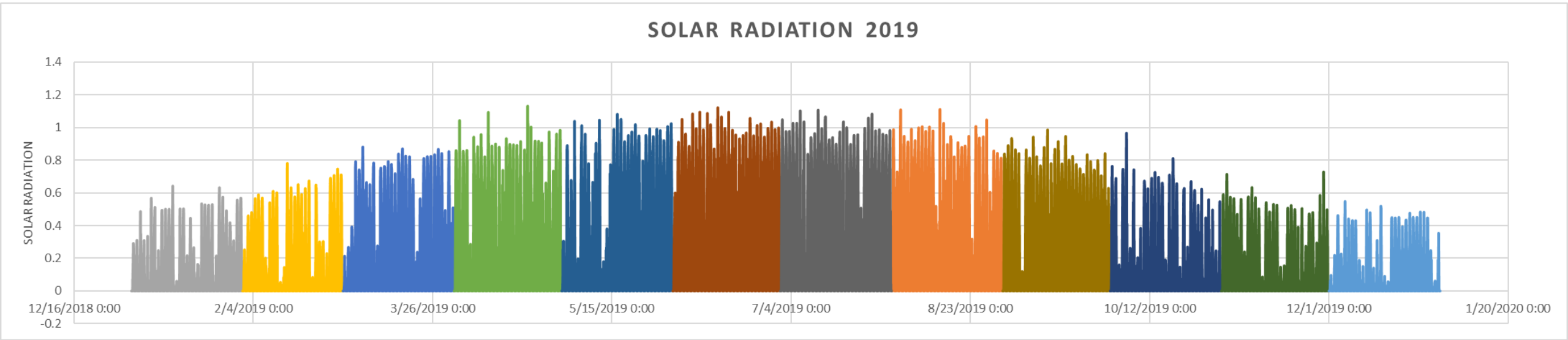
Questions



In Bog Climate Monitoring




June
20/21
Summer
March
20
Spring
December
21/22
Winter
Autumn
Winter
Autumn
Summer
September
22/23
Spring
Season in Northern Hemisphere
Season in Southern Hemisphere


SOLAR RADIATION 2019
SOLAR RADIATION
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
12/16/2018 0:00
2/4/2019 0:00
3/26/2019 0:00
5/15/2019 0:00
7/4/2019 0:00
8/23/2019 0:00
10/12/2019 0:00
12/1/2019 0:00
1/20/2020 0:00

What you can see when your UMWELDT changes….

Dave Jones – Intern extraordinaire!