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Cotton Insights Newsletter

A service provided by Windstar, Inc. affiliated gins.

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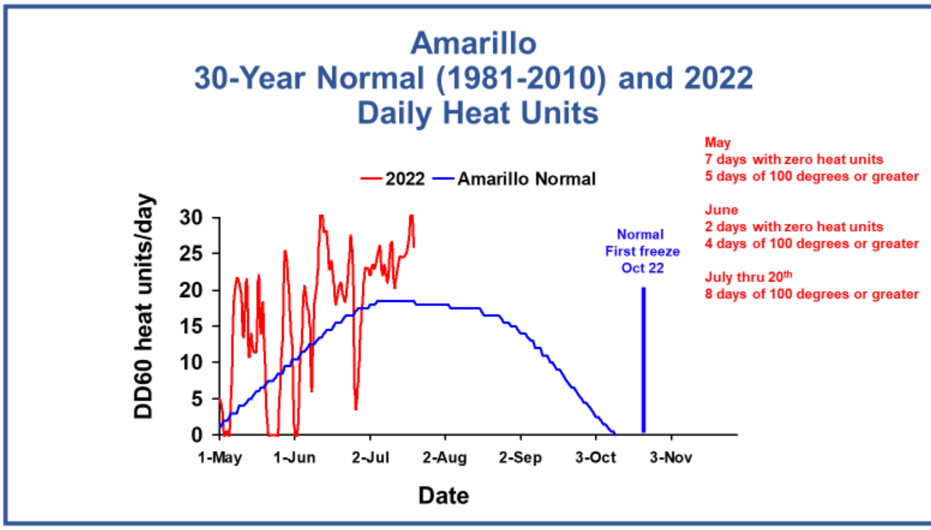
Crop Update

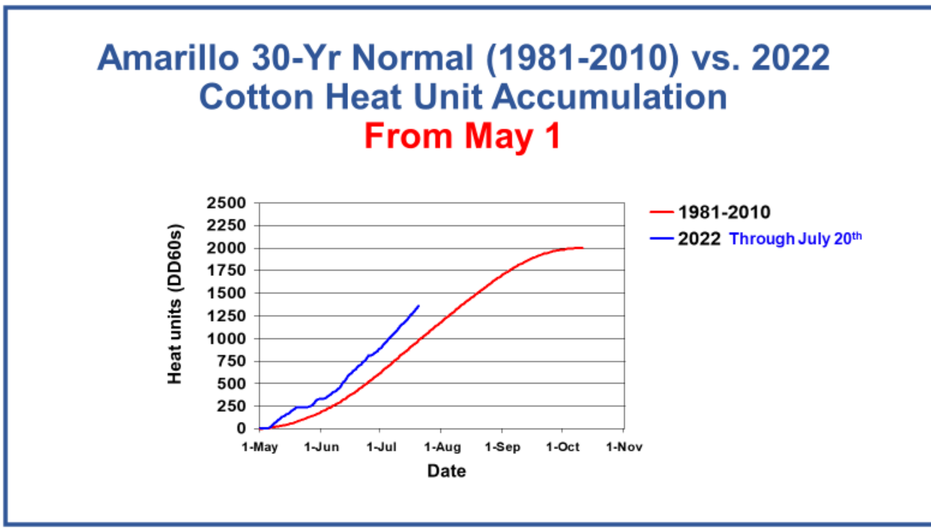
The 2022 crop year continues to be challenging for virtually all producers in our region. Rainfall has generally been scant since at least the first week of June, and high temperatures and significant winds have been problematic. Records indicate that at Amarillo, a total of 17 days of at least 100 degree temperatures have been encountered since May 1. For the first 20 days of July, 8 days have been 100 degrees or greater. These recent high temperatures and significant winds have resulted in cotton evapotranspiration (ET) rates of up to around 0.45 inches per day for cotton that has reached the bloom stage.

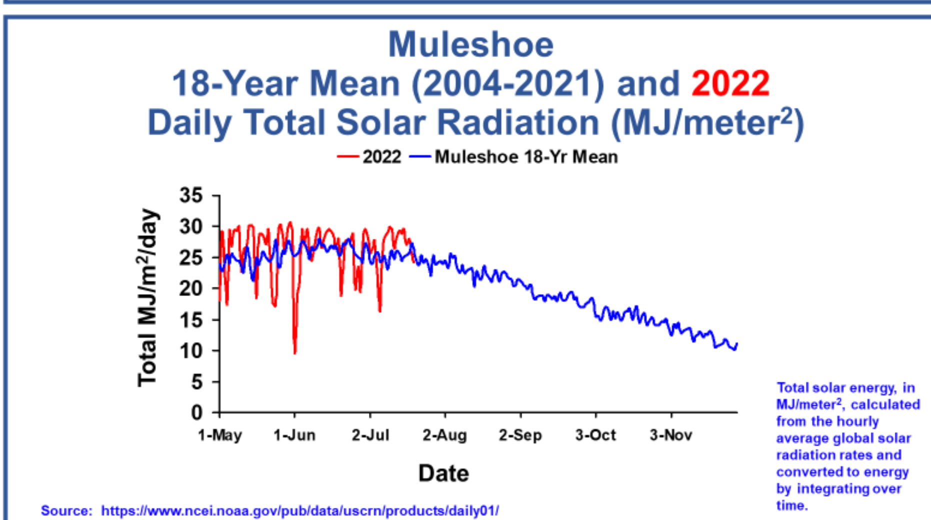
Trial and field inspections have indicated that many irrigated fields have entered bloom around 7 nodes above white flower (NAWF). Where fields have received some timely rainfall events, we are seeing around 8-9 nodes above white flower. For the higher NAWF fields, the yield potential is very good IF we can get water to the crop and sustain it. The question at this time is how much water growers can and are willing to put into this crop. It's all about economics and only they can determine that answer.

An extremely high percentage of dryland cotton acreage in many counties in our service area has already been abandoned due to lack of rainfall. A few dryland fields have managed to receive some early help from "mother nature" and have good stands and plant architecture. However, continued high temperatures and lack of rainfall will likely take their toll on them.

A considerable amount of irrigated acres have also gone under the insurance adjuster's knife, and this is likely to increase as growers hit the wall with irrigation expenditures and less than desirable growth. Weather.com extended forecasts show that high 90s to triple digit temperatures are likely for the next week or so, and then somewhat cooler temperature should arrive. See the graphs below for the daily fluctuation in DD60s compared to "normal" for Amarillo cotton heat unit accumulation from May 1, the seasonal accumulation from May 1, and Muleshoe solar radiation by day.


Amarillo
30-Year Normal (1981-2010) and 2022
Daily Heat Units
2022
Amarillo Normal
May
7 days with zero heat units
5 days of 100 degrees or greater
June
2 days with zero heat units
4 days of 100 degrees or greater
July thru 20th
8 days of 100 degrees or greater
Normal
First freeze
Oct 22
DD60 heat units/day
30
25
20
15
10
5
0
1-May
1-Jun
2-Jul
2-Aug
2-Sep
3-Oct
3-Nov
Date


Amarillo 30-Yr Normal (1981-2010) vs. 2022
Cotton Heat Unit Accumulation
From May 1
1981-2010
2022 Through July 20th
Heat units (DD60s)
2500
2250
2000
1750
1500
1250
1000
750
500
250
0
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
Date


Muleshoe
18-Year Mean (2004-2021) and 2022
Daily Total Solar Radiation (MJ/meter2)
2022
Muleshoe 18-Yr Mean
Total MJ/m2/day
35
30
25
20
15
10
5
0
1-May
1-Jun
2-Jul
2-Aug
2-Sep
3-Oct
3-Nov
Date
Total solar energy, in MJ/meter2, calculated from the hourly average global solar radiation rates and converted to energy by integrating over time.
Source: https://www.ncei.noaa.gov/pub/data/uscrn/products/daily01/

4-Bract Floral Anomalies Noted

During recent inspection of our trials I and others have found some floral anomalies called "4-bract squares." Four-bract square initiation is poorly understood, but I have seen this many times during my career. I don't like remembering 2011, but that year we experienced an excessive number of these types of square anomalies during the mega-heat. **There is a presence of this anomaly in many fields this year, but I am not greatly concerned because the incidence is very low.**

- The best published information I can find on this is in the vintage publication Cotton Physiology Today, Volume 4, Number 1 (1993). This publication can be accessed here:

https://www.cotton.org/tech/physiology/cpt/plantphysiology/upload/CPT-Jan93-REPOP.pdf

- This publication states: *After the fruiting branch meristem forms the subtending leaf, it starts to form the bracts. High spring temperatures (average day/night temperature above 80 degrees) can cause this meristem to attempt to produce another leaf after the subtending leaf, but before the bracts are formed. This extra leaf forms a fourth "bract", and is located just outside the normal 3 bracts. The lowest fruiting branches appear most susceptible to 4-bract squares, because high temperatures later in the season do not have the same effect. Four-bract squares are more susceptible to shed and thrips injury - the fourth bract provides an opening for thrips to enter the young square - than well-developed 3-bract (normal) squares.*
- My experience with 4-bract squares is that this doesn't end well. Virtually all of these types of squares which have a tissue appendage on the floral dome (bud) will eventually abort.
- The 4-bract squares will usually be associated with the first and oldest squares. Initially, if 2-3 nodes of 4-bract squares are noted on the first few fruiting branches, these will no longer be found in younger fruit higher up the plant. It's almost as if the plant "gets accustomed to the heat" or perhaps the extreme temperatures are no longer encountered and subsequent squares are normal.
- When 4-bract squares are observed, many times the aborted squares found on the ground will have this condition.
- Four-bract squares WITHOUT any tissue appendage on the floral dome will many times set and make normal bolls, with the exception of having 4 bracts on the boll instead of the normal 3.
- In my opinion, the take-home-lesson is to recognize 4-bract squares, and don't confuse these as having been impacted by insect damage and start spraying insecticides for possible "stealth insect feeding." This just adds additional input costs and pyrethroids can trigger secondary pest outbreaks (such as aphids) if the beneficial arthropods are removed from the agroecosystem by various insecticides.
- **This is caused by a physiological phenomenon and is attributed to high heat when the first squares are forming in the terminal.**
- Photos below will provide some clarity to this situation.

Normal Square Development – Note 3 Bracts and Normal Floral Dome (Calyx and Petals Normal)

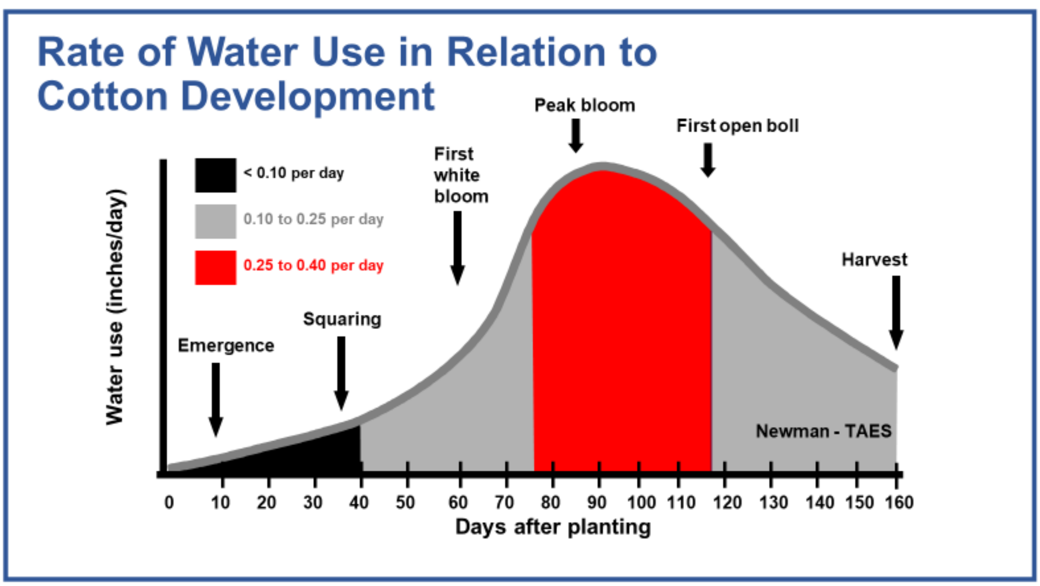

"A Normal Square with 4-Bracts" (Note There Is No Tissue Appendage on Floral Dome)

Abnormal 4-Bract Squares (Note Presence of Tissue Appendage on Floral Dome)


Additional Abnormal 4-Bract Squares (Note Presence of Tissue Appendage on Floral Dome)

Irrigation Comments

Earlier planted cotton has entered the bloom stage, and later May planted cotton will be blooming soon. That is the stage when cotton water demand increases considerably. The image below is a "vintage" cotton water consumption graphic , but it is still valuable.



A few years back I generated the following tables that show the amount of irrigation application that is possible for a 120-acre full pivot of cotton, and a 60-acre half pivot (other half pivot is fallow, so all water can be applied to one-half of the circle). These numbers are based on varying irrigation capacities and crop ET rates. The tables also assume uninterrupted 24-hour pumping and delivery.

120-acre pivot

(assumes uninterrupted pumping)

Amount of Cotton Evapotranspiration Replacement for Various 120-Acre Center Pivot Irrigation Pumping Capacities and Delivery Efficiencies

Pumping capacity delivered to center pivot					Acre-inches/acre/day	Inches/acre/day delivered at irrigation application efficiency (%)			For 85% irrigation application efficiency % ET replacement if actual crop ET (in inches/day) is:			
GPM	GPM/acre	Gallons/day	Acre-feet/day	Acre-inches/day	at 100% efficiency	95 (LEPA, SDI)	85 (Low elevation spray)	75 (Poor spray)	0.25 (moderate)	0.35 (high)	0.45 (very high)	0.55 (extreme)
100	0.8	144,000	0.44	5.3	0.04	0.04	0.04	0.03	15	11	8	7
200	1.7	288,000	0.88	10.6	0.09	0.08	0.08	0.07	30	21	17	14
300	2.5	432,000	1.33	15.9	0.13	0.13	0.11	0.10	45	32	25	20
400	3.3	576,000	1.77	21.2	0.18	0.17	0.15	0.13	60	43	33	27
500	4.2	720,000	2.21	26.5	0.22	0.21	0.19	0.17	75	54	42	34
600	5.0	864,000	2.65	31.8	0.27	0.25	0.23	0.20	90	64	50	41
700	5.8	1,008,000	3.09	37.1	0.31	0.29	0.26	0.23	105	75	58	48
800	6.7	1,152,000	3.53	42.4	0.35	0.34	0.30	0.27	120	86	67	55
900	7.5	1,296,000	3.98	47.7	0.40	0.38	0.34	0.30	135	97	75	61
1000	8.3	1,440,000	4.42	53.0	0.44	0.42	0.38	0.33	150	107	83	68

Note: 12 acre inches = 1 acre-ft = ~326,000 gallons

Texas High Plains research indicates that ~75% ET replacement can generally maximize water-use efficiency (lbs of lint/inch of water) but not necessarily total yield/acre. Salinity will complicate this response.

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60-acre one-half circle of cotton, other half fallow

(assumes uninterrupted pumping)

Amount of Cotton Evapotranspiration Replacement for Various 60-Acre Center Pivot Irrigation Pumping Capacities and Delivery Efficiencies

GPM	Pumping capacity delivered to center pivot: GPM/acre	Gallons/day	Acre-feet/day	Acre-inches/day	Acre-inches/acre/day at 100% efficiency	Inches/acre/day delivered at irrigation application efficiency (%): 95 (LEPA, SDI)	85 (Low elevation spray)	75 (Poor spray)	For 85% irrigation application efficiency, % ET replacement if actual crop ET (in inches/day) is: 0.25 (moderate)	0.35 (high)	0.45 (very high)	0.55 (extreme)
100	1.7	144,000	0.44	5.3	0.09	0.08	0.08	0.07	30	21	17	14
200	3.3	288,000	0.88	10.6	0.18	0.17	0.15	0.13	60	43	33	27
300	5.0	432,000	1.33	15.9	0.27	0.25	0.23	0.20	90	64	50	41
400	6.7	576,000	1.77	21.2	0.35	0.34	0.30	0.27	120	86	67	55
500	8.3	720,000	2.21	26.5	0.44	0.42	0.38	0.33	150	107	83	68
600	10.0	864,000	2.65	31.8	0.53	0.50	0.45	0.40	180	129	100	82
700	11.7	1,008,000	3.09	37.1	0.62	0.59	0.53	0.46	210	150	117	96
800	13.3	1,152,000	3.53	42.4	0.71	0.67	0.60	0.53	240	172	133	109
900	15.0	1,296,000	3.98	47.7	0.80	0.76	0.68	0.60	270	193	150	123
1000	16.7	1,440,000	4.42	53.0	0.88	0.84	0.75	0.66	300	215	167	137

Note: 12 acre inches = 1 acre-ft = ~326,000 gallons

Texas High Plains research indicates that ~75% ET replacement can generally maximize water-use efficiency (lbs of lint/inch of water) but not necessarily total yield/acre. Salinity will complicate this response.

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