What's up with this weather?

UK Horticulture Webinar Wednesday's

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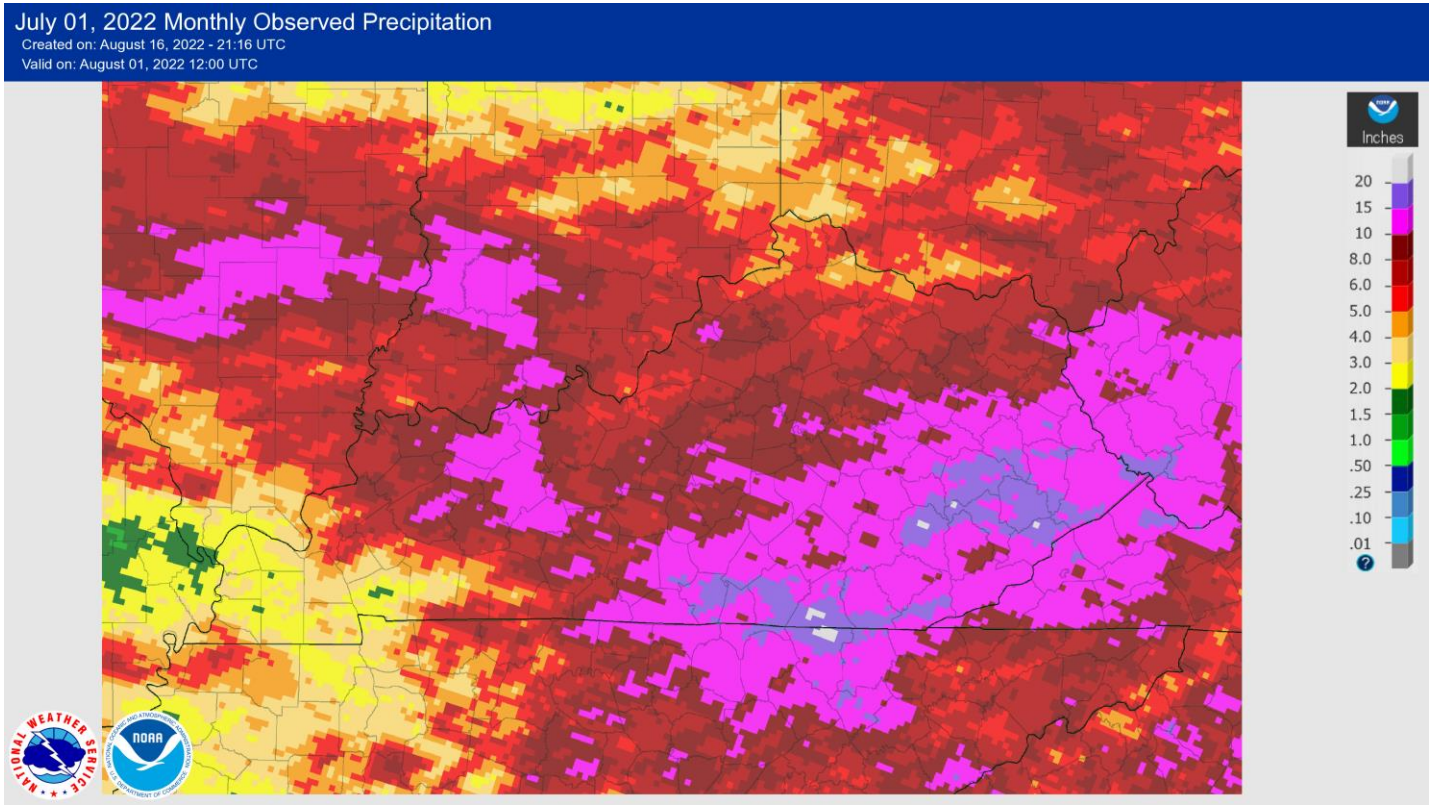
Outline

- Summer 2022 Overview
- Forecast and Outlooks
- Warmer/Wetter Climate & Impact on Horticulture
- Climate and weather resources in KY

Photo Courtesy: Louisville National Weather Service Office, The Great Flood of 1937, https://www.weather.gov/lmk/flood_37

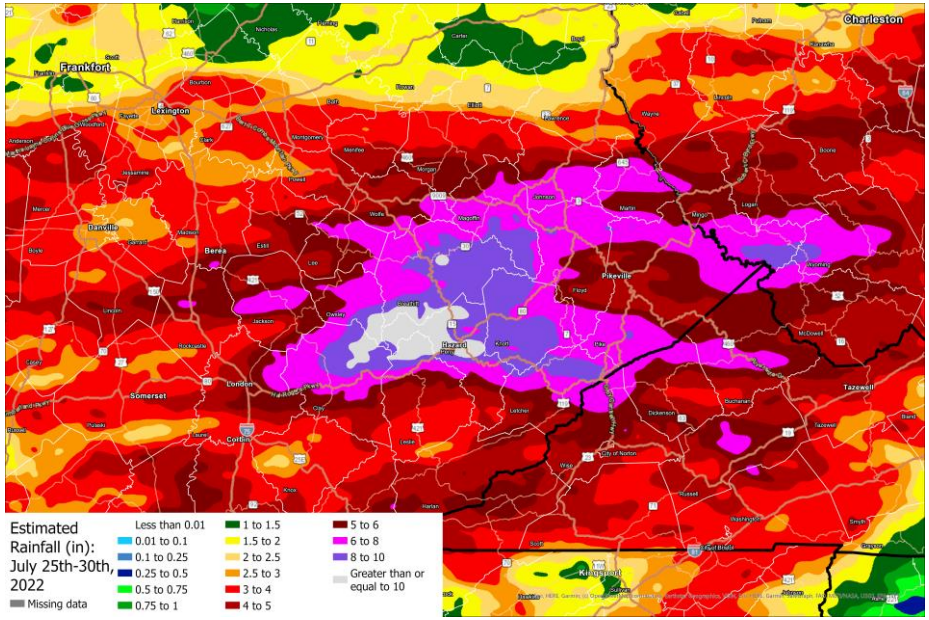
4th Wettest July on Record/14th Driest June

KY averaged 7.93 inches, +3.07 inches above normal. Only 2.72 in June, most occurred early in the month.



July Flooding - Eastern KY:

Statistics, Rarity, and Environment



Statistics and Rarity

This was a 1 in 1,000-year rain event (0.1% chance of happening in any given year) over a 5-day period, caused by a training of thunderstorms over the same area. Tropical, moist air was advected north in Kentucky where a frontal boundary was seemingly stationary across the area. A highly unstable and very moist atmosphere led to storms capable of torrential downpours. Upper level winds steer surface systems and in this case, these winds were running parallel to the front.

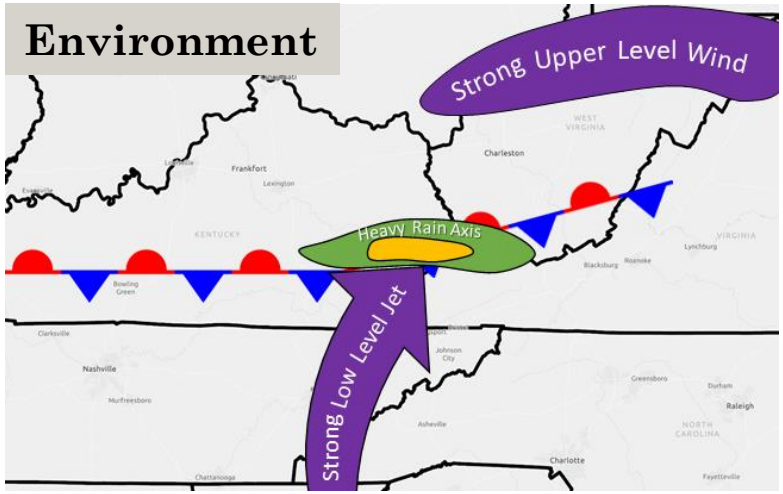
Rainfall rates of 4 inches/hour

13 flash flood warnings issued that night, 3 upgraded to a flash flood emergency

Highest total was 14.00 inches from southern Knott County.

North Fork of the Kentucky River at Jackson set a new record crest at 43.47 feet.

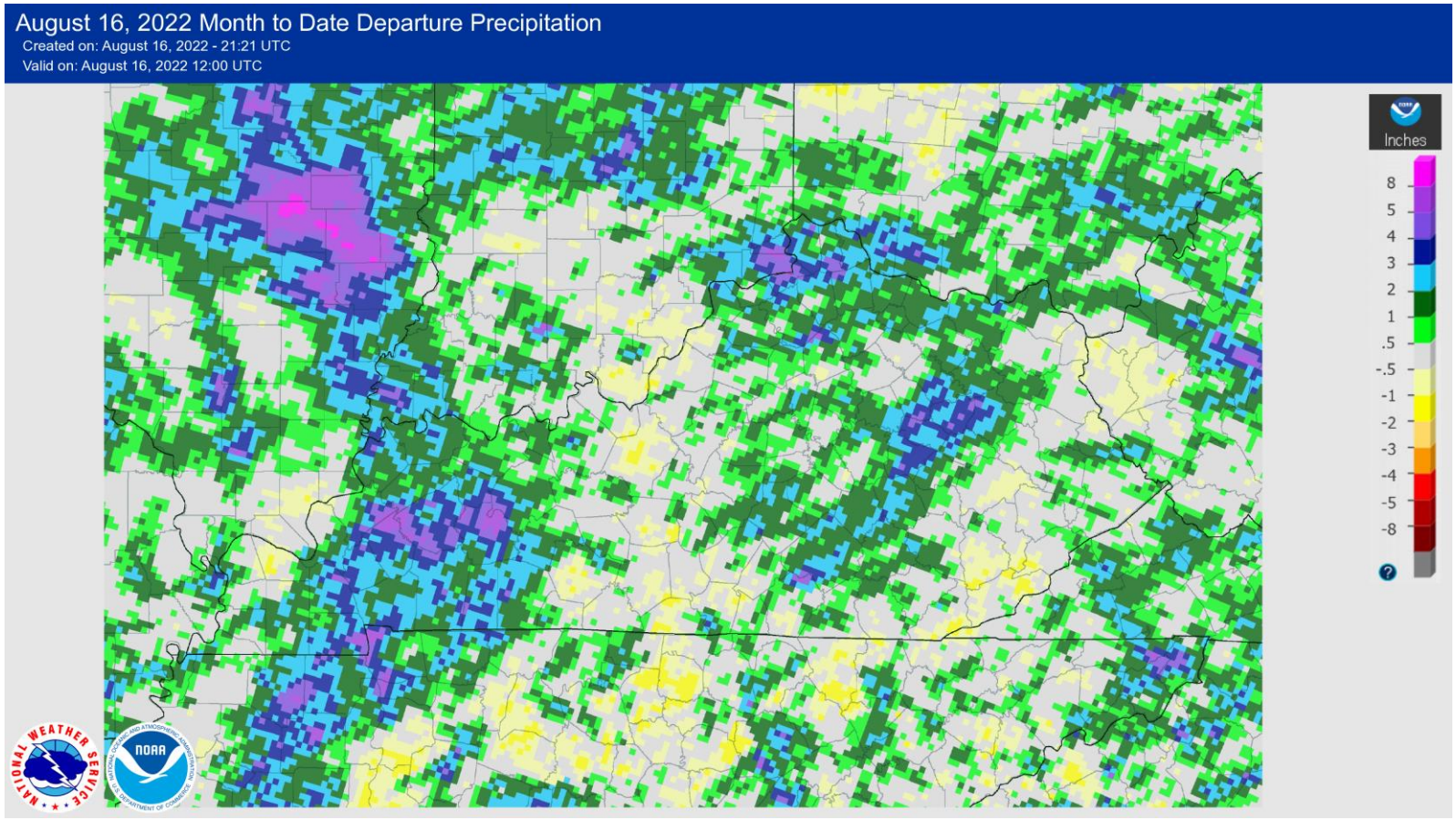
This amount of rainfall could overwhelm any location across KY.



Images & Statistics Courtesy/More info: Historic July 26th – July 30th, 2022 Eastern Kentucky Flooding, URL: https://www.weather.gov/jkl/July2022Flooding

2nd Straight Wet Month Ahead?

KY average of 2.76 inches through Aug. 15. Normal for Aug. = 3.62

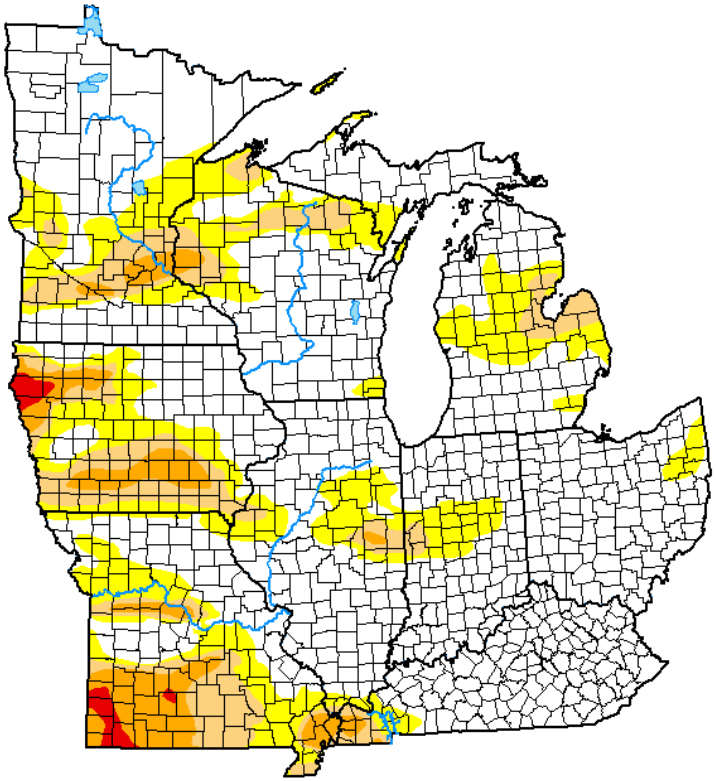


Drought 2022?

Over half of KY was in a moderate drought on July 5th, 2022

U.S. Drought Monitor

Midwest



August 9, 2022

(Released Thursday, Aug. 11, 2022)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	66.35	33.65	14.99	5.74	0.72	0.00
Last Week 08-02-2022	61.47	38.53	18.00	7.12	2.39	0.00
3 Months Ago 05-10-2022	91.18	8.82	0.78	0.25	0.00	0.00
Start of Calendar Year 01-04-2022	63.32	36.68	15.25	2.41	0.00	0.00
Start of Water Year 09-28-2021	57.44	42.56	23.36	12.29	4.16	0.00
One Year Ago 08-10-2021	61.56	38.44	25.07	17.12	7.94	1.25

Intensity:

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

Author:

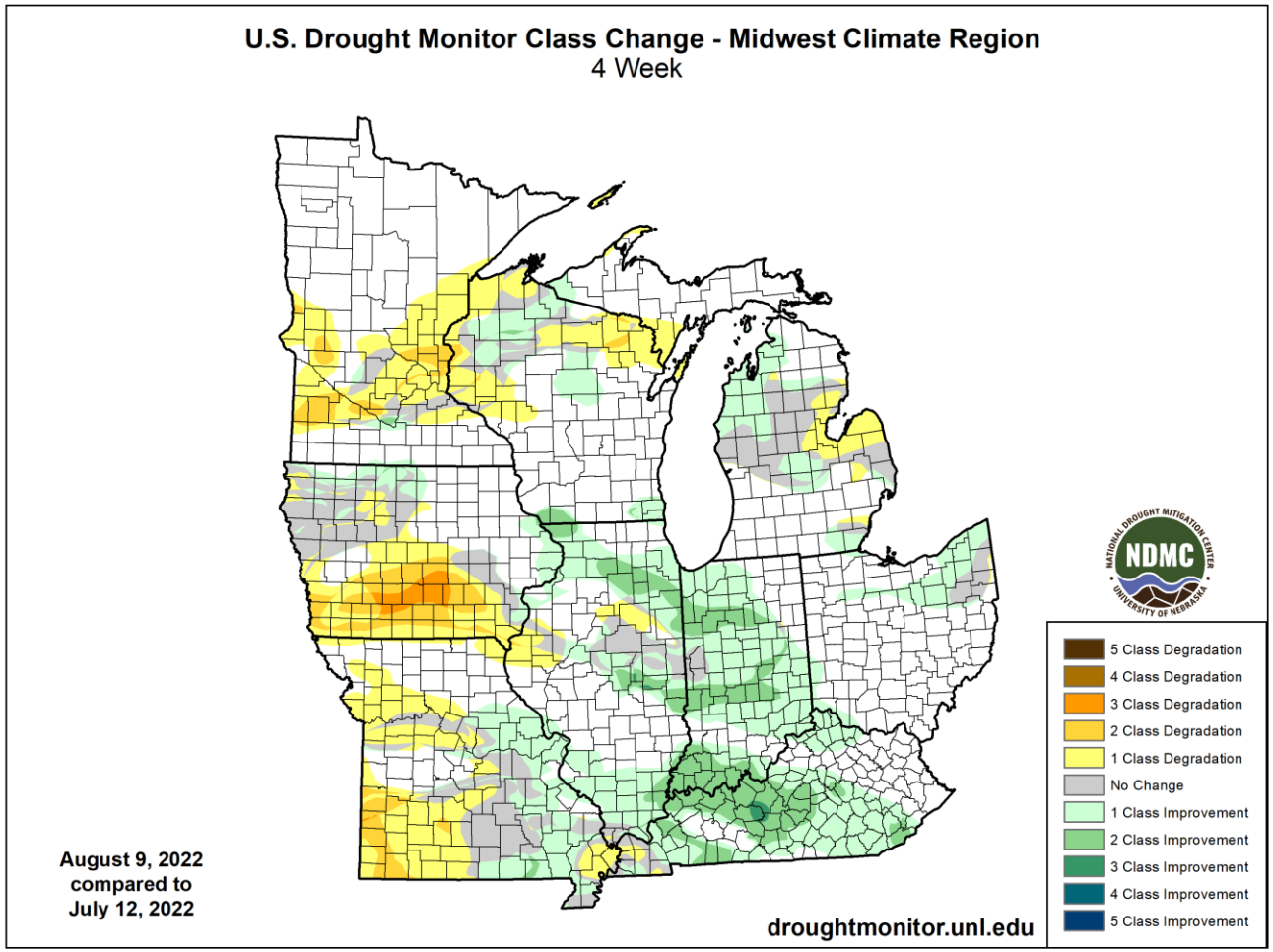
Richard Tinker

CPC/NOAA/NWS/NCEP

droughtmonitor.unl.edu

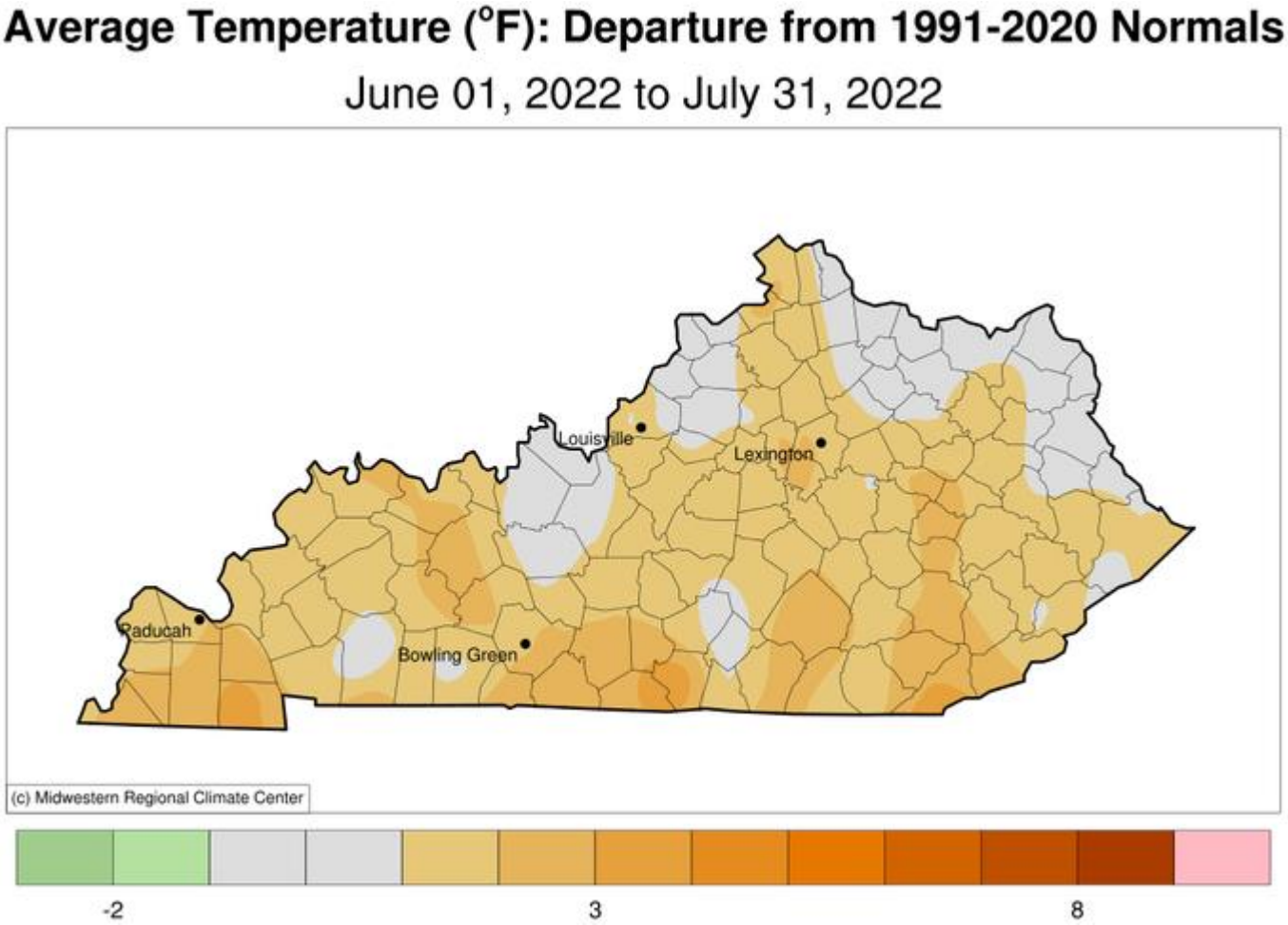
Drought 2022?

Over half of KY was in a moderate drought on July 5th, 2022



Hot/Humid Summer of 2022:

20th warmest June/July on record, warmest since 2016



Hot/Humid Summer of 2022:

20th warmest June/July on record, warmest since 2016

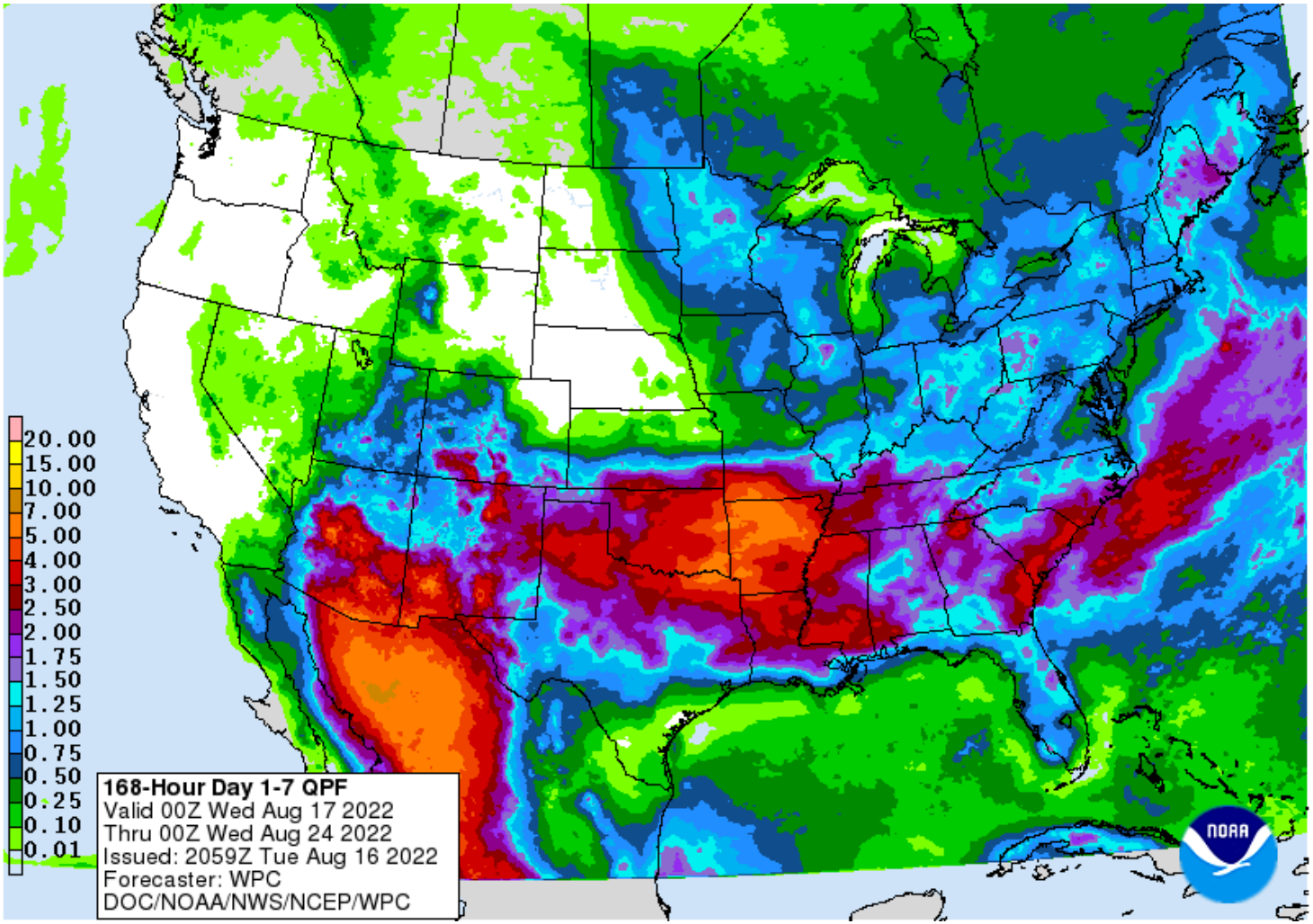
Number of hours that Heat Index ≥ 90° F				
Station	Paducah Barkley RGNL AP	Bowling Green Warren Co AP	Lexington Bluegrass AP	Jackson Julian Carroll AP
June Average	98.4	76	33.4	20.1
Jun-22	132	157	92	78
July Average	186.2	158.8	83.4	57.9
Jul-22	258	252	128	72

Number of hours that Heat Index ≥ 100° F				
Station	Paducah Barkley RGNL AP	Bowling Green Warren Co AP	Lexington Bluegrass AP	Jackson Julian Carroll AP
June Average	12.3	5.7	0.7	0.4
Jun-22	44	40	23	17
July Average	53.4	30	8.2	4.1
Jul-22	97	54	19	2

Data Courtesy: Midwestern Regional Climate Center Heat Index Climatology (https://mrcc.purdue.edu/gismaps/heatindex.htm) & cli-MATE toolkit (https://mrcc.purdue.edu/CLIMATE/)

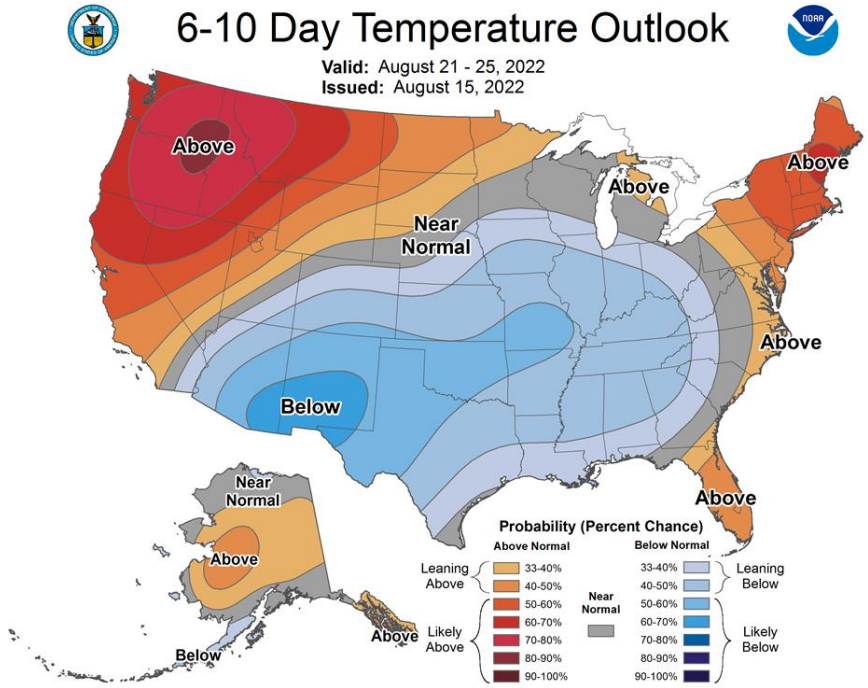
7-Day Precipitation Forecast

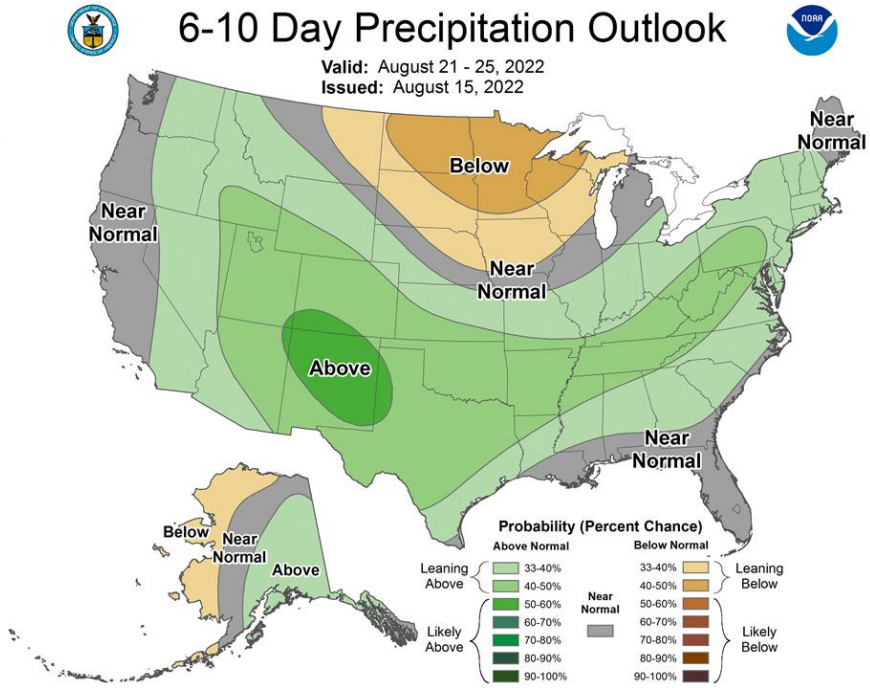
NWS Weather Prediction Center



6-10 Day Outlooks

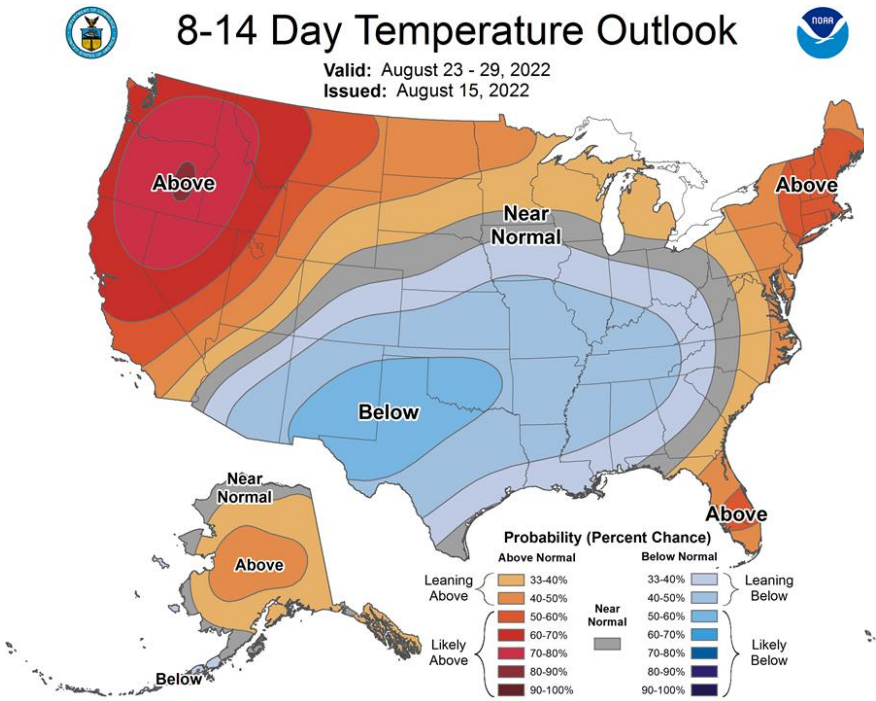
NWS Climate Prediction Center

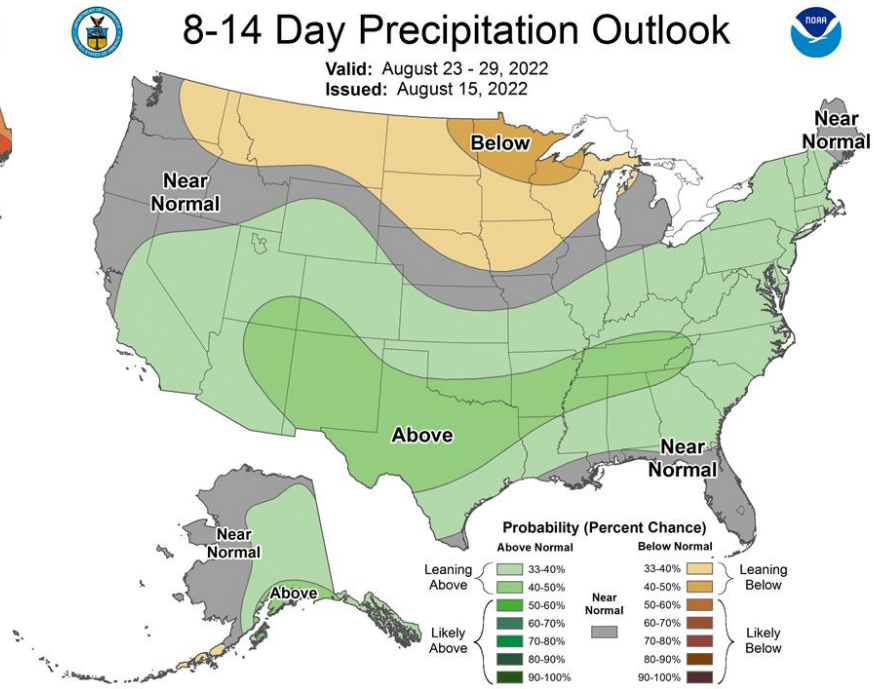




8-14 Day Outlooks

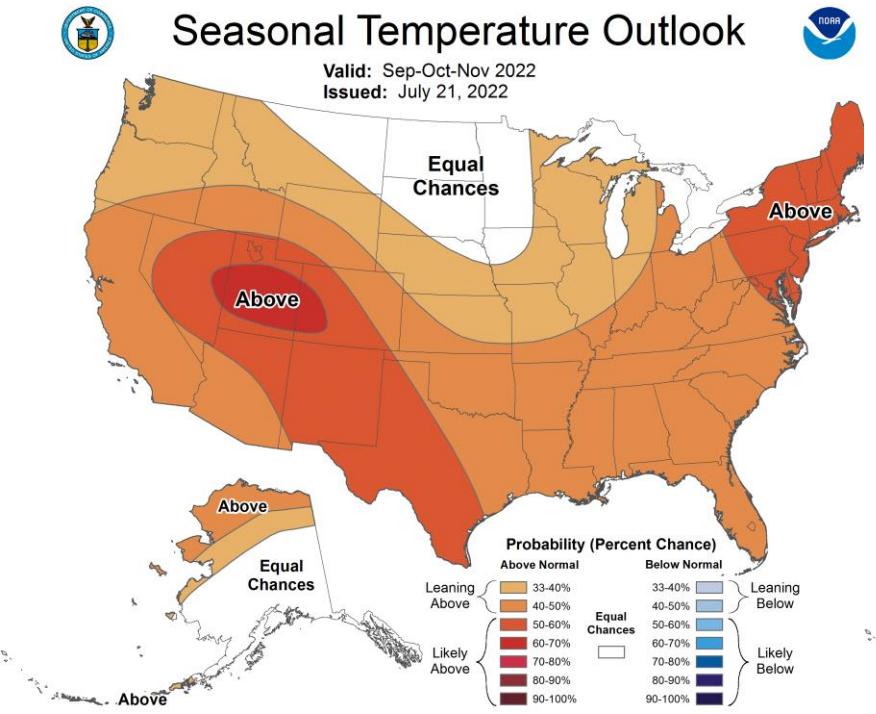
NWS Climate Prediction Center

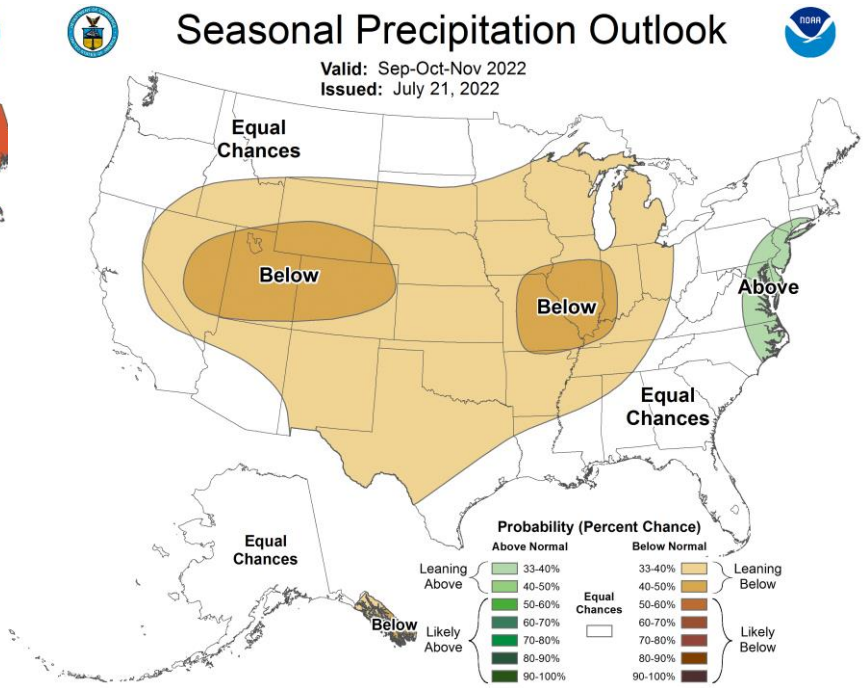




Fall Seasonal Outlooks

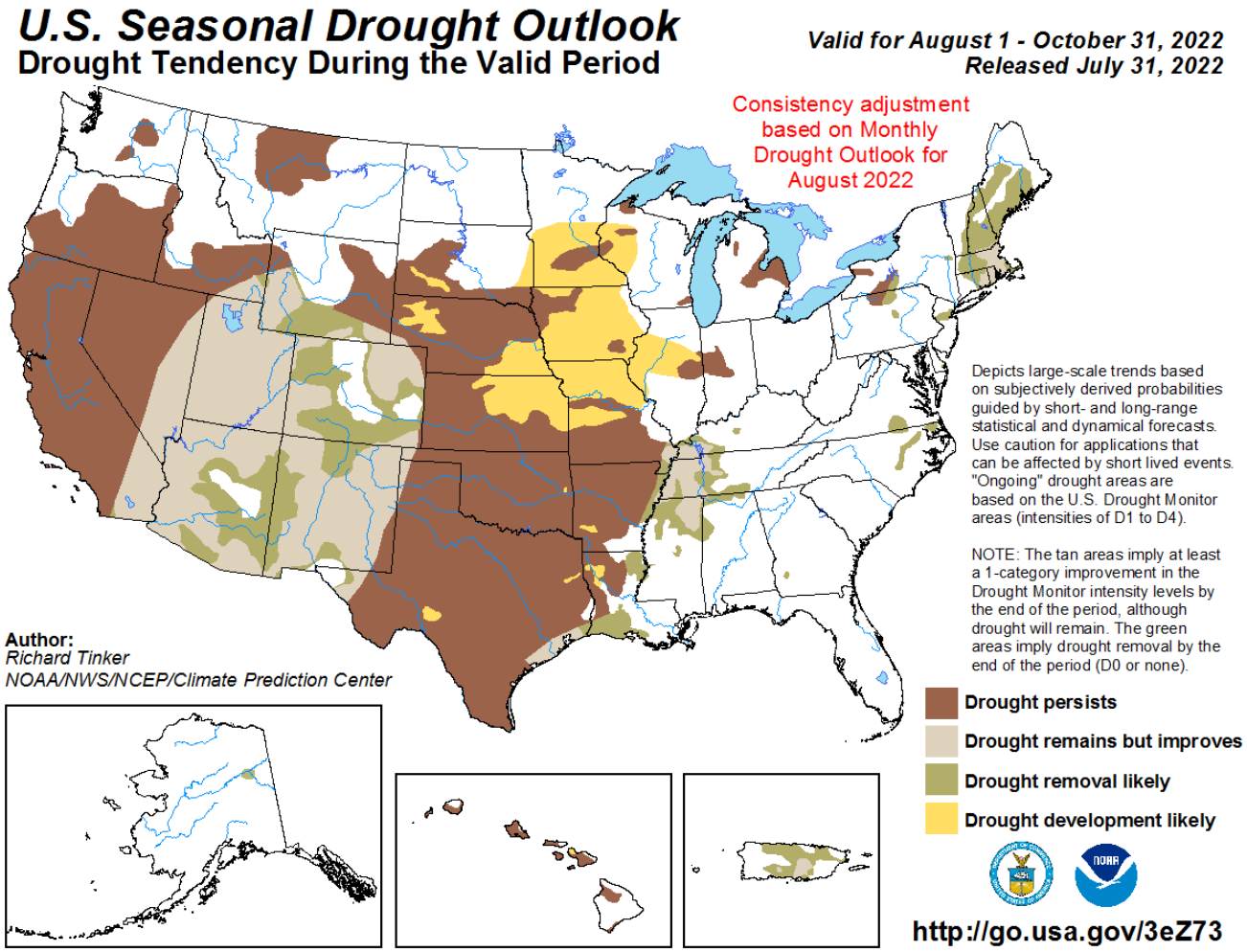
NWS Climate Prediction Center





Seasonal Drought Outlook

NWS Climate Prediction Center



Winter 2022/23 Outlook

NWS Climate Prediction Center

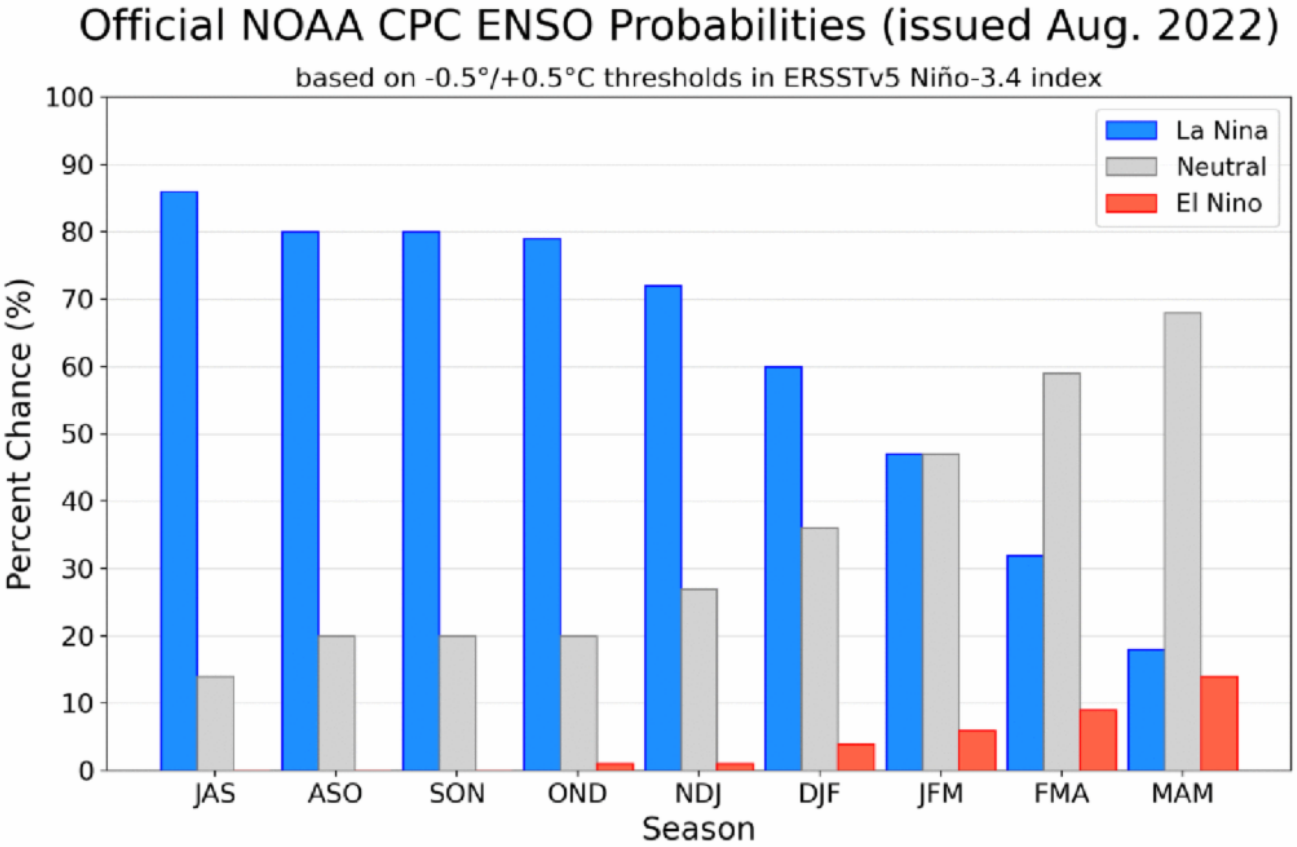
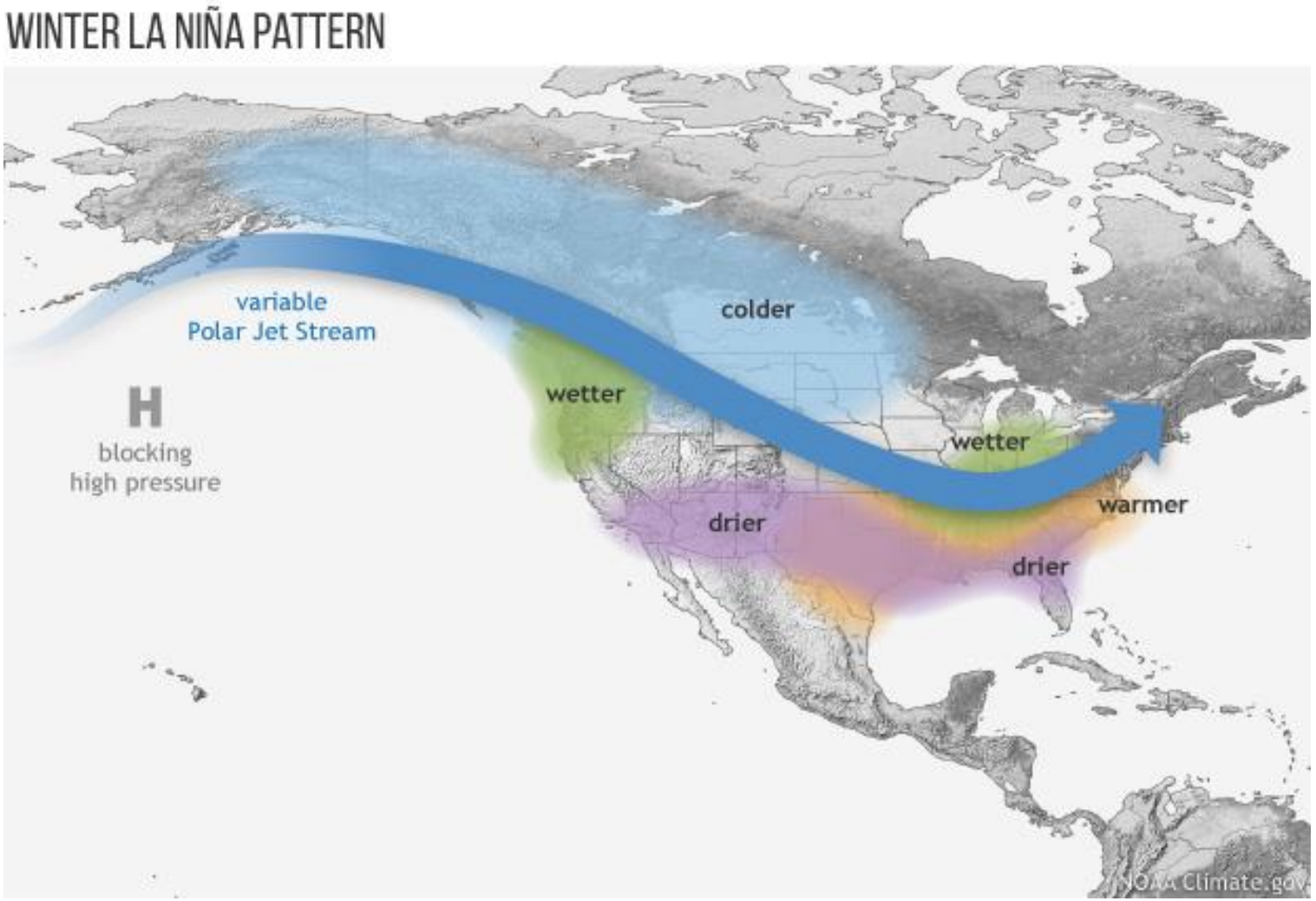


Figure 7. Official ENSO probabilities for the Niño 3.4 sea surface temperature index (5°N-5°S, 120°W-170°W). Figure updated 11 August 2022.

Winter 2022/23 Outlook

NWS Climate Prediction Center

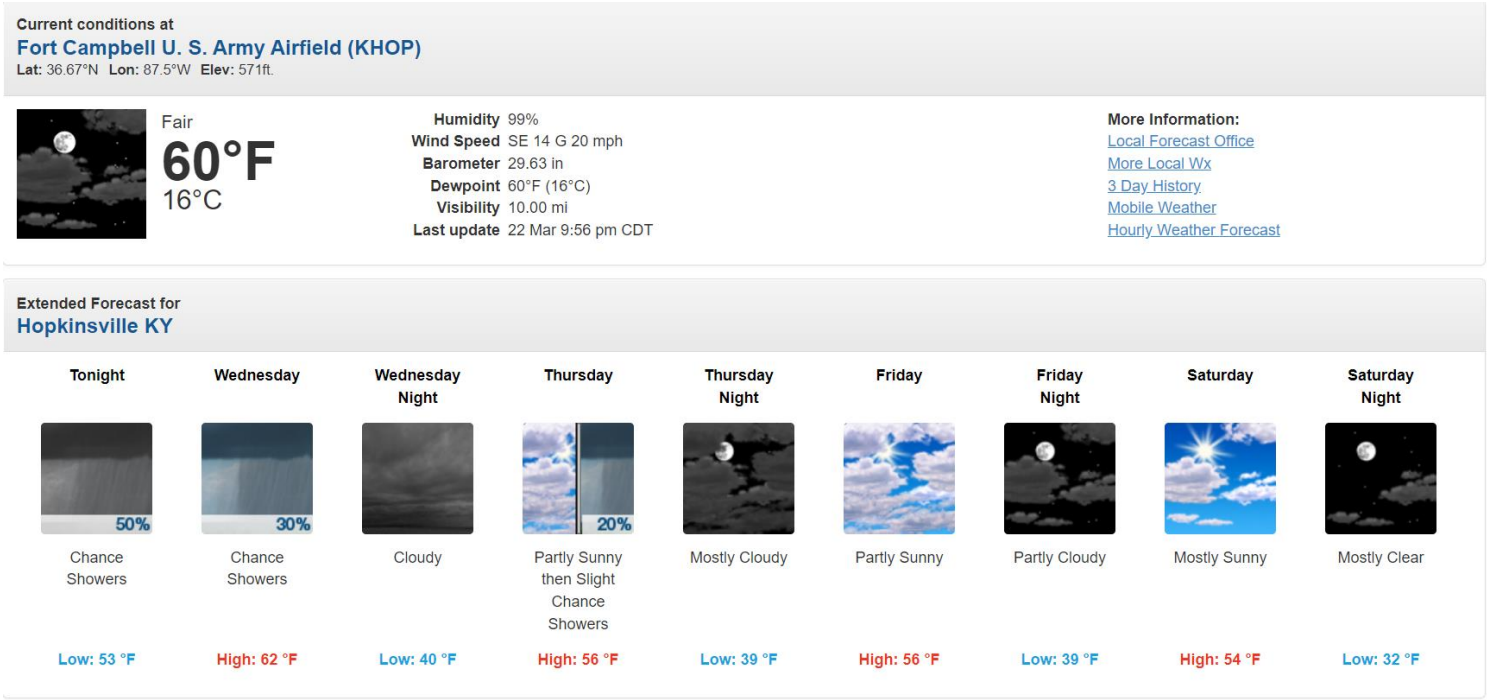


Weather and Climate Defined

"Weather is what you get, climate is what you expect."

Weather is the state of the atmosphere at some place and time (**short term**)

- Described with quantitative variables
  - Temperature, humidity, cloudiness, precipitation, wind speed, wind direction
- What should I wear? Should I run irrigation? Can I spray today?



Weather and Climate Defined

"Weather is what you get, climate is what you expect."

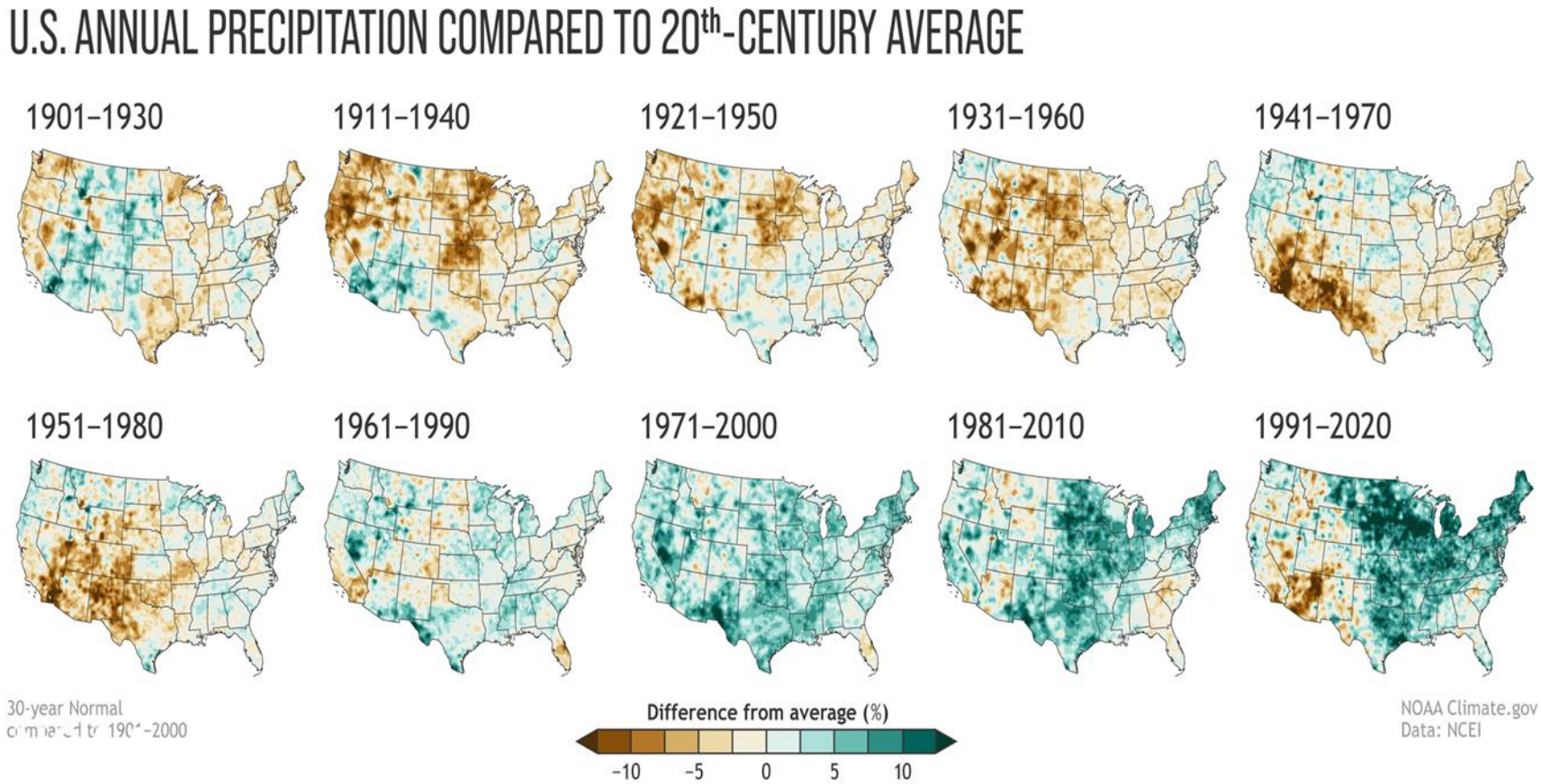
Climate is weather conditions at some locality averaged over a specified time period (long term)

- Climate is an average of the weather, figured over the last 30-years and updated every decade (normals)
- A locale's climate also includes weather extremes
- What should I buy? When can I plant crops? What crops can I plant? Long term sustainability? Should I invest in irrigation?

Month	MAX TEMP (°F)	MIN TEMP (°F)	AVG TEMP (°F)	PRECIP (IN)	SNOW (IN)
Jan	43.8	27.2	35.5	3.41	1.8
Feb	48.4	30.7	39.6	4.06	1.8
Mar	58.1	37.8	48.0	4.76	0.8
Apr	69.1	47.1	58.1	4.81	0.1
May	77.2	57.7	67.4	5.38	0.0
Jun	84.8	66.2	75.5	4.26	0.0
Jul	88.2	70.0	79.1	4.87	0.0
Aug	87.5	68.2	77.9	4.29	0.0
Sep	81.9	60.8	71.4	3.54	0.0
Oct	70.9	48.6	59.7	3.79	0.0
Nov	58.0	38.2	48.1	3.90	0.0
Dec	47.0	31.4	39.2	4.69	0.7

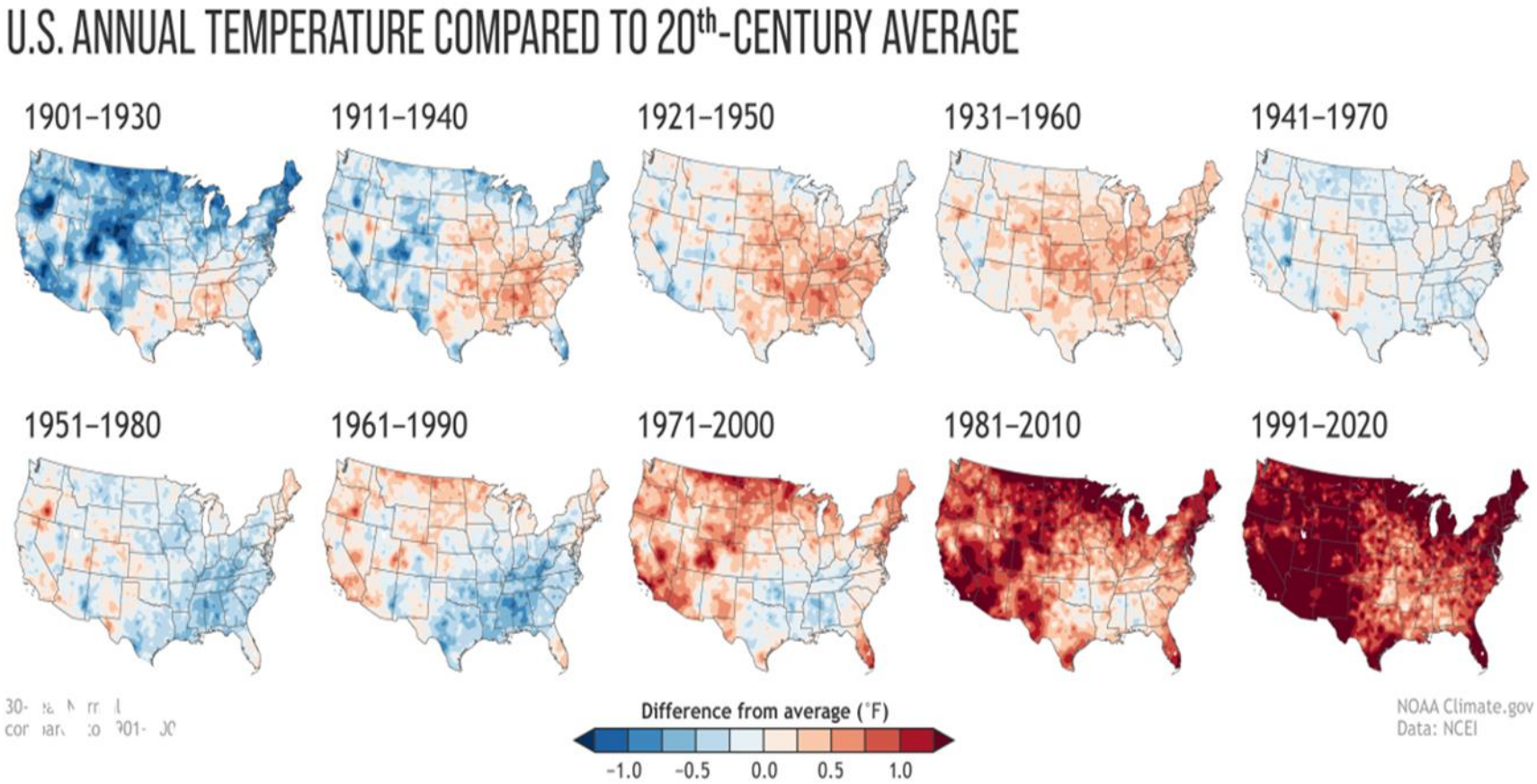
Hopkinsville, KY 1991-2020 Monthly Normals:
https://www.ncei.noaa.gov/access/us-climate-normals/

Tracking the changes
Climate Normals



Images Courtesy: National Oceanic and Atmospheric Administration,
The new U.S. Climate Normals are here. What do they tell us about climate change?,
https://www.noaa.gov/news/new-us-climate-normals-are-here-what-do-they-tell-us-about-climate-change

Tracking the changes
Climate Normals



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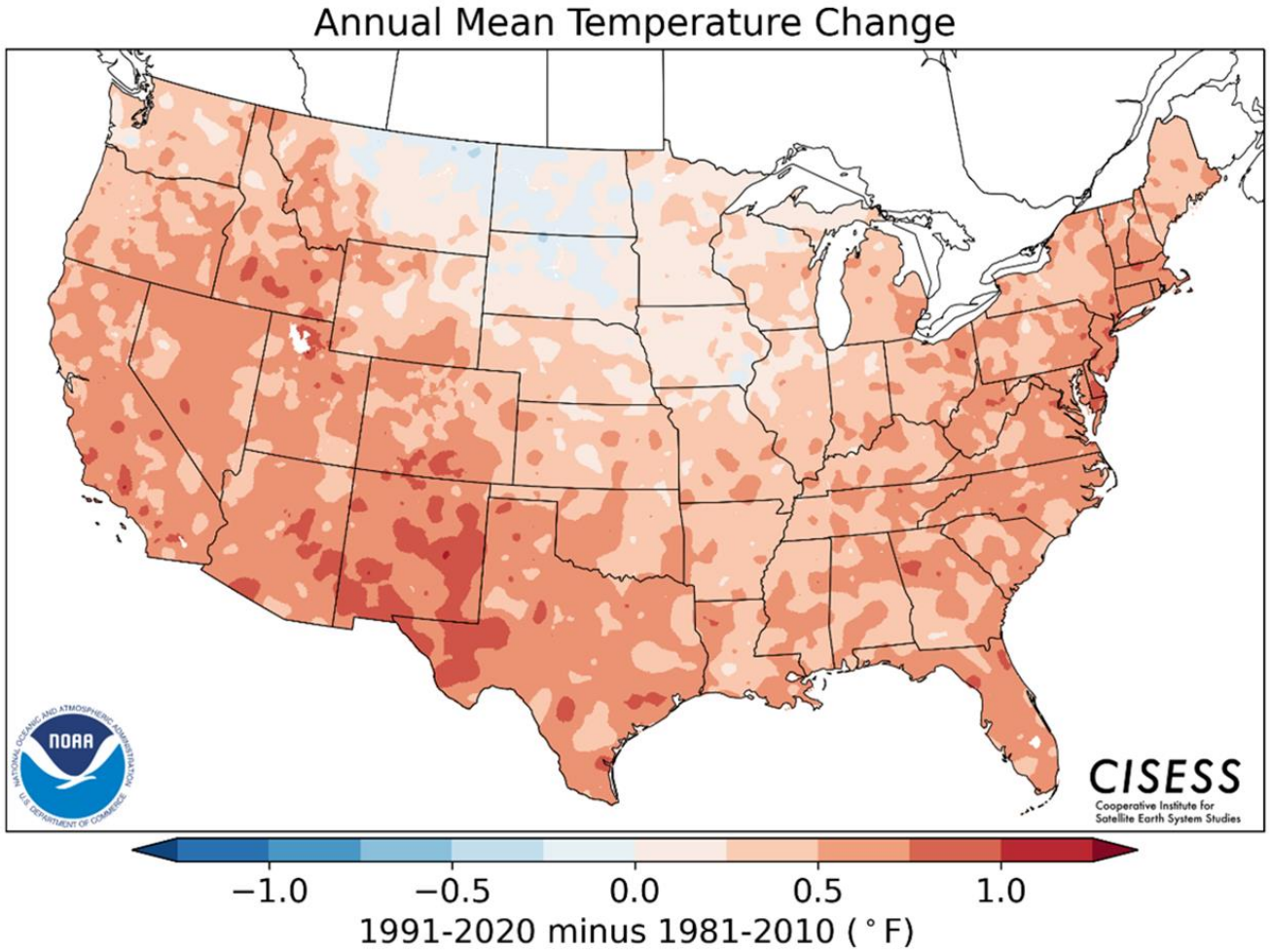
Warmer Climate in KY:

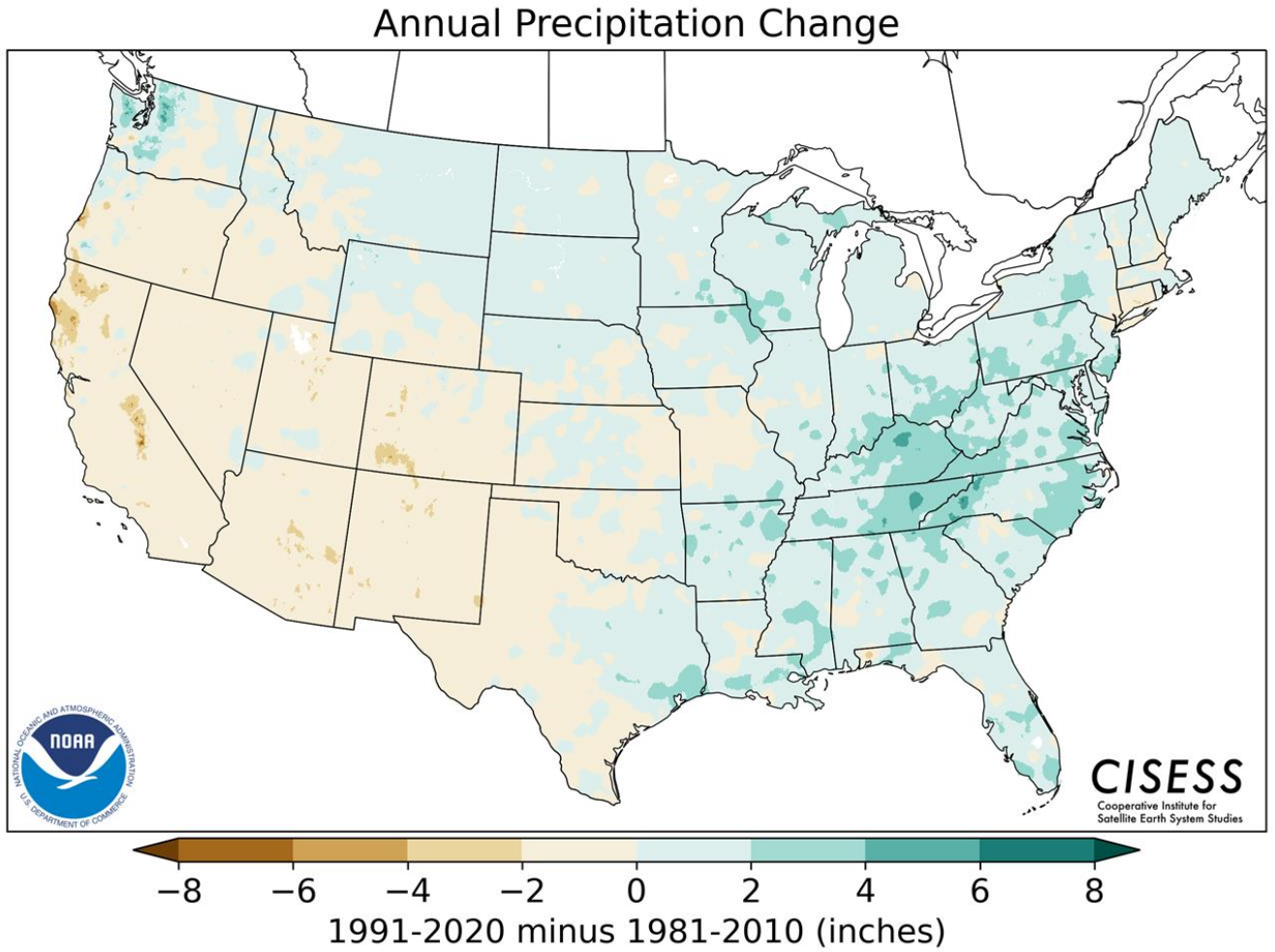
Flash Droughts, Storm Fuel, More Winter Flooding



Imaged Courtesy/More info: Cooperative Institute for Satellite Earth System Studies, retrieved from National Centers for Environmental Information, https://www.ncei.noaa.gov/news/noaa-delivers-new-us-climate-normals

Wetter Climate in KY:

More extreme rainfall events, narrower windows for chemical applications



Imaged Courtesy/More info: Cooperative Institute for Satellite Earth System Studies, retrieved from National Centers for Environmental Information, https://www.ncei.noaa.gov/news/noaa-delivers-new-us-climate-normals

Wetter Climate in KY:

More extreme rainfall events, warm/wet favors many diseases

Kentucky Top-10 Warmest Years on Record (1895 - 2020)

Rank	Year	Avg.	Normal	Dep.
1	1921	58.7	56.3	2.4
2	2012	58.4	56.3	2.1
3	1998	58.2	56.3	1.9
4	2016	57.9	56.3	1.6
5	2017	57.8	56.3	1.5
5	1931	57.8	56.3	1.4
7	2007	57.7	56.3	1.4
8	1938	57.5	56.3	1.2
8	2019	57.5	56.3	1.1
10	1933	57.4	56.3	1.1
10	1991	57.4	56.3	1

Data Courtesy: Midwestern Regional Climate Center cli-MATE toolkit: *https://mrcc.purdue.edu/CLIMATE/*

2021: 57.0 ° F, +0.6 °, #20 on record
2022 (January – July): 56.2 ° F, +0.5 °, #31 on record

Kentucky Top-10 Wettest Years on Record (1895 - 2020)

Rank	Year	Total	Normal	Dep.	%Norm
1	2011	64.35	50.38	13.97	128
2	2018	63.74	50.38	13.36	127
3	1950	62.63	50.38	12.25	124
4	1979	62.58	50.38	12.2	124
5	2019	61.32	50.38	10.94	122
6	1935	58.38	50.38	8	116
7	2015	58.31	50.38	7.93	116
8	2020	58.11	50.38	7.73	115
9	1989	57.74	50.38	7.36	115
10	1972	57.08	50.38	6.7	113

Data Courtesy: Midwestern Regional Climate Center cli-MATE toolkit: *https://mrcc.purdue.edu/CLIMATE/*

2021: 53.40 inches, +3.02 inches, #23 on record
2022 (January – July): 35.02 inches, +3.33 inches, #23 on record

Growing Season Longer

NWS Climate Prediction Center

Comparison of Kentucky Freeze Normals

	Fall Freeze 50%		
Station	**1971-2000**	**1981-2010**	**1991-2020**
LEXINGTON BLUEGRASS AP, KY	25-Oct	27-Oct	28-Oct
LOUISVILLE INTL AP, KY	30-Oct	4-Nov	7-Nov
CINCINNATI NORTHERN KENTUCKY INTL AP, KY	17-Oct	24-Oct	25-Oct
PADUCAH BARKLEY REGIONAL AP, KY	25-Oct	26-Oct	28-Oct
LONDON CORBIN AP, KY	16-Oct	22-Oct	25-Oct
BOWLING GREEN WARREN CO AP, KY	23-Oct	27-Oct	31-Oct

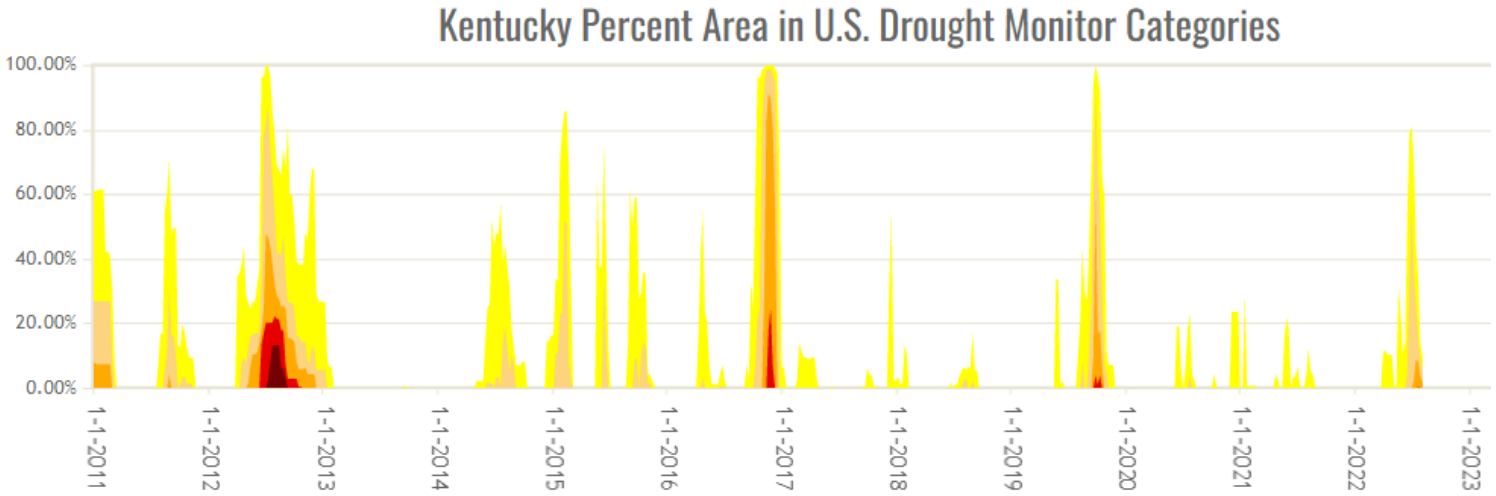
	Spring Freeze 50%		
Station	**1971-2000**	**1981-2010**	**1991-2020**
LEXINGTON BLUEGRASS AP, KY	15-Apr	14-Apr	13-Apr
LOUISVILLE INTL AP, KY	8-Apr	3-Apr	31-Mar
CINCINNATI NORTHERN KENTUCKY INTL AP, KY	20-Apr	16-Apr	18-Apr
PADUCAH BARKLEY REGIONAL AP, KY	7-Apr	8-Apr	5-Apr
LONDON CORBIN AP, KY	19-Apr	16-Apr	15-Apr
BOWLING GREEN WARREN CO AP, KY	11-Apr	9-Apr	5-Apr

	Average Freeze-Free Period		
Station	**1971-2000**	**1981-2010**	**1991-2020**
LEXINGTON BLUEGRASS AP, KY	193	196	198
LOUISVILLE INTL AP, KY	205	215	221
CINCINNATI NORTHERN KENTUCKY INTL AP, KY	180	191	190
PADUCAH BARKLEY REGIONAL AP, KY	201	201	206
LONDON CORBIN AP, KY	180	189	193
BOWLING GREEN WARREN CO AP, KY	195	201	209

Data Courtesy: National Centers for Environmental Information, U.S. Climate Normals, https://www.ncei.noaa.gov/products/land-based-station/us-climate-normals

Drought Frequency

Running shorter, but still impactful

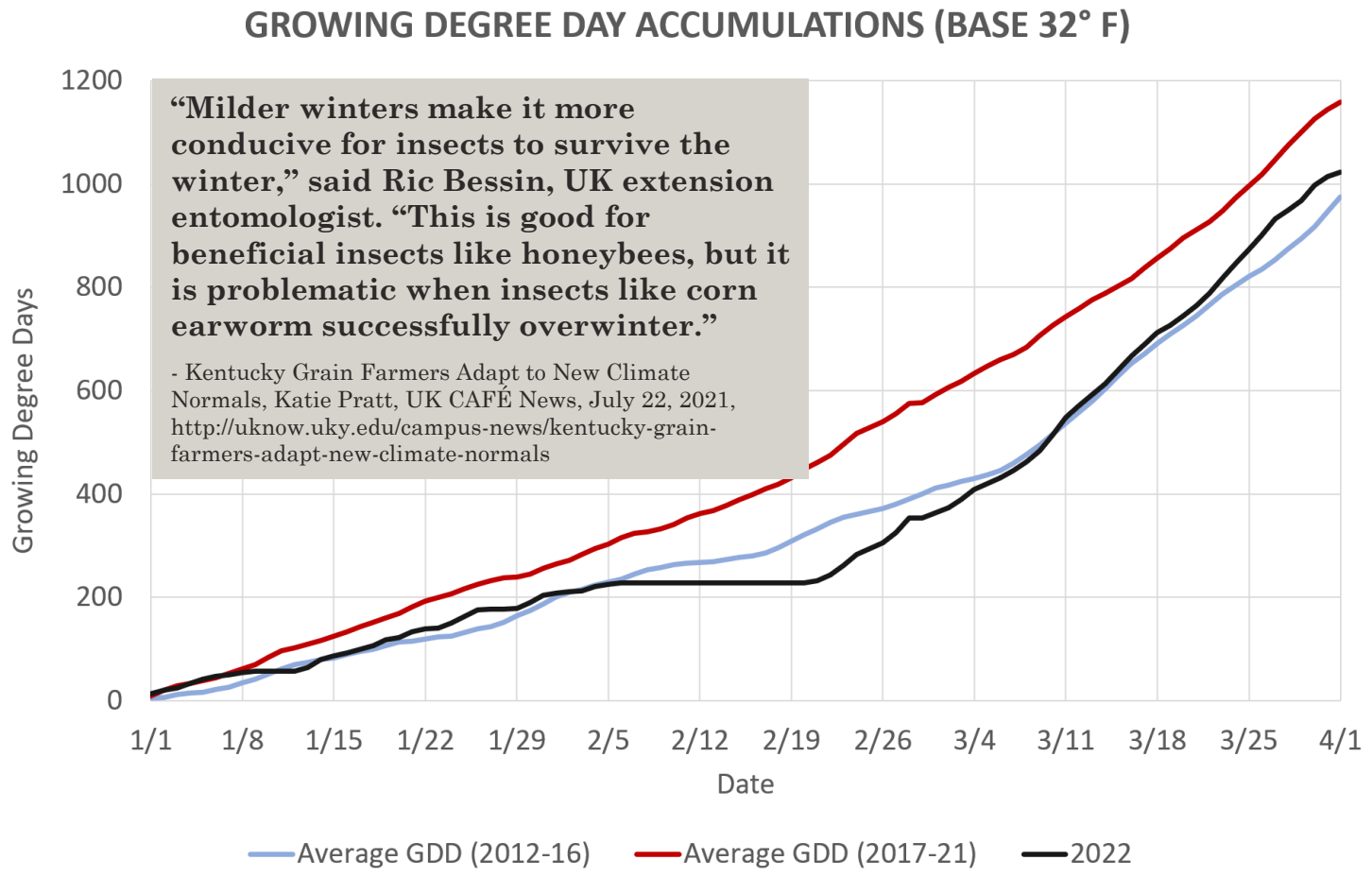


Category	Impact
D0	Lawns and vegetation are brown
	Crops and pastures show mild stress
D1	Crops and pastures show stress; corn germination is poor
	Burn bans are issued; wildfires are reported
	Increased algae and fungus growth is noted
	Trees begin to show mild stress
D2	Hay yield is low; crop losses are reported; livestock need supplemental hay and water
	Ponds, lakes, and river levels are low; boating hazards are found in lakes
	Tress distressed, leaves wilting, pine trees turning brown
D3	Maintaining cattle and horses is very expensive, cost of food and water is very high; producers sell livestock
	Creeks and ponds are completely dry; water shortages are widespread; water restrictions begin
D4	Hay hotline is put in place due to shortages; producers are hauling water
	Water sources are extremely low

Data Courtesy: U.S. Drought Monitor Time Series, https://droughtmonitor.unl.edu/DmData/TimeSeries.aspx, and State Impacts, https://droughtmonitor.unl.edu/DmData/StateImpacts.aspx

Warmer Winters/Springs:

Fruit development ahead of schedule



"Milder winters make it more conducive for insects to survive the winter," said Ric Bessin, UK extension entomologist. "This is good for beneficial insects like honeybees, but it is problematic when insects like corn earworm successfully overwinter."

- Kentucky Grain Farmers Adapt to New Climate Normals, Katie Pratt, UK CAFÉ News, July 22, 2021, http://uknow.uky.edu/campus-news/kentucky-grain-farmers-adapt-new-climate-normals

Billion Dollar Weather & Climate Disasters in Kentucky:

Billion-dollar events to affect Kentucky from 1980 to 2022 (CPI-Adjusted)*

Disaster Type	Events	Events/Year	Percent Frequency	Total Costs	Percent of Total Costs
Drought	9	0.2	11.8%	$5.0B-$10.0B	33.0%
Flooding	3	0.1	3.9%	$250M-$500M	1.2%
Freeze	3	0.1	3.9%	$100M-$250M	1.1%
Severe Storm	46	1.1	60.5%	$10.0B-$20.0B‡	53.3%‡
Tropical Cyclone	4	0.1	5.3%	$1.0B-$2.0B	5.6%
Wildfire	--	--	--	--	--
Winter Storm	11	0.3	14.5%	$1.0B-$2.0B	5.9%
All Disasters	**76**	**1.8**	**100.0%**	**$20.0B-$50.0B‡**	**100.0%‡**

Images Courtesy/More info: NOAA National Centers for Environmental Information (NCEI) U.S. Billion-Dollar Weather and Climate Disasters (2022). https://www.ncei.noaa.gov/access/billions/, DOI: 10.25921/stkw-7w73

Billion Dollar Weather & Climate Disasters in Kentucky:

Time Period	Billion-Dollar Disasters	Events/Year	Cost	Percent of Total Cost
1980s (1980-1989)	9	0.9	$2.0B-$5.0B	20.2%
1990s (1990-1999)	11	1.1	$1.0B-$2.0B	8.4%
2000s (2000-2009)	21	2.1	$5.0B-$10.0B	26.3%
2010s (2010-2019)	24	2.4	$5.0B-$10.0B	28.9%
Last 5 Years (2017-2021)	15	3.0	$2.0B-$5.0B	19.1%
Last 3 Years (2019-2021)	9	3.0	$2.0B-$5.0B	15.8%
Last Year (2021)	4	4.0	$2.0B-$5.0B	14.1%
All Years (1980-2022)*	**76**	**1.8**	**$20.0B-$50.0B‡**	**100.0%‡**

Images Courtesy/More info: NOAA National Centers for Environmental Information (NCEI) U.S. Billion-Dollar Weather and Climate Disasters (2022). https://www.ncei.noaa.gov/access/billions/, DOI: 10.25921/stkw-7w73

Tracking Weather & Climate in KY

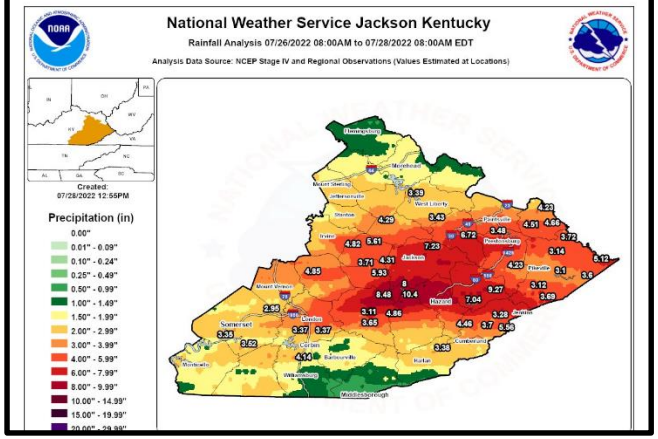
Ag Weather Update

Ag Weather Update

Matt Dixon, Meteorologist
UK Ag Weather Center
Updated 8-9-22

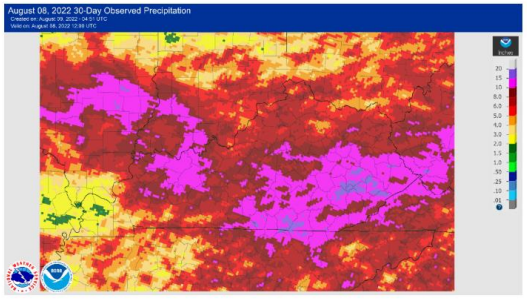
Eastern KY Flooding - July 2022

Kentucky is susceptible to a wide range of natural disasters, including severe weather, ice storms, drought, and wildfires (just to name a few). Unfortunately, this past year has been exceptionally tough for many Kentuckians with two of the more unprecedented disasters that the state has ever seen. First was the tornadoes of December 2021. Now, we include the exceptional flooding across Eastern KY. Below is a look at the precipitation totals over a 48-hour period between July 26th and July 28th, courtesy of the National Weather Service in Jackson, KY. A large portion of these totals fell over a few hours.



4th Wettest July on Record

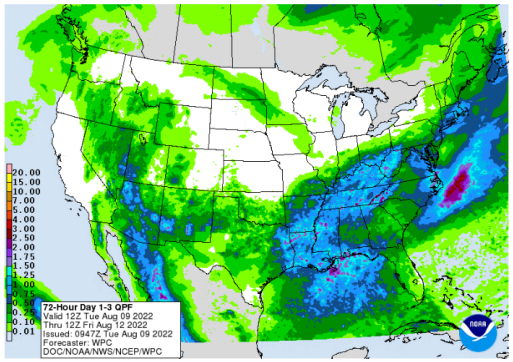
After a dry start to summer, the pattern has flipped the past month. Over the past 30 days, data at the Ag Weather Center shows the state has averaged 7 inches, which is roughly 3 inches above normal. Saying that, the range is quite large. Below is a look at accumulations across the state over that time span. While a large area of SE KY has seen more than 10 inches, portions of the Purchase area are still struggling (sub-3 inches). The high in our database sits at 15.64 inches, recorded at Jackson 3SE. The lowest total was seen at Paducah Barkley Regional Airport with a value of 2.83 inches.



Looking back at the month of July, Kentucky saw it's 4th wettest July ever recorded (128 year record)(precipitation ranks across the U.S. below). The state averaged 7.93 inches over that time frame. Interestingly, five Julys in the previous decade have placed in the top-20 wettest July's on record. 2015 and 2016 sit at #1 and 2 with averages of 9.37 and 8.39, respectively. 2021 sits at #19, while 2013 comes in at 13.

Forecast

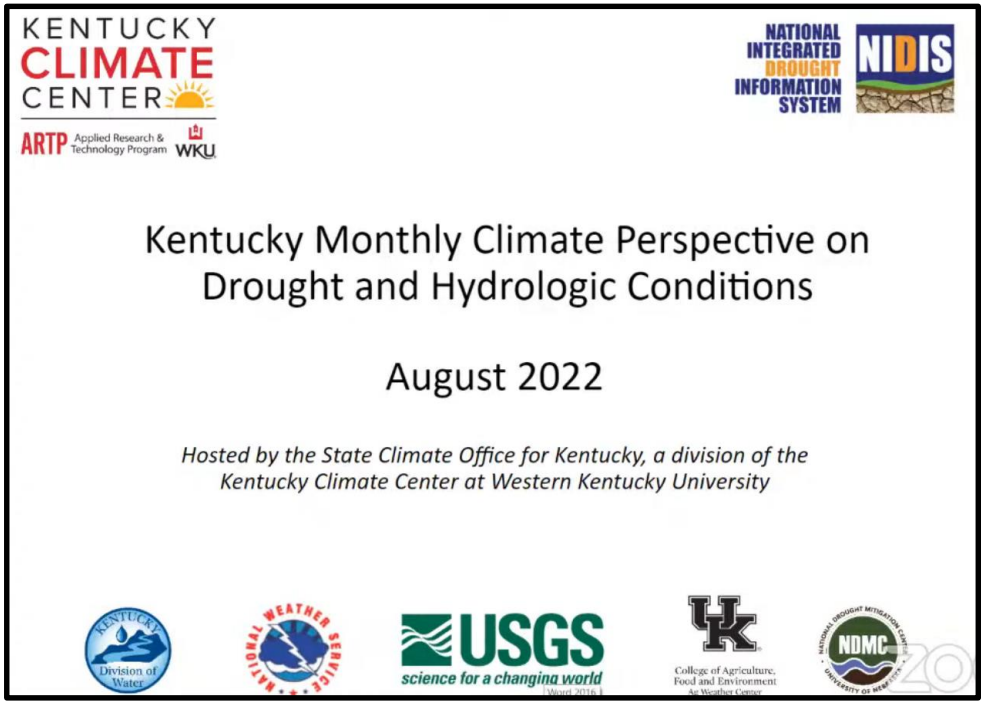
More rain is on the way for most of the Bluegrass State over the next couple days. Showers and storms are starting to pop as of 2PM this afternoon (8/9) within a very humid and unstable airmass. Any storm will be capable of producing very heavy rainfall and with slow storm motions in place, localized flash flooding will once again be on the table. Look for coverage to grow through the afternoon and into the evening hours. Rain chances then persist through much of Wednesday. This looks to be your typical summertime pattern. Some will see more than an inch or two, while others may not see much. Nonetheless, a flood watch is in effect through Wednesday evening (8/10) for mainly the eastern half of Kentucky where localized flash flooding is most likely.

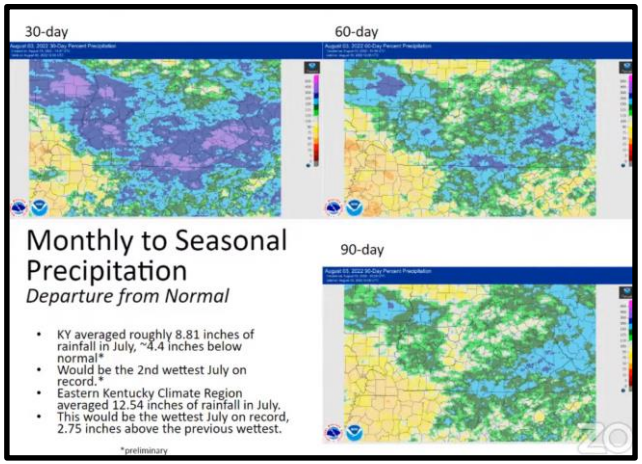


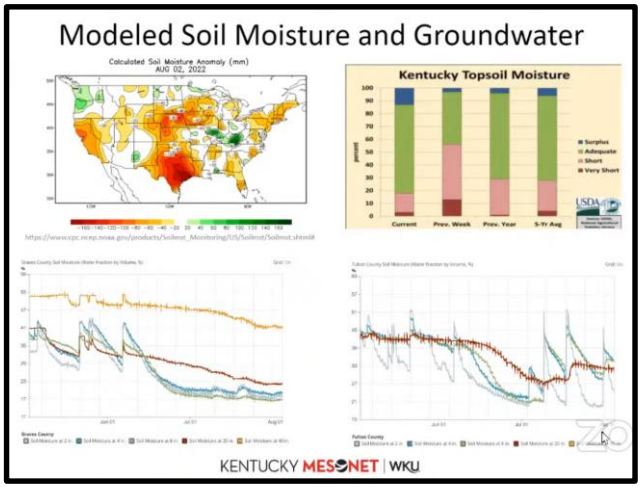
Sign-up for the Ag Weather Update

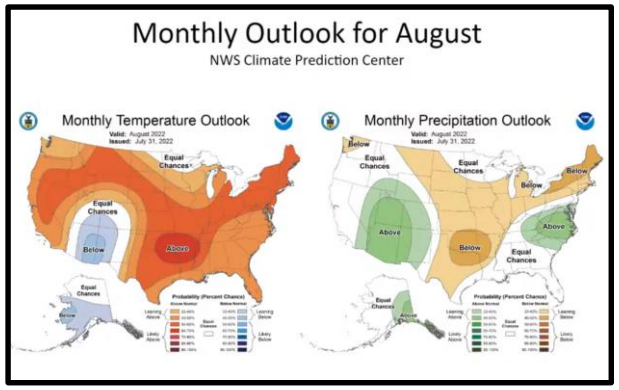
Tracking Weather & Climate in KY

Monthly Webinar









Biosystems & Agricultural Engineering

Tracking Weather & Climate in KY

Drought Impact Reporter

Drought Condition Monitoring Observations and Reports 2022

Seleccione un idioma

Para utilizar este formulario en español, utilice el menú en la parte superior izquierda.

Introduction

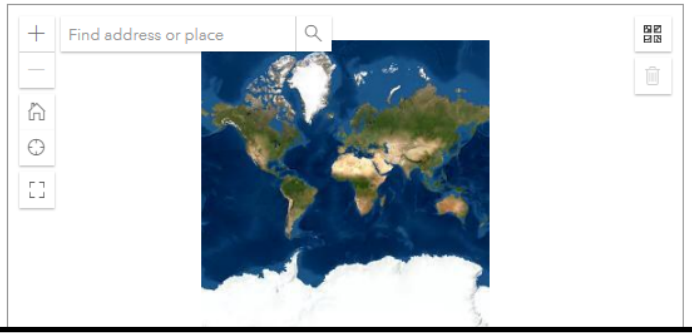
Report drought-related conditions and impacts within Kentucky. This survey is hosted by Western Kentucky University and the Kentucky Division of Water and part of a nation-wide service provided by the National Drought Mitigation Center, based at the University of Nebraska, developed in partnership with the National Integrated Drought Information System and the U.S. Department of Agriculture. Please note that this form is not part of the process to apply for assistance. To participate, you must legally be an adult, at least 18 years old in Kentucky. By submitting information, you agree that it may be used in drought monitoring research. Questions? Please email DIRinfo@unl.edu.

Find your report(s) on the map

Information submitted via this form appears on a map and becomes part of a permanent public record. See your mapped reports at https://go.unl.edu/cmor_drought.

***Where are you?**

Use the search box to enter the city or county of your observation. If you are using the mobile app, you have the option to enable location and use that instead. From a computer, clicking on the compass icon may work if you are not using a VPN, depending on your configuration.



How dry or wet is it?*

Please use what you know about your part of the country and base your observation on what is normal for this time of year. A normal dry season is not the same as drought.

Severely Dry: There is no soil moisture. Ponds, lakes, streams and wells may be nearly empty or dry. Producers may have crop or pasture losses. Mandatory water restrictions may be in place.

Moderately Dry: Plants may be brown due to dry conditions. Streams, reservoirs or well water levels may be low. Voluntary water use restrictions may be in place. There may be water shortages. Plants, crops or pastures may be stressed. Soil is dry.

Mildly Dry: Growth may have slowed for plants, crops or pastures. Soil is somewhat dry. Local plants, pastures or crops may not have fully recovered if conditions are changing from drier to wetter.

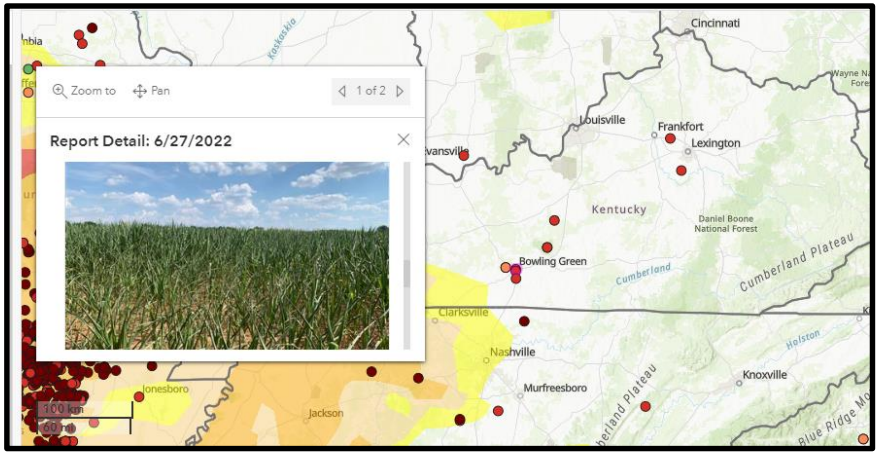
Near Normal: What you're seeing is what you expect for this time of year.

Mildly Wet: Local plants, crops or pastures are healthy, recovering from dry conditions or draining from wet conditions. Soil moisture is above normal.

Moderately Wet: Local plants, crops or pastures are healthy and lush. Soil is very damp and the ground may be saturated with water. There may be standing water in low areas and ditches. Water bodies may be fuller than normal.

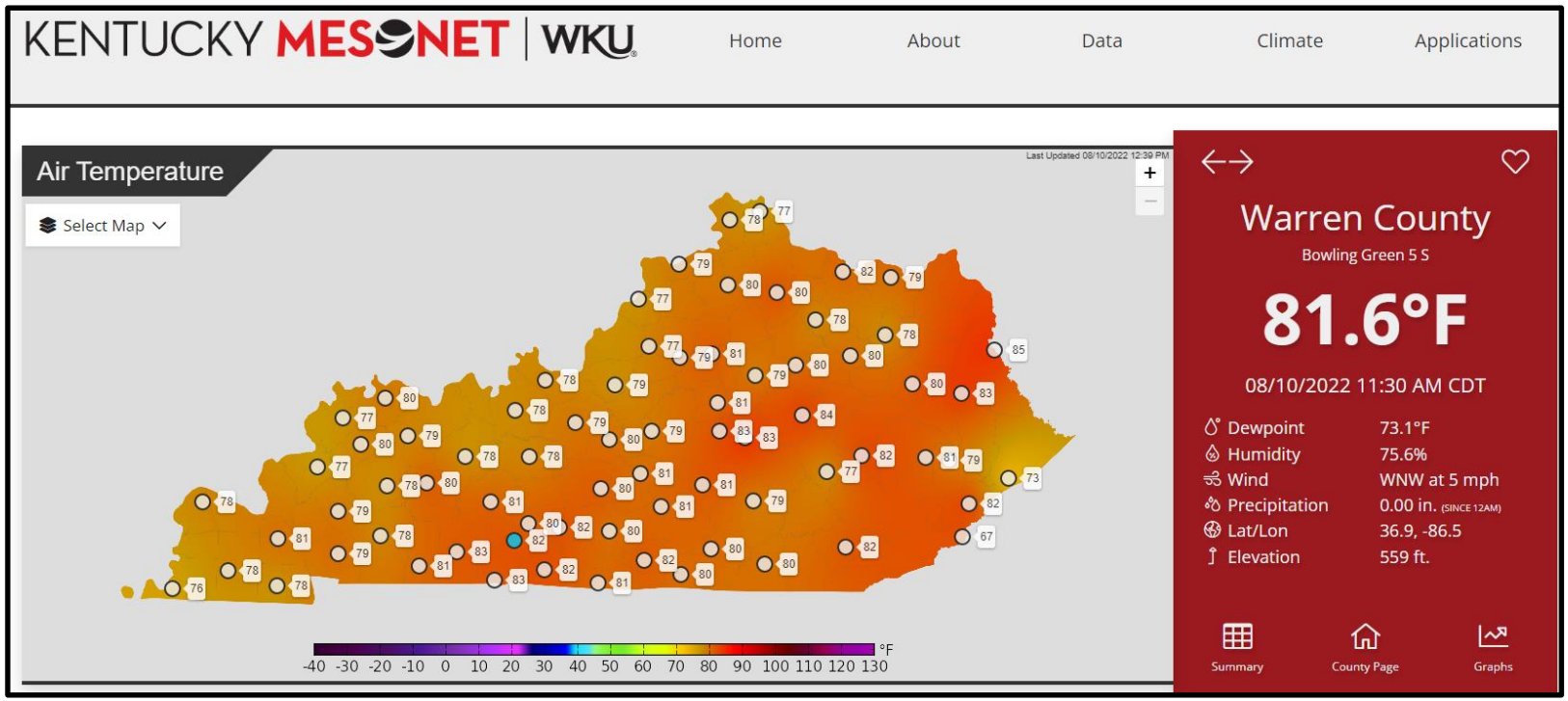
Severely Wet: Water levels in lakes, streams and ponds are well above normal. Standing water covers some areas that are normally dry. Soil is wet and ground is completely saturated. There may be flooding.

Severely Dry | Moderately Dry | Mildly Dry | Near Normal | Mildly Wet | Moderately Wet | Severely Wet



Tracking Weather & Climate in KY

Supporting the KY Mesonet, http://www.kymesonet.org/



Used in National Weather Service decision support.
Example (severe storms, floods, droughts, etc.)

Tracking Weather & Climate in KY

New County Product Coming January 2023

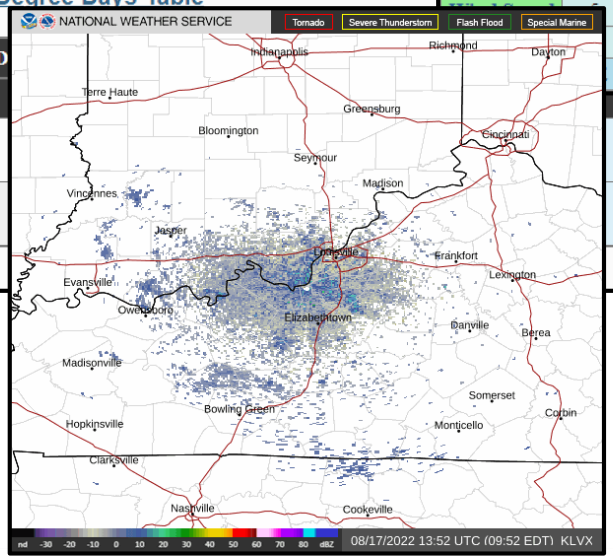
Weather Summary Table (Station: PRINCETON 2SE)

Last n Days	Temperature						Precipitation			Extreme Temp	
	Max	Dev	Min	Dev	Ave	Dev	Total	Dev	%Norm	Hi	
1	75	-14	68	2	72	-6	0.04	-0.08	33	75	
7	81	-8	66	0	74	-4	1.12	0.28	133	86	
14	85	-4	69	2	77	-1	4.56	2.78	256	91	
30	87	-2	70	3	79	1	7.98	4.03	202	97	
90	86	-1	67	2	77	1	15.02	2.38	119	99	
180	76	-1	56	2	66	1	28.53	1.83	107	99	
360	69	0	49	2	59	1	50.20	-0.63	99	99	

DAY	WEDNESDAY				THURSDAY				
EDT 3HR	NOON	3P	6P	9P	MIDN	3A	6A	9A	NOON
MAX/MIN	--	--	--	82°	--	--	--	61°	--
TEMP.	77°	82°	80°	73°	67°	64°	61°	66°	78°
Sky Cover	25%	27%	23%	13%	14%	12%	7%	4%	8%
Clouds									
DEW PT	65°	64°	64°	66°	65°	63°	61°	64°	65°
RH	67%	55%	58%	79%	93%	97%	100%	94%	64%
POP 12HR	--	--	--	0%	--	--	--	0%	--
Rain/Snow	--	0.00in	--	0.00in	--	0.00in	--	0.00in	--
		6	5	2	2	2	2	2	5
		10	9	7	7	6	5	7	9
		NE	N	N	N	N	N	NE	NE

Degree Days Table

Growing Degree Days			Corn Growing Degree D		
Start Date	GDD	Dev	Start Date	Corn GDD	
Count from Jan 1	3088	104	Planting Apr 1	2834	3088
Count from Apr 1	2907	-77	Planting May 1	2542	2935



Biosystems & Agricultural Engineering

Questions?

UK Horticulture Webinar Wednesday's

Matt Dixon
Meteorologist
UK Ag Weather Center

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