2020 NexGen 2982 B3XF Nitrogen Rate Trial – Lonestar Gin

Lance Williams Farm – Paul's Home Place
Groom, TX

Dr. Randy Boman, Cotton Agronomics Manager – Windstar Inc.

Carey McKinney – Manager Lonestar Gin

Summary

In 2019, a cotton variety testing program was established as a new service created by Windstar Inc. affiliated gins. These gins are working together to support a Cotton Agronomics Manager position. One of the components of this program is to work with local producers to scientifically evaluate varieties in a commercial on-farm setting from planting through ginning. These unique replicated trials are planted and harvested with the grower's commercial equipment. Each variety's round modules are combined across all replicates and then ginned and classed separately in an extremely detailed manner. Purging and weighing any remnant bale of from the press is also performed for each variety. All lint samples from each variety's commercial bales are then classed by the USDA-AMS classing office. This detailed ginning and classing management of all round modules for each variety is key to the success of this program and to the best of our knowledge is without peer in the U.S. ginning industry.

In 2020 it was decided to expand the program to include a nitrogen (N) fertilizer management component. Excess N can have a very significant impact on crop maturity and quality but it has been poorly researched in this region. Since many growers in our service area are rotating to cotton following corn, N rate trials were established. These trials included an unfertilized control (0 N) and rates of 50, 100, and 150 lbs N/acre. N rates were applied during strip-till operations and 82-0-0 (anhydrous ammonia) was used.

NexGen 2982 B3XF with XtendFlex technology was planted in a center-pivot irrigated field in a scientifically valid N rate trial with three replicates. Although some weather events during the growing season were noted, subsequent growing conditions were such that good to excellent yields were obtained. *This trial was first planted in late April and due to a poor stand was replanted on May 22. It escaped damage that was typically associated with the June 9th regional high wind event. It also escaped hail events that occurred in the surrounding area. Overall, the trial was able to stay on track with growth and development and apparently was not visually affected by the September 9 record low temperature. However, the loss of four days of maturity (essentially zero cotton heat units) associated with the cold spell from September 8 through 11 most certainly affected overall maturity and this was reflected in low micronaire across all N rates.*

Harvest results indicated that statistically significant differences were observed among N rates. Lint yields ranged from a high of 1675 lb/acre at the 100 lb/acre N rate to a low of 1479 lb/acre in the 0 N rate treatment (Table 1). In this field in 2020, a lint yield response to N fertilization

occurred up to the 100 lb/acre N rate. Average Loan value for varieties from commercially ginned and classed bales varied from a low of $0.3428/lb for the 150 lb N rate to a high of $0.3992/lb for the 0 N treatment. Overall Loan value for the trial across all entries was $0.3687/lb. When including lint Loan value on a per acre basis and net gin credit (defined as gross Loan value/acre plus net gin credit) and removing N fertilizer cost, statistically significant differences were found among N treatments. N cost was determined based on $335/ton for 82-0-0 (anhydrous ammonia). The 0, 50 and 100 lb/acre N rates generated the highest net value at $625/acre, $630/acre, and $627/acre respectively, and were statistically equal. High N fertilizer cost, and lower yield and quality reduced the value of the 150 lb N/acre rate significantly compared to the other rates.

Table 2 presents in-season data including stand establishment percentage, vigor, nodes above white flower (NACB) and plant height on three sampling dates, leaf tissue N concentration at both early bloom and cutout, and nodes above cracked boll (NACB) on September 28. Many of the plant vigor parameters were statistically different among N rates for mid- to late-season measurements. By two weeks past early bloom, NAWF and plant height increased compared to the 0 N check with higher N rate. By 4 weeks past early bloom, the 0 N rate had almost bloomed through the terminal (cutout), and N fertilization resulted in delayed cutout. This response was greater with higher N rate. Plant height followed a similar pattern and by 4 weeks past early bloom, plants were about 4 to 6 inches larger in the 100 and 150-lb N rates, respectively, compared to the unfertilized check. Leaf N concentration was affected by N fertilization at early bloom, with the unfertilized check having the lowest (4.8%) versus N fertilized treatments having 5.0% or above. By cutout on August 24, the unfertilized check had 3.4% N compared to 3.9% or above for N fertilized treatments. On September 28, significant differences among N rates were noted in nodes above cracked boll (a quantitative measure of crop maturity). The unfertilized check and 50-lb N rate had fewer NACB (denoting earlier maturity) with 3.4 and 3.8, respectively. The 100 lb-N/acre rate exhibited 4.4 NACB, and the 150-lb N rate had 6.1. Overall, the higher N rates had statistically significant later maturity than the unfertilized control and 50-lb N rate treatment.

Table 3 provides the USDA-AMS classing results from each bale for each N rate treatment and the averages of up to 18 to 19 commercially ginned bales per treatment. Averages indicate that color grades were mostly 31 (higher quality) and 41 (lower quality). The unfertilized check had more 31 color grade bales than other treatments. Average leaf grades were impacted by N fertilizer rate. The unfertilized check had the best leaf grades with an average of 5.9. Leaf grades of 6.4, 6.7, and 6.6 were noted for the 50, 100, and 150 lb-N rates, respectively. Average staple was typically 36 to 37 32nds inch, with minimal impact of N fertilization observed. Average micronaire values were highest in the unfertilized check (2.9) and decreased with higher N rates. Micronaire averages were 2.7, 2.7, and 2.6 for the 50, 100, and 150-lb N rates, respectively. It is apparent that the somewhat later planting date of May 22 and perhaps the cold spell in early September negatively impacted fiber development, and this was likely exacerbated by excess N in this trial. Minimal bark contamination was noted in commercial bales for the unfertilized check and the 50-lb N rate treatment. Only about 5% of the bales exhibited bark contamination. However, as N rate increased, bark contamination increased, with 31% and 27% of the bales were classed with bark for the 100 and 150-lb N rate treatments, respectively. Therefore, higher N rates had substantially higher bark contamination. Average fiber strength ranged from 30-31 g/tex, and appeared unaffected by N fertilization. Uniformity ranged from 81.2 to 81.8% and also appeared to be unaffected by N fertilization. Overall

negative impacts on various fiber quality parameters are integrated into the CCC Loan value. Average Loan values were 39.92, 36.91, 36.37, and 34.28 cents/lint lb for the unfertilized check, 50, 100, and 150-lb N rates, respectively. Therefore, in this commercial field trial, significant fiber quality impacts due to N fertilization were noted.

Disclaimer: Readers should realize that results from one trial do not represent conclusive evidence that the same response would occur where conditions vary. Multi-site and multi-year data are always best. For this trial, good scientific techniques were used and the results are presented to indicate what actually occurred in the trial. Context of the environment, overall growing season impact, management techniques, and trial methodology used are important and must be considered.

Site Information and Methods

Elevation: 3295 ft

Previous crop: corn harvested in 2019

Tillage system: strip-till, with N rates applied on March 6

Planted: late April, stand lost, replanted May 22

Replicates: 4 replicates of 0, 50, 100, and 150 lb N/acre in a randomized complete block design

Plot width: 12-row harvested plots, 16-row strip till and N application

Plot length: length of fertilized and harvested plot ~2,150 ft

Seeding rate: 50,000 seed/acre

30-inch rows under center pivot irrigation

Total rainfall: ~7 inches

May – 0.4, June – 2.2, July – 1.3, August – 3.1

Total irrigation: ~11 inches

April – 1.0, May - 3.0, June – 0, July – 3, August – 4.0, September – 0

Additional fertility: 20 gal/acre 10-27-4-0 on March 6

Herbicide management:

Preplant burndown – (March 10) 2,4-D + Valor + Roundup PowerMax + Zidua

Preemergence – (May 5) dicamba + diuron

Post emergence - (June 13) glufosinate, clethodim, Outlook, XtendiMax

Post emergence - (July 20) Roundup PowerMax

Insecticides: 4 oz/acre acephate (June 4)

Plant growth regulators: 16 oz/acre (August 18)

Harvest aids: 1 qt/acre ethephon (October 14)

Harvesting: November 17 using a John Deere CS690, with harvested area calculated by the GPS on the stripper monitor. Approximately 2,150 ft of plot length was harvested in two round modules per individual plot. Round modules were weighed using the CS690 scale, and all round modules (from each of 4 replicates = 8 total) for each fertilizer treatment were weighed at the Lonestar Gin.

