Summer Heat in Vermont

Two Rivers-Ottauquechee
Regional Emergency Management Committee

31 May 2023

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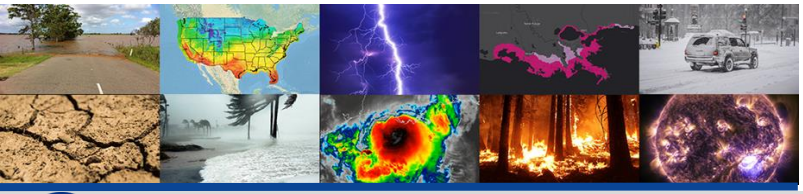


Overview - Agenda

- Climatology and Trends of
  - Summer and Hot Days (≥85˚F, ≥90˚F)
  - Are summers getting longer?

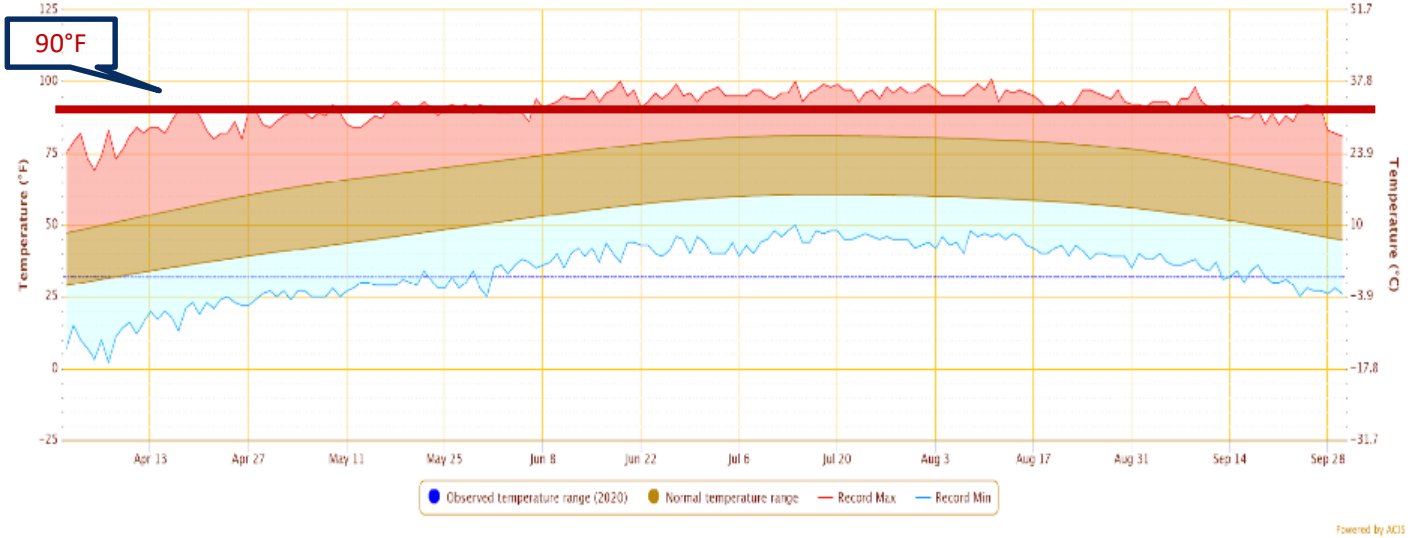
- **NEW** NWS Burlington **HEAT** Page

- What to possibly expect in the future

Temperature Climatology for VT

April 1st – September 30th

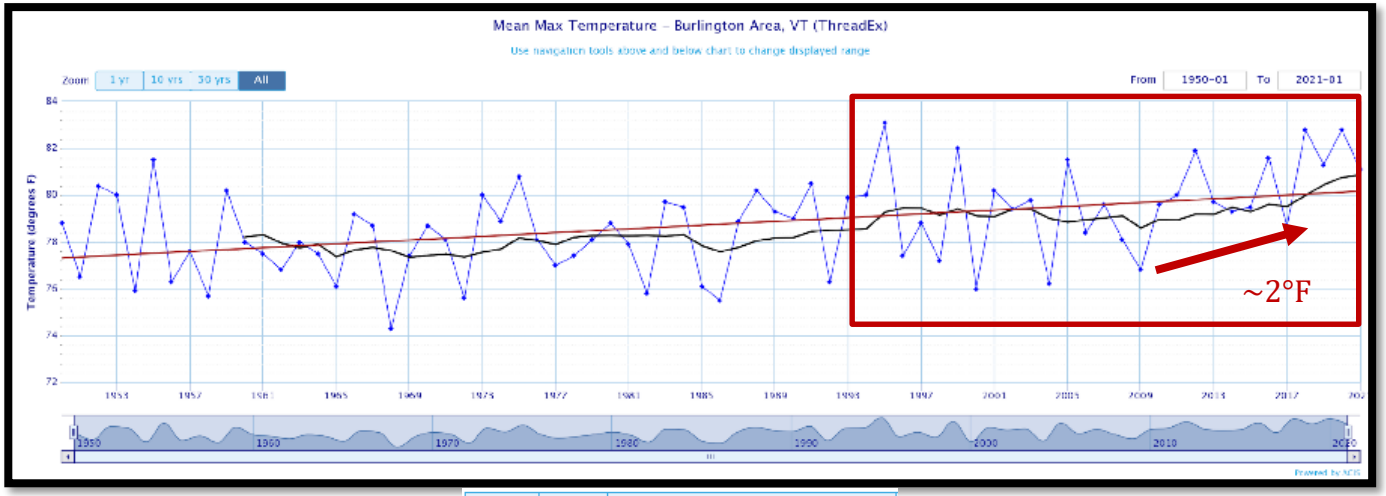
Temperatures above 90 degrees are possible from mid-April through late September



Early heat is problematic due to lack of acclimation.
Prolonged heat is problematic due to compounding effects.

