

POTENTIAL FOR HEAT STRESS DAMAGE FOLLOWING THE COOL SPRING OF 2003

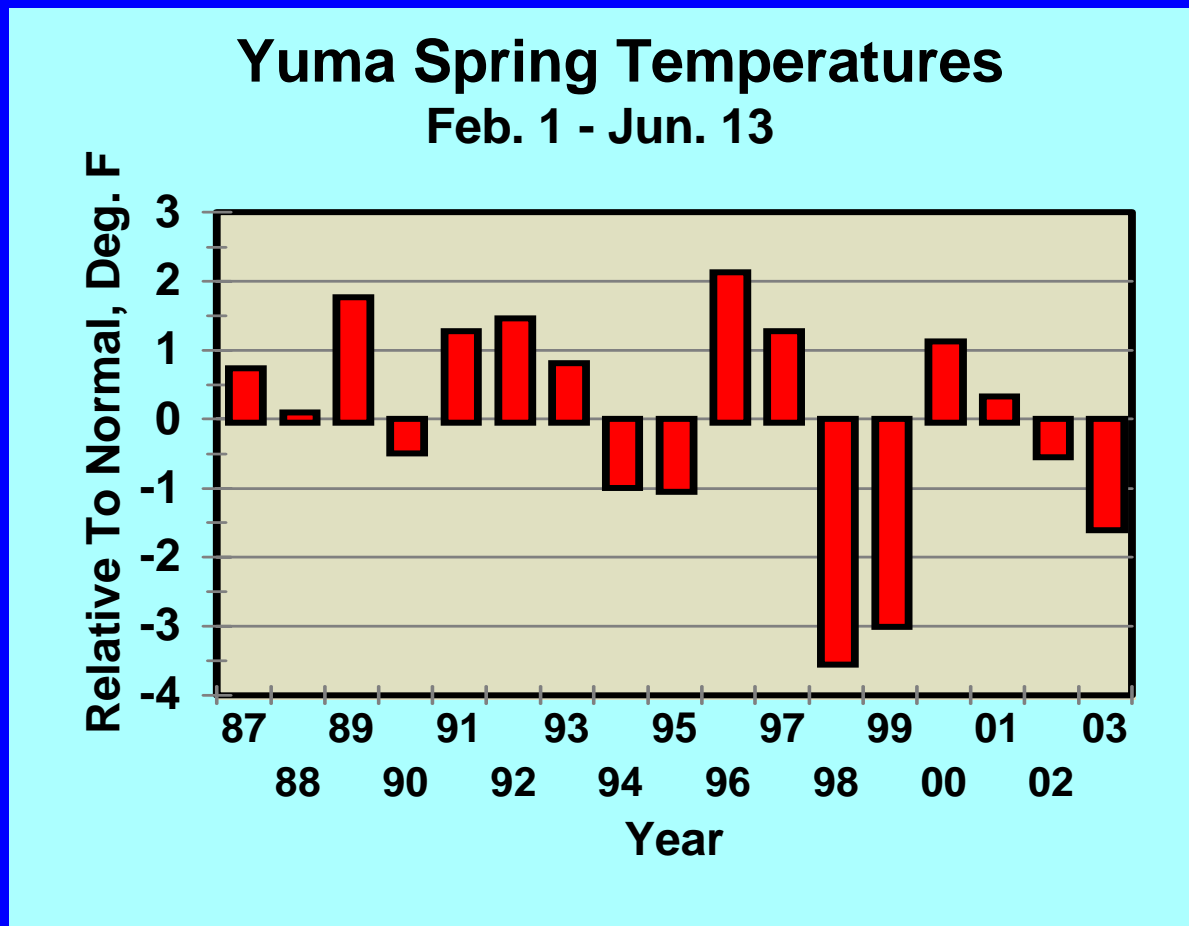
Paul Brown
Extension Biometeorologist
University of Arizona

TOPICS

- **Spring Weather Review**
- **Heat Stress**
- **History Lesson**
- **Forecast**

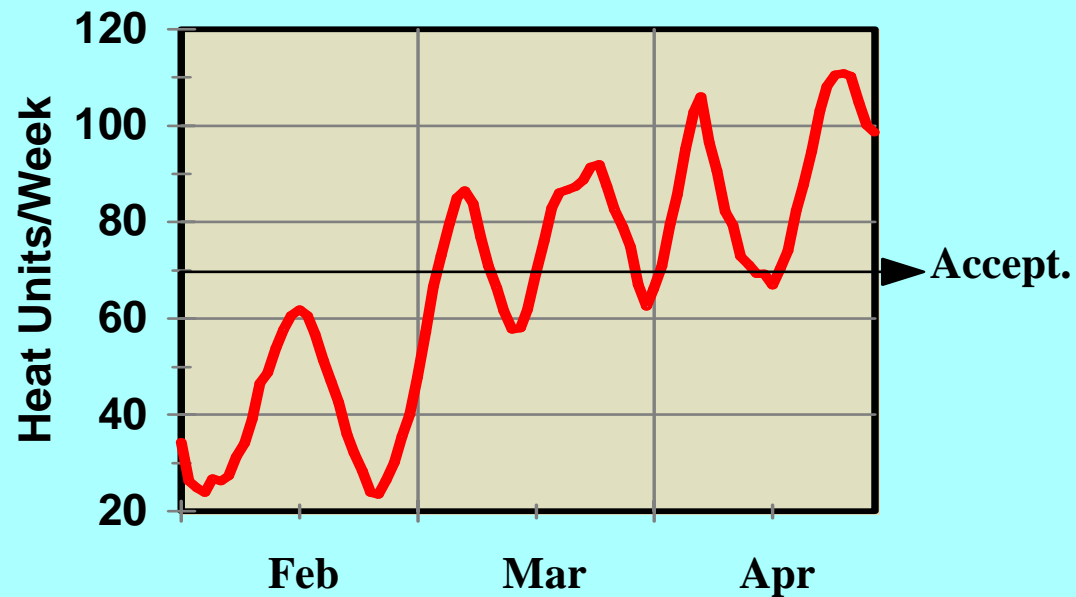
SPRING TEMPERATURES

(3rd Coolest Since 1987)

