

SUMMER SIZZLE – THE REAL FACTORS

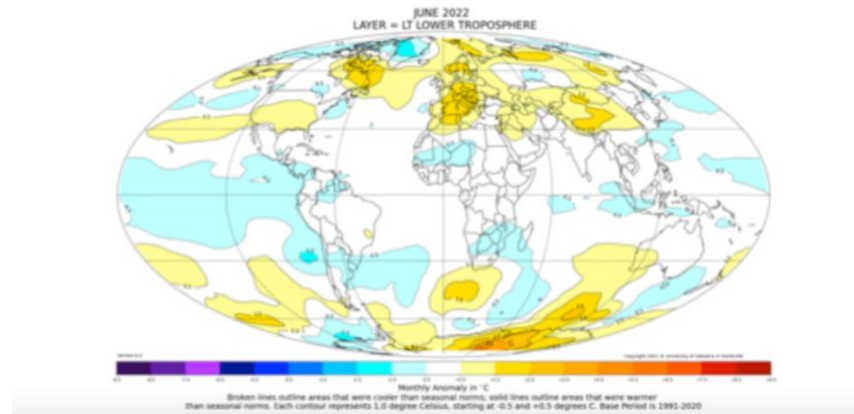
By Joseph D'Aleo

Most every area of the mid-latitudes will see summer heat during the high sun angle summer months. Some years the extremes are greater and more persistent. Ocean temperature patterns, solar drivers and local factors including soil moisture, and foehn wind events play a key role in extreme temperatures in summer.

The summer this year June started out on the cool side in many areas including the tropics which averaged -0.65F colder than the 30-year average as measured by satellites. Some warmth was starting to show in the south-central U.S and western Europe.

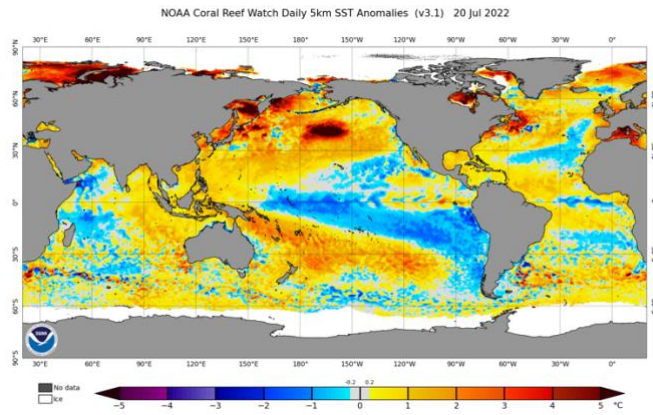
UAH Global Lower Troposphere Temperature Report: June 2022

- Global composite temp.: +0.06 C (+0.11°F) above seasonal average
- Northern Hemisphere: +0.07 C (+0.13 °F) above seasonal average
- Southern Hemisphere: +0.04 C (+0.07 °F) above seasonal average
- Tropics: **-0.36 C (-0.65°F) below seasonal average**



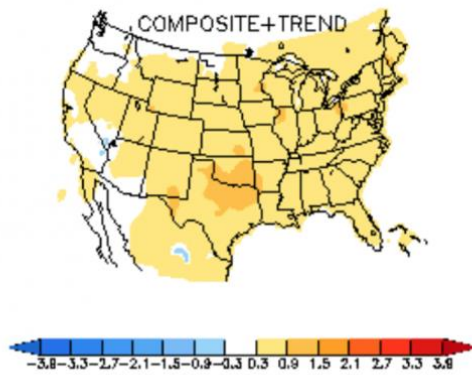
LA NINA SUMMERS

We are in the third year of 'La Nina'. It is the strongest year of the event. Strong La Ninas have historically been hot and dry in the central states into the east. They produce more tornadoes in the spring and when the Atlantic is warm, more landfalling hurricanes in the east.

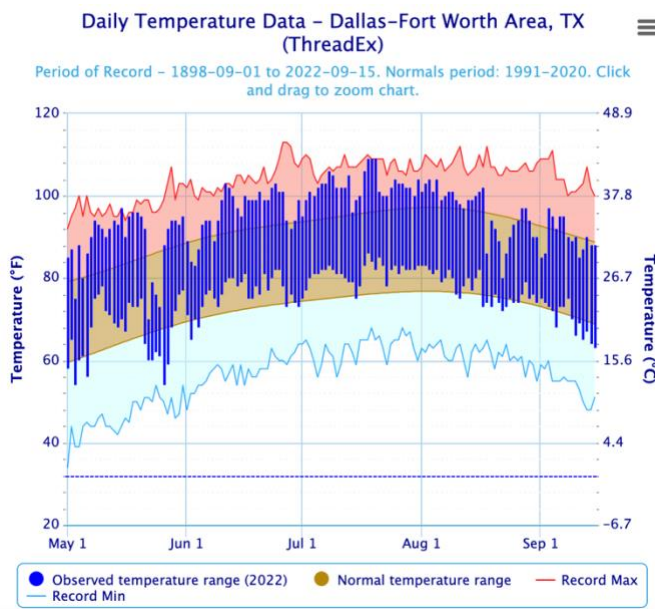


Indeed, the heat is augmented where the springs and early summers are drier than normal. The July to September mean temperature anomalies for La Ninas are shown here (CPC).

JAS LA NINA TEMPERATURE ANOMALIES (C)



The Southern plains often see the most persistent heat in La Ninas. So far, there were 47 100F days in Dallas, TX in 2022. See how after a cold spell in May, it was increasingly hot in Dallas. Rains arrived in August and temperatures moderated.

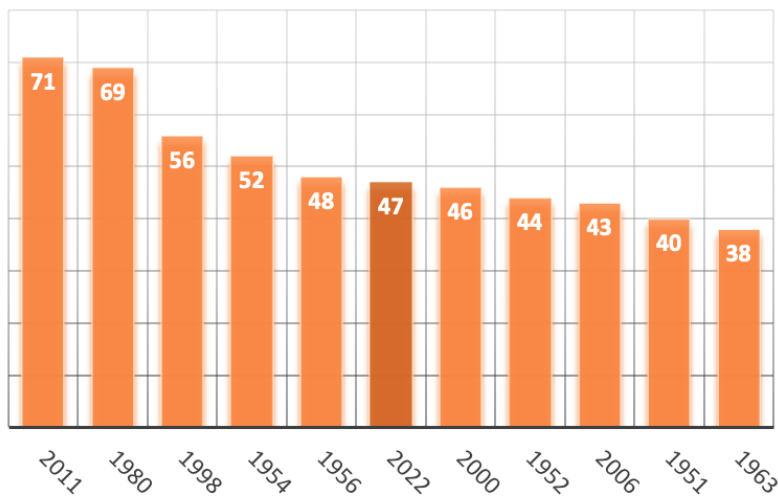


Dallas since 1950 has had as many as 71 days over 100F.

MOST NUMBER OF 100F DAYS IN DALLAS SINCE 1950

All are La Nina years.

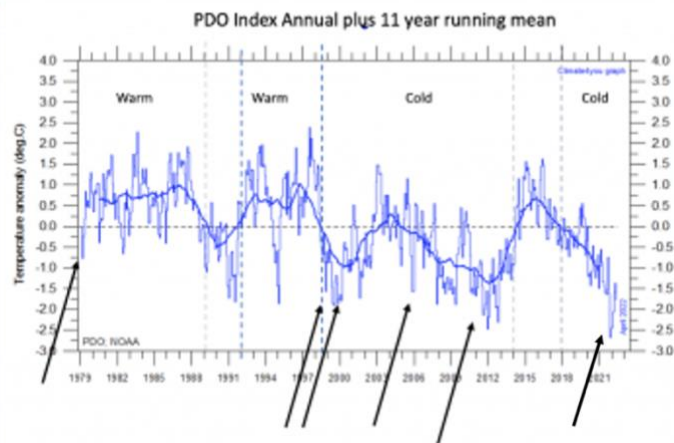
100F Days Dallas Fort Worth



We can see below the hot summers were indeed in strong, multi-year La Ninas (negative MEI v2 (Multivariate ENSO Index) usually found in periods of a negative PDO (Pacific Decadal Oscillation)).

Greatest Annual 100 Days DFW			
Rank	#Days	Year	ENSO
1	71	2011	La Nina
2	69	1980	Nuetral
3	56	1998	La Nina
4	52	1954	La Nina
5	48	1956	La Nina
6	47	2022	La Nina
7	46	2000	La Nina
8	44	1952	Nuetral
9	43	2006	Neutral
10	40	1951	El Nino
11	38	1963	Nuetral

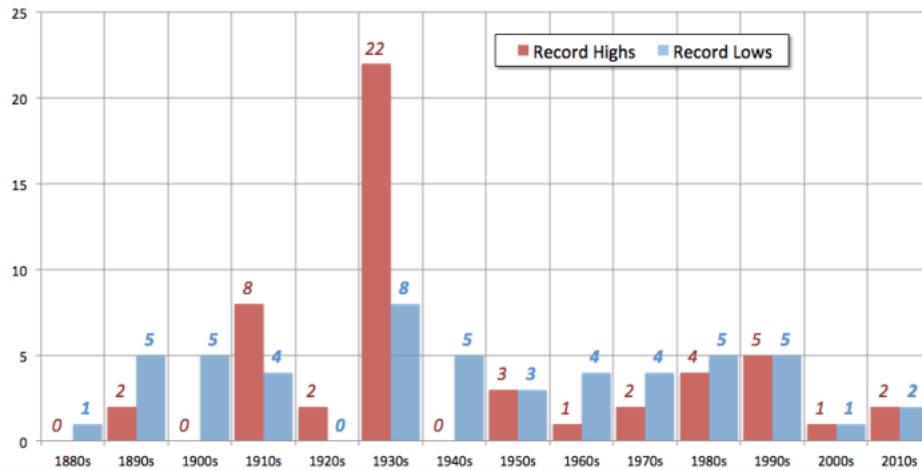
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You can see the MEI and the negative PDO are both the strongest since 1979 (right side of the above graph). This was a strong event.

As the Dallas data showed, heat is not a new phenomenon nor getting more frequent. In fact, the warmest decade for Texas and the entire U.S. by far was the 1930s. 22 state/territory all-time heat records still reside in the record books in the 1930s. There have been more record lows since the 1940s than record highs.

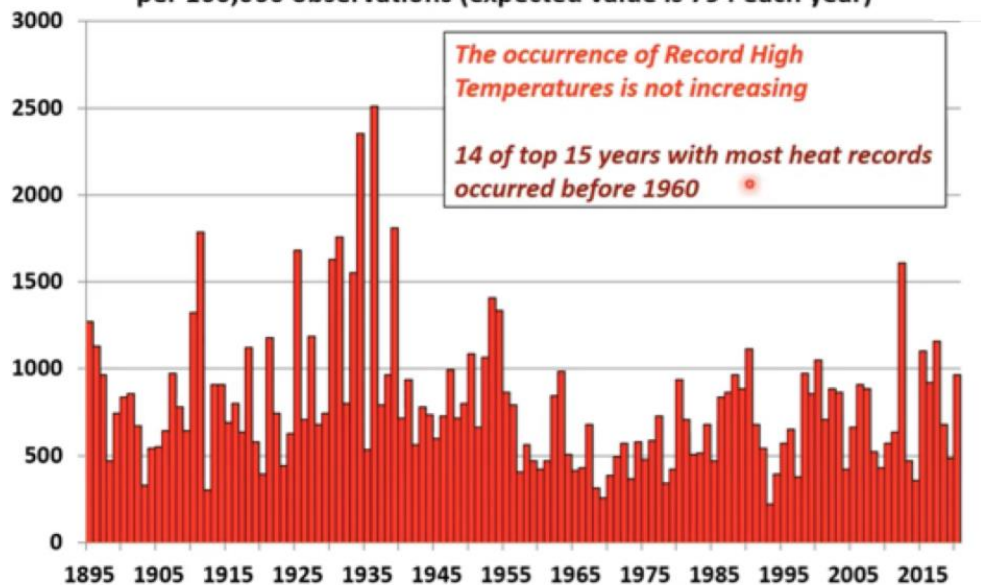
State/Territory All-time Record Highs, Lows per Decade



Source: NOAA NCDC

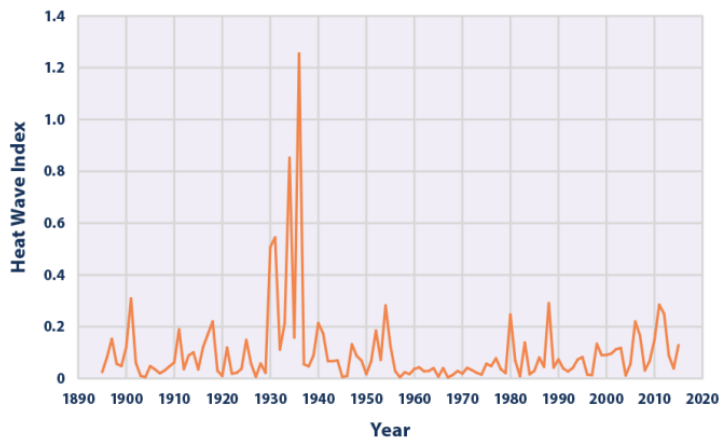
The 1930s were extreme for the heat and the 'dust bowl'. 14 of the 15 years with the most heat records occurred before 1960.

Number of Daily Record High Temperatures by year for 737 USHCN Stations with at least 105 years of record (1895-2020) per 100,000 observations (expected value is 794 each year)



John R. Christy, The University of Alabama in Huntsville
NCEI/NOAA data downloaded 3 Dec 2020

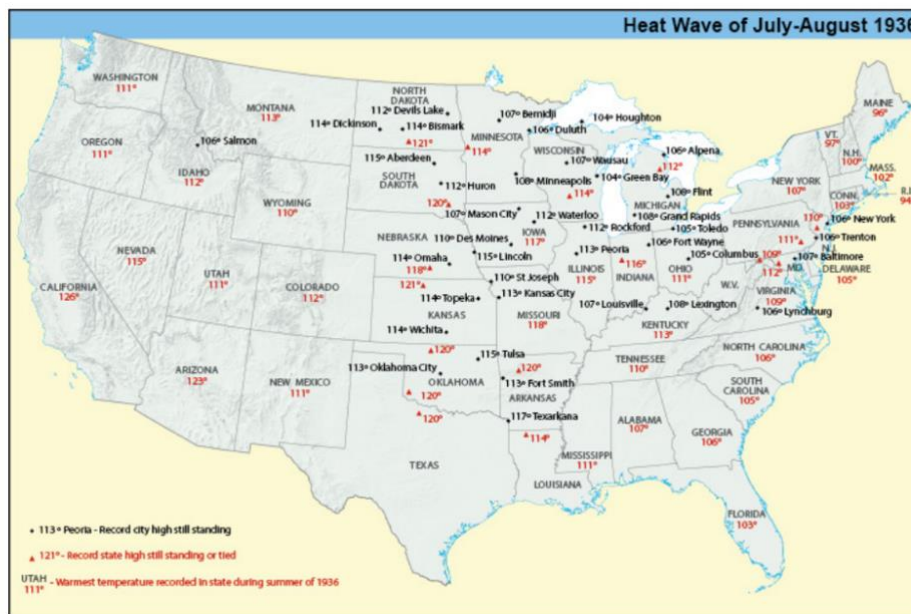
Even the EPA shows the heat of the 1930s.



Source: EPA Heat Wave Index (Kunkel 2016)

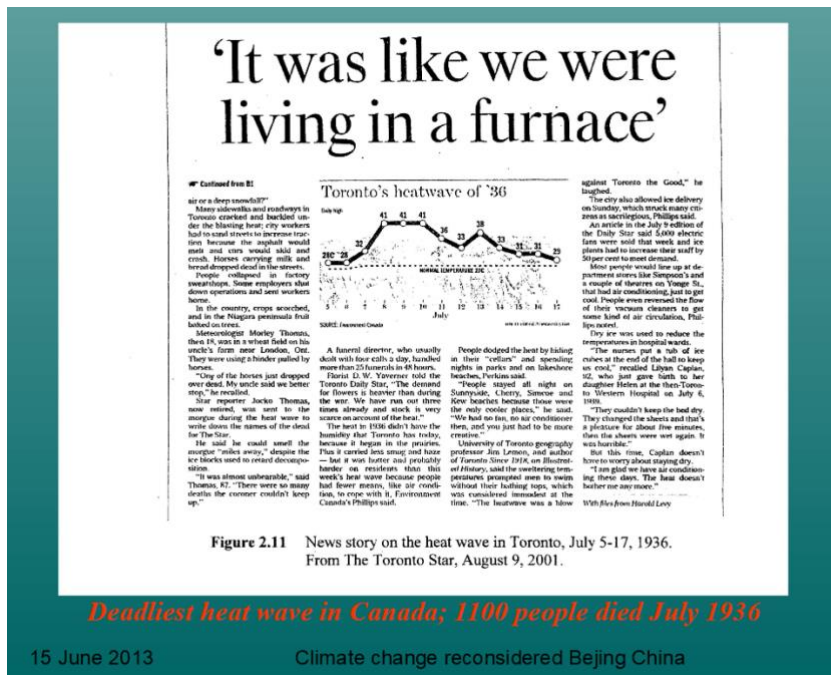
The mid 1930s were especially hot (and record cold in winter). Dryness accentuates both heat and cold.

The [Washington Post](#) this week talked about the amazing heat of the summer of 1936 (following the coldest winter).



The summer of 1936 produced triple digit heat in 45 of the 48 CONUS states, most records that are still standing. 8 states saw highs over 120F!

The central heat in La Ninas often plumes north and east in mid-summer into the eastern U.S. and southeast Canada.



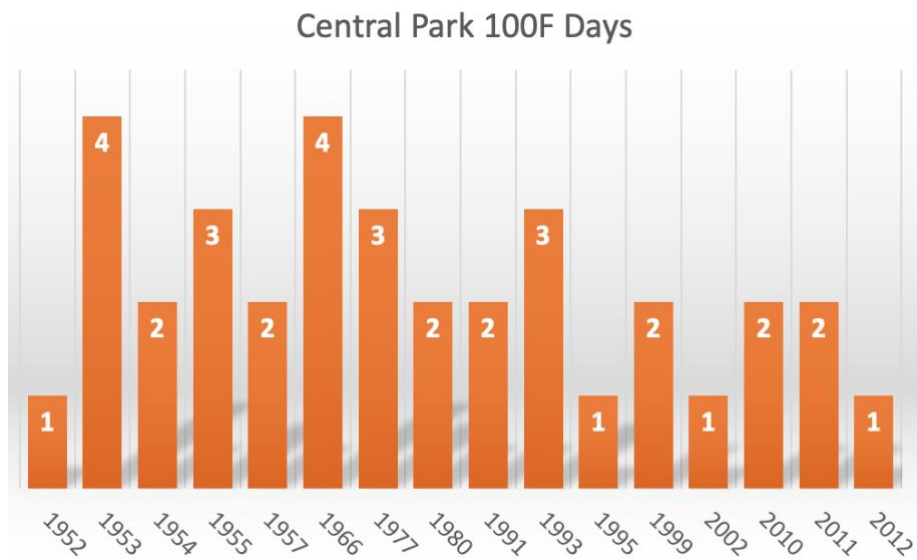
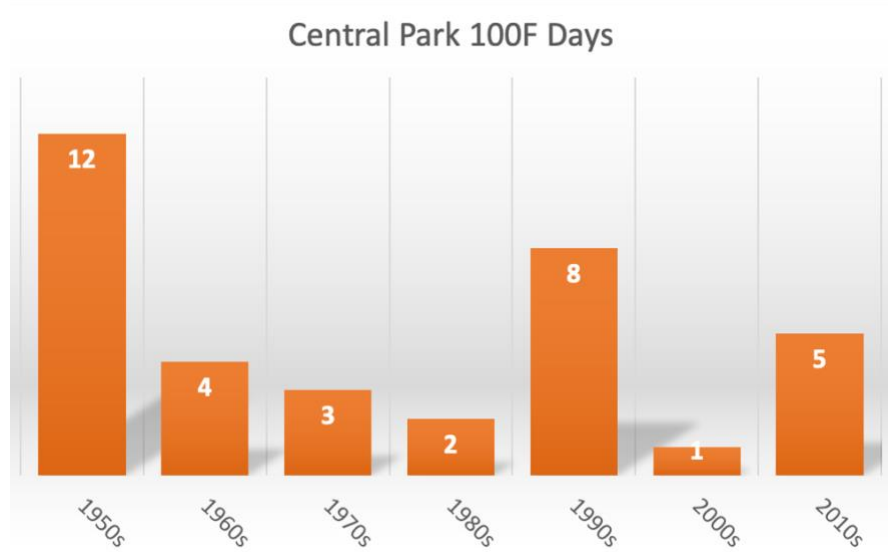
BAKED APPLE

In NYC, 7 of the top 10 warmest Julys in Central Park occurred in La Nina summers. The other 3 were in years where ENSO was neutral and/or transitioning to La Nina. As of July 21, CPK has averaged 78.6F. 5 more hot days occurred before temperature eased.

Central Park Warmest Julys

Warmest (°F)		
1	81.4	1999
2	81.3	2010
3	80.8	1955
4	80.3	1952
5	80.2	2011
6	80.1	1993
7	80.0	2020/1908
8	79.8	2013
9	79.7	1966
10	79.6	1949

In Central Park, the 1950s was the hottest decade by far.



The summer heat wave in the Big Apple in what had been a mostly moderate summer in the first half, will continue to Monday before more typical summer weather returns.

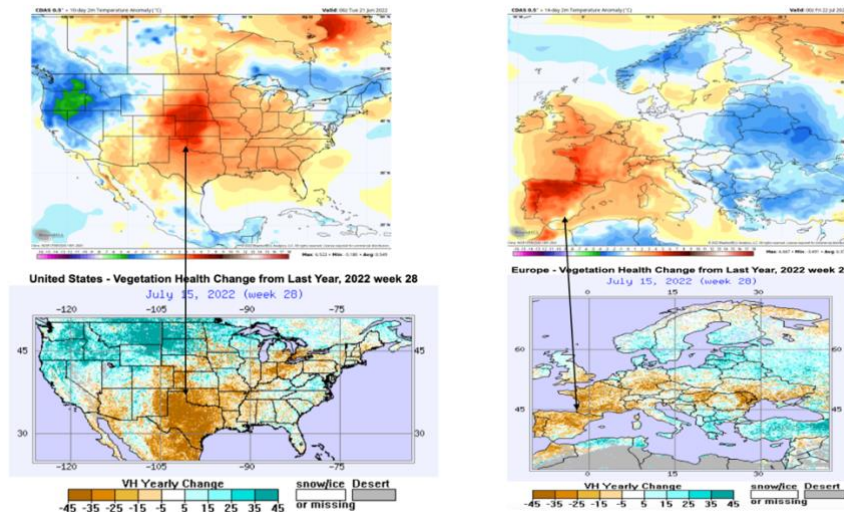
Central Park has had sixteen 90F days in summer 2022. As many as 39 days have reached that level in the record.

Top Number of 90 Degree + Days by Year	
39 Days	1993 /1991
37 Days	1944, 2010
36 Days	1983
35 Days	1966
32 Days	2002, 1988, 1980, 1953
29 Days	1995, 1961, 1949, 1941
28 Days	1943
27 Days	1999 /1959
26 Days	1936
25 Days	1955

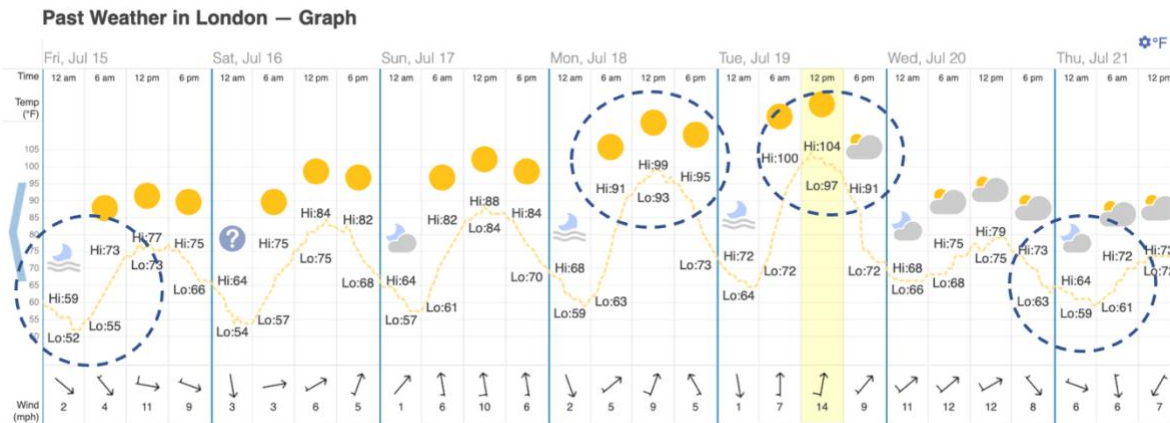
LACK OF SOIL MOISTURE ACCENTUATES WARMING

The soil moisture is a key factor in summer. When the soil is dry, the sun's energy warms the ground and is not consumed in evaporating moisture back into the air. It amplifies any heat building in an amplified pattern.

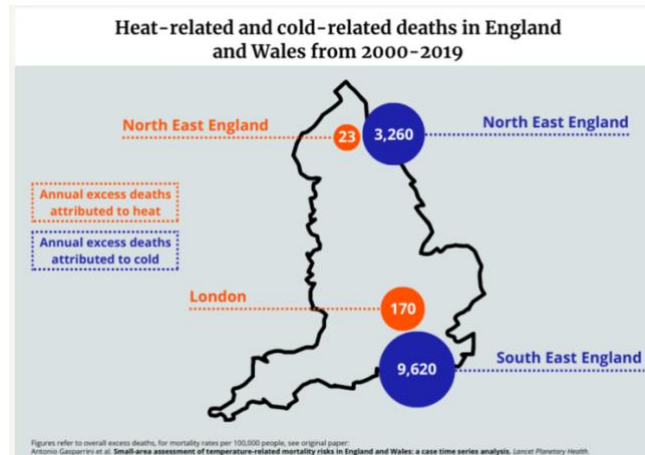
See the La Nina induced dryness effect on vegetation in the southern plains. Europe like the central US, has found itself in a part of the global wave pattern that has limited rainfall and enhanced the summer temperatures. Notice the cold alternates with the warm, a sign of an amplified trough ridge pattern.



The UK is surrounded by water and often that limits the heat. However, the winds turned from off the warm continent into Britain for a few days last week and the temperatures spiked for two days until the maritime influence returned.



Even with the high heat, nights brought some relief. More seasonable air returned. In the UK, cold is a greater danger than heat especially as blackouts threaten in the winter when solar energy is limited given the latitude and cold often comes with little winds at night. Over 20% of the population are in energy poverty, often having to choose between heating and eating. Britain and most countries find 10 to 20 times more people die from cold than heat.

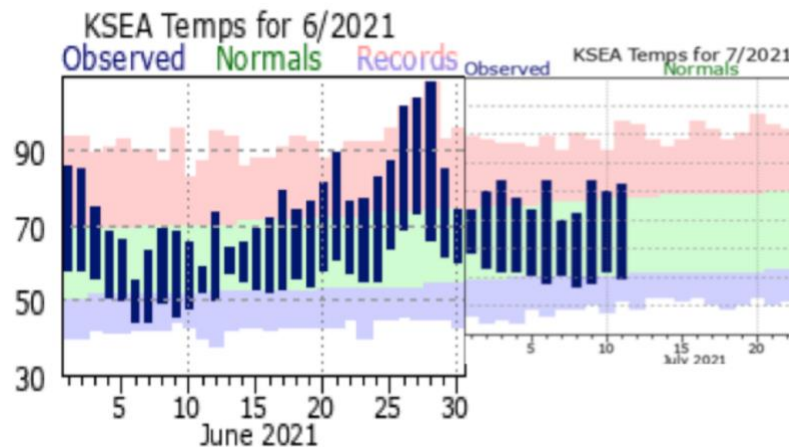


DOWNSLOPE WINDS IN THE WEST

The west U.S. west of the Cascades and to the south the Sierra Nevada normally has natural air conditioner working with the cool waters of the

eastern Pacific. Only when a pressure pattern strong enough to force downslope winds does the heat develop to the coast. The air is warmed by compression of the air as it descends into higher pressure near the surface. These episodes are usually brief.

In late June 2021, a three-day heat wave besieged the near coastal areas of the droughty Pacific Northwest as a heat ridge set up in British Columbia on position to cause intermountain heat to sink down to the lower elevations with compression producing all-time record heat. See the brief heat burst in Seattle in late June.



These local heat events are not uncommon and often are found in urban areas near mountains and especially in dry years.

This event led to new record highs in the coastal cities as downslope winds kept the ocean cooling at bay. Triple digit heat is common in summer in the intermountain away from the ocean influence. But occasionally some of that heat makes its way to the coast and is superheated by compression as it sinks downslope.

This event was similar to Sundowner, dubbed a “poison wind,” was reported June 17, 1859, by the Coastal Pilot of California. According to the report, the morning air temperature of 75 to 80 degrees rose steadily until about 1 p.m., when a series of superheated waves of wind blasted the Santa Barbara area.

By 2 p.m., the air temperature reached 133 degrees and hovered there for three hours, killing small animals, destroying fruit, ruining gardens and heavily damaging trees the newspaper reported. That year a similar

powerful heat ridge likely forced the wind to sink off the mountains to the north and superheat just as we saw this June.

These events are usually brief and these local oddities are not signs of man-made changes.

Many heat records occurred in locations where downslope winds add heat to transitory very warm air masses – found in the east coastal states of the United States, Canada, Europe, Asia, Africa, Australia and even the Antarctic Peninsula.

The metropolitan areas of the Mid-Atlantic and Northeast U.S., when heat ridges build east from the central in summer, experience this compressional warming from downslope winds which also block any sea breezes. Most of the triple digit readings and high records here occur with west to northwest winds.