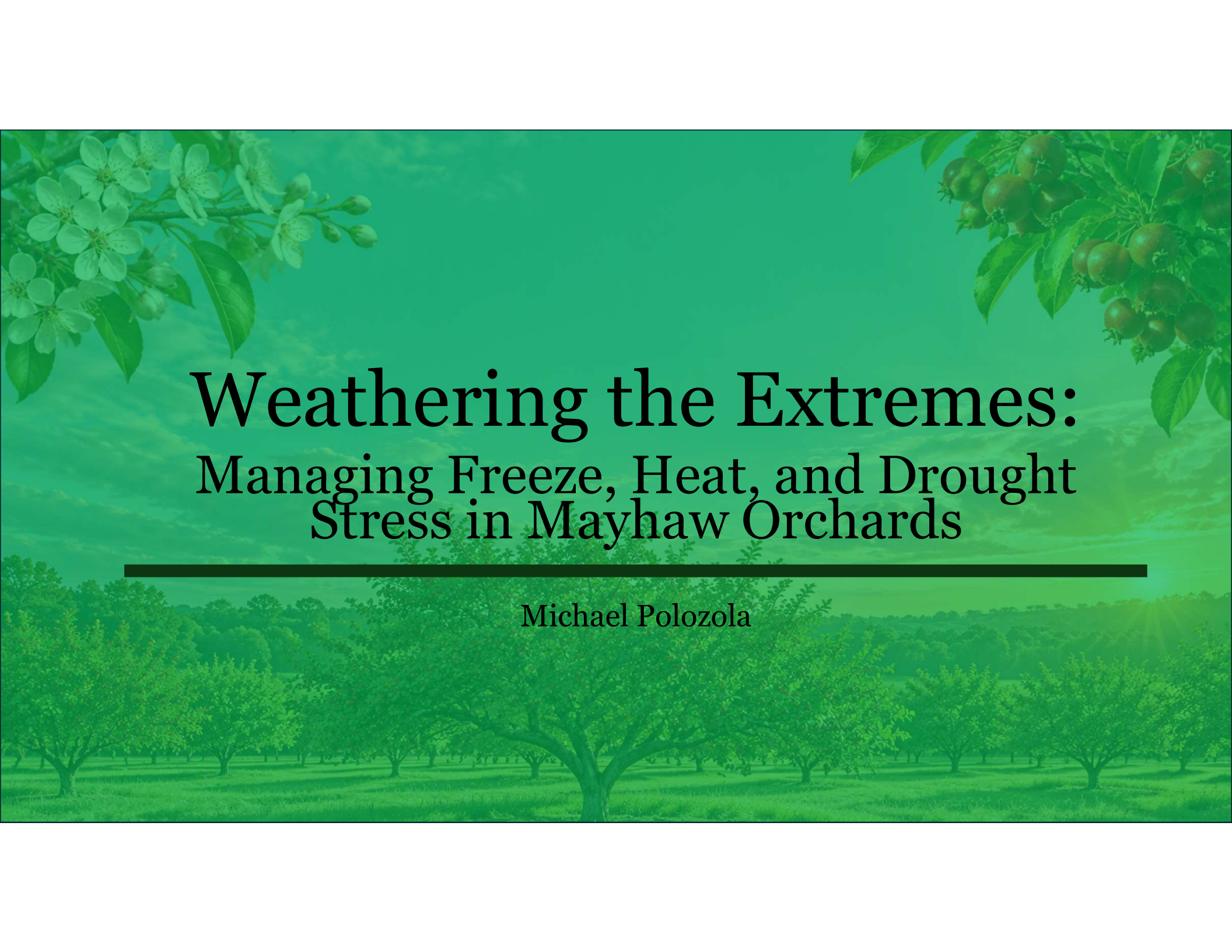




Weathering the Extremes: Managing Freeze, Heat, and Drought Stress in Mayhaw Orchards

Michael Polozola

Weather Matters. Resilience Matters More.

- Weather affects flowering, fruit set, and yield.
- Not all stress can be prevented.
- Some impacts can be minimized.
- Recovery can often be improved.

Today's Goals

- Understand environmental stresses.
- Discuss management strategies.
- Improve orchard resilience.