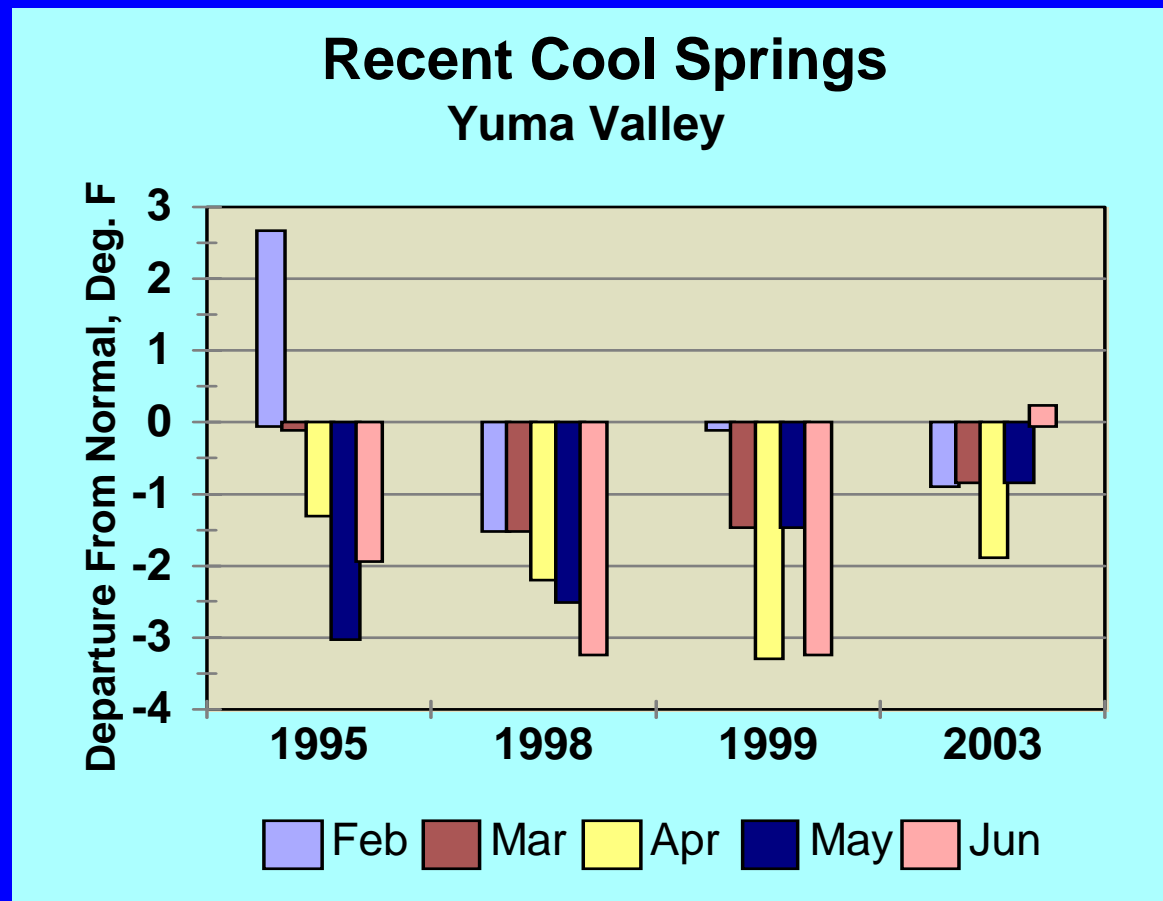


VARIABLE TEMPERATURES

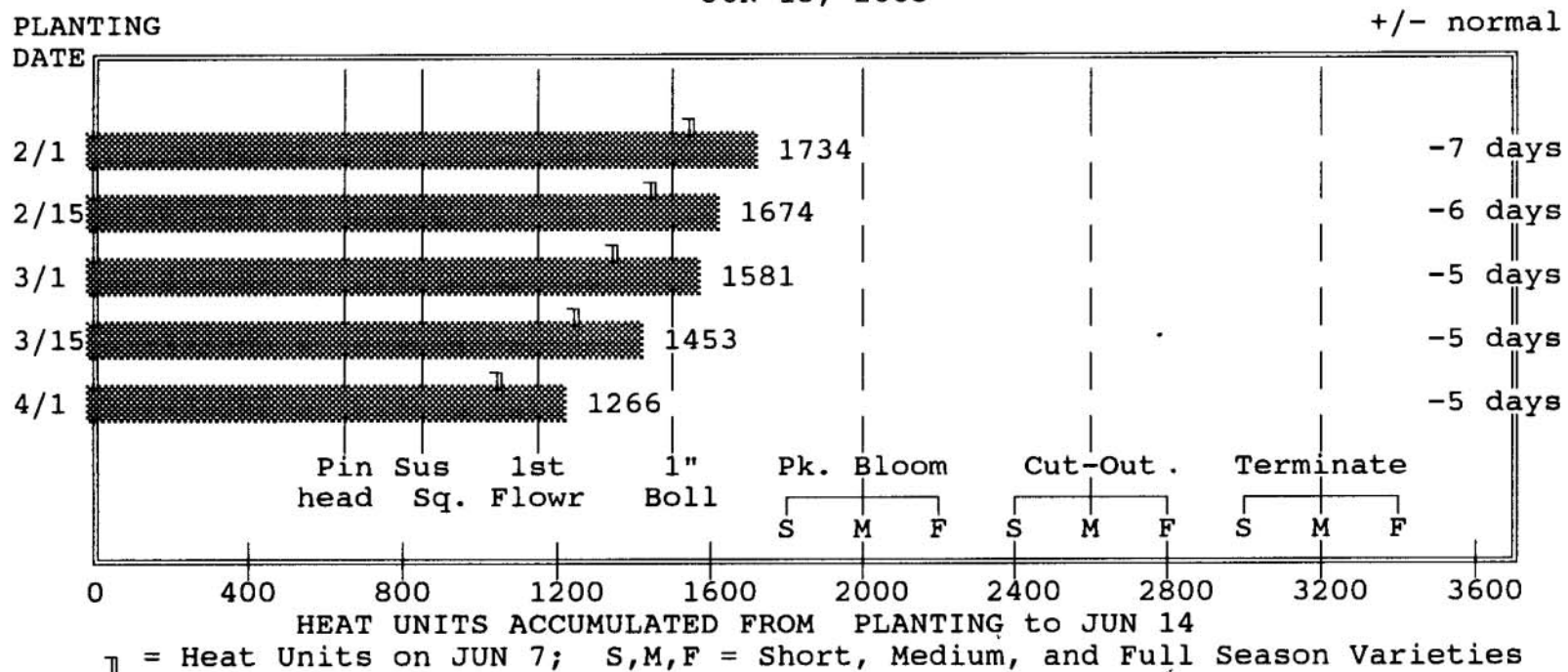
Spring Heat Unit Accumulation
Yuma



MONTHLY PATTERNS (4 Coolest Springs)

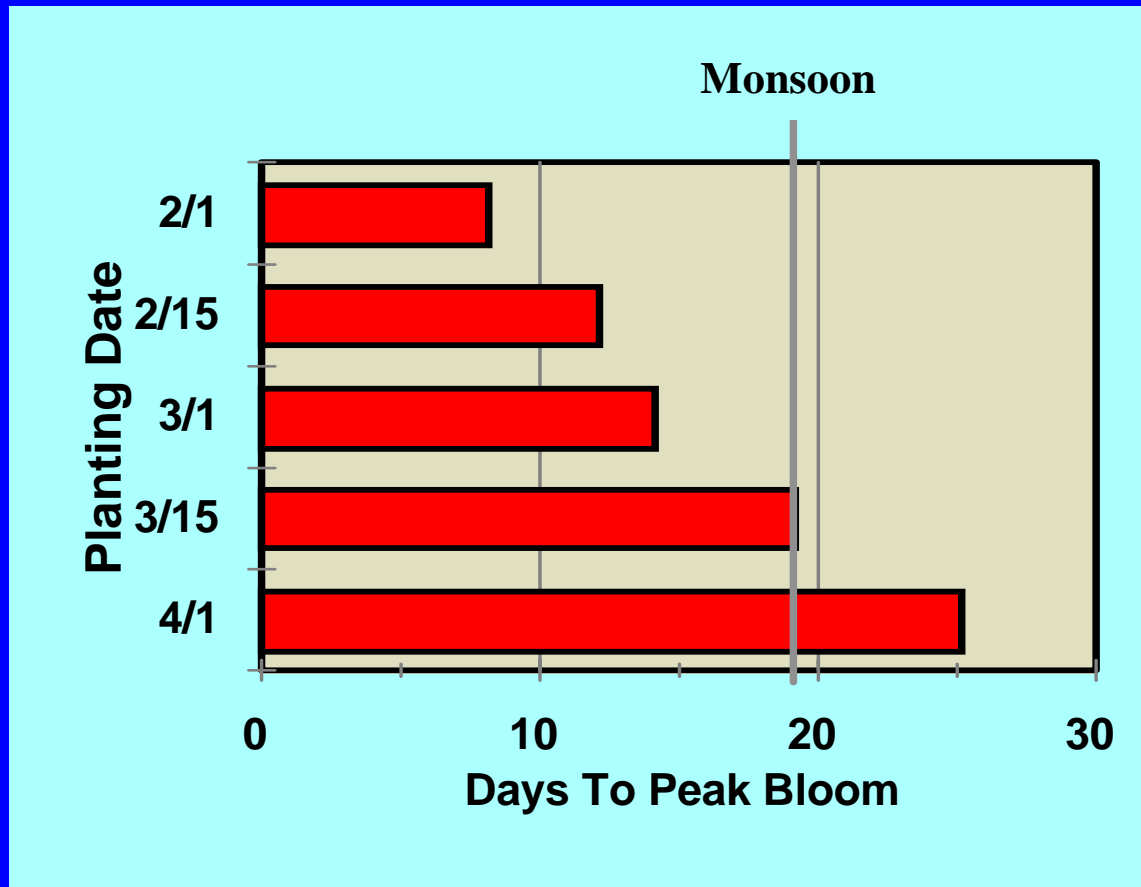


YUMA VALLEY COTTON DEVELOPMENT ADVISORY
JUN 15, 2003



- For Given Planting Date...
 - 5 – 7 Days Weeks Late...
- Two Week Planting Delay...
 - 10 – 12 Days Behind

