Introduction to High Tunnel Production

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High Tunnel and Urban Ag Instructor

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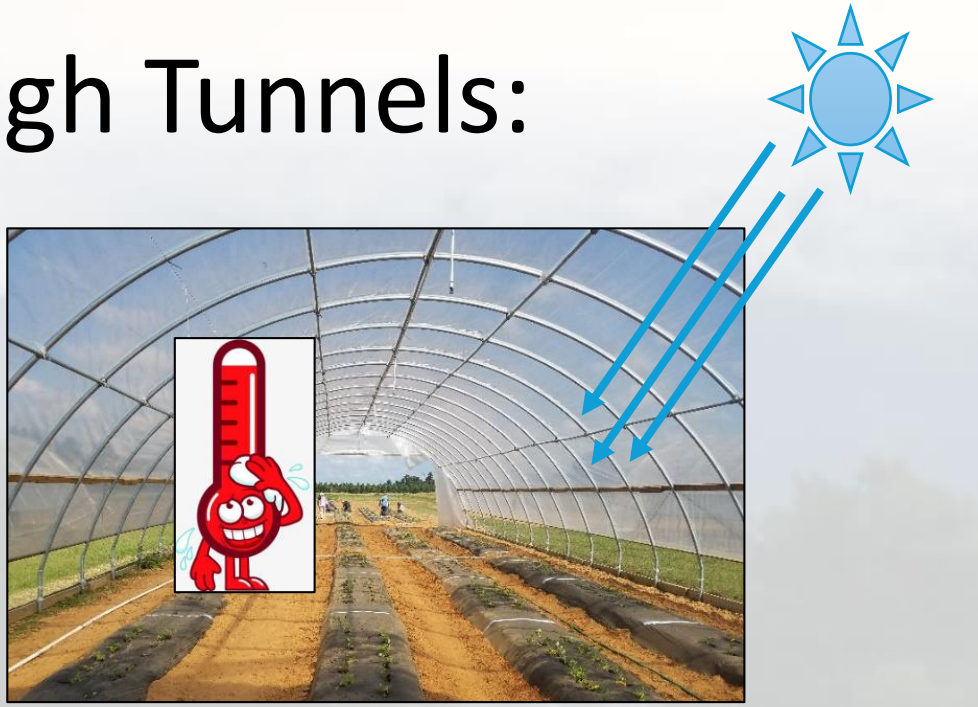
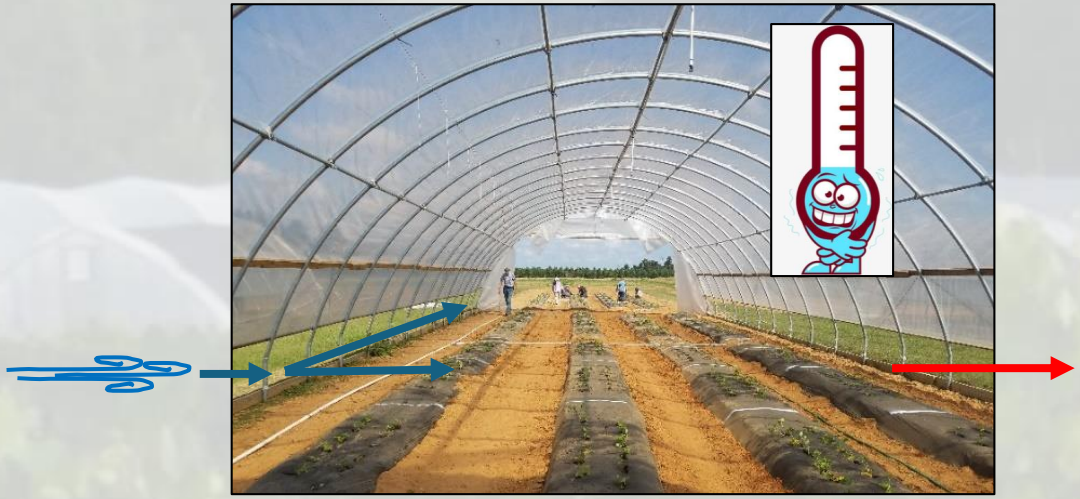
Quick Introduction to High Tunnels:

- Plastic covered structures that use solar radiation and wind to raise and lower their internal temperature.
- No additional lighting
- Plants are grown directly in the existing soil





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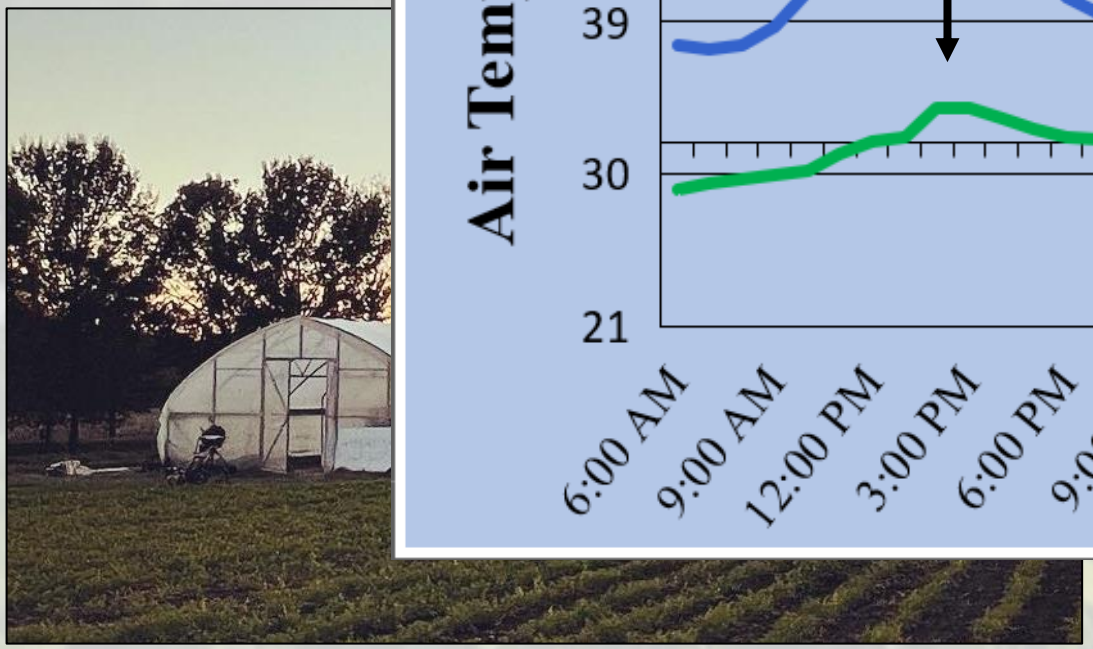

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Benefits and Uses of High Tunnels

- Protect plants from weather events that could stress or kill plants and limit crop production
  - Frost
  - Rain
- Reduce disease pressure
- Reduce the number fungicides sprays

Proper climate management

- Some control over a crops' environment

Season Extension!

- Strengthens grower/customer relationship by maintaining contact year-round

Plant earlier in the spring
↳ **Earlier harvests**
↳ **First to the market**
↳ $$

Extend harvest into the fall and winter
↳ **Stay longer at markets**
↳ **Extend farm revenue periods**

Site Selection and Preparation

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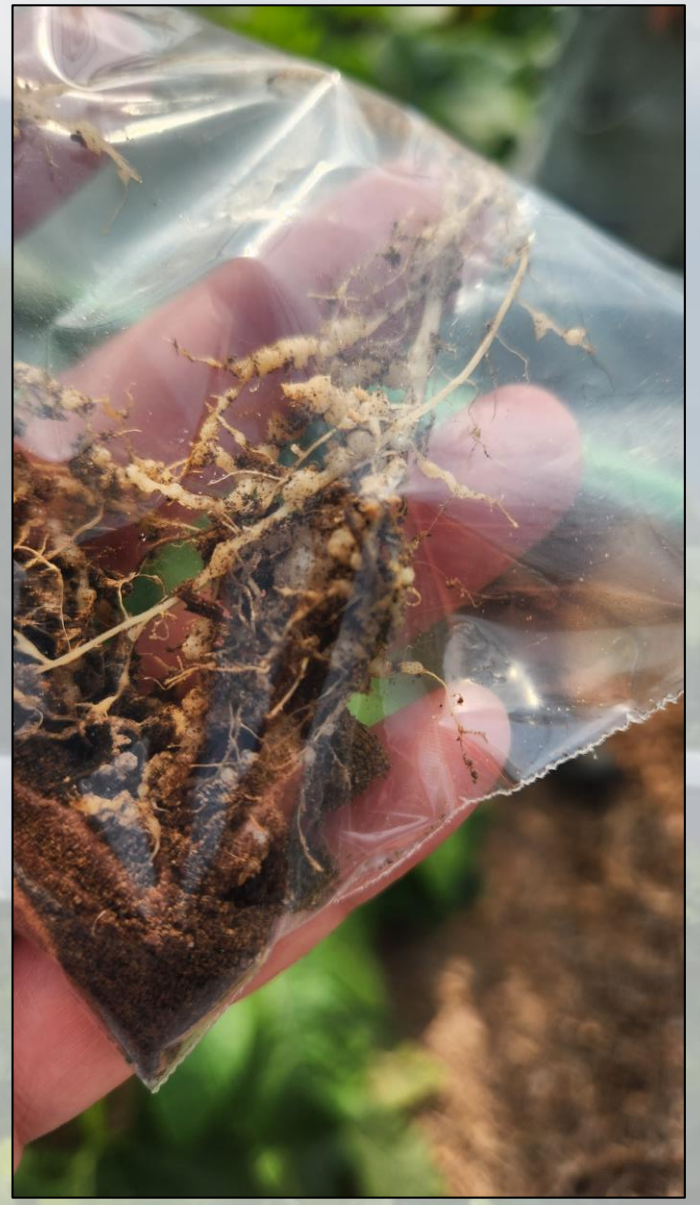
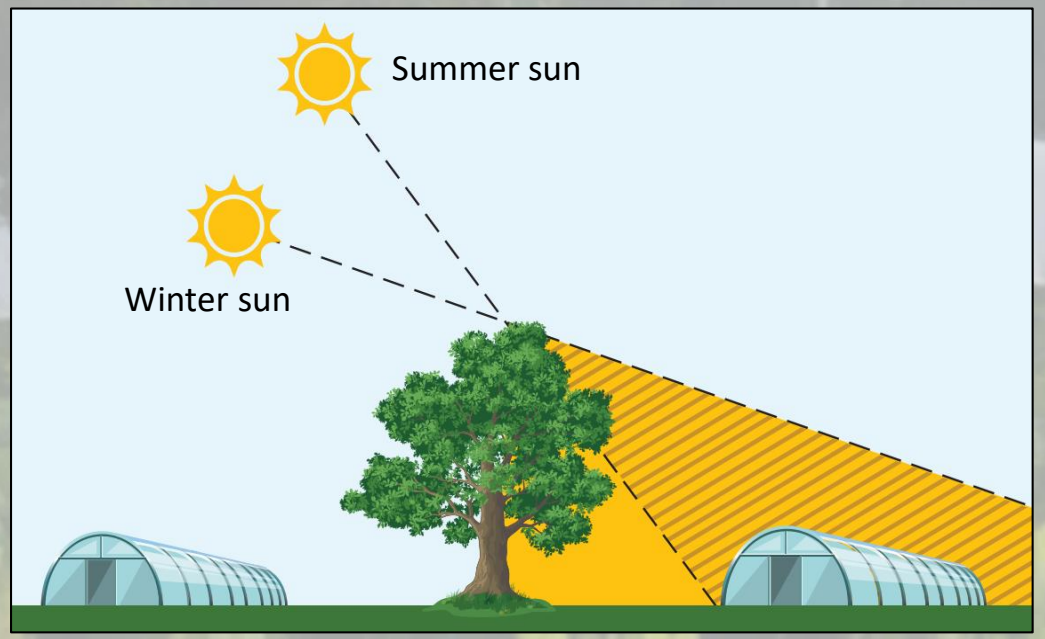
Key Considerations when Choosing a Location for a High Tunnel:

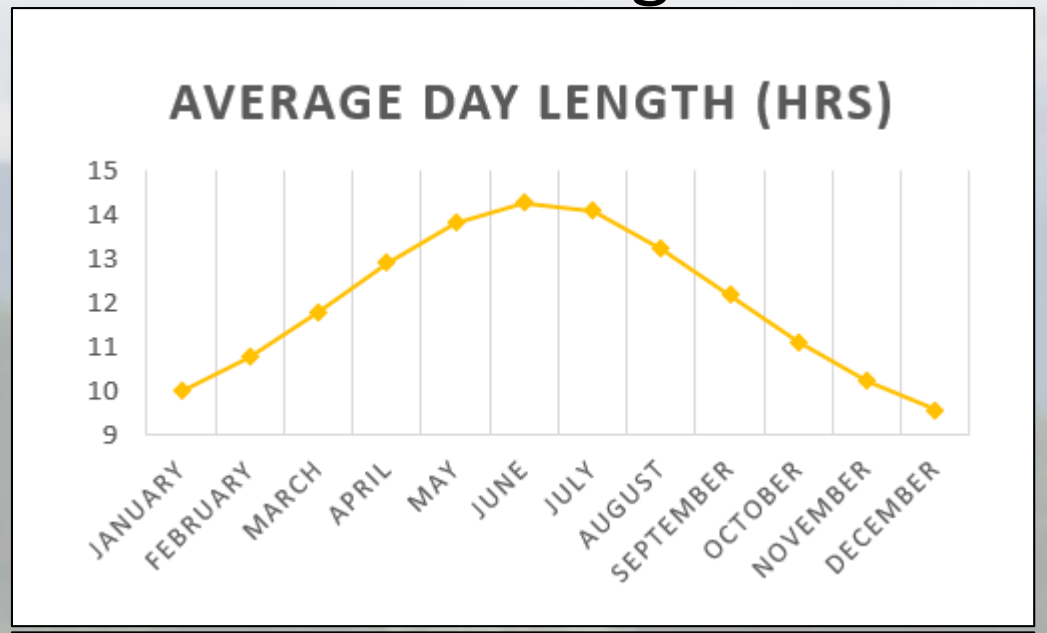
1. Soil Conditions:
   - Health: history? compaction? soilborne diseases? nematodes?
   - Drainage:
     - Well drained soils – lower disease pressure
     - Slope or grade site to divert water
   - Soil type: Sandy type soils are better for out of season production
     - Warm earlier and more quickly
     - Drain well

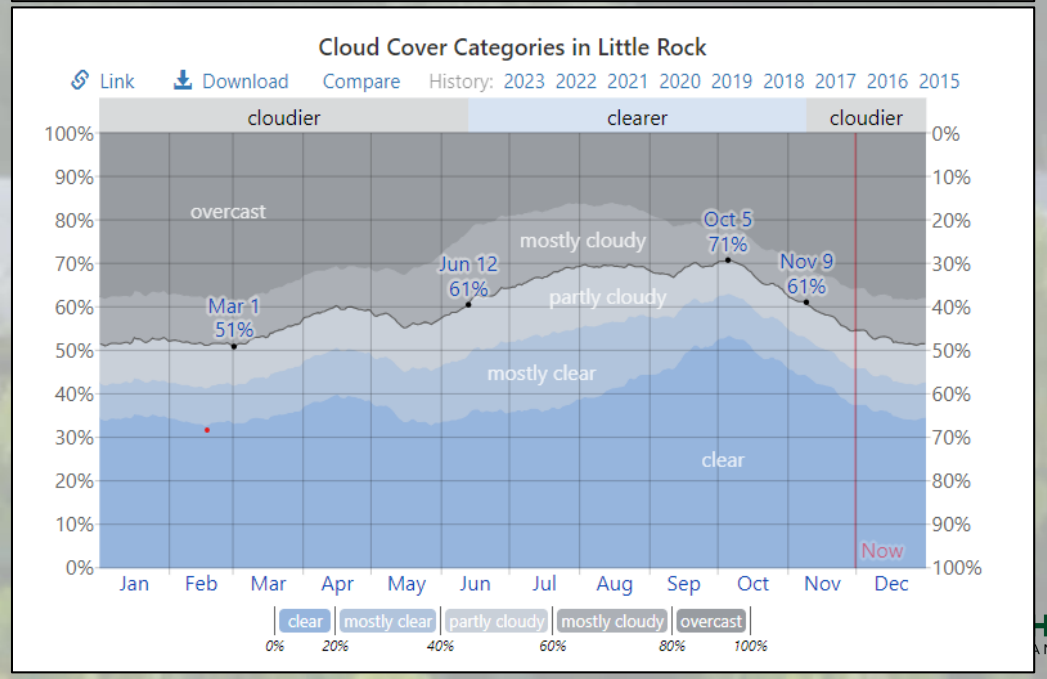


Key Considerations when Choosing a Location for a High Tunnel:

1. Soil Conditions:
   - Health:
   - Drainage:
   - Soil type:
2. Sunlight:
   - limited sunlight = slow growth
   - important for winter production







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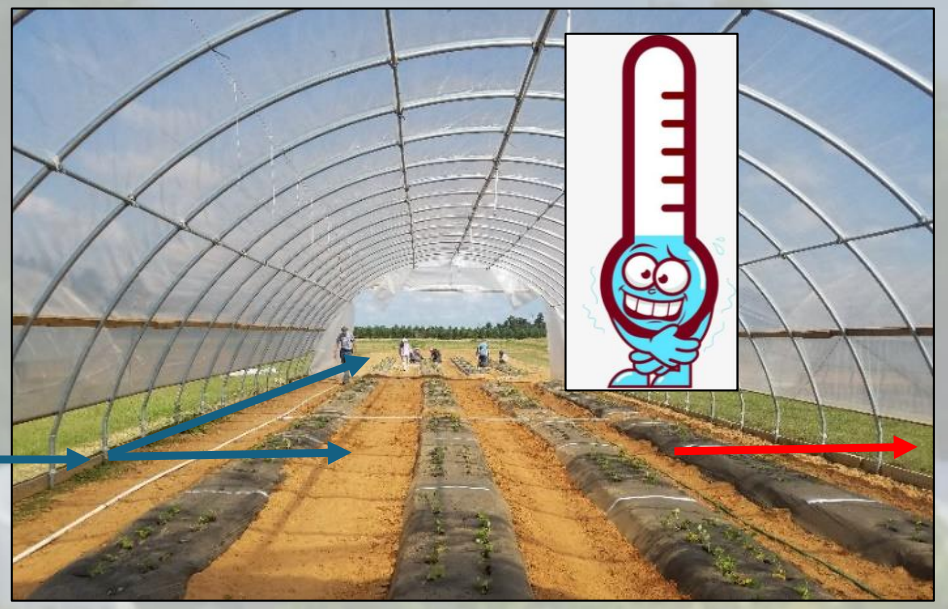
Key Considerations when Choosing a Location for a High Tunnel:

1. Soil Conditions:
   - Health:
   - Drainage:
   - Soil type:
2. Sunlight:

   limited sunlight = slow growth
3. Wind:
   - Temperature and humidity management
   - disease suppression

   breezy but avoid high winds



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1. Soil Conditions:
   - Health:
   - Drainage:
   - Soil type:
2. Sunlight:

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3. Wind:

   breezy but avoid high winds
4. Access to utilities
   - Water
   - Electricity
5. Room to expand
6. Know your neighbors

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Key Considerations when Choosing a Location f

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7. Orientation
   - Sunlight
   - Wind - major vents perpendicular to the prevailing wind

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High Tunnel Design Considerations

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Tunnel Design

- Shape and size will affect light/shading, heat retention and growing space
  - Narrow tunnels cool more quickly
  - Taller, wider tunnels retain heat longer
- Ventilation capacity = better climate control and disease suppression

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Crop Selection and Planting Dates:

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Crop Selection

- Home garden:

  Any common fruit or vegetable can be grown in a tunnel

- For the Market:

  Vegetables are most common and most profitable

  - Tomatoes $$$
  - Lettuces
  - Peppers
  - Cucumbers
  - Eggplant
  - Summer squash

  Small fruiting crops - strawberries

Considerations for Planting Date:

Planting date is largely determined by three key things:

1. The crops specific growing requirements:
    1. Temperature
    2. Daylength and lighting
2. Temperatures that can be maintained inside the high tunnel
3. Market times and availability

Crop	Temperature		
	Day	Night	Soil
Eggplant	70 – 80°F	65°F	
Cucumber	70 – 75°F	65°F	70 – 80°F
Summer Squash	70 - 75°F	65°F	65 – 80°F
Pepper	70 – 75°F	60°F	65 – 75°F
Tomato	70 – 75°F	60°F	65 – 75°F
Broccoli	65 – 70°F	60°F	60 – 70°F
Lettuce	60 – 65°F	40°F	60 – 70°F

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Considerations for Planting Date:

GENERAL:

- More hardy warm season crops:
  - such as tomatoes, peppers
  - transplant 1-1.5 months before your areas frost-free day in the spring
  - may need additional protection – frost cloths
- Tender warm season crops:
  - such as cucumber, summer squash
  - transplant 2 -3 weeks later
  - additional frost protection may be needed
- Cool season crops:
  - Full heads/plants: plant early enough that plants are near full maturity before light and temperatures become too low to support growth.
  - Leaves/small plants: later plantings possible – stagger plantings

Remember growth rates will be slower

Average Frost-Free Date

Climate Management:

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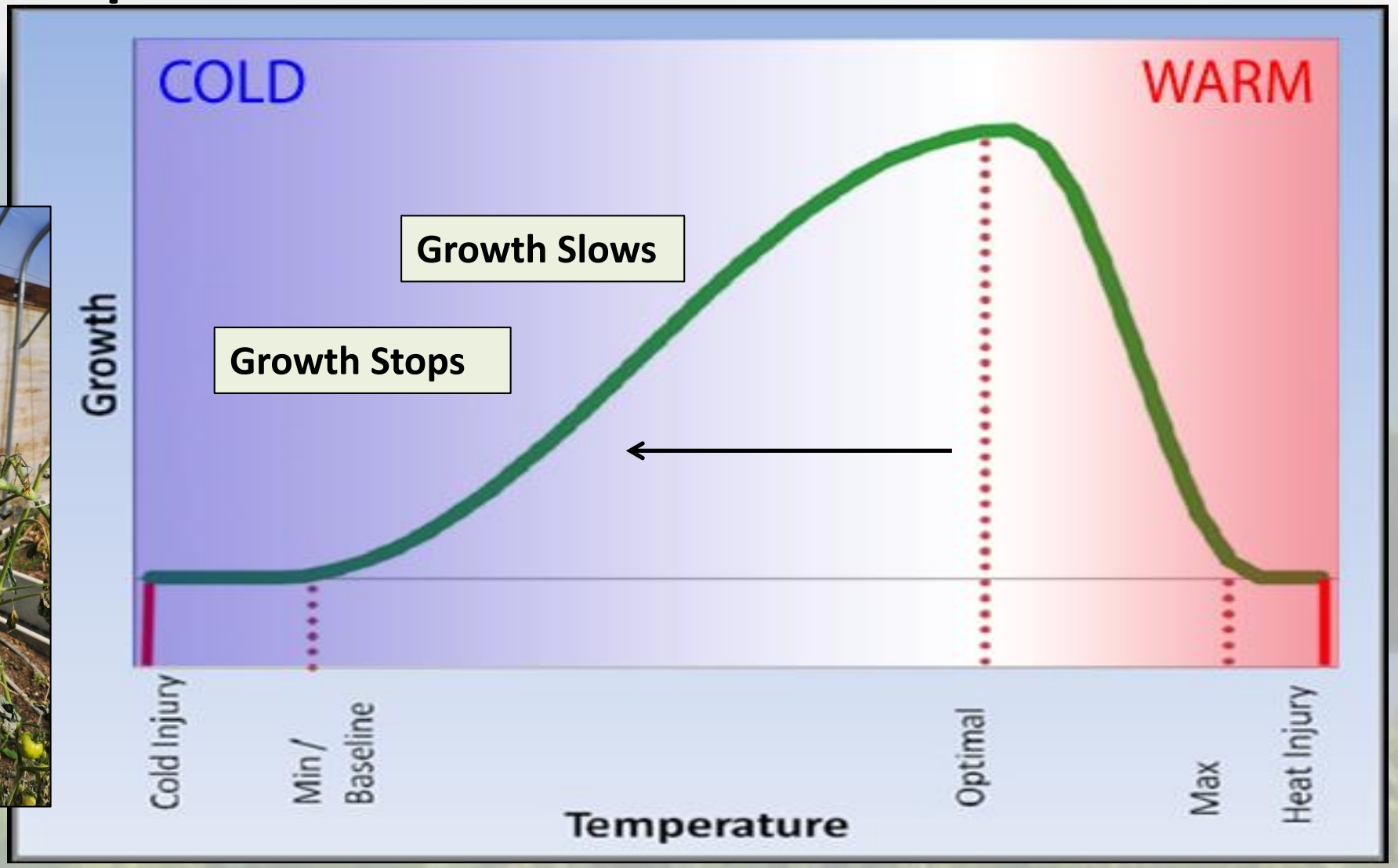
Plant Growth and Temperature



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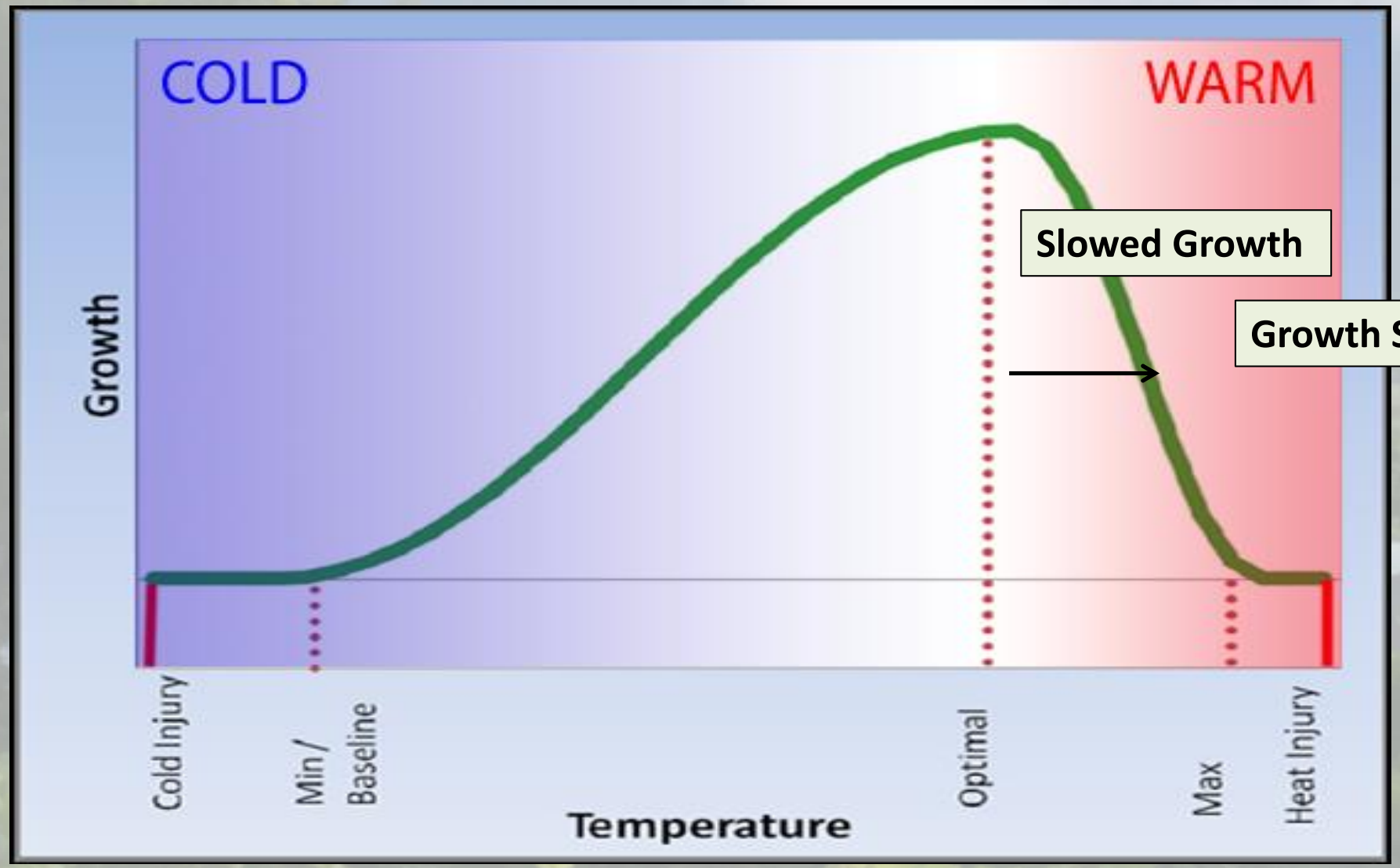

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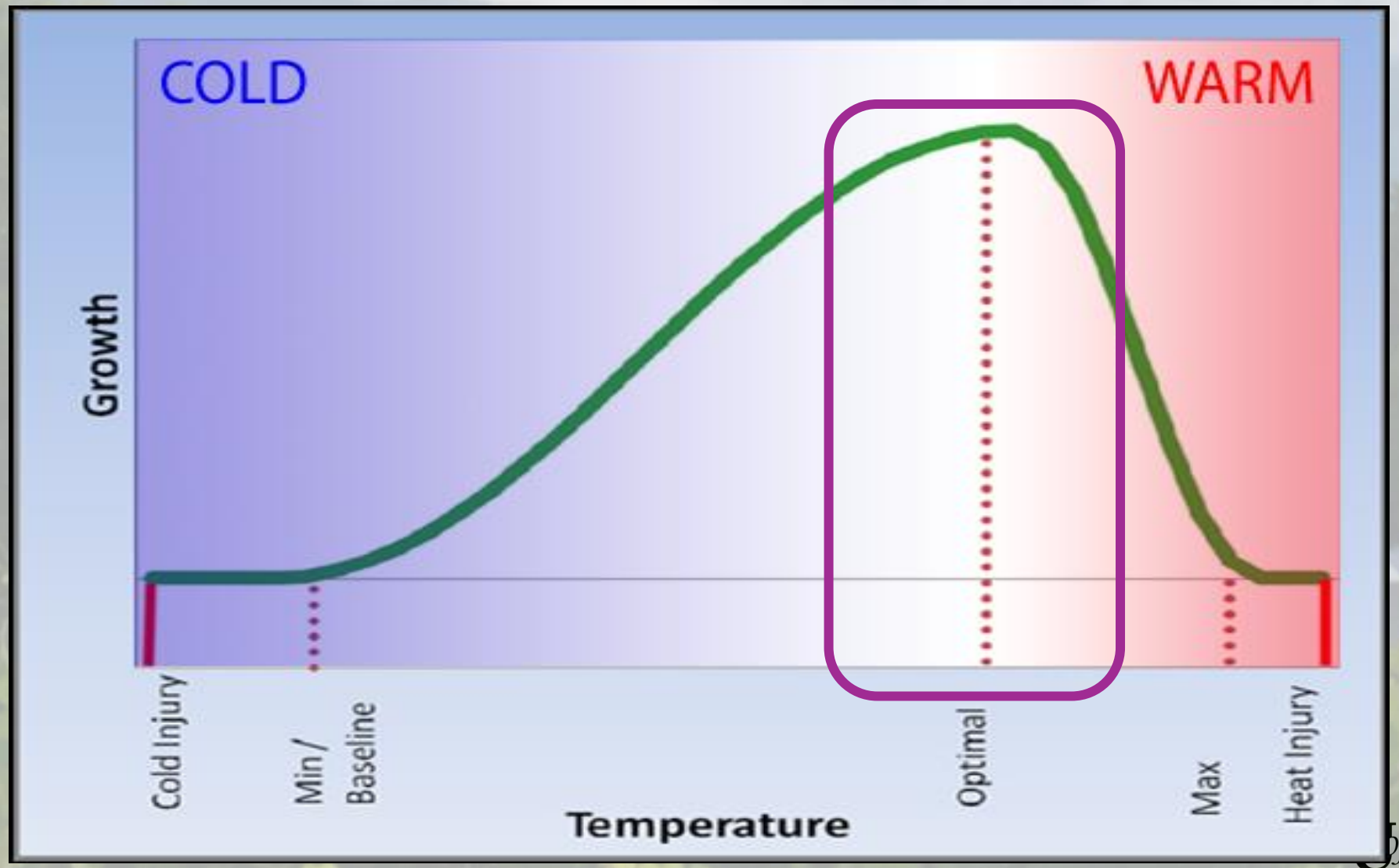

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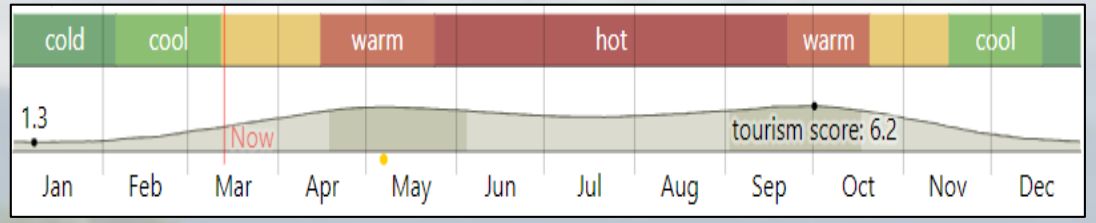
Plant Growth and Humidity

- Directly affect plant architecture
  - ↑ relative humidity = ↓ natural wax
    - More susceptible to drought conditions
- Affect water movement through the plant
- Increased disease pressure
  - Botrytis
  - Downey mildew
- Vapor Pressure Deficient (VPD)
- Cooler air = lower humidity

Standard Daily Climate Management Practices

Winter:

1. Prevent or protect from damaging cold temperatures
2. Avoid excessively high temperatures (70-75°F)



- Secondary covers - night
  - Row cover (0.5-1.5 oz)
    - 1st cover 2-5 degrees
    - 2nd cover additional 1-2 degrees
- Ventilate on warm or sunny days
- Additional heating
- Monitor humidity
  - Remove secondary covers during the day

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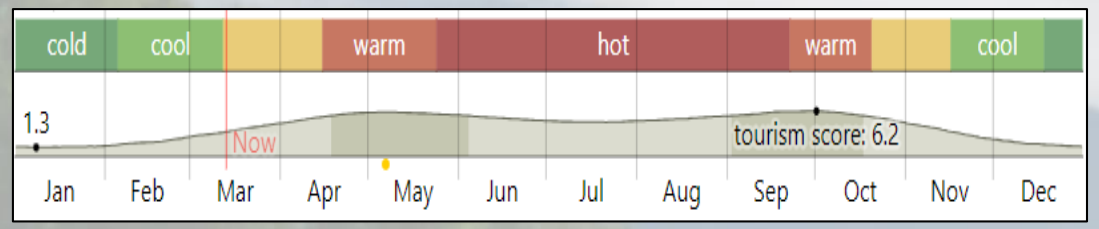
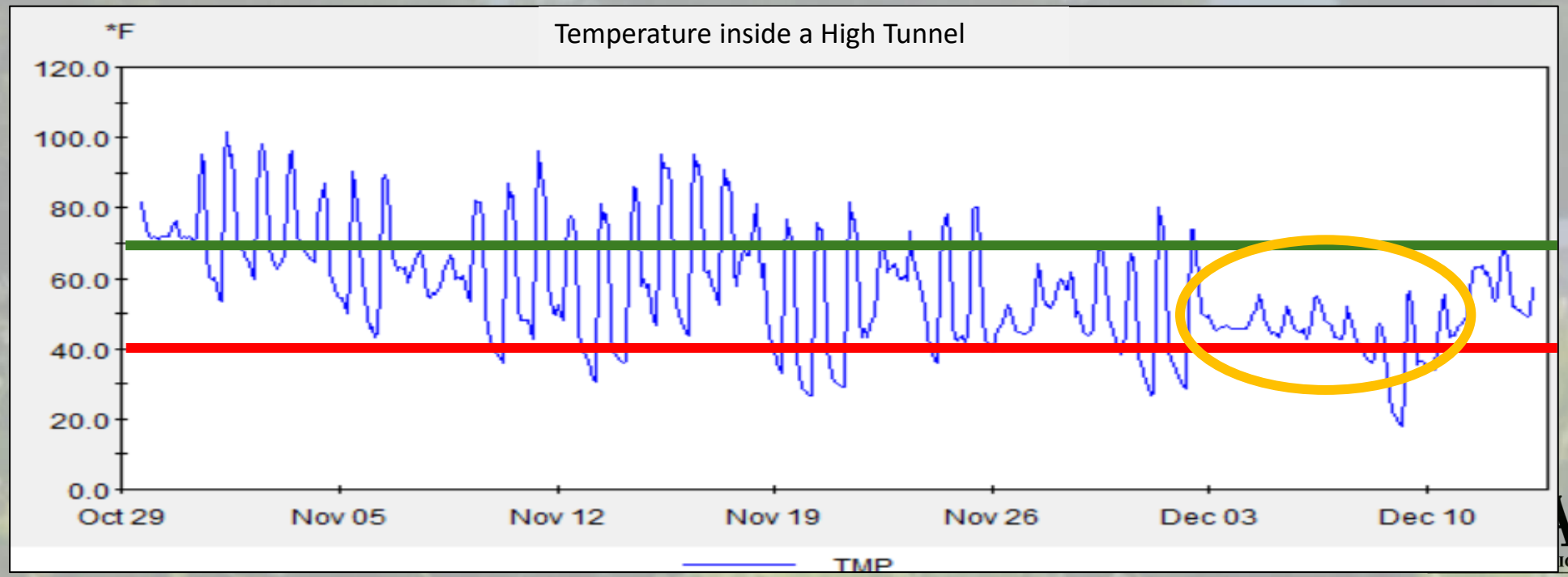


Spring and Fall:

1. Preventing high temperatures
2. Protect plants from sudden temperature drops

- Highest labor need (usually)



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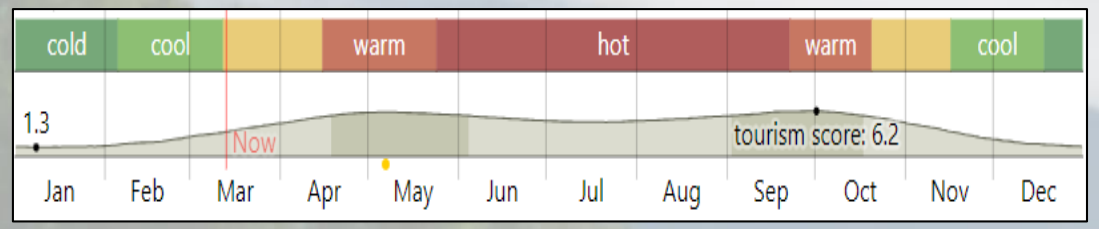

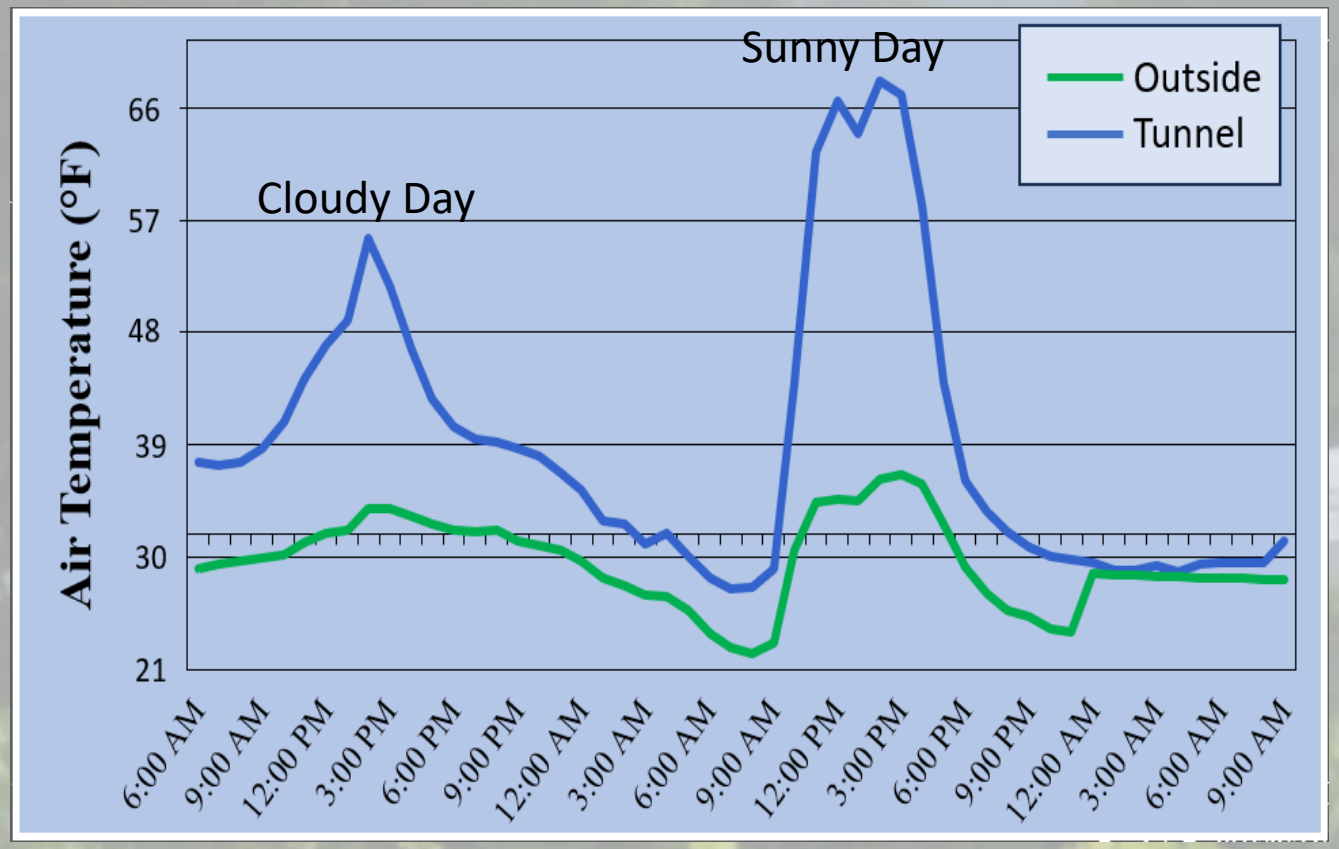

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1. Preventing high temperatures
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Highest labor need (usually)

Daily Management:

- Monitor forecasts daily
  - Indicate venting and/or secondary cover needs
  - Extremely cold and overcast = no venting
- Monitor the internal temperature of the high tunnel
  - Partly sunny cold days, or warm overcast days
- Monitor humidity

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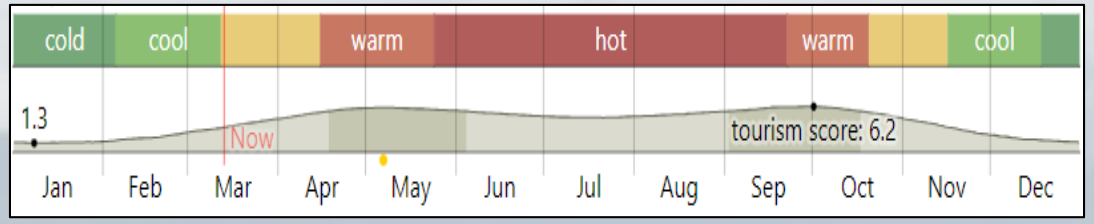
Standard Daily Climate Management Practices

Summer:

1. Prevent excessively high temperatures
2. Ventilation

- Maximize ventilation and air movement
- Shade cloth is absolutely necessary!
  - Varying degrees of shade 10-80%
  - Cover from June- August
- Fans



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