How Environmental Stress Affects Mayhaw Production

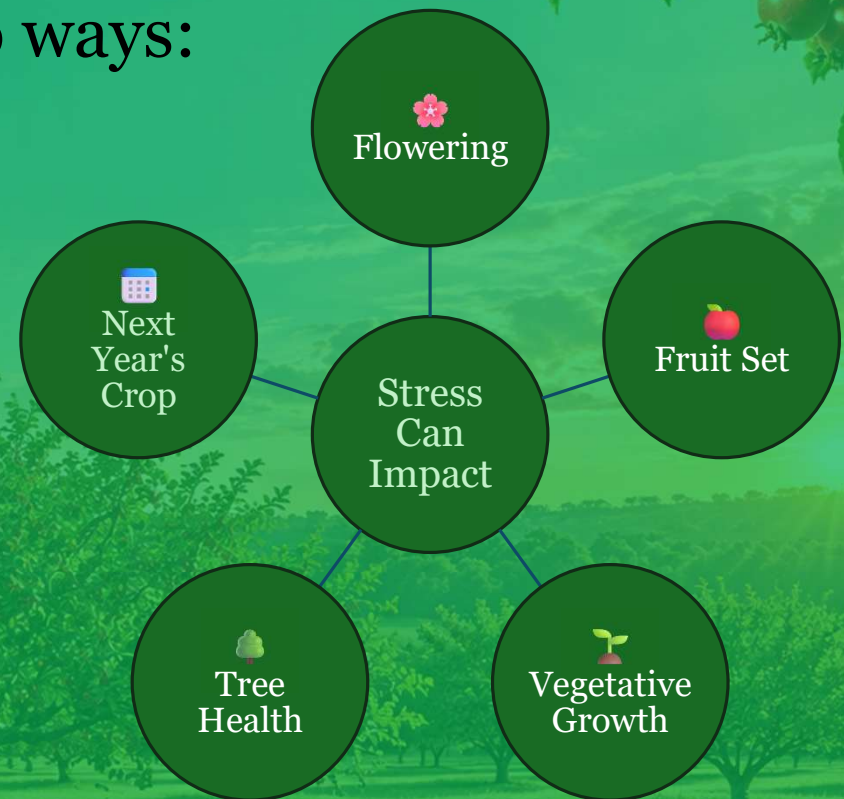
Stress can affect the orchard in two ways:

Immediate Effects

- Freeze injury
- Fruit loss
- Defoliation

Delayed Effects

- Reduced bud development
- Poor return bloom
- Reduced vigor
- Lower future yields



The background of the slide is a lush green orchard scene. In the foreground, there are several large, leafy trees. In the background, there are more trees and a bright sun shining through the clouds on the right side. In the top left corner, there are white cherry blossoms, and in the top right corner, there are clusters of red fruit, likely cherries or apples, hanging from a branch.

Freeze Stress

Freeze Stress: Growth Stage Matters

- Freeze damage depends on growth stage.
- Flowers and fruit are more vulnerable than dormant buds.
- A tree may survive while the crop is lost.

Increasing Freeze Vulnerability →



The same temperature can produce very different outcomes depending on growth stage.

What Temperature Damages Mayhaw Blooms?

The Honest Answer: We Don't Know.

- Critical freeze thresholds are known for some fruit crops.
- Comparable data are limited for mayhaw.
- What we know comes from grower observations.
- Additional research is needed to define critical temperatures.

Rabbiteye Blueberry Increasing Freeze Vulnerability →



Rabbiteye Blueberry Increasing Freeze Vulnerability

S1 TIGHT BUD	S2 BUD SWELL	S3 TIGHT CLUSTER	S4 EARLY PINK BUD	S5 LATE PINK BUD	S6 FULL BLOOM	S7 PETAL FALL	S8 EARLY GREEN FRUIT	S9 LATE GREEN
								

Dormant
Bud
- 10° to 0° F

Swollen
Bud
21° F

Flowers
Visible
25° F

Open
Bloom
29° F

Young Fruit
30° F

Bloom Timing: Your First Line of Defense

The Best Freeze Protection Often Happens Before the Freeze.

- Cultivar bloom timing influences freeze exposure.
- Mild winter weather can accelerate bloom development.
- Earlier bloom often means greater freeze risk.
- Bloom timing should be considered when selecting cultivars..