Trend of Summer Mean Maximum Temperatures

June, July, August



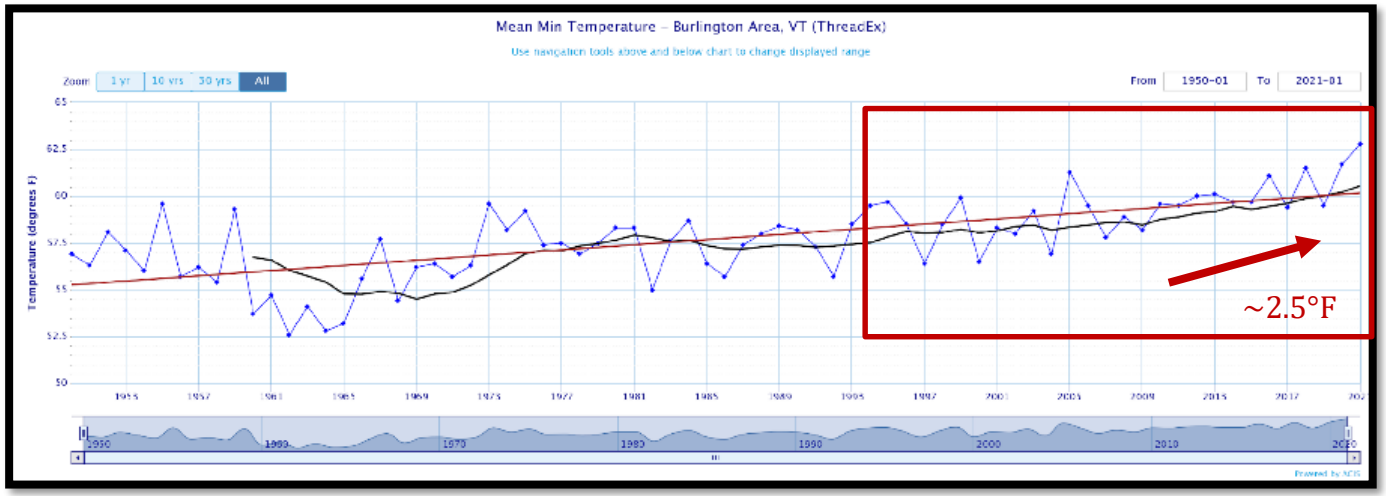
7 of the Top 10 Warmest Summer **High Temperatures** have occurred in the last 10 years

Rank	Year	Mean Max Temperature
1	1995	83.1
2	2020	82.8
-	2018	82.8
4	1999	82.0
5	2012	81.9
6	2016	81.6
7	2005	81.5
-	1955	81.5
9	2019	81.3
10	2022	81.1
-	2021	81.1

9 of the Top 10 have occurred since 1995

Trend of Summer Mean Minimum Temperatures

June, July, August



Rank	Year	Mean Min Temperature
1	2021	62.8
2	2020	61.7
3	2018	61.5
4	2005	61.3
5	2016	61.1
6	2022	61.0
7	2013	60.1
8	2012	60.0
9	1999	59.9
10	2015	59.7
-	2014	59.7
-	1995	59.7

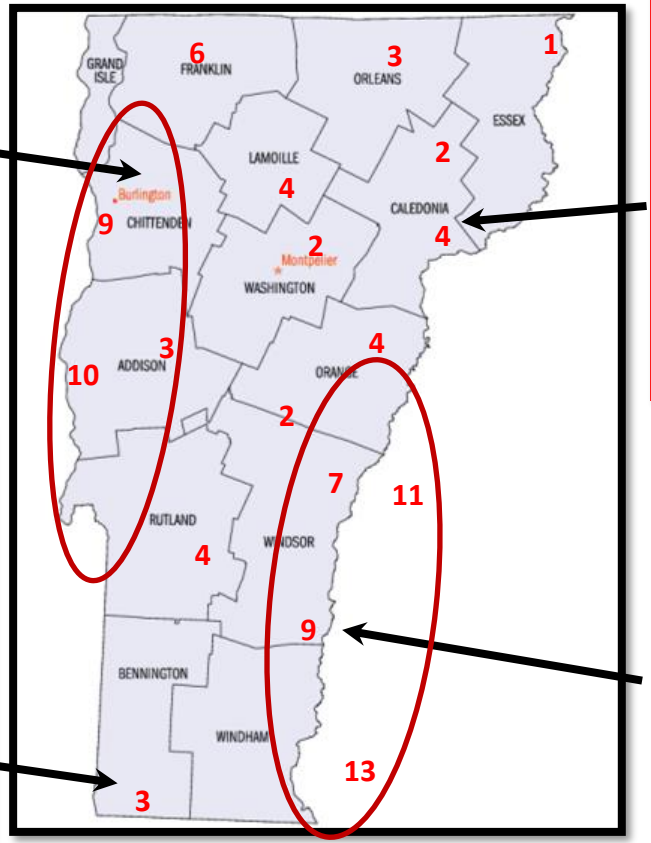
9 of the Top 10 Warmest Summer **Low Temperatures** have occurred in the last 10 years

ALL of the Top 10 have occurred since 1995

Climatology of Mean # Days ≥ 90°

2002-2021

Year	Number of Days Max Temperature >= 90
2002	17
2003	6
2004	0
2005	5
2006	6
2007	10
2008	3
2009	2
2010	11
2011	7
2012	13
2013	9
2014	3
2015	9
2016	12
2017	8
2018	17
2019	8
2020	20
2021	14