DAYS TO PEAK BLOOM

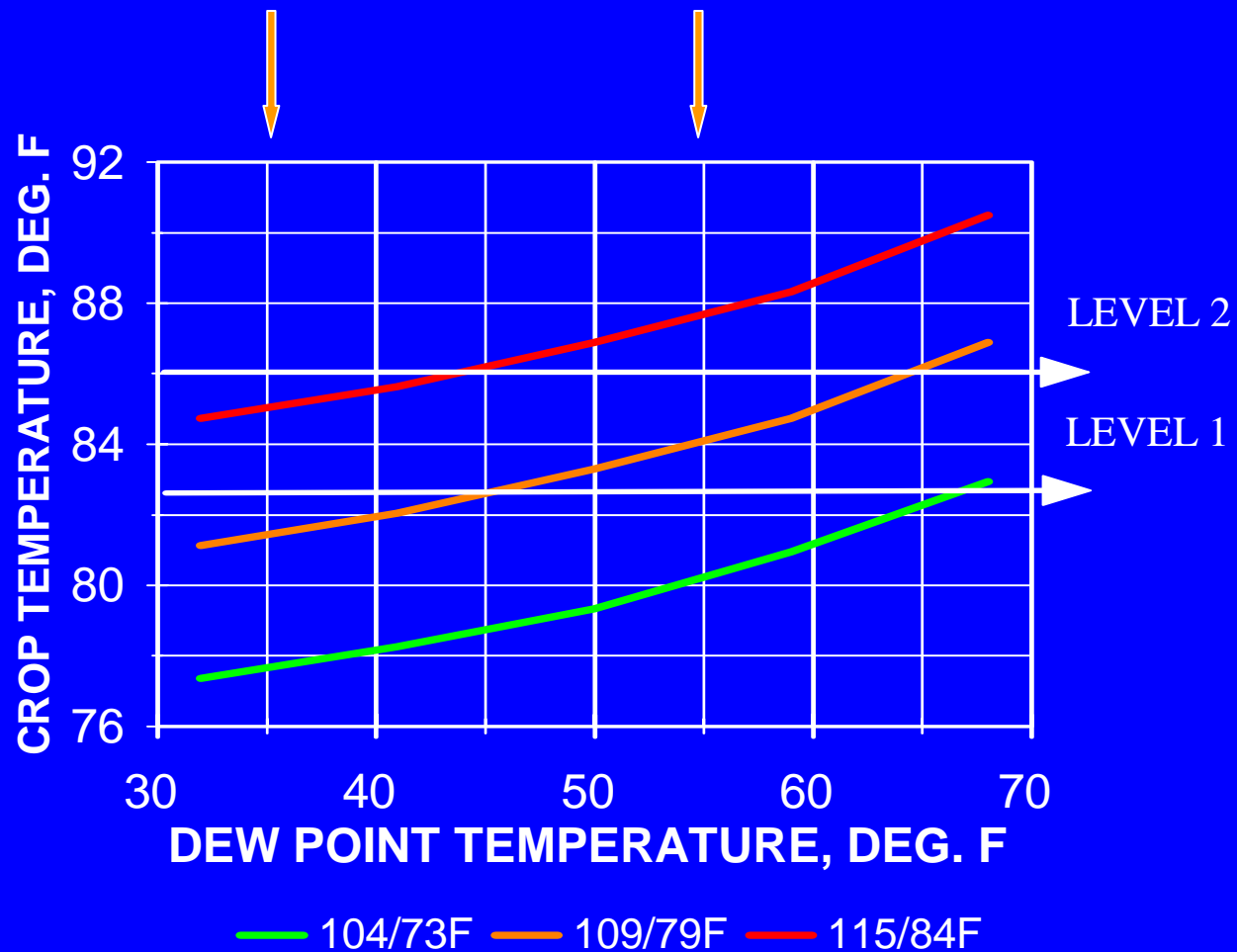


HEAT STRESS REVIEW

COTTON HEAT STRESS

- Begins When Crop Temperatures Rise Above 82.4°F (28°C) For Day
 - Level 1
 - Crop Temperatures 82.4°F – 86°F
 - Level 2
 - Crop Temperatures > 86°F

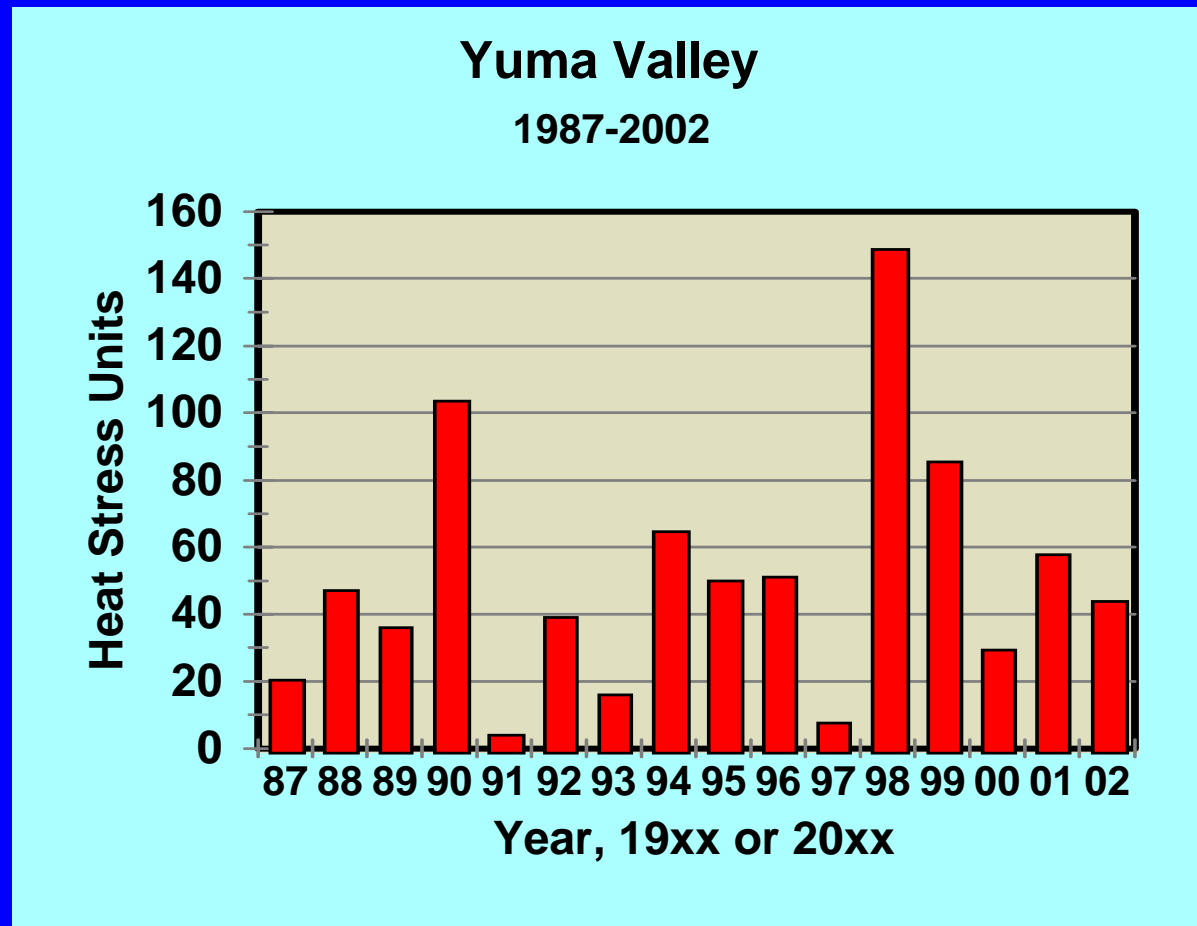
TEMPERATURE & HUMIDITY CREATE HEAT STRESS



QUANTIFYING HEAT STRESS

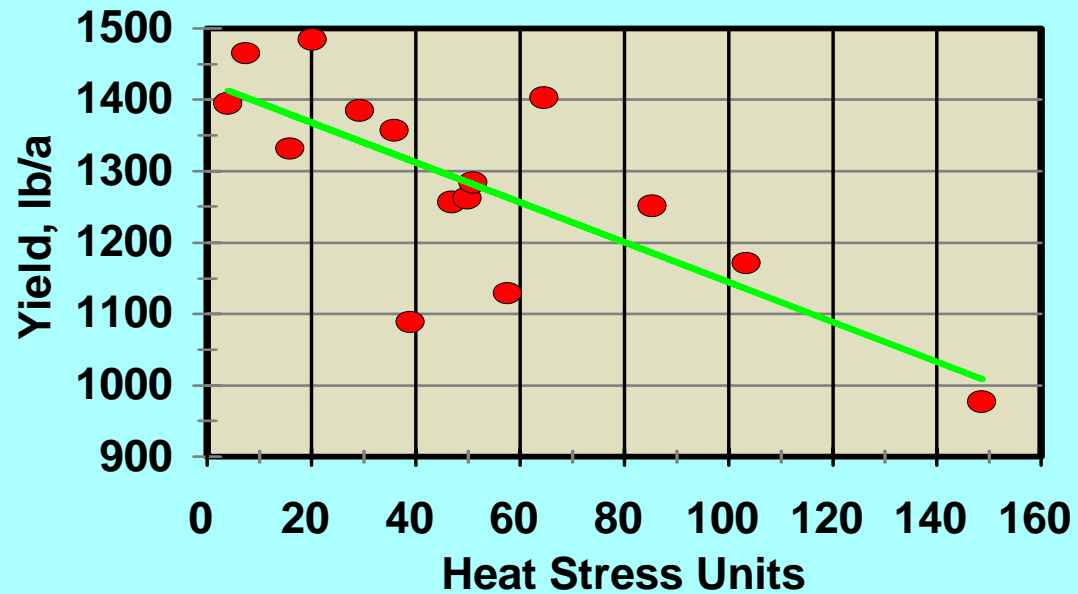
- **Canopy Temperature Model**
 - **AZMET**
 - Air Temperature
 - Humidity
- **Heat Stress Units (HSU)**
 - Compute Mean Canopy Temperature
 - Subtract 82.4°F From Value
 - If Negative, HSU=0

HEAT STRESS HISTORY (During Primary Bloom)

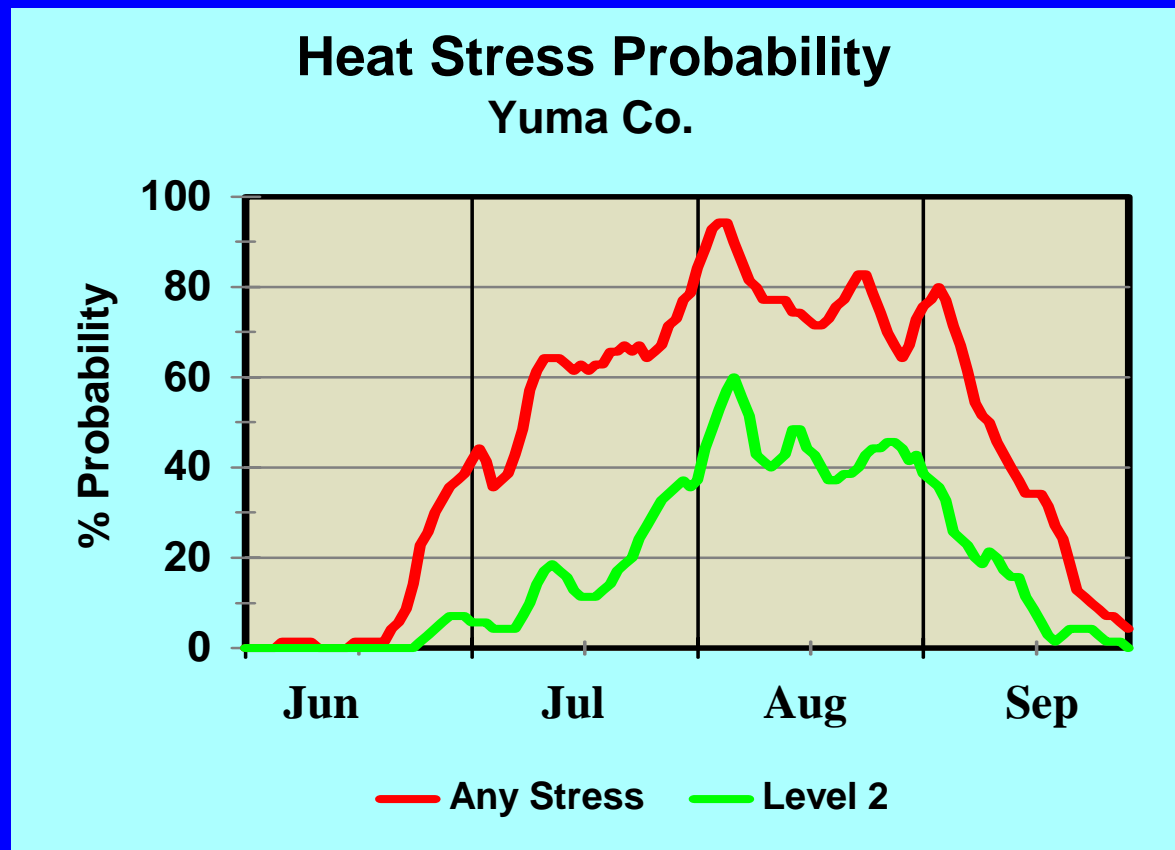


HEAT STRESS & YIELD

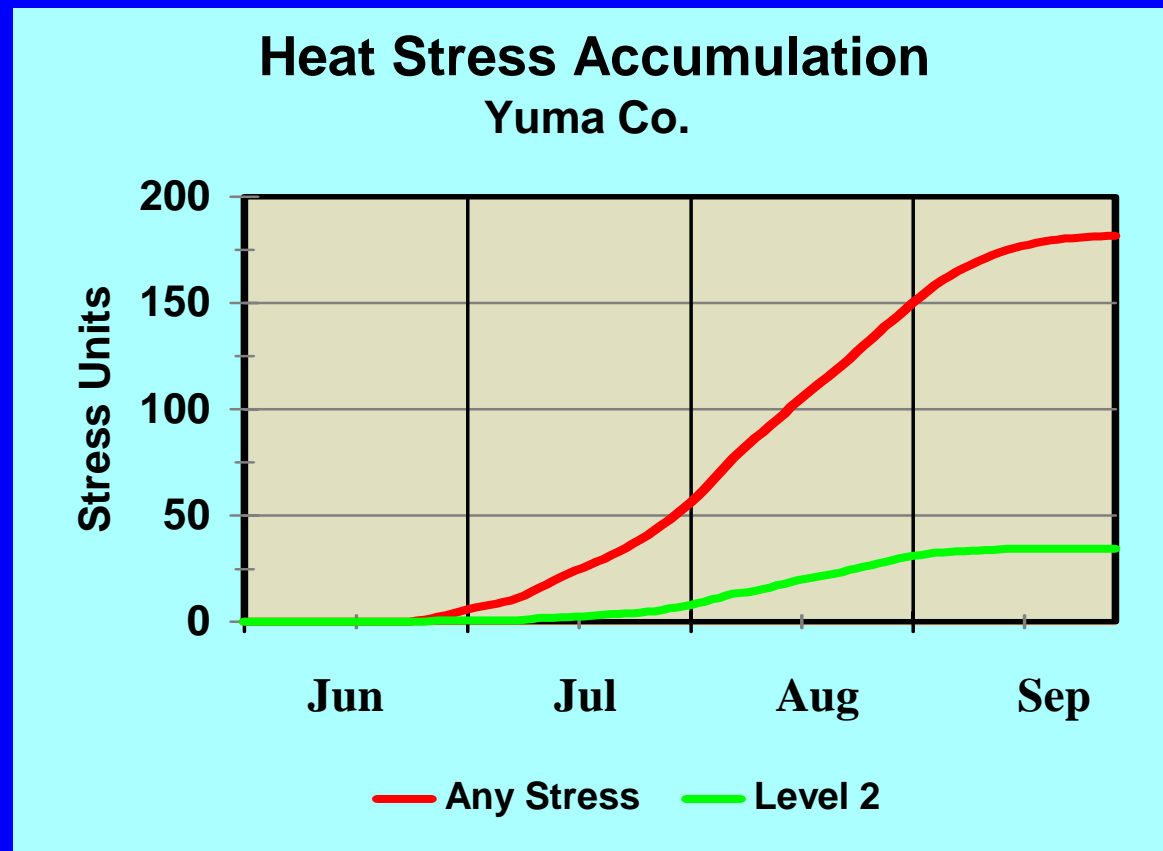
Yield vs Heat Stress
Yuma Co.



PROBABILITY OF HEAT STRESS

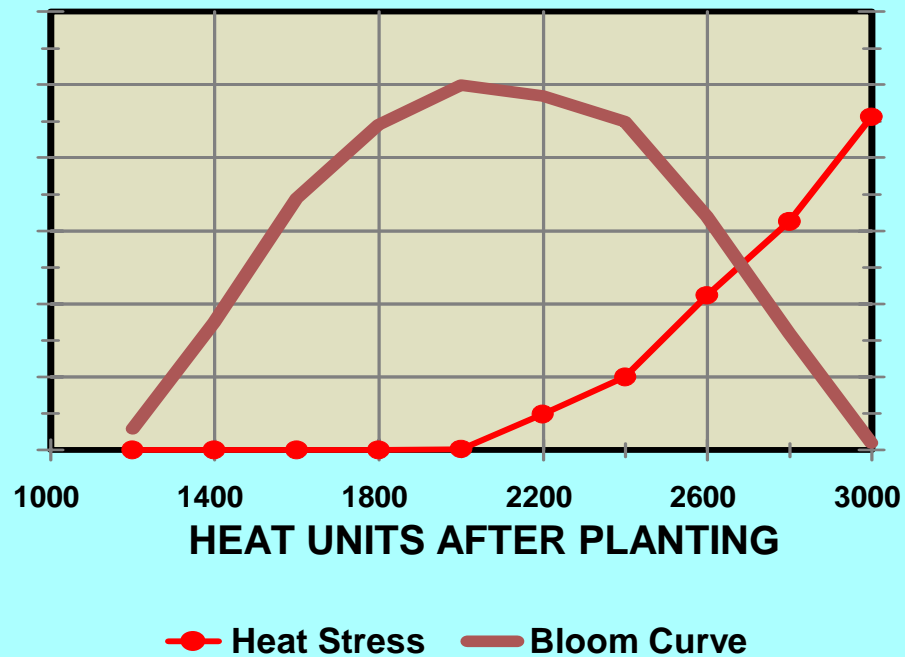


HEAT STRESS SEASONAL ACCUMULATION

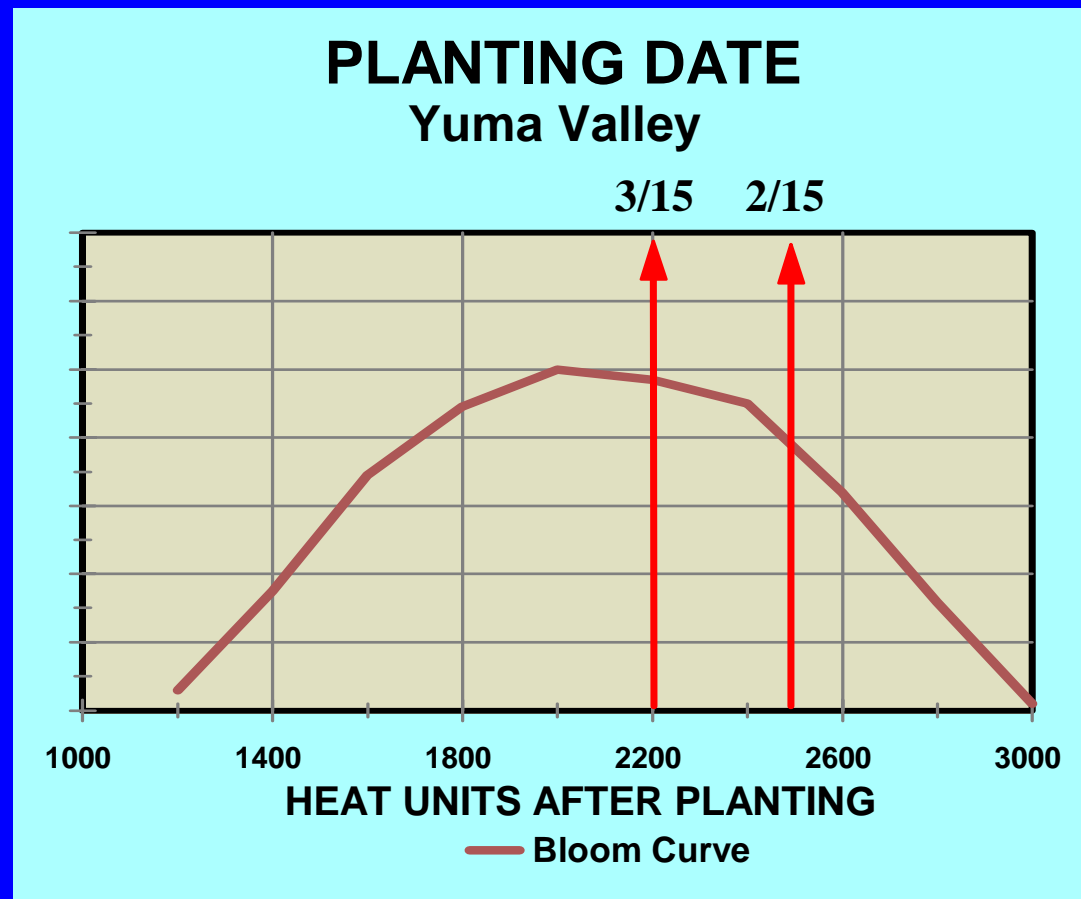


HEAT STRESS DURING FLOWERING

HEAT STRESS & FLOWERING
March 1st Planting Date



HEAT STRESS & PLANTING DATE

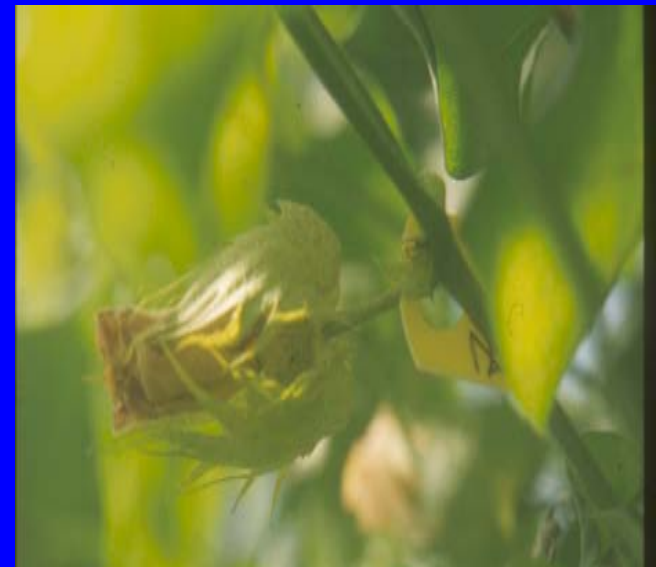


COTTON HEAT STRESS

- **No Stress**
 - Crop Temperatures Below 82.4°F
 - NO STRESS
- **Level 1**
 - Crop Temperature: 82.4°F - 86°F
- **Level 2**
 - Crop Temperatures: > 86°F

LEVEL 1 STRESS

- **REDUCED FRUIT RETENTION**
 - Low – Moderate Fruit Loss
 - Small Bolls (3-5 Days Post Bloom)
- **SMALLER BOLLS**
 - Fewer Seeds/Boll
 - Increased Number of Motes
 - Shorter Boll Fill Period



LEVEL 2 STRESS

- **REDUCED FRUIT RETENTION**
 - **Heavy Fruit Loss**
 - Starts Within 1-3 Days
 - 2nd Drop: 14 days Later
 - Malformed Flowers
- **REDUCED BOLL SIZE**
 - **Smaller Bolls**
 - **Hooked Beak Bolls**



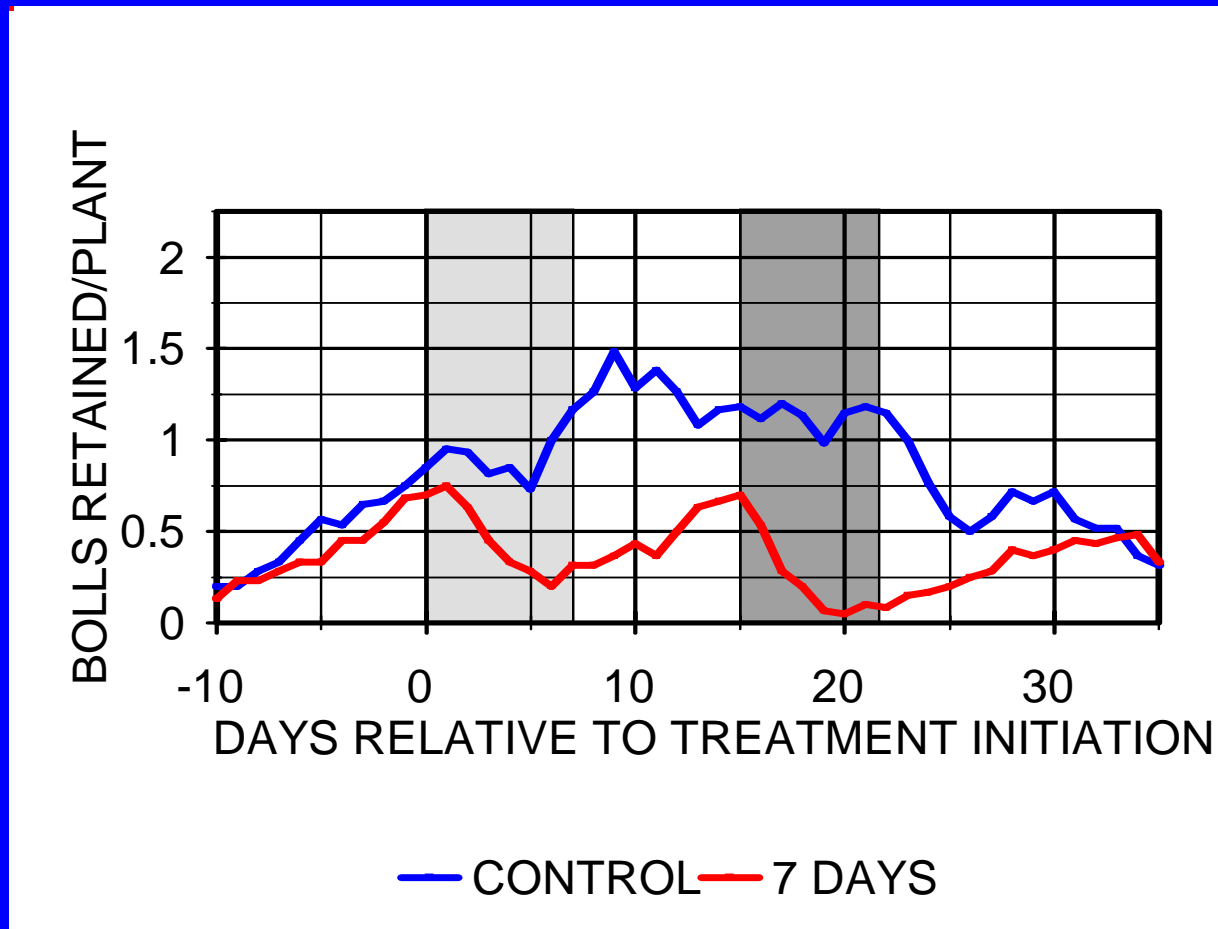
HEAT STRESSED FLOWERS...

- Don't Fully Open
 - Smaller
- Little/No Pollen Shed
- “Elongated” Stigma
- Poor Pollen & Ovule Viability



DELAYED REACTION

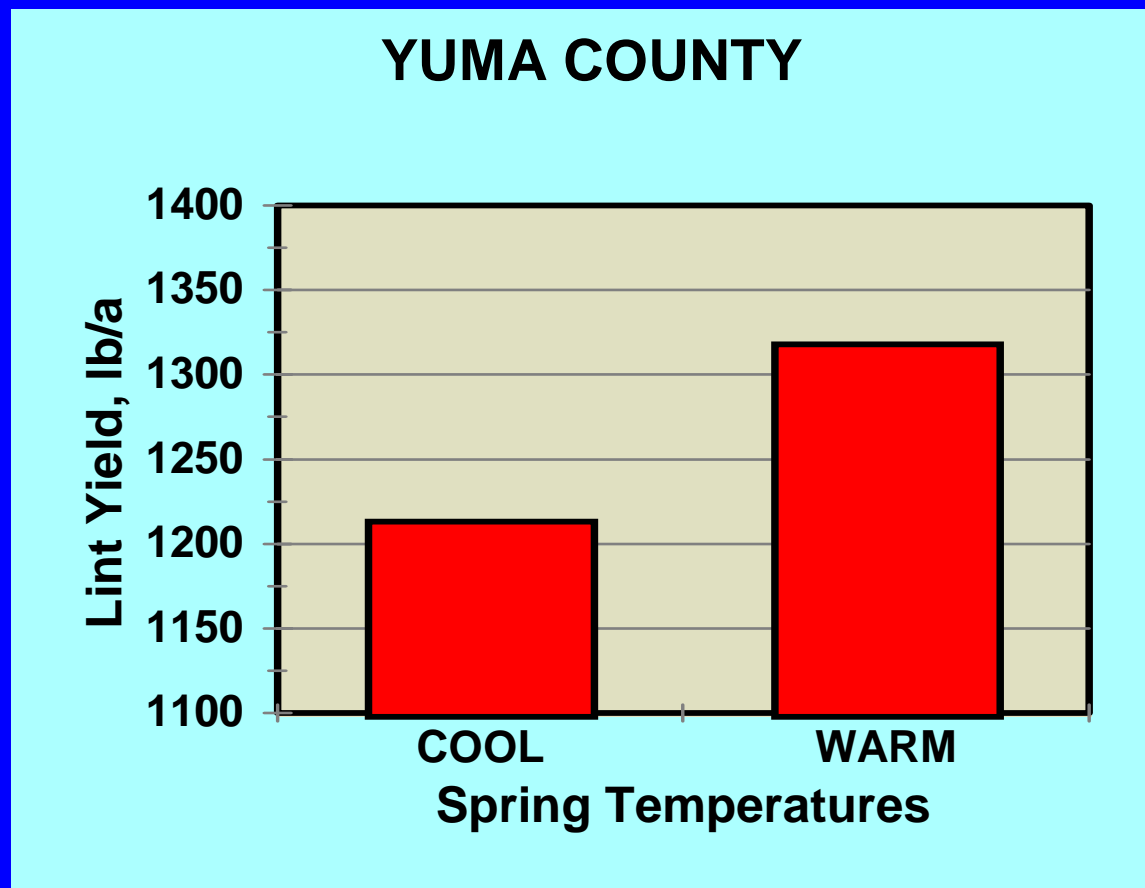
(7 Days Of Level 2 Stress)



HISTORY

**LOOKING BACK AT PAST
COOL SPRINGS**

SPRING TEMPERATURES & YIELDS (1987-Present)

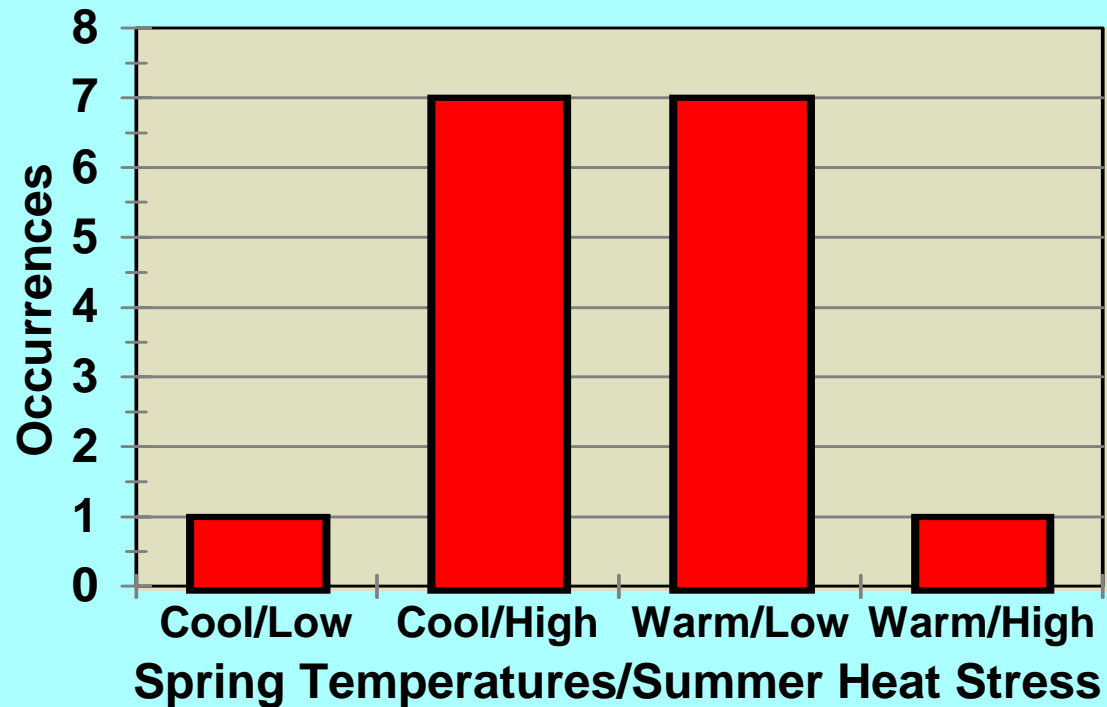


SPRING & SUMMER ANALYSIS

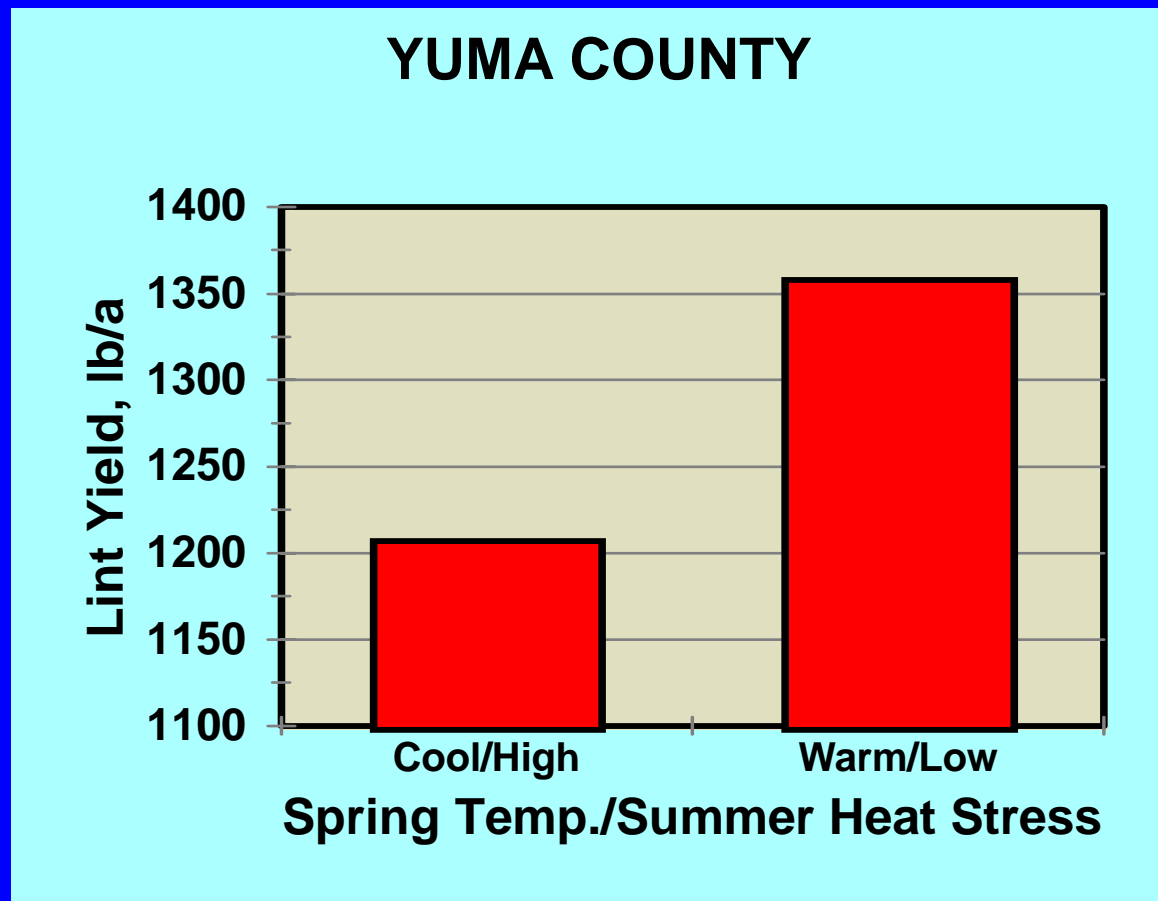
- **Warm Springs...**
 - **Below Normal Heat Stress**
 - **Above Normal Heat Stress**
- **Cool Springs...**
 - **Below Normal Heat Stress**
 - **Above Normal Heat Stress**

SPRING + SUMMER

Spring-Summer Combinations
Yuma County (1987- Present)



SPRING/SUMMER ANALYSIS

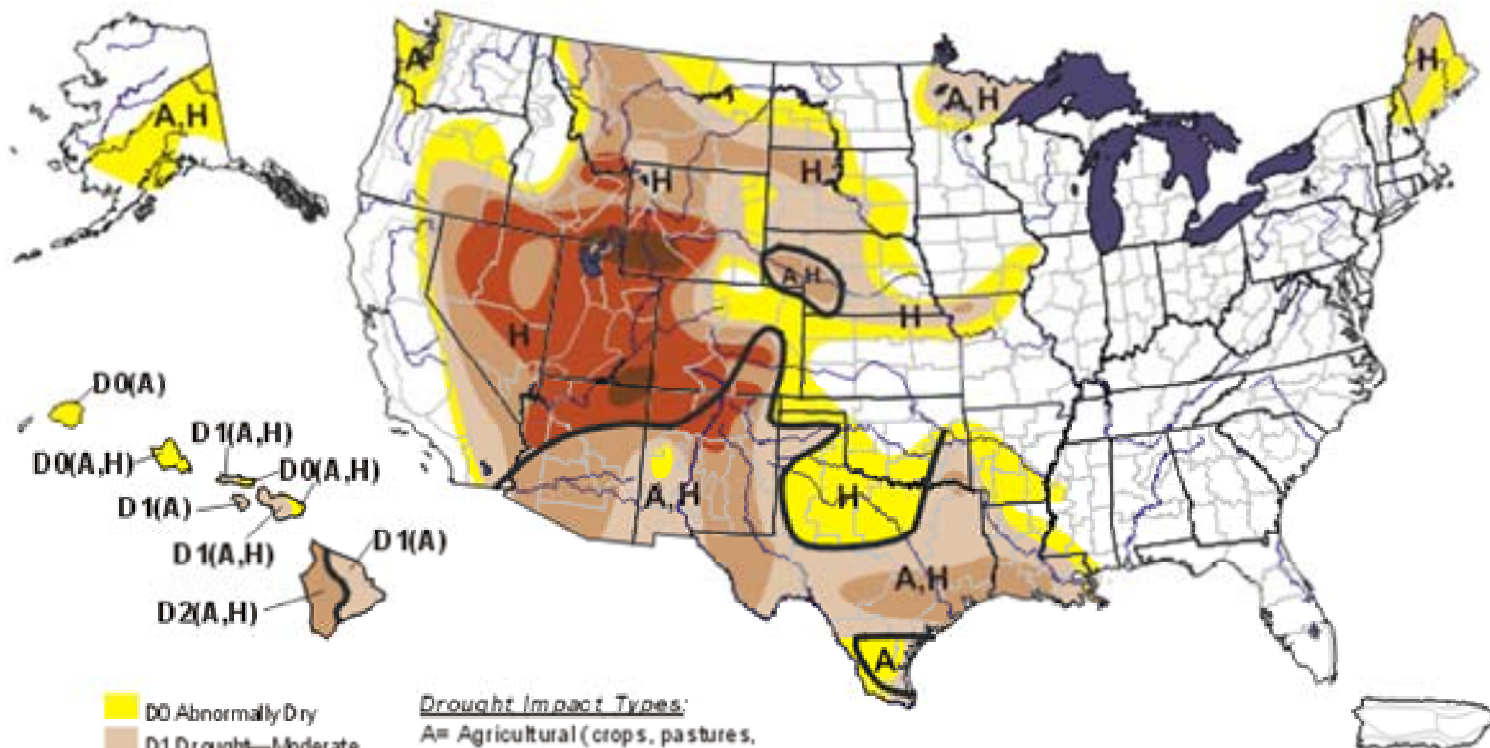


FORECASTS

U.S. Drought Monitor

June 10, 2003

Valid 8 a.m. EDT



- D0 Abnormally Dry
- D1 Drought—Moderate
- D2 Drought—Severe
- D3 Drought—Extreme
- D4 Drought—Exceptional

Drought Impact Types:

- A= Agricultural (crops, pastures, grasslands)
- H= Hydrological (water)
- No type = both impacts
- Delineates dominant impacts

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

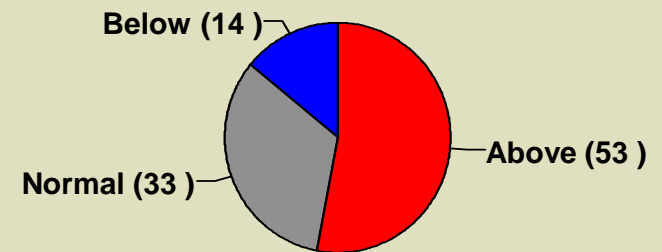
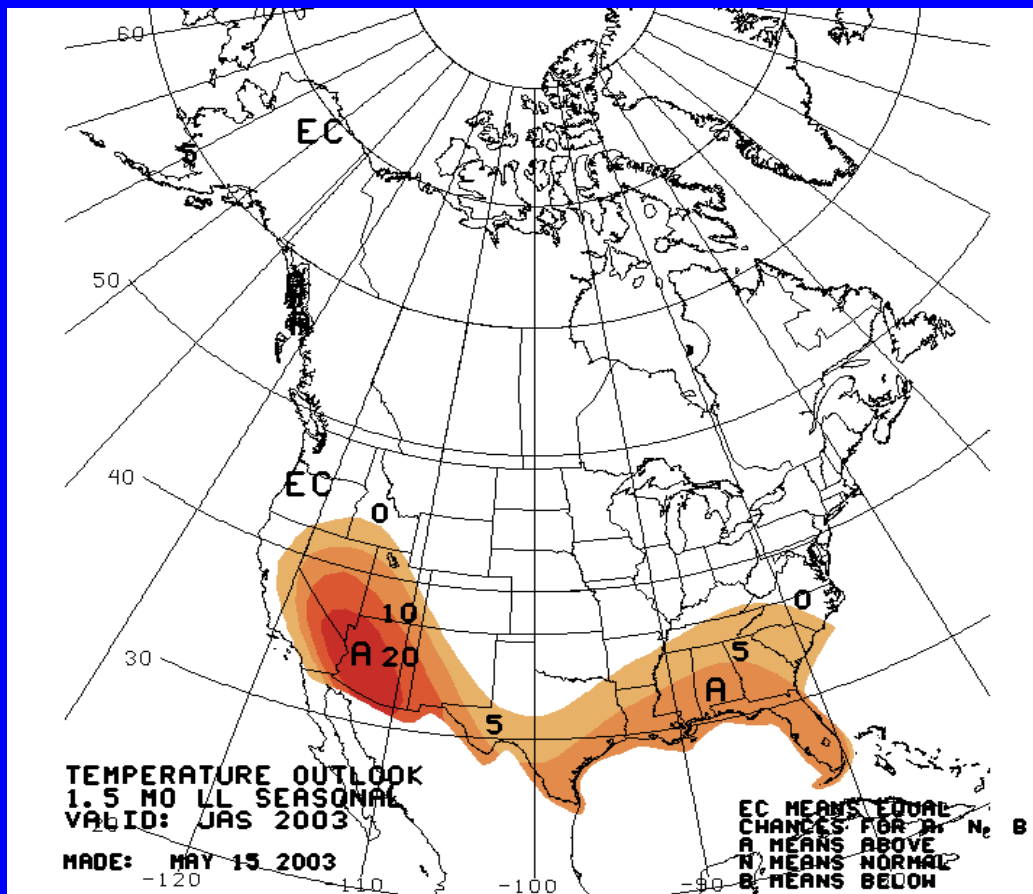
<http://drought.unl.edu/dm>



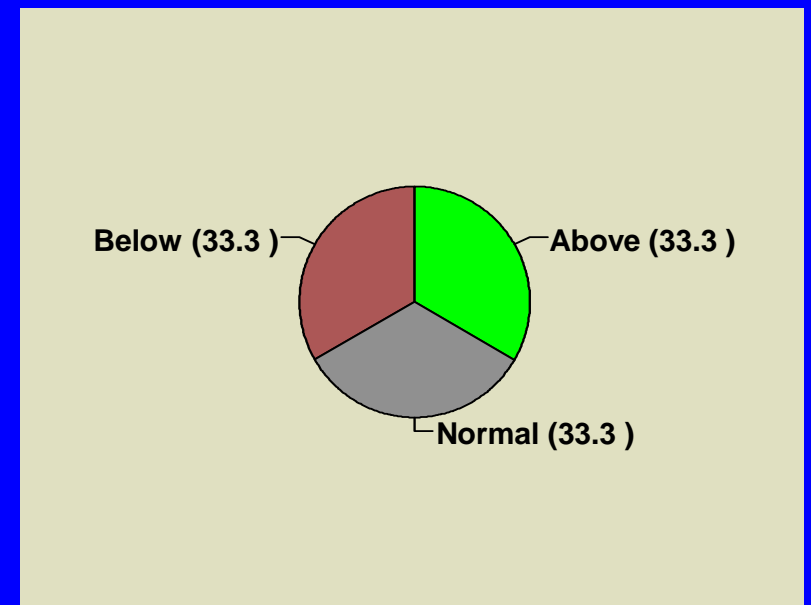
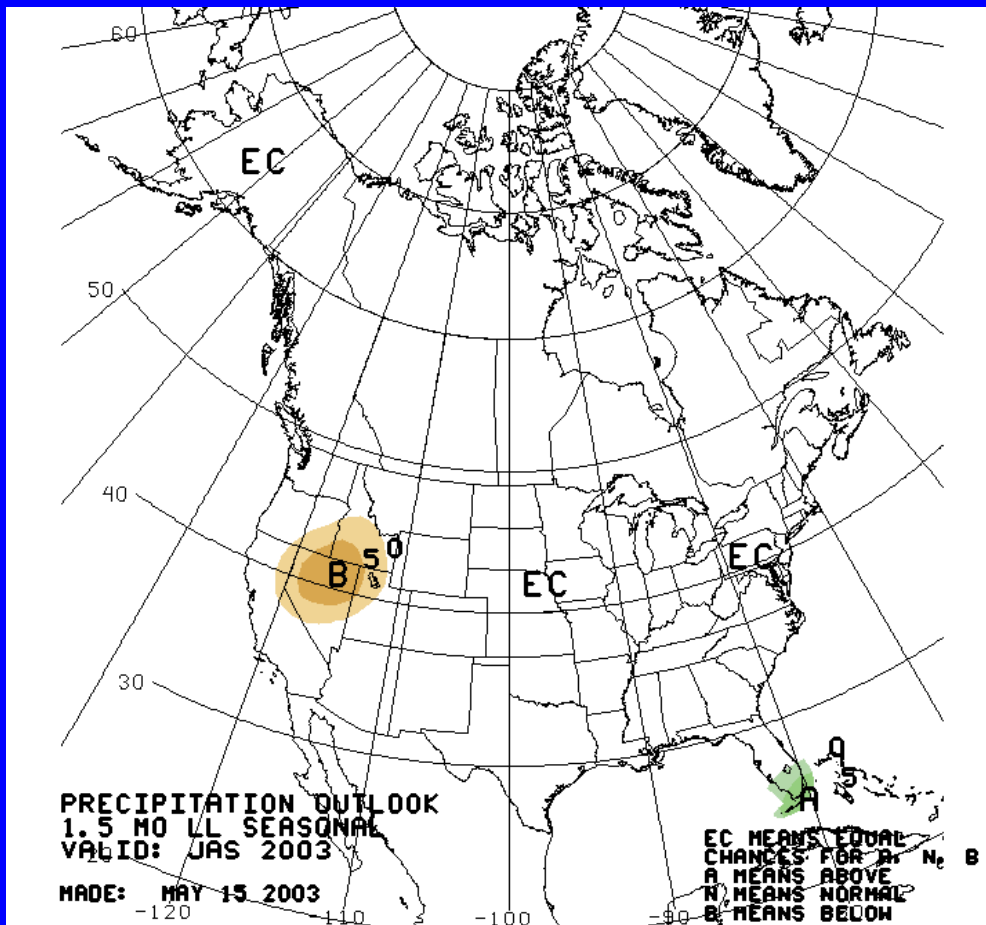
Released Thursday, June 12, 2003

Author: Mark Svoboda, NDMC

SUMMER FORECAST (Temperature)



SUMMER FORECAST (Precipitation)



HEAT STRESS REPORTS

<http://ag.arizona.edu/azmet>

Statewide Cotton Heat Stress Report Generated on 7 July 2002

Cotton Stress Levels : Past 7 Days

	Jun 30	Jul 1	Jul 2	Jul 3	Jul 4	Jul .5	Jul 6
Tucson	ns	ns	ns	ns	ns	ns	ns
Yuma Valley	ns	ns	L1	L1	ns	ns	ns
Yuma Mesa ..	ns	ns	L1	ns	ns	ns	ns
Safford	ns	ns	ns	ns	ns	ns	ns
Coolidge ...	ns	ns	ns	ns	ns	ns	ns
Maricopa ...	ns	L1	L1	L1	ns	ns	ns
Aguila	ns	ns	L1	ns	ns	ns	ns
Parker	ns	ns	L1	ns	ns	ns	ns
Bonita	ns	ns	ns	ns	ns	ns	ns
Citrus Farm	ns	L1	L1	L1	ns	ps	L1
Litchfield	L1	L1	L1	L1	ns	ns	L1
Phx Greenway	ns	L1	L1	L1	ns	ns	ns
Marana	ns	ns	ns	ns	ns	ns	ns
Yuma N.Gila	ns	ns	L1	ns	ns	ns	ns
Phx Encanto	ns	L1	L1	L1	ns	ns	ns
Eloy	ns	ns	ns	ns	ns	ns	ns
Paloma	ns	ns	ns	ns	ns	ns	ns
Mohave	ns	ns	L1	ns	ns	ns	ns
Queen Creek	ns	ns	ns	ns	ns	ns	ns
Harquahala	ns	ns	ns	ns	ns	ns	ns
Roll	ns	ns	L1	ns	ns	ns	ns
Buckeye	ns	ns	L1	L1	ns	ns	--

ns = No Stress : Canopy Temperature Less Than 82.4F

L1 = Stress Level 1 : Canopy Temperature From 82.4 to 86F

L2 = Stress Level 2 : Canopy Temperature Greater Than 86F

-- = No data available

THE END