Earlier Bloom → Later Bloom

March 10th
Double G

March 22nd
Texas Star

March 25-30th
Maxine

March 20th
Red Champ

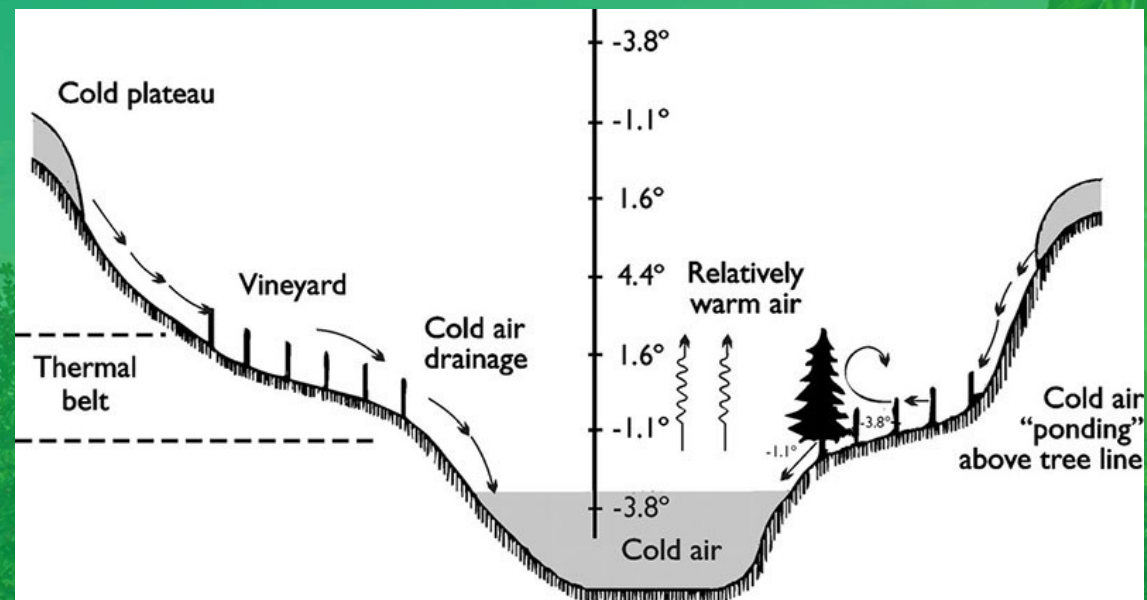
March 24th
Royalty

April 1st
Surprise

Site Selection and Air Drainage

Cold Air Behaves Like Water

- Cold air flows downhill and collects in low areas.
- Frost pockets form where cold air becomes trapped.
- Good air drainage can reduce freeze risk.
- Slopes often remain warmer than valley bottoms.



Freeze Protection Through Heat Retention

- Wet soils store more heat than dry soils.
- Bare, moist soil absorbs more daytime heat.
- Row covers and frost blankets trap heat near the tree.
- Supplemental heat can protect small areas.

Works Best When:

- Temperatures are only a few degrees below freezing.
- Freeze duration is relatively short.
- Protection is applied before temperatures drop.
- Protecting young trees or small areas.

Less Effective When:

- Temperatures are well below freezing.
- Freeze events last many hours.
- Large orchard acreage must be protected.

Methods

✓ Maintain moist soils before a freeze

✓ Frost cloths and row covers

✓ Covers for young trees

✓ Orchard heaters

Freeze Protection Through Air Circulation

- Cold air settles into low areas.
- Temperature inversions can form on calm nights.
- Warmer air may exist just above the orchard.
- Air movement can mix warmer and colder air.

Works Best When:

- Clear, calm nights.
- Radiation frost events.
- A temperature inversion is present. (Warmer air exists above the orchard)

Less Effective When:

- Advective freezes.
- Strong winds are already present.
- The entire air mass is uniformly cold. (No inversion exists.)

Methods

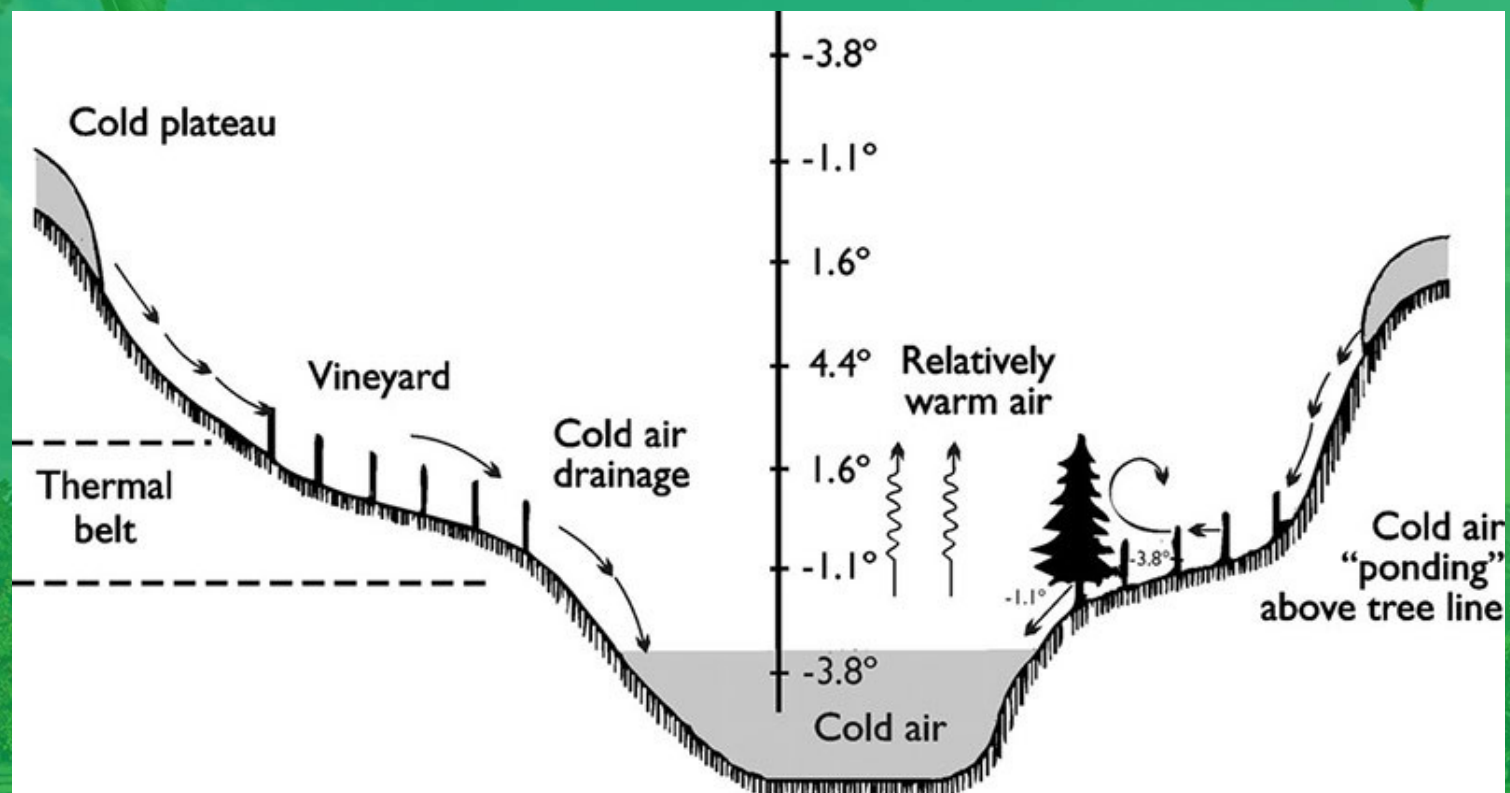
✓ Wind machines

✓ Large fans

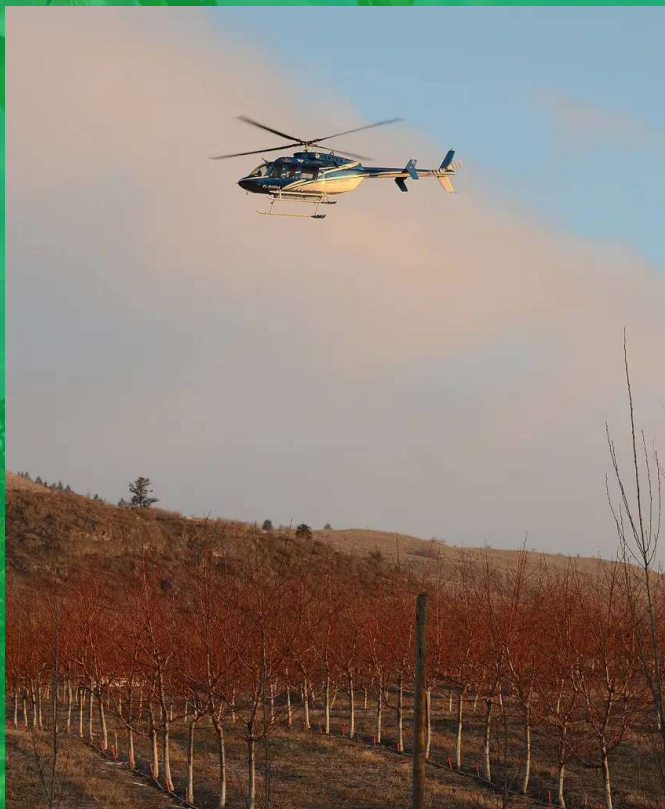
✓ Good cold-air drainage

✓ Strategic orchard siting

Temperature inversions



Freeze Protection Through Air Circulation



The background of the slide is a photograph of an orchard, likely apple, with rows of trees in a field. The entire image is overlaid with a semi-transparent green filter. In the top left corner, there is a close-up of white apple blossoms. In the top right corner, there is a close-up of green apple fruit hanging from a branch. The title "Heat and Drought Stress" is centered in the upper half of the image.

Heat and Drought Stress

Heat and Drought Stress: Cumulative Effects

One hot day rarely causes major problems.

Weeks or months of stress can.

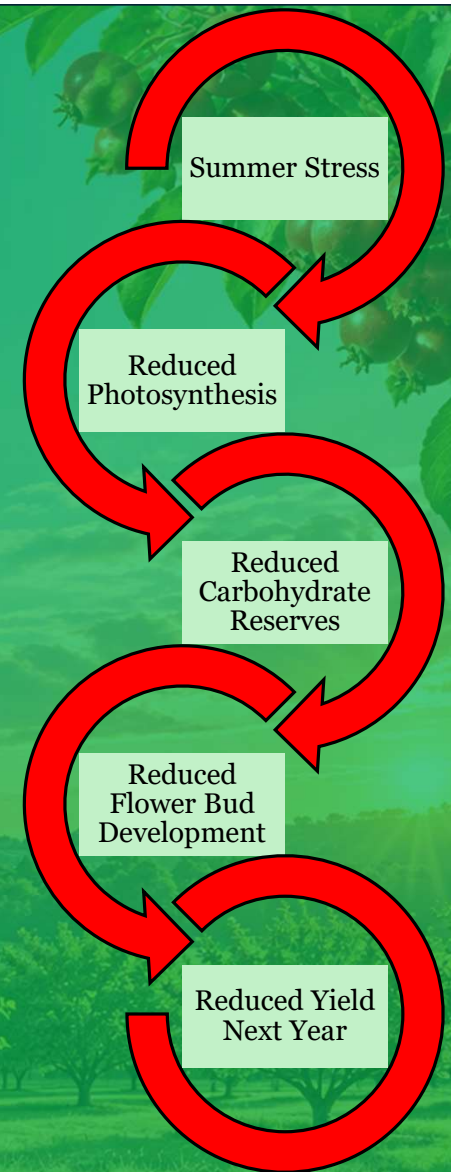
- Reduced growth
- Premature leaf drop
- Reduced flower bud development
- Lower future yields



Next Year's Crop Starts This Year

Flower buds for next year's crop are being formed during the current growing season.

- Healthy leaves produce carbohydrates.
- Carbohydrates support flower bud development.
- Heat and drought can reduce photosynthesis.
- Summer stress can reduce next year's bloom and yield.



Critical Drought and Heat Stress Periods

Not all times of the year are equally important.

Spring

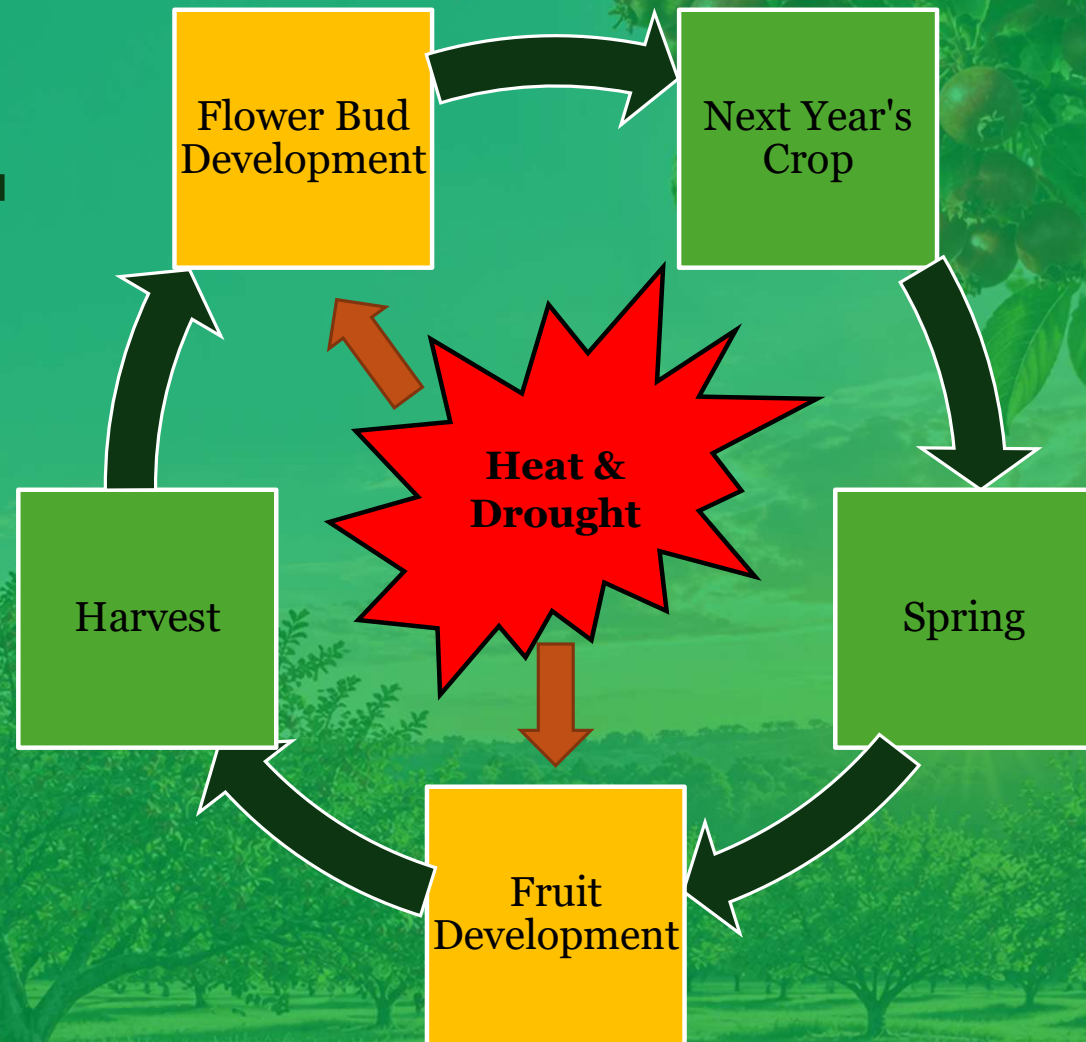
- Shoot growth
- Fruit development

Summer

- Carbohydrate production
- Tree recovery after harvest

Late Summer / Early Fall

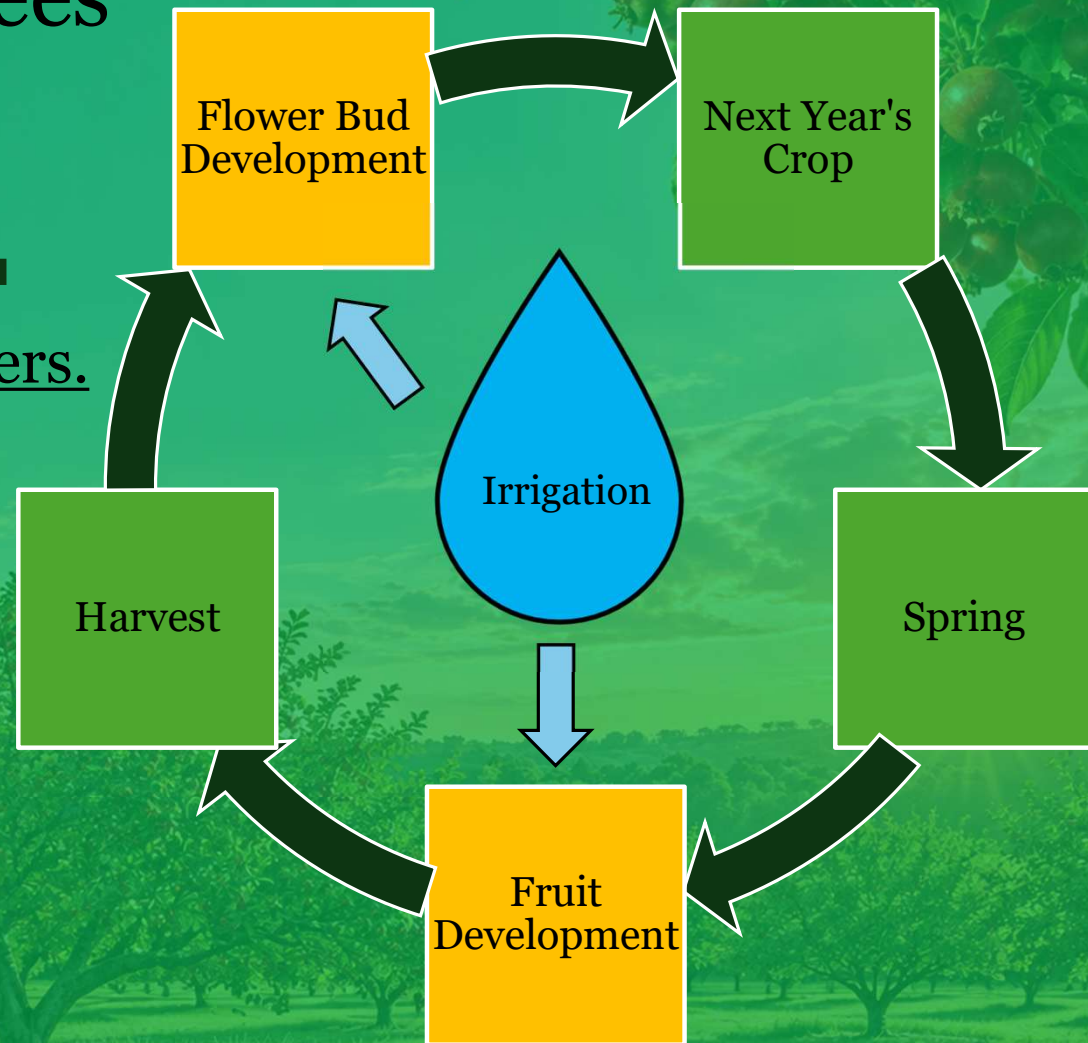
- Flower bud development
- Preparation for next year's crop



Irrigation: Protecting Trees During Critical Stress Periods

When water is limited, timing matters.