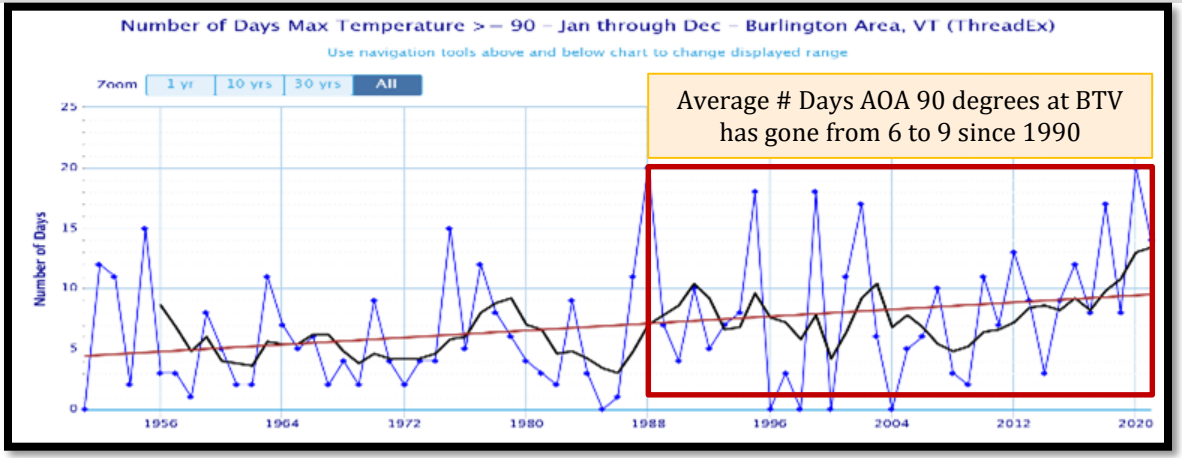


Year	Number of Days Max Temperature >= 90
2002	6
2003	4
2004	0
2005	3
2006	6
2007	5
2008	2
2009	1
2010	5
2011	3
2012	4
2013	4
2014	1
2015	1
2016	3
2017	5
2018	6
2019	2
2020	11
2021	7

Year	Number of Days Max Temperature >= 90
2002	4
2003	0
2004	0
2005	5
2006	3
2007	3
2008	2
2009	0
2010	9
2011	2
2012	7
2013	4
2014	0
2015	3
2016	4
2017	3
2018	12
2019	1
2020	6
2021	2

Year	Number of Days Max Temperature >= 90
2002	19
2003	7
2004	1
2005	5
2006	7
2007	8
2008	5
2009	2
2010	15
2011	9
2012	20
2013	11
2014	1
2015	5
2016	7
2017	6
2018	14
2019	6
2020	10
2021	13

Trend of Summer Mean Maximum Temperatures # Days ≥ 90°



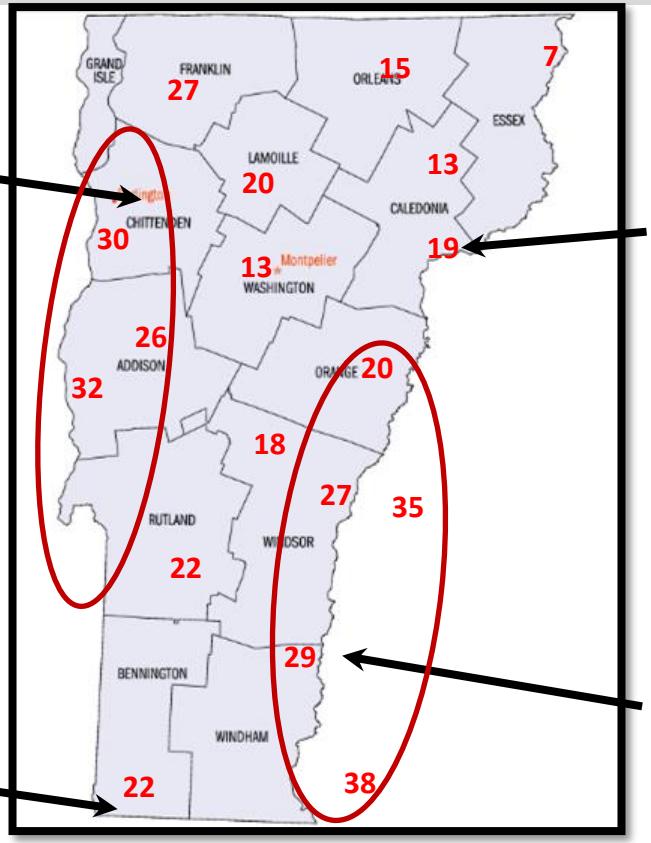
Rank	Year	Number of Days Max Temperature >= 90
1	2020	20
-	1988	20
3	1999	18
-	1995	18
5	2018	17
-	2002	17
7	1975	15
-	1955	15
9	2021	14
10	2022	13
-	2012	13

5 of the Top 10 have occurred in the last 10 years and **8 of the Top 10** since 1995

Climatology of Mean # Days ≥ 85°

2002-2021

Year	Number of Days Max Temperature >= 85
2002	36
2003	28
2004	8
2005	37
2006	23
2007	30
2008	12
2009	14
2010	30
2011	24
2012	37
2013	29
2014	25
2015	41
2016	45
2017	23
2018	49
2019	30
2020	49
2021	37