Commercial ginning: Round modules for all 4 replicates of each nitrogen rate treatment were staged together and commercially ginned separately by Lonestar Gin. Commercial ginning included: cleaning module feeder, clearing gin stream, dumping seed rolls, and purging remnant bale in press. This process was initiated before the first variety module was ginned and then repeated for each nitrogen rate treatment in the trial.

Remnants were ejected from the bale press and weighed, but not sampled for USDA-AMS classing. Only data from commercial bales are included in classing data for each variety.

Lint value: Table 1 is based on CCC Loan value from commercial ginning and USDA-AMS classing results.

List of Tables

Acknowledgements

Lonestar Gin would like to thank Lance Williams with Williams Farms, LLC, for committing equipment, land, and time to conduct and manage the trial. Jimmy Osborn fertilized and harvested the trial and we are very appreciative of his excellent skills and cooperation. Gratitude is expressed to Windstar Inc. Detailed ginning was performed by Malcom Jones, Dalton Skinner and the Lonestar ginning crew and a big thank you is extended to this hard-working group.

Table 1. Harvest results for the center pivot irrigated NexGen 2982 B3XF nitrogen rate trial, Williams Farm, Groom, TX, 2020.

N rate	Lint turnout	Seed turnout	Bur cotton yield	Lint yield	Seed yield	Lint loan value	Lint loan value	Net gin credit	N cost	Net value	
lb/acre	---------- % ----------		---------- lb/acre ----------			$/lb	---------- $/acre ----------				
0	25.4	35.7	5827	1479	2079	0.3992	591	35	0	625	a
50	25.7	35.1	6373	1641	2236	0.3691	606	34	10	630	a
100	25.9	35.6	6466	1675	2302	0.3637	609	38	20	627	a
150	24.4	35.6	6346	1548	2259	0.3428	531	37	31	537	b
Test average	25.4	35.5	6253	1586	2219	0.3687	584	36	15	605	
CV, %	--	--	5.5	5.4	5.5	--	5.3	5.6	--	5.5	
OSL	--	--	0.1002	0.0388	0.1227	--	0.0191	0.0461	--	0.0081	
LSD	--	--	446	112	NS	--	40	3	--	43	

For net value/acre, means within a column with the same letter are not significantly different.
CV - coefficient of variation.
OSL - observed significance level, or probability of a greater F value.
LSD - least significant difference at the 0.10 level, NS - not significant.
Note: some columns may not add up due to rounding error.

Assumes:
$3.15/cwt commercial ginning cost.
$210/ton for seed.
Net gin credit is defined as seed credit minus ginning expense.
N cost was determined based on $335/ton of 82-0-0.
Net value is defined as gross loan value/acre plus net gin credit minus N fertilizer cost.
Value for lint based on CCC loan value from commercial ginning and USDA-AMS classing results.

Table 2. Plant observation results from the center pivot irrigated NexGen 2982 B3XF nitrogen rate trial, Williams Farm, Groom, TX, 2020.

N rate	Final population	Stand establishment	Vigor	Nodes above white flower			Plant height			Leaf tissue N concentration		Nodes above cracked boll
				Early bloom	+2 weeks	+4 weeks	Early bloom	+2 weeks	+4 weeks	Early bloom	Cutout	
lb/acre	plants/acre	%	1-5 visual scale, 5 best	count			inches			% N		count
	18-Jun	18-Jun	18-Jun	29-Jul	12-Aug	24-Aug	29-Jul	12-Aug	24-Aug	29-Jul	24-Aug	28-Sep
0	39,858	79.7	3.8	8.1	4.7	0.8	22.3	24.3	23.3	4.8	3.4	3.4
50	43,342	86.7	4.0	8.5	5.2	1.7	23.6	24.8	25.0	5.1	3.9	3.8
100	42,035	84.1	4.0	8.1	5.7	2.1	24.2	26.3	26.8	5.0	3.9	4.4
150	40,947	81.9	4.0	8.4	5.9	3.0	24.7	27.8	29.3	5.2	4.1	6.1
Test average	41,546	83.1	4.0	8.3	5.4	1.9	23.7	25.8	26.1	5.0	3.8	4.4
CV, %	5.7	5.7	6.4	4.8	8.6	27.6	1.1	3.4	1.7	2.0	4.8	7.6
OSL	0.2625	0.2609	0.4363	0.5644	0.0717	0.0123	0.0228	0.0089	0.0001	0.0107	0.0201	0.0003
LSD	NS	NS	NS	NS	0.7	0.8	1.1	1.4	0.7	0.2	0.3	0.5

CV - coefficient of variation.

OSL - observed significance level, or probability of a greater F value.

LSD - least significant difference at the 0.10 level, NS - not significant.

Table 3. Commercial classing data for the center pivot irrigated NexGen 2982 B3XF nitrogen rate trial, Williams Farm, Groom, TX, 2020.

N rate and Bale Number	Color Grade-Quadrant grade-quadrant	Color digit 1	Color digit 2	Leaf grade	Staple 32nds inch	Micronaire units	Extraneous matter	Remarks --	Strength g/tex	Rd %	+b %	Trash % area	Uniformity %	Length 100ths inch	Loan rate cents/lb
0 lb N/acre															
618949	41-1	4	1	5	36	2.5	.	.	30.7	78.4	7.0	7	80.2	112	38.00
618950	41-1	4	1	5	37	2.4	.	.	28.4	78.2	7.2	7	82.4	114	33.40
618951	31-2	3	1	6	37	2.4	.	.	29.3	77.5	7.3	7	81.9	115	31.20
618952	31-2	3	1	7	36	2.6	.	.	30.6	77.8	7.3	10	79.4	112	34.40
618953	41-1	4	1	6	36	2.6	.	.	28.5	78.2	7.0	9	80.0	113	35.10
618954	41-1	4	1	6	37	2.6	.	.	29.2	78.2	7.1	8	81.6	116	35.15
618955	41-1	4	1	7	37	2.6	.	.	30.5	77.2	7.2	10	80.3	114	34.00
618956	31-2	3	1	6	36	2.9	.	.	32.9	77.8	7.3	7	82.0	112	40.95
618957	31-1	3	1	4	36	3.3	.	.	31.7	79.6	7.3	5	80.6	112	50.10
619013	41-1	4	1	6	35	3.2	.	.	33.2	76.4	7.7	9	83.2	110	42.45
619014	41-1	4	1	7	36	3.0	.	.	32.2	76.3	7.7	9	80.9	112	41.70
619015	31-2	3	1	7	36	3.1	.	.	31.7	76.9	7.7	10	80.0	111	42.60
619016	41-1	4	1	6	36	2.7	.	.	31.9	77.3	7.2	8	82.3	113	40.50
619017	41-1	4	1	6	37	2.7	.	.	32.6	77.9	7.1	8	82.9	116	40.50
619018	41-1	4	1	6	37	3.2	11	level 1 bark	30.3	75.9	7.7	9	82.2	115	39.50
619019	41-1	4	1	6	37	3.2	.	.	30.6	77.4	7.6	8	82.3	115	42.90
619020	41-1	4	1	5	36	3.0	.	.	32.8	76.3	7.5	7	81.6	113	45.70
619021	31-2	3	1	5	36	3.1	.	.	31.2	77.3	7.8	8	83.0	113	46.75
619022	31-2	3	1	6	36	3.1	.	.	31.2	77.8	7.6	9	82.4	111	43.55
Average	--	3.6	1.0	5.9	36.3	2.9	1/19	level 1 bark	31.0	77.5	7.4	8.2	81.5	113.1	39.92
50 lb N/acre															
618958	41-1	4	1	6	37	2.6	.	.	29.8	78.1	6.7	11	80.2	115	35.15
618959	41-1	4	1	6	37	2.5	.	.	29.8	78.0	7.2	7	81.5	117	35.15
618960	41-1	4	1	6	37	2.5	.	.	30.4	78.4	7.1	9	80.5	115	35.35
618961	41-1	4	1	7	37	2.4	.	.	29.4	77.3	7.2	10	81.9	116	29.35
618962	41-1	4	1	6	36	2.7	.	.	30.0	76.8	7.4	8	81.6	113	40.25
618963	41-1	4	1	8	37	2.8	.	.	29.6	76.4	7.3	11	81.5	114	23.00
618964	41-1	4	1	7	36	2.6	.	.	29.5	76.9	7.4	9	82.0	111	33.85
618965	41-1	4	1	7	36	2.8	.	.	30.4	76.6	7.3	10	81.4	113	38.90
618966	41-1	4	1	6	37	2.9	.	.	31.0	77.3	7.5	8	82.7	115	40.50
618967	41-1	4	1	6	37	2.9	.	.	32.9	76.2	7.8	7	81.3	114	40.45
618968	41-1	4	1	6	36	2.9	.	.	29.8	75.9	7.8	8	81.9	112	40.05
618969	41-1	4	1	6	36	3.0	.	.	31.2	77.1	7.6	9	81.2	112	43.05
618970	41-1	4	1	7	36	2.8	.	.	30.1	75.6	7.8	8	80.7	111	38.90
618971	41-1	4	1	7	37	2.8	.	.	30.0	75.3	7.7	10	80.6	114	38.90
618972	41-1	4	1	7	37	2.8	.	.	30.4	75.6	7.8	8	82.3	114	38.95
618973	41-1	4	1	6	36	2.7	.	.	30.8	76.4	7.6	8	80.3	113	40.25
618974	41-1	4	1	6	37	2.7	11	level 1 bark	30.9	76.4	7.4	8	81.8	115	36.85
618975	41-1	4	1	6	37	2.6	.	.	30.8	77.2	7.2	9	83.4	114	35.45
Average	--	4.0	1.0	6.4	36.6	2.7	1/18	level 1 bark	30.4	76.8	7.4	8.8	81.5	113.8	36.91

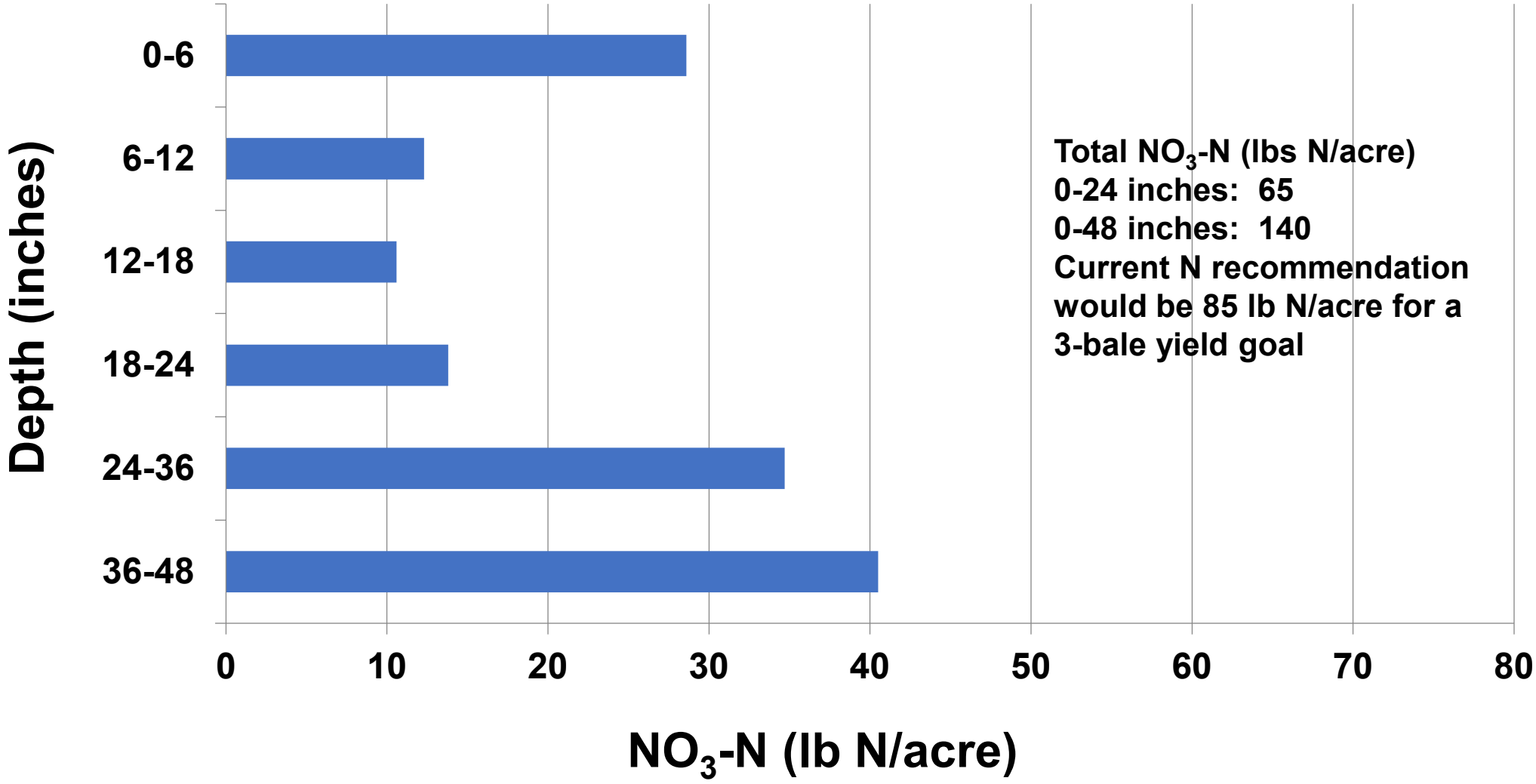
Table 3 (continued). Commercial classing data for the center pivot irrigated NexGen 2982 B3XF nitrogen rate trial, Williams Farm, Groom, TX, 2020.

N rate and Bale Number	Color Grade-Quadrant grade-quadrant	Color digit 1	Color digit 2	Leaf grade	Staple 32nds inch	Micronaire units	Extraneous matter	Remarks --	Strength g/tex	Rd %	+b %	Trash % area	Uniformity %	Length 100ths inch	Loan rate cents/lb
100 lb N/acre															
618976	41-1	4	1	6	38	2.5	.	.	30.3	77.6	6.9	9	82.8	118	35.40
618977	41-1	4	1	7	38	2.6	.	.	30.1	75.5	7.3	10	80.1	118	34.00
618978	41-1	4	1	6	37	2.7	.	.	30.3	76.6	7.5	7	82.3	114	40.30
618979	41-1	4	1	6	36	2.7	.	.	30.1	75.6	7.7	7	81.2	112	40.25
618980	41-1	4	1	6	36	2.8	.	.	30.9	76.5	7.6	7	81.5	112	40.25
618981	41-1	4	1	6	36	2.8	11	level 1 bark	30.7	76.1	7.7	7	81.7	113	36.85
618982	41-1	4	1	7	36	2.7	.	.	28.6	75.3	7.6	9	81.3	113	38.65
618983	41-1	4	1	7	37	2.7	11	level 1 bark	31.1	75.3	7.7	10	85.1	116	35.90
618984	41-1	4	1	7	37	2.7			30.2	75.5	7.6	8	81.8	115	38.90
618985	41-1	4	1	7	38	2.7	11	level 1 bark	29.4	74.9	7.8	9	81.8	118	35.30
618986	41-1	4	1	8	37	2.9	.	.	33.3	74.6	7.9	10	81.1	114	23.45
618987	41-1	4	1	6	35	3.1	.	.	33.5	74.8	8.0	8	81.3	110	42.35
618988	41-1	4	1	7	36	3.2	.	.	30.2	74.9	8.1	8	82.4	111	41.55
618989	41-1	4	1	7	36	3.0	11	level 1 bark	32.3	73.9	8.0	9	81.5	113	38.30
618990	41-1	4	1	7	37	2.7	11	level 1 bark	30.5	76.2	7.9	10	81.8	115	35.50
618991	41-1	4	1	7	37	2.6	.	.	31.6	76.3	7.4	10	82.7	117	34.25
618992	41-1	4	1	7	37	2.5	.	.	29.6	76.6	7.6	11	81.8	117	33.80
618993	41-1	4	1	7	36	2.6	.	.	30.8	75.7	7.5	11	80.6	112	34.00
618994	41-1	4	1	6	37	2.5	11	level 1 bark	30.6	77.2	7.2	8	81.1	115	31.95
Average	--	4.0	1.0	6.7	36.7	2.7	6/19	level 1 bark	30.7	75.7	7.6	8.8	81.8	114.4	36.37
150 lb N/acre															
618995	41-1	4	1	7	37	2.5	.	.	28.2	76.6	7.2	11	81.2	117	33.75
618996	41-1	4	1	7	37	2.5	11	level 1 bark	30.6	76.6	7.5	11	80.0	116	30.60
618997	41-1	4	1	6	37	2.3	11	level 1 bark	31.4	76.2	7.5	9	80.9	117	27.70
618998	41-1	4	1	6	37	2.6	11	level 1 bark	29.2	75.0	7.7	8	80.7	115	31.75
618999	41-1	4	1	6	37	2.6	.	.	30.4	75.4	7.7	8	81.8	115	35.35
619000	41-1	4	1	7	37	2.7	.	.	30.8	75.0	7.9	9	82.3	115	38.95
619001	41-1	4	1	8	37	2.7	.	.	30.8	74.6	8.0	10	81.6	114	23.20
619002	41-1	4	1	6	36	2.8	11	level 1 bark	29.9	74.2	8.2	9	82.1	113	36.70
619003	41-1	4	1	7	36	2.8	.	.	32.2	75.7	7.8	10	80.9	113	39.10
619004	41-1	4	1	7	37	2.7	.	.	30.8	75.7	7.6	11	81.6	115	38.90
619005	41-1	4	1	6	37	2.7	.	.	31.8	75.7	7.6	7	81.5	115	40.45
619006	41-1	4	1	6	37	2.7	.	.	31.6	75.7	7.6	8	81.6	116	40.45
619007	41-1	4	1	6	36	2.6	.	.	30.1	75.9	7.7	8	80.8	113	35.35
619008	41-1	4	1	7	36	2.6	.	.	30.7	76.2	7.6	10	81.2	112	34.00
619009	41-1	4	1	6	37	2.6	.	.	31.3	76.5	7.6	8	81.3	115	35.55
619010	41-1	4	1	7	37	2.6	.	.	29.9	76.2	7.5	10	81.5	115	33.80
619011	41-1	4	1	7	36	2.2	11	level 1 bark	30.0	77.1	7.4	9	79.4	113	25.65
619012	31-2	3	1	6	37	2.6	.	.	30.5	77.8	7.4	9	81.2	117	35.85
Average	--	3.9	1.0	6.6	36.7	2.6	5/18	level 1 bark	30.6	75.9	7.6	9.2	81.2	114.8	34.28

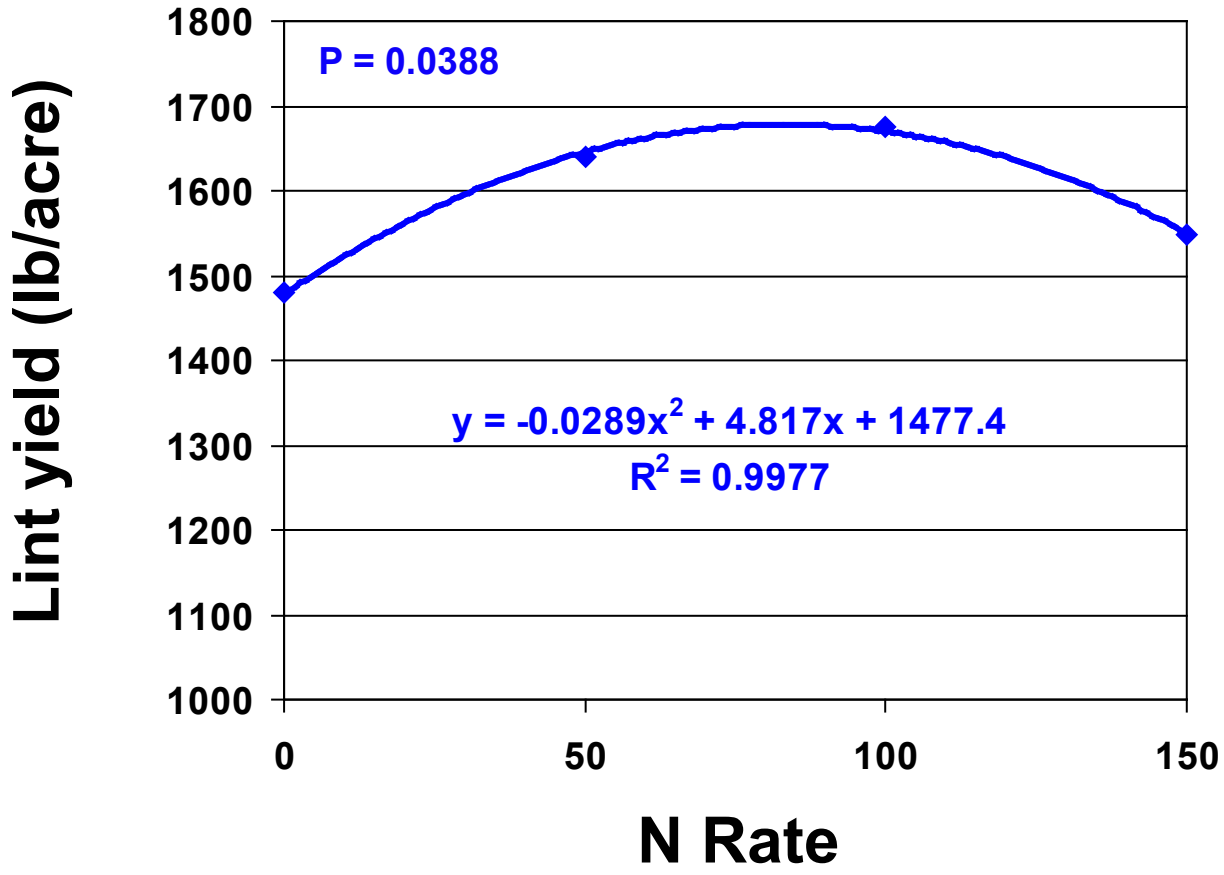
Appendix

Residual preplant NO_3-N in Paul's Home Place field, Lint yield quadratic regression function, Net value/acre quadratic regression function, Amarillo 2020 cotton heat units and weather data

NO_3-N (Pounds N/Acre) vs. Depth (inches)
Williams – Paul's Home Place, Groom

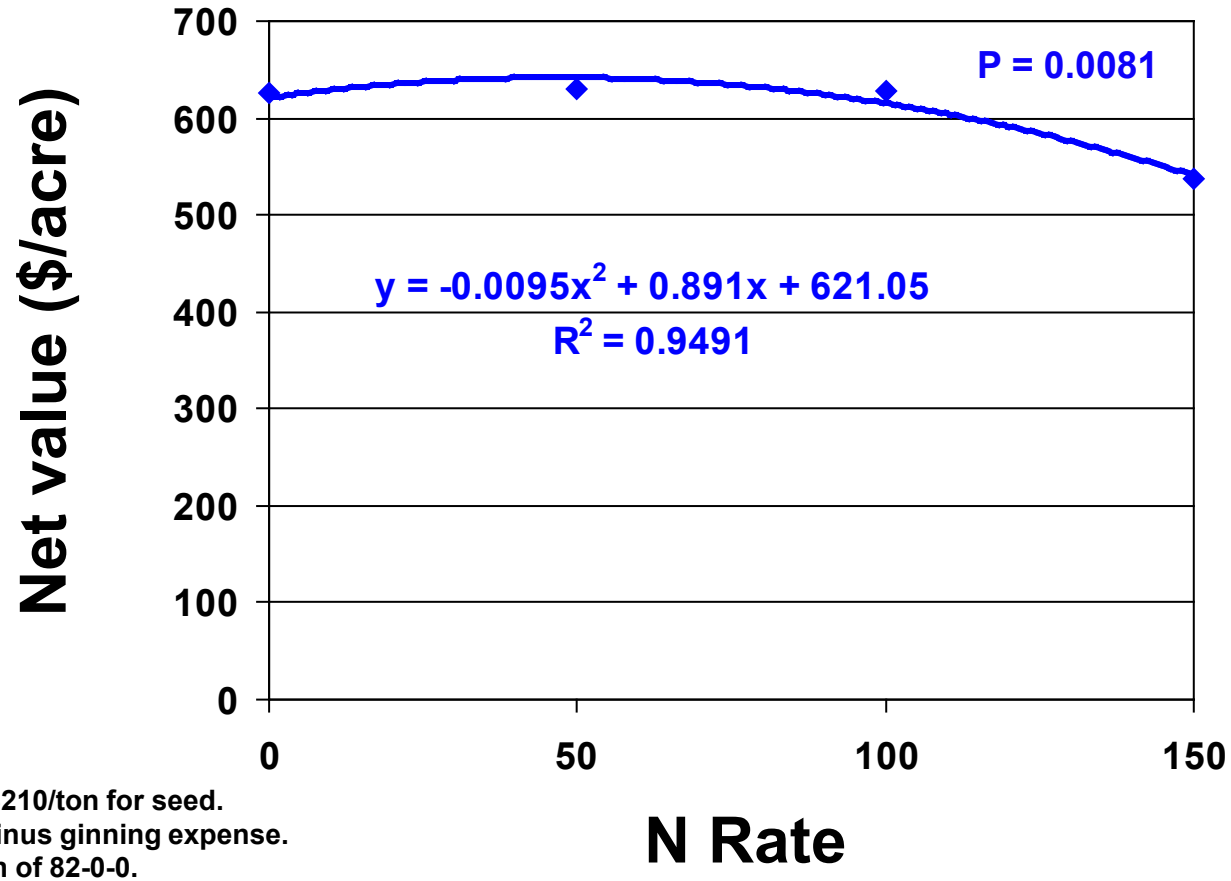


NexGen 2982 B3XF - N Rate Trial
Groom, TX – 2020
4 Replicates



Strip till – N application
Planted: May 22
Seeding rate: 50K
1st bloom date: Jul 29
Cutout date: Aug 24

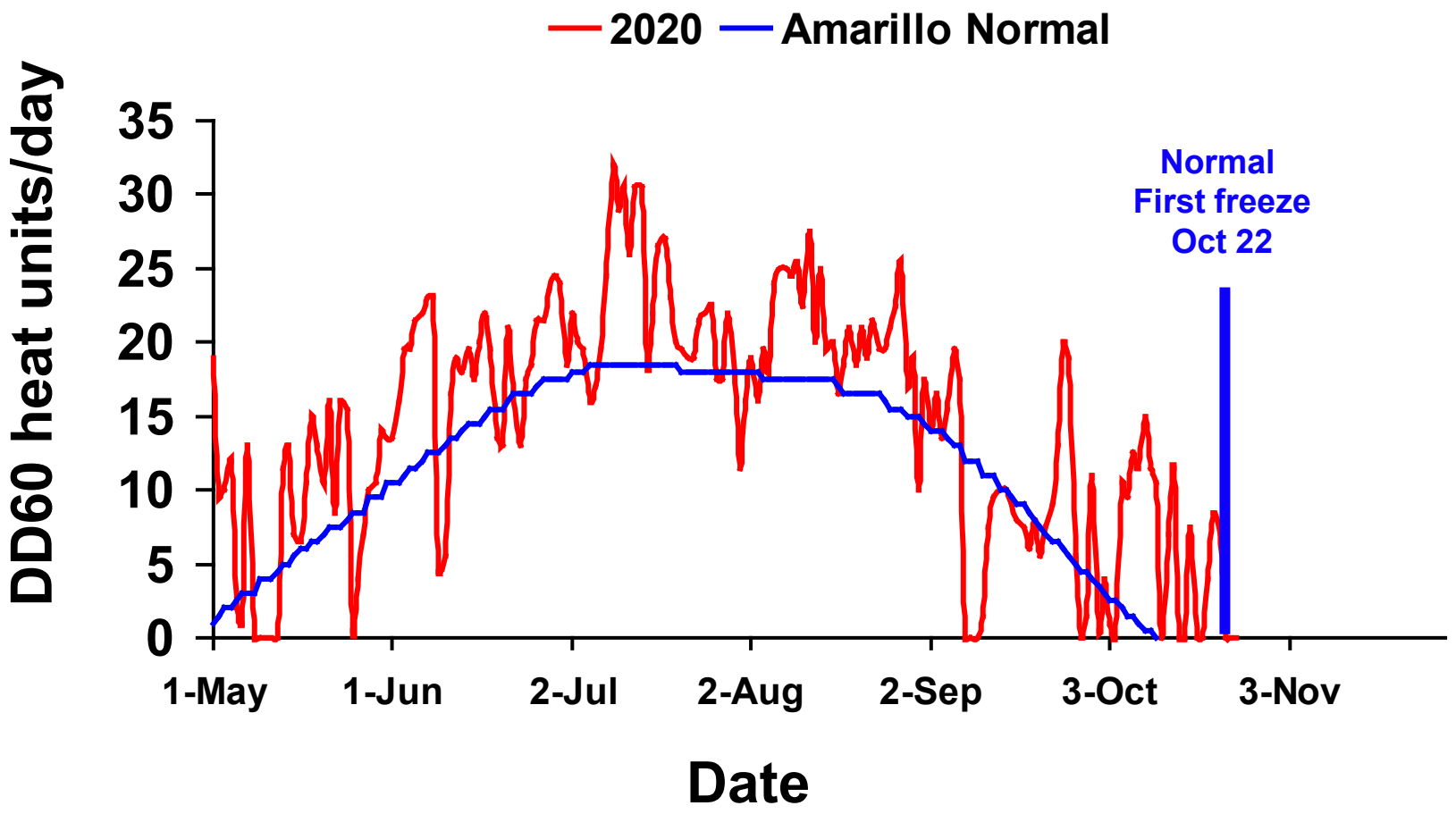
NexGen 2982 B3XF - N Rate Trial
Groom, TX – 2020
4 Replicates



Strip till – N application
Planted: May 22
Seeding rate: 50K
1st bloom date: Jul 29
Cutout date: Aug 24

Assumes:
$3.15/cwt commercial ginning cost, and $210/ton for seed.
Net gin credit is defined as seed credit minus ginning expense.
N cost was determined based on $335/ton of 82-0-0.
Net value is defined as gross loan value/acre plus net gin credit minus N fertilizer cost.
Value for lint based on CCC loan value from commercial ginning and USDA-AMS classing results.

Amarillo
30-Year Normal (1981-2010) and 2020
Daily Heat Units



Total Accumulated Heat Units
From May 1 through Hard Freeze:

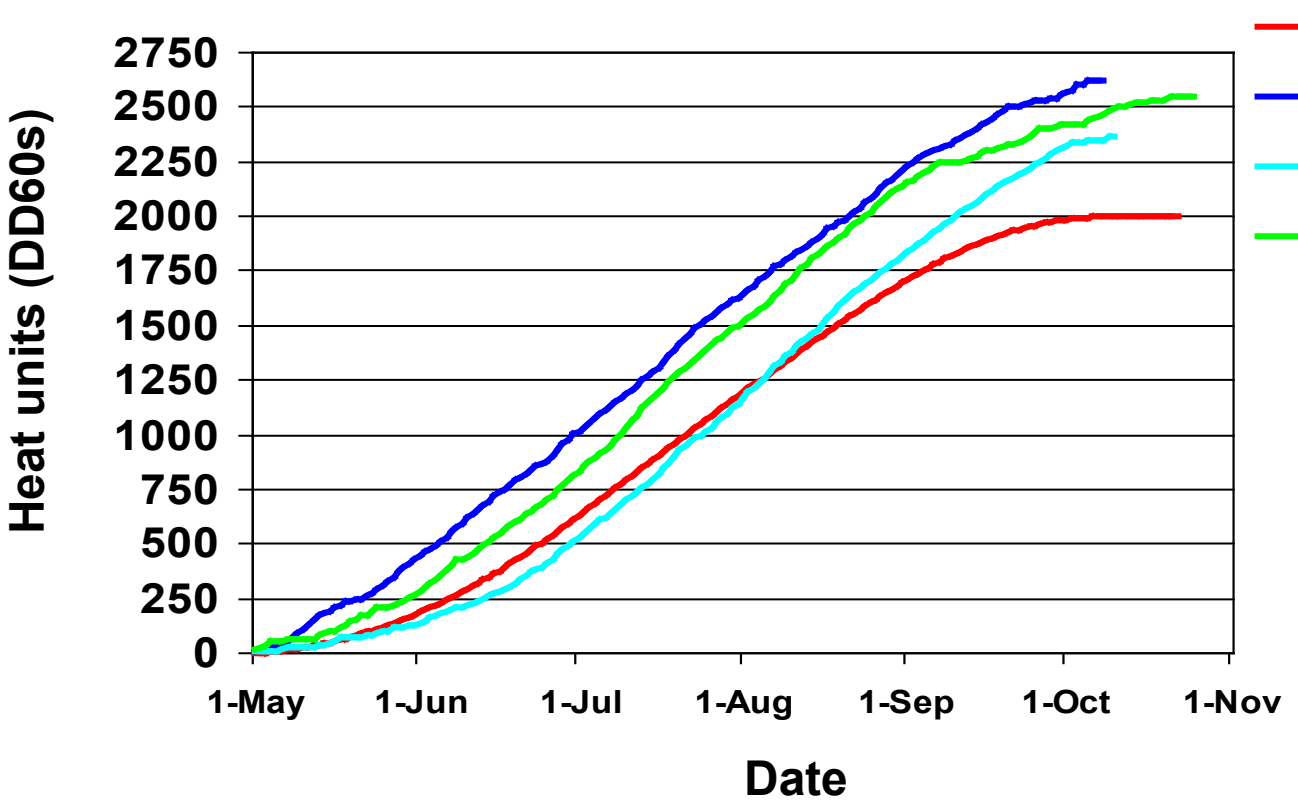
Normal: 2001
2020: 2552
% of normal: +28%

July had 10 days of 100 degrees or greater

Aug had 7 days of 100 degrees or greater

Hard freeze on Oct 25

Amarillo 30-Yr Normal (1981-2010) vs. 2018, 2019, and 2020 Cotton Heat Unit Accumulation for May 1 Through First Hard Freeze



1981-2010 (2001)
2018 (2621)
2019 (2362)
2020 (2552)

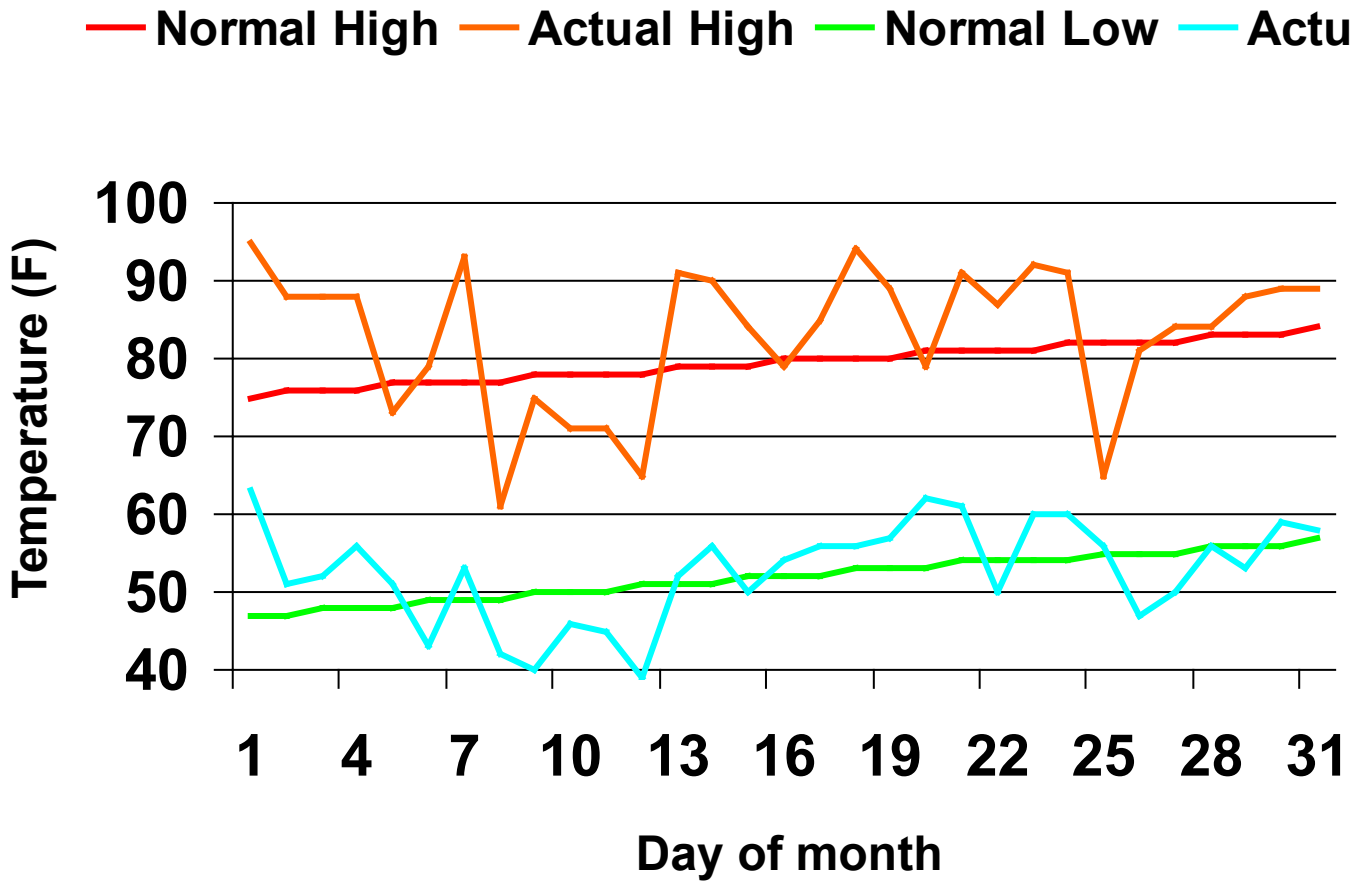
From May 1 through First Hard Freeze
Normal: 2001

2020: 2552
% of Normal: +28%

2019: 2362
% of Normal: +18%

2018: 2621
% of Normal: +31%

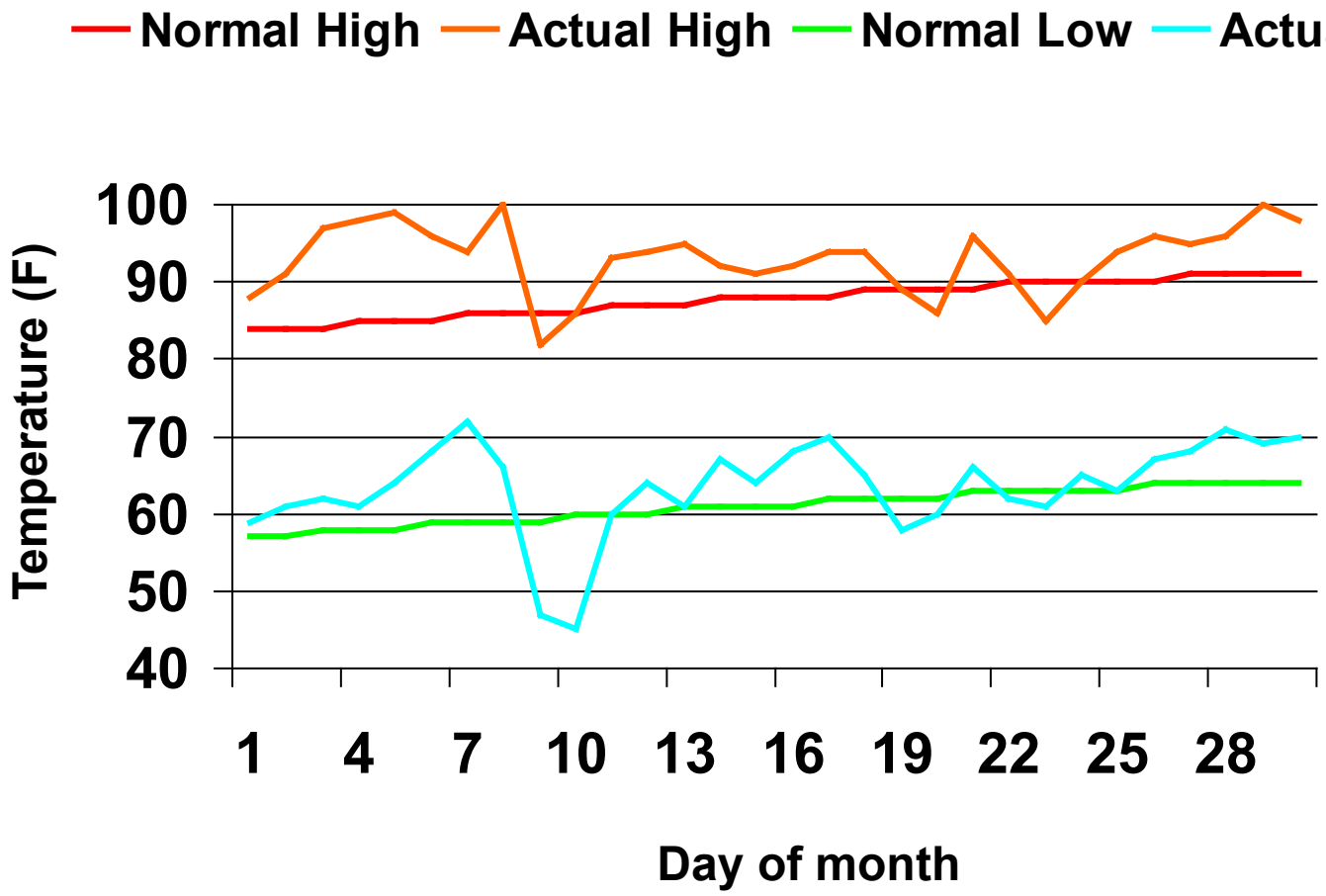
Amarillo
30-Yr Normal (1981-2010) and May 2020 Air Temperatures



Heat Units

Normal: 177
2020: 269
% of normal: +52

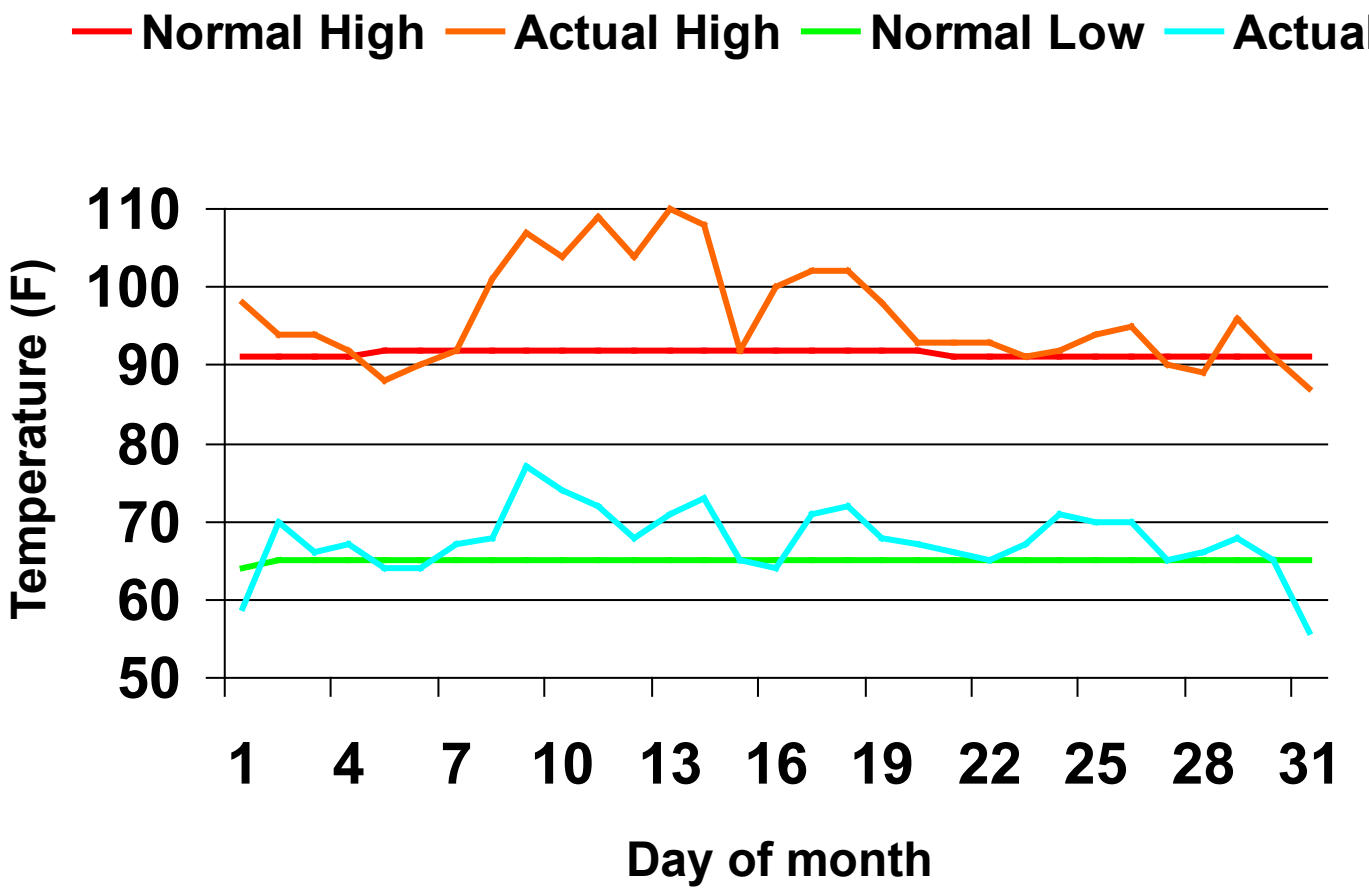
Amarillo
30-Yr Normal (1981-2010) and June 2020 Air Temperatures



Heat Units

Normal total: 433
2020: 548
% of normal: +27

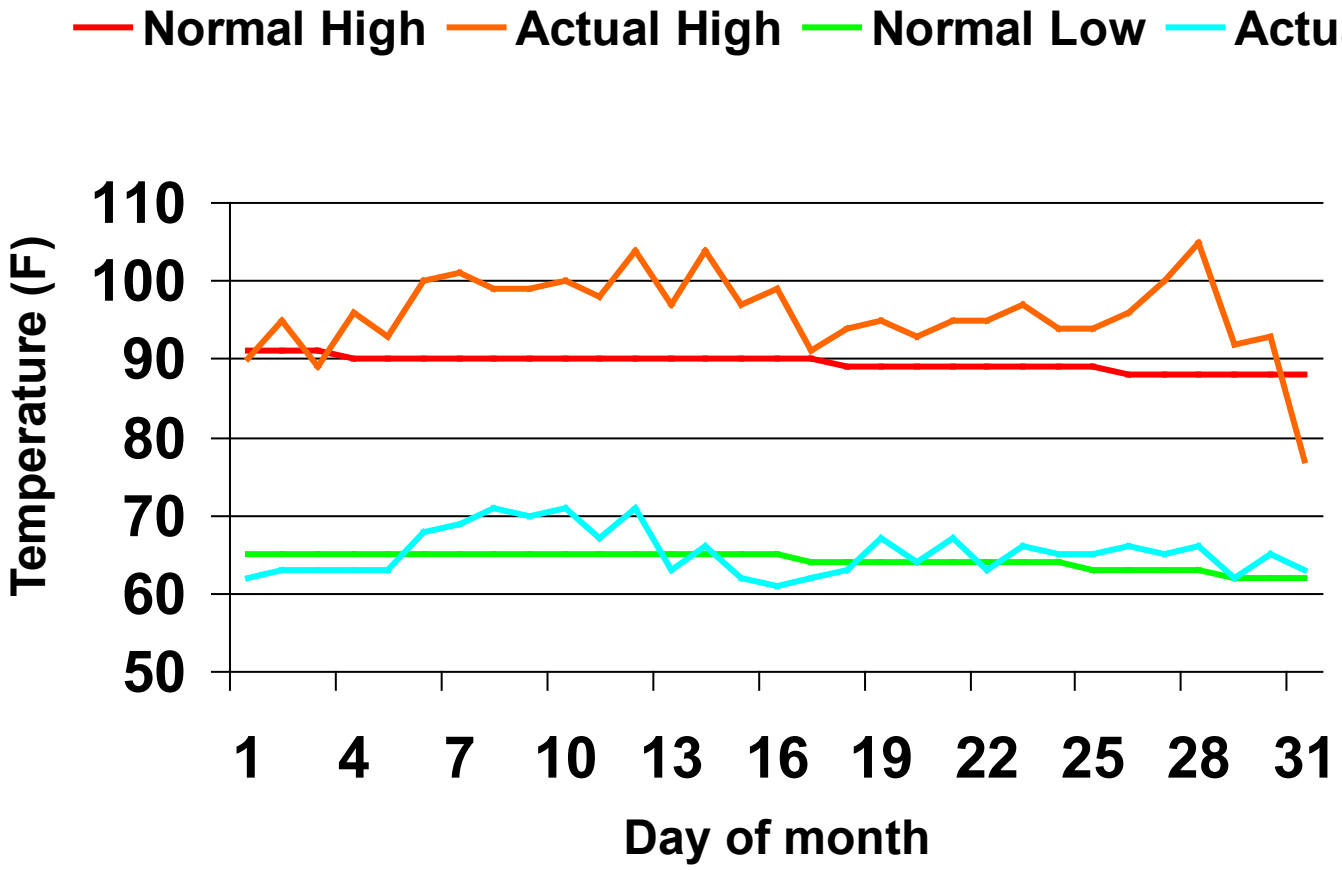
Amarillo
30-Yr Normal (1981-2010) and July 2020 Air Temperatures



Heat Units

Normal total: 566
2020: 683
% of normal: +21

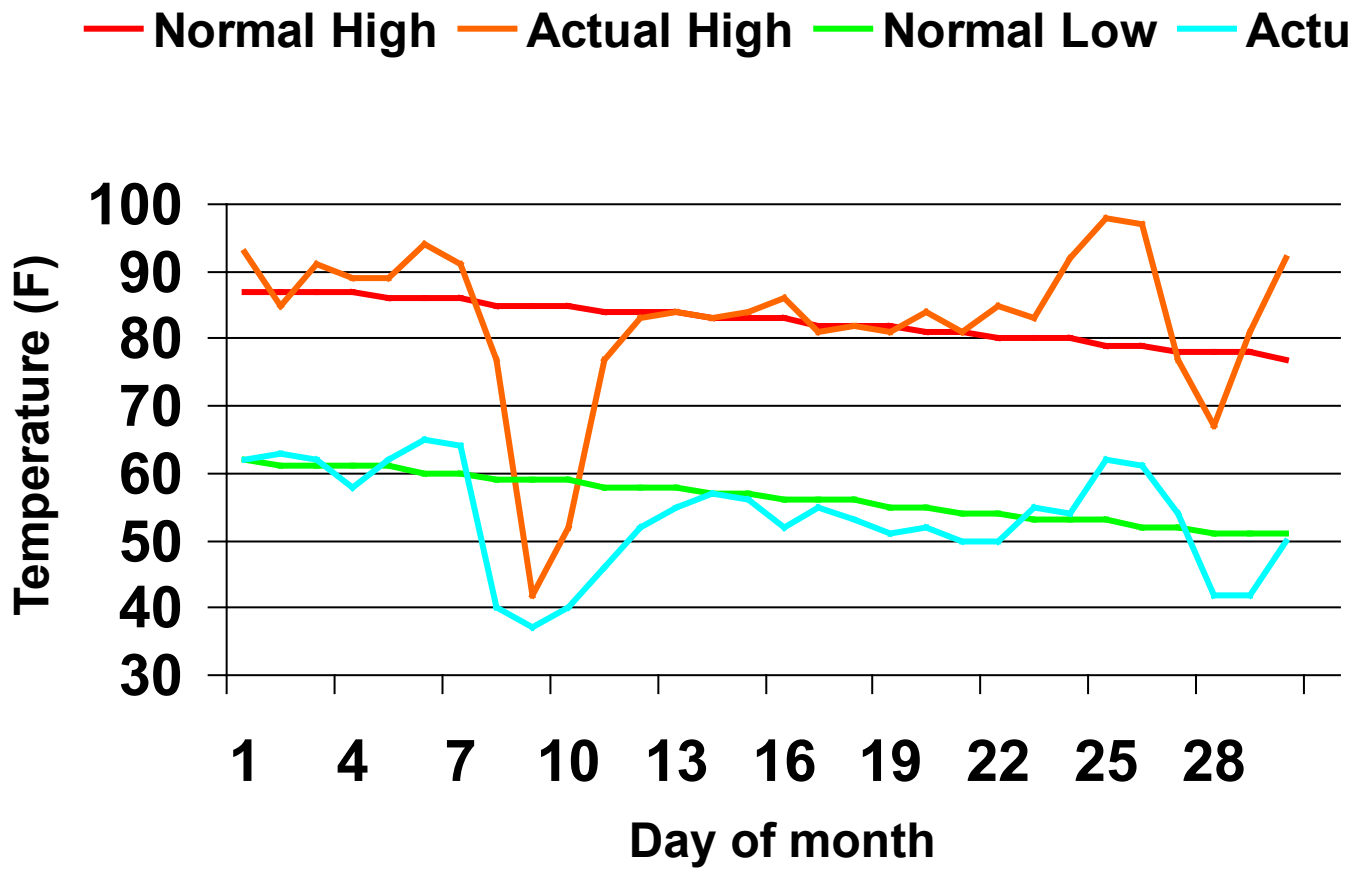
Amarillo
30-Yr Normal (1981-2010) and August 2020 Air Temperatures



Heat Units

Normal for Month: 522
2020: 637
% of normal: +22

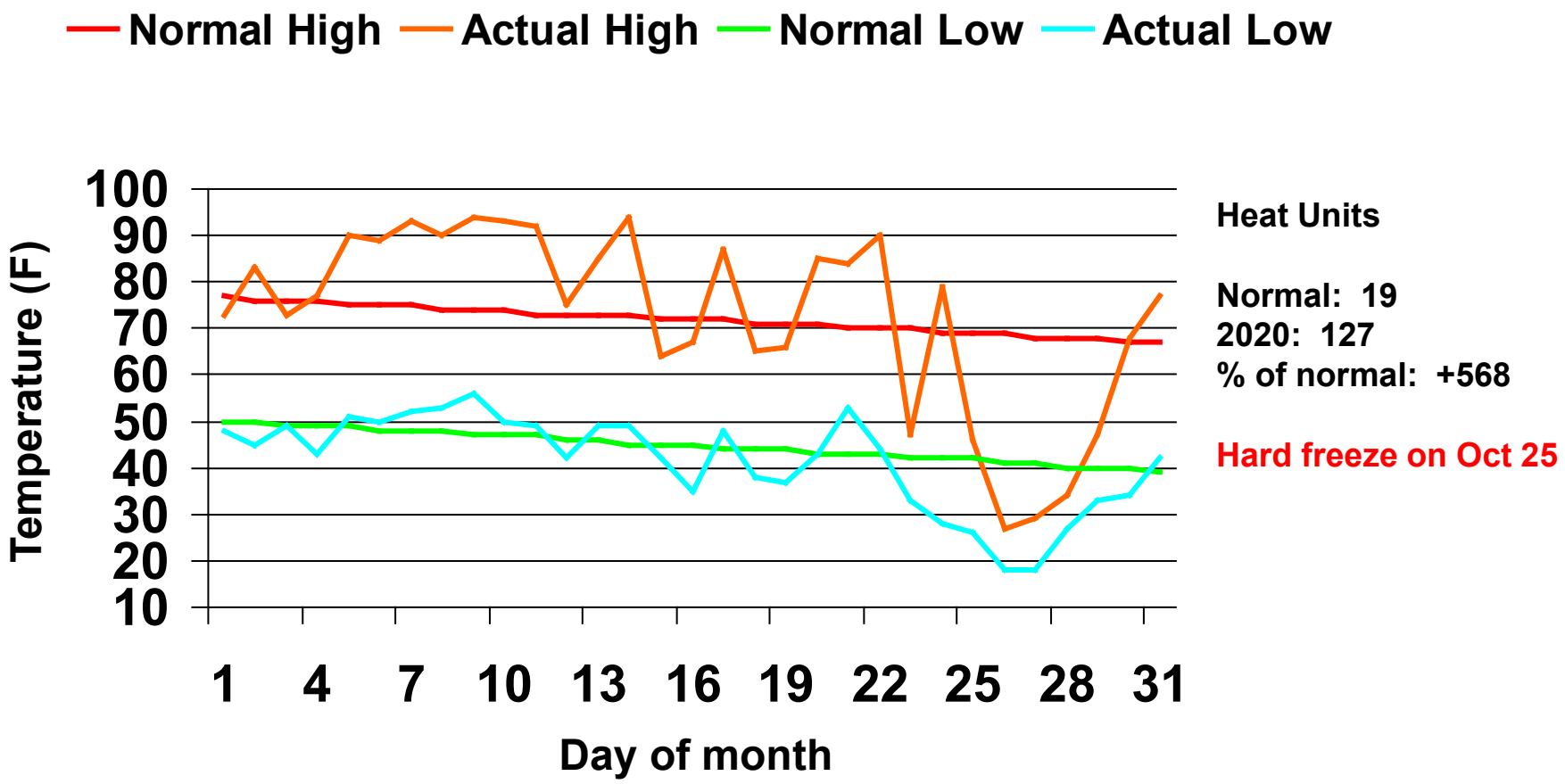
Amarillo
30-Yr Normal (1981-2010) and September 2020 Air Temperatures



Heat Units

Normal for Month: 286
2020: 283
% of normal: -1

Amarillo
30-Yr Normal (1981-2010) and October 2020 Air Temperatures



Heat Units

Normal: 19
2020: 127
% of normal: +568

Hard freeze on Oct 25