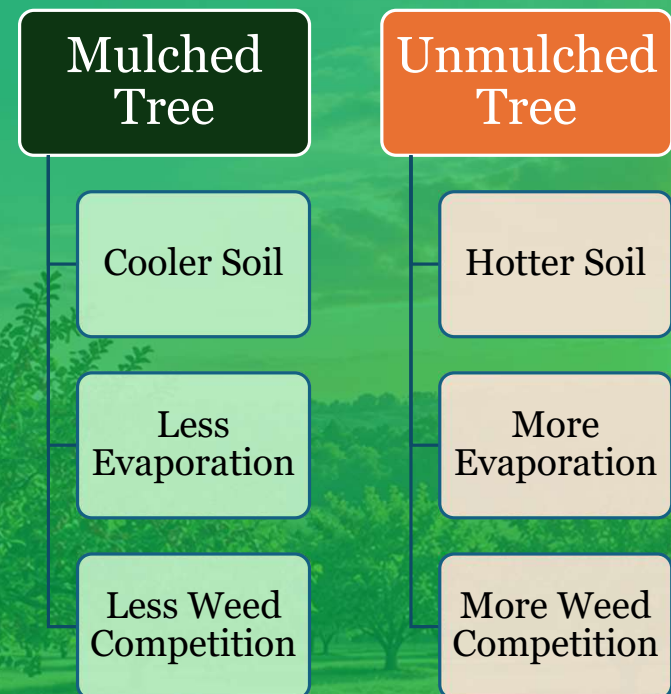
- Fruit development requires consistent moisture.
- Drought stress can reduce flower bud development.
- Irrigation may help preserve both current and future crops.
- Young trees are especially vulnerable because their root systems are less developed



Conserving Soil Moisture

Not every gallon of irrigation water reaches the tree.

- Weeds and grasses compete with trees for moisture.
- Mulch reduces evaporation from the soil surface.
- Mulch moderates soil temperatures.
- Weed control and mulch help conserve soil moisture.



Maintaining Healthy Leaves Through Fall

Healthy leaves in September are helping build next year's crop.

- Healthy leaves continue producing carbohydrates that support root growth and flower bud development.
- Premature leaf loss from drought, insects, or disease shortens the period of carbohydrate production and reduces carbohydrate accumulation.
- Protecting foliage helps support next year's crop.



The background of the slide is a photograph of an orchard with many trees in a field. A semi-transparent green overlay covers the entire image. In the top left corner, there is a branch with white blossoms. In the top right corner, there is a branch with green leaves and small, round, reddish-brown fruits.

Excess Moisture and Poor Drainage

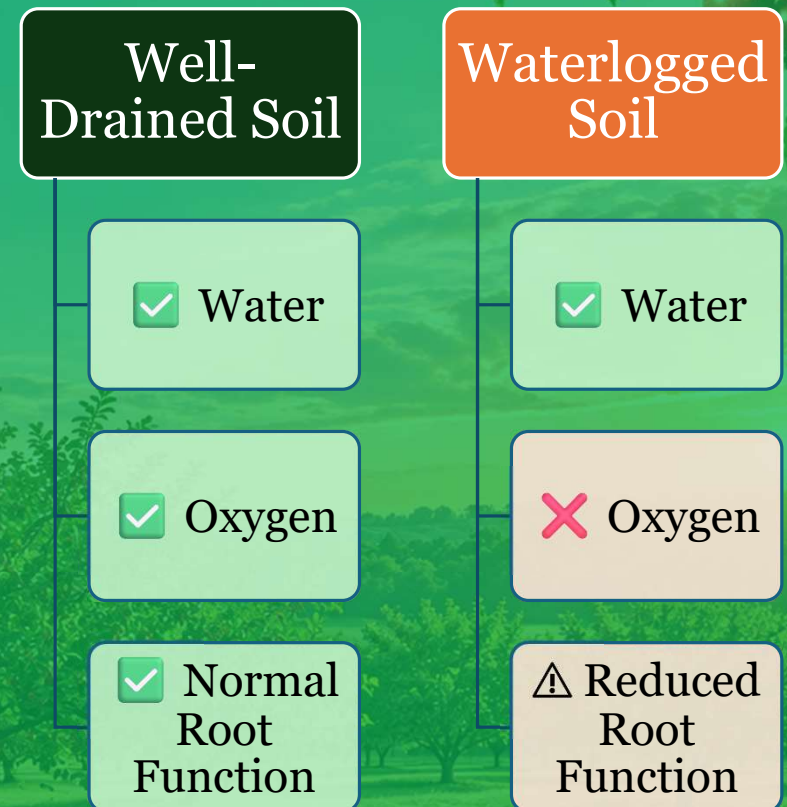
Mayhaws and Water: A Unique Relationship

- Mayhaws are native to swamps, sloughs, and bottomlands.
- They tolerate wet conditions better than most fruit crops.
- However, tolerance does not always mean optimum performance.
- Mayhaws survive wet conditions, but they thrive on well-drained soils.



When Too Much Water Becomes a Problem

- Prolonged saturation reduces oxygen in the root zone.
- Root function declines in waterlogged soils.
- Nutrient uptake may be reduced.
- Growth and vigor can suffer.
- Problems are often greatest during active growth.



Managing Excess Moisture

Good drainage improves root health, vigor, and long-term productivity.

- Select sites with good internal drainage.
- Use raised rows where needed.
- Maintain surface drainage around orchards.
- Avoid prolonged ponding during the growing season.
- Manage water before excess moisture becomes a problem.



Building a More Resilient Mayhaw Orchard

Weather cannot be controlled, but orchard resilience can be improved.

Freeze Risk

- Later-blooming cultivars
- Good air drainage
- Freeze protection when practical

Heat & Drought

- Irrigation during critical stress periods
- Mulch and weed management
- Maintain healthy foliage

Excess Moisture

- Good drainage
- Avoid prolonged saturation