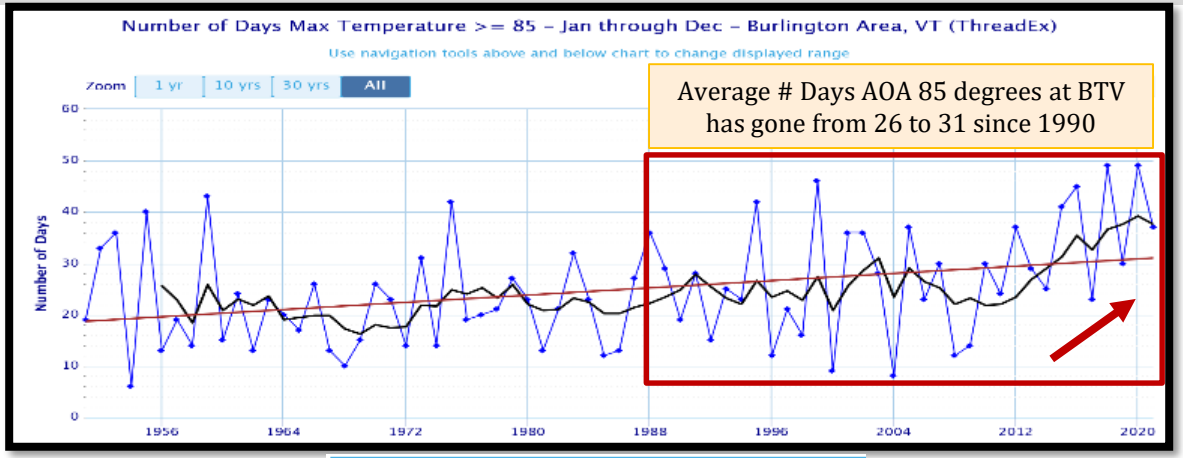
Year	Number of Days Max Temperature >= 85
2002	27
2003	13
2004	8
2005	26
2006	23
2007	25
2008	7
2009	10
2010	24
2011	16
2012	20
2013	17
2014	12
2015	18
2016	20
2017	14
2018	24
2019	15
2020	33
2021	23

Year	Number of Days Max Temperature >= 85
2002	29
2003	11
2004	7
2005	36
2006	17
2007	20
2008	15
2009	10
2010	27
2011	15
2012	32
2013	22
2014	12
2015	26
2016	31
2017	19
2018	35
2019	16
2020	33
2021	24

Year	Number of Days Max Temperature >= 85
2002	40
2003	22
2004	13
2005	41
2006	20
2007	26
2008	14
2009	16
2010	40
2011	29
2012	44
2013	26
2014	17
2015	33
2016	36
2017	23
2018	33
2019	29
2020	40
2021	29

 # Days ≥ 85˚F is 3-5X MORE compared to # Days ≥ 90˚F

Trend of Summer Mean Maximum Temperatures # Days ≥ 85°



Rank	Year	Number of Days Max Temperature >= 85
1	2020	49
-	2018	49
3	1999	46
4	2016	45
5	1959	43
6	1995	42
-	1975	42
8	2015	41
9	1955	40
10	2021	37
-	2012	37
-	2005	37

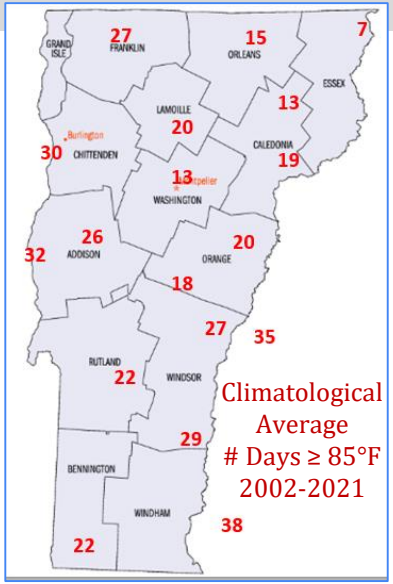
6 of the Top 10 have occurred in the last 10 years and **8 out of 10** since 1995

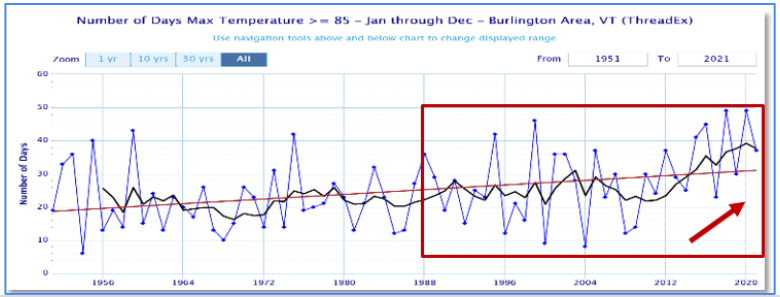
Risk of Heat-Related ED Visits

VT Department of Health

Risk of Heat Related ED Visits
20X More at 95th Percentile

Location	65th Percentile Heat Index (May-Sept) (~ 30 Year Normal High)	95th Percentile Dry Bulb Temp (May-Sept) *	95th Percentile Heat Index (May-Sept)*
Bennington	79	87	90
Burlington	81	89	92
Montpelier	77	85	87
Newport	75	84	85
Rutland	78	85	87
Springfield	80	89	90
St. Johnsbury	78	86	88
Stowe	78	87	88
Swanton	79	88	91



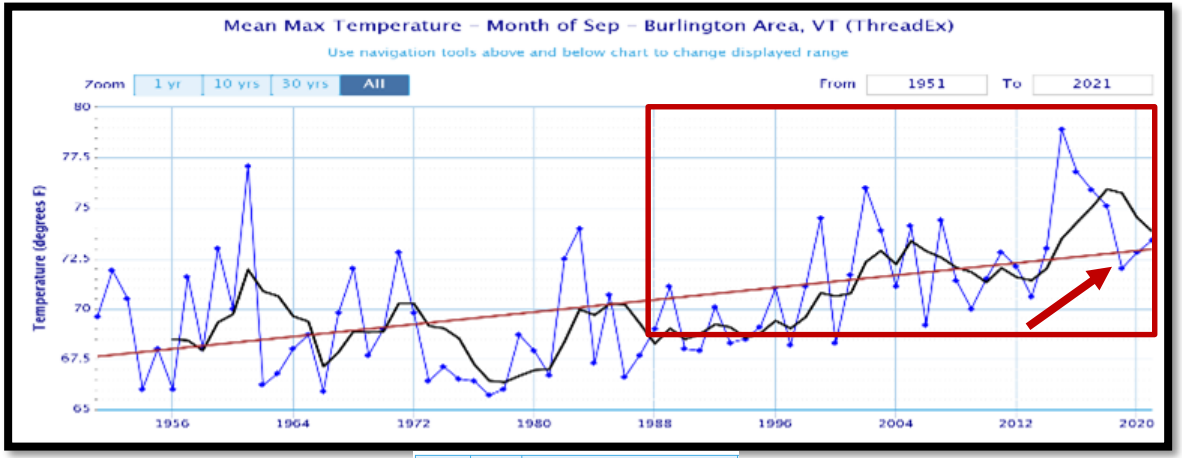


- Basically 90-95F in the Champlain Valley and Lower CT River Valley **~ 8-12 days/year**
- Mid-Upper 80s for Interior/Higher Elevations of VT **~ 8-12 days/year**
- **Trend is going higher!!!**

 # Days ≥ 85˚F is 3-5X MORE compared to # Days ≥ 90˚F

Is Summer Getting Longer?

September

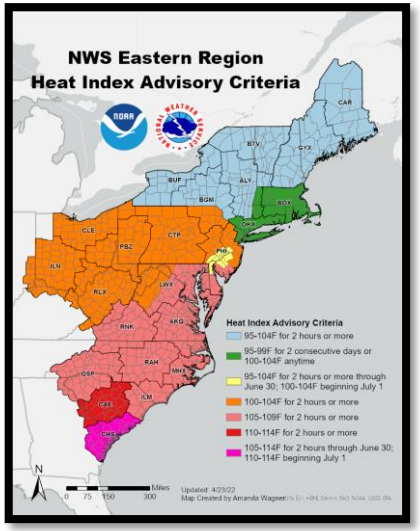


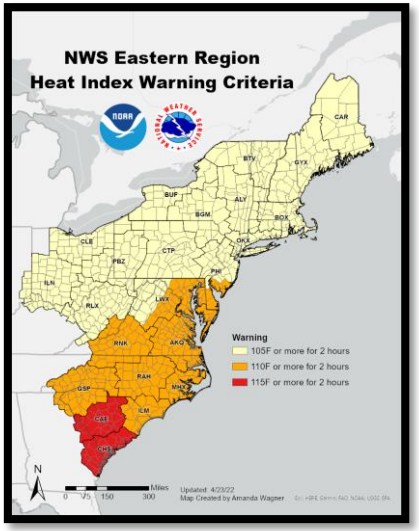
Rank	Year	Mean Max Temperature
1	2015	78.9
2	1961	77.1
3	2016	76.8
4	2002	76.0
5	2017	75.9
6	2018	75.1
7	1999	74.5
8	2007	74.4
9	2005	74.1
10	1983	74.0
11	2003	73.9
12	2021	73.4
13	2014	73.0
-	1959	73.0
15	2020	72.8
-	2011	72.8
-	1971	72.8
18	1982	72.5
19	2012	72.1
20	2019	72.0

9 of the Top 20 have occurred in the last 10 years.
15 out of Top 20 since 1995.

NWS Heat Headlines

- NWS issues Heat Headlines using the Heat Index.
  - Heat Index is the combination of the ambient (air) temperature and the humidity.
  - **Heat Advisory** issued for Heat Index of 95-104˚F
  - **Excessive Heat Warning** issued for Heat Index ≥ 105˚F





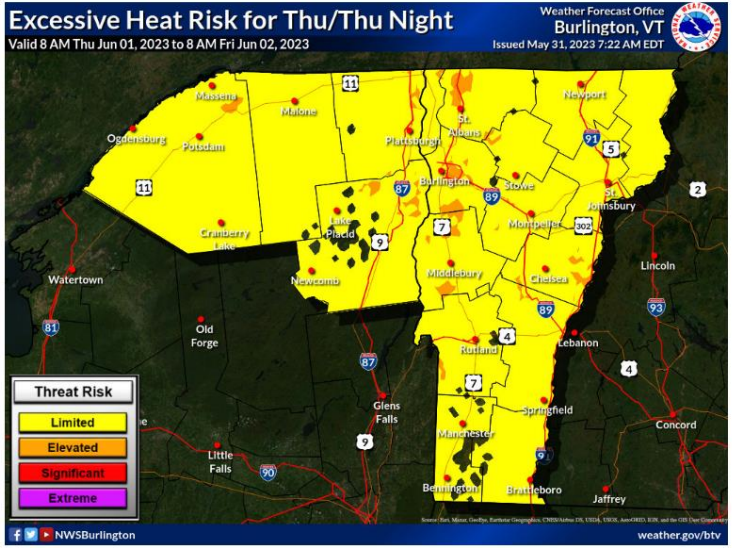
Graphical Hazardous Weather Outlook

Color coded quick preview of potential weather hazards for the next 7 days

Graphical Hazards

Experimental Graphical Hazardous Weather Outlook

We encourage your comments or suggestions for improvements using this electronic survey



24 Hr Hazard Risks	Today	Thu	Fri	Sat	Sun	Mon	Tue
Severe Thunderstorm							
Tornado							
Thunderstorm Wind							
Hail							
Lightning							
Excessive Rainfall							
Excessive Heat							
Wind							
Frost/Freeze							
Fog							
Fire Weather							

Threat Map

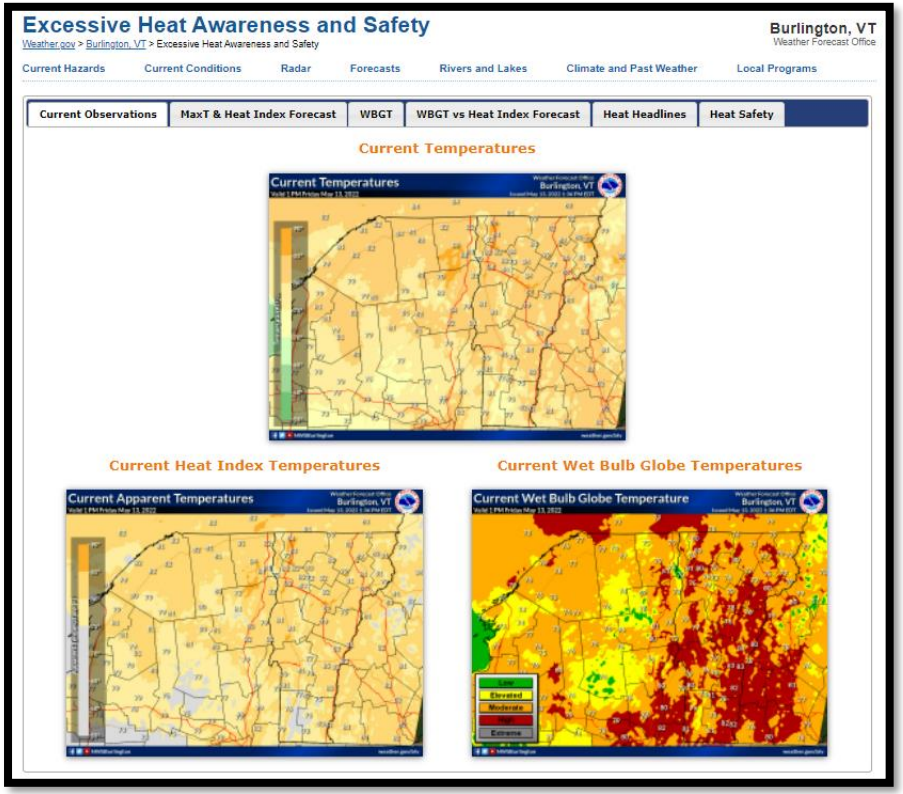
Days 1-7 Threats

Risk Level	Category	Definition
	None	Maximum heat index < 80 degrees. No Excessive Heat Risk.
	Limited	Maximum heat index 80 to 89 degrees. Heat exhaustion possible with prolonged exposure.
	Elevated	Maximum heat index 90 to 94 degrees. Heat exhaustion likely with prolonged exposure. Heat stroke possible.
	Significant	Maximum heat index 94 to 104 degrees. Heat exhaustion or heat stroke likely with prolonged exposure.
	Extreme	Maximum heat index >= 105 degrees. Dangerously hot conditions could quickly result in heat exhaustion or heat stroke.

Risk Level Legend

NWS Burlington NEW Heat Page - www.weather/gov/btv/heat

- **Heat Headlines**
- Current Observations
  - Ambient, Apparent (HI) and WBGT
- Max T and Heat Index Forecast
- WBGT (Wet Bulb Globe Temperature)
- WBGT vs. Heat Index Forecast
- Heat Safety



NWS Burlington NEW Heat Page - www.weather/gov/btv/heat

Heat Headlines

- Heat Headlines
  - Any heat headlines will have a **RED** tab and appear as the first tab with more detailed heat headline information.

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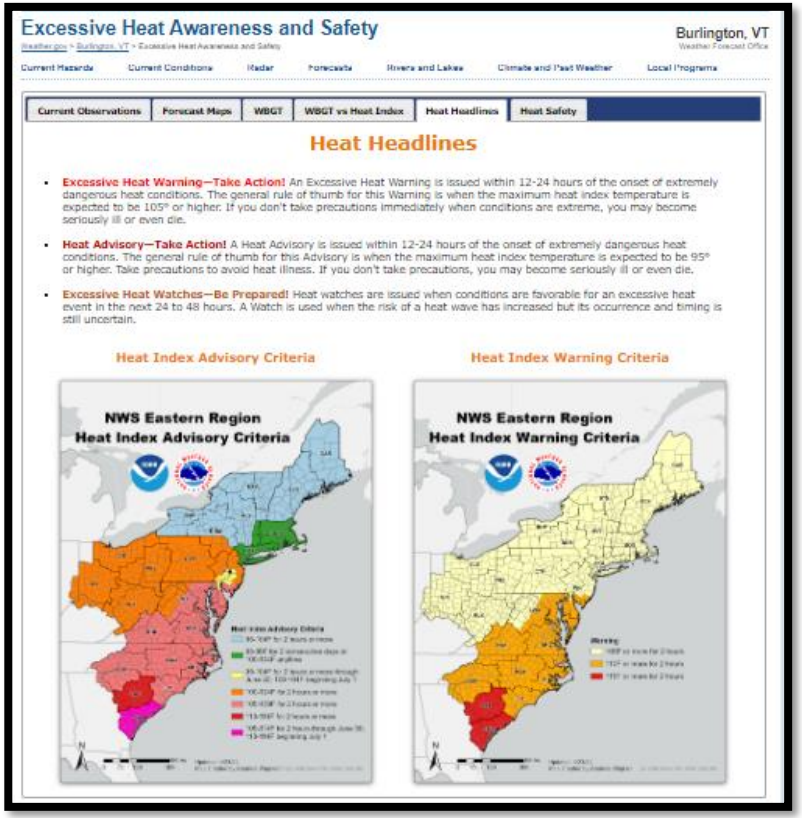
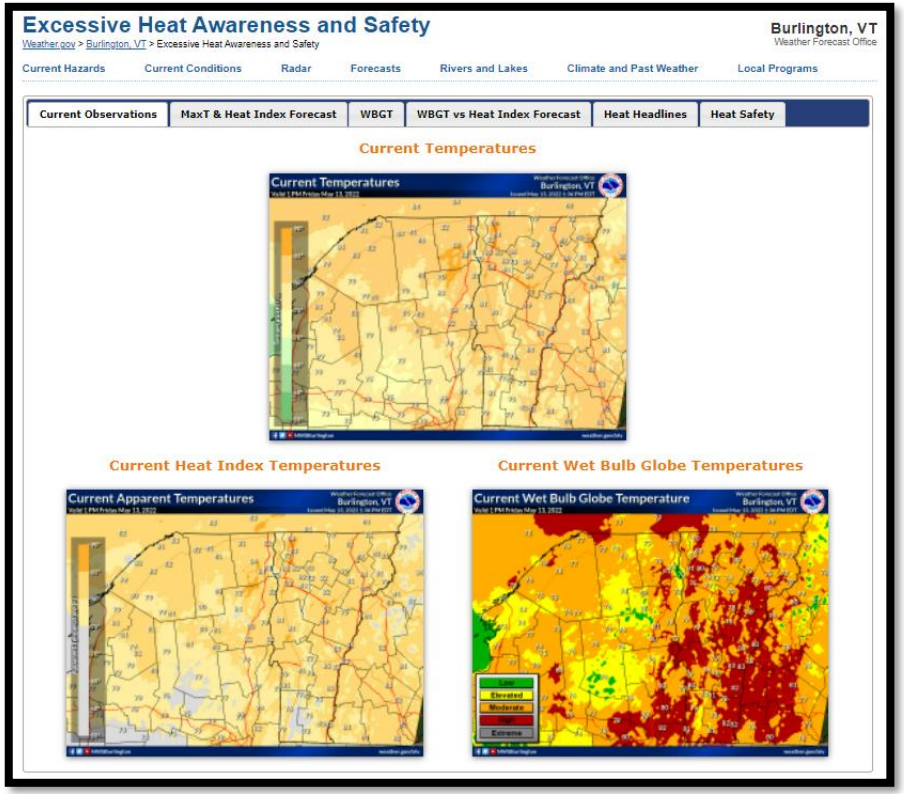


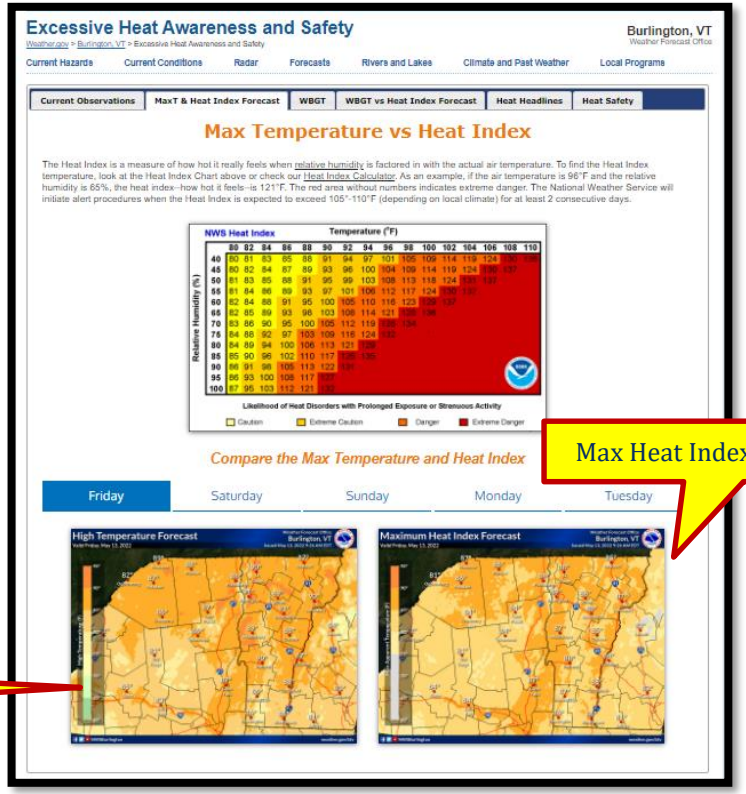
Current Observations

- **Current Observations**
  - Ambient, Apparent (HI) and WBGT



Max T & Heat Index Forecast

- Max T and Heat Index Forecast
  - Daily forecast for Days 1-5



Max Ambient (Air) Temperature

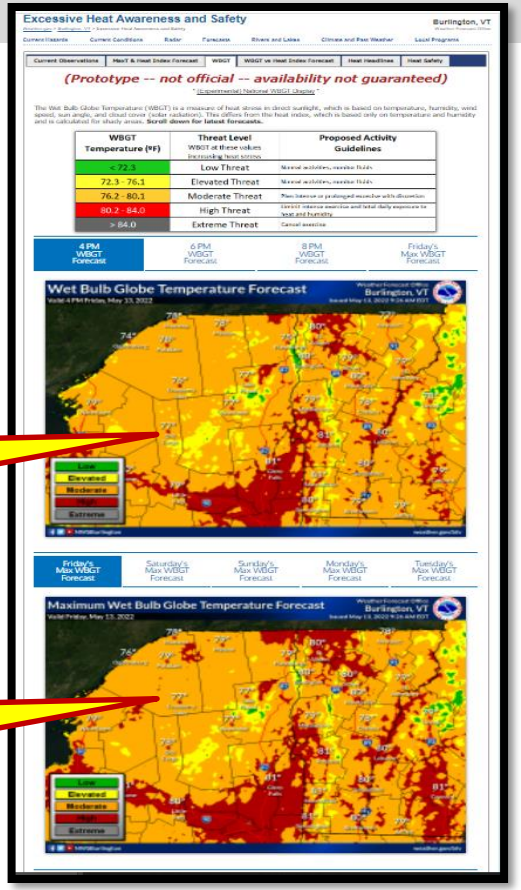
NWS Burlington NEW Heat Page - www.weather/gov/btv/heat

WBGT

- WBGT (Wet Bulb Globe Temperature)
  - The WetBulb Globe Temperature (WBGT) is a measure of the heat stress in direct sunlight, which takes into account: temperature, humidity, wind speed, sun angle and cloud cover (solar radiation).
  - If you work or exercise in direct sunlight, this is a good element to monitor.
  - Military agencies, OSHA and many nations use the WBGT as a guide to managing workload in direct sunlight.
  - Day 1 WBGT Forecast 10 am to 8 pm (every 2 hours)
  - Max WBGT for Days 1-5

WBGT Day 1 Forecast for (10 am to 8 pm)

Max WBGT Days 1-5



Resources

- General WBGT Information (Wiki page)
- American College of Sports Medicine (ACSM), [position stand]
- Korey Stringer Institute
- University of Georgia Research [AMS conference presentation]
- WBGT Research
- OSHA Heat Hazard Assessment and WBGT
- Department of the Army: Prevention of Heat and Cold Casualties
- Department of the Army: WBGT, Guidelines, Prevention

WBGT vs. Heat Index Forecast

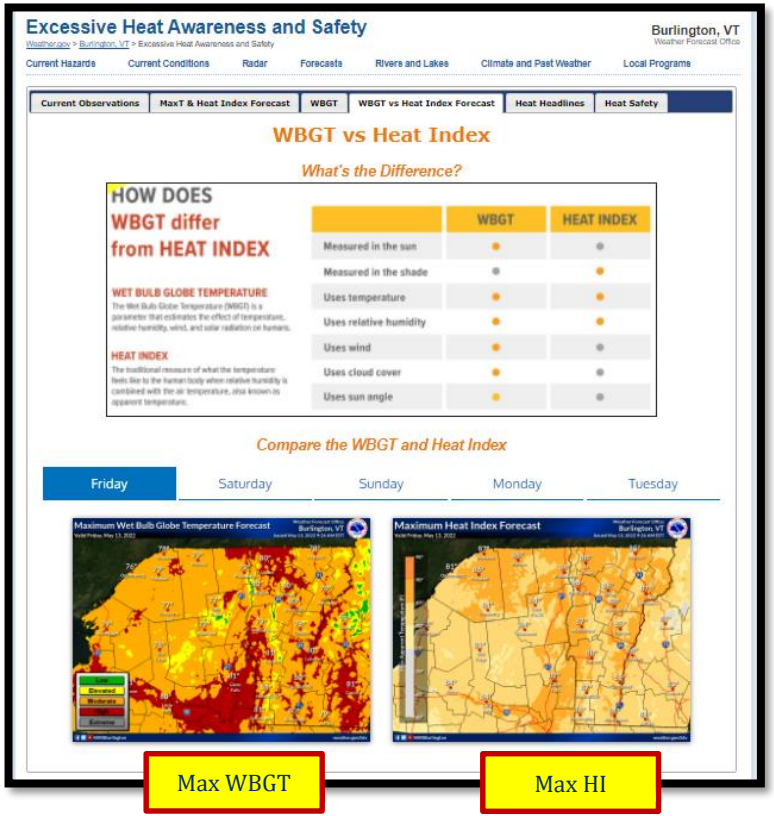
- WBGT vs. Heat Index Forecast
  - Days 1-5 Forecast comparing Heat Index and WBGT

HOW DOES WBGT differ from HEAT INDEX

WET BULB GLOBE TEMPERATURE
The Wet Bulb Globe Temperature (WBGT) is a parameter that estimates the effect of temperature, relative humidity, wind, and solar radiation on humans.

HEAT INDEX
The traditional measure of what the temperature feels like to the human body when relative humidity is combined with the air temperature, also known as apparent temperature.

	WBGT	HEAT INDEX
Measured in the sun	●	●
Measured in the shade	●	●
Uses temperature	●	●
Uses relative humidity	●	●
Uses wind	●	●
Uses cloud cover	●	●
Uses sun angle	●	●



Max WBGT

Max HI

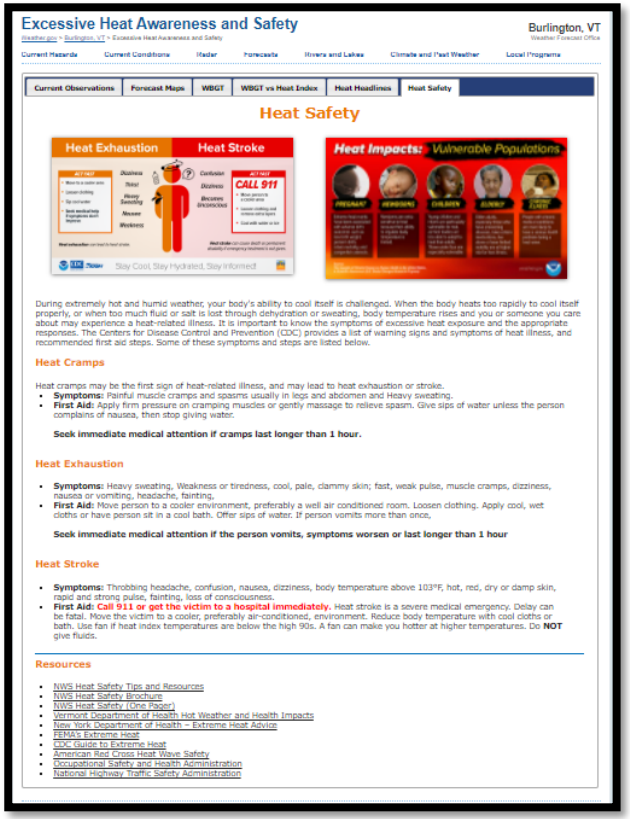
NWS Burlington NEW Heat Page - www.weather/gov/btv/heat

Heat Safety

- Heat Safety
  - Quick Heat Safety Tips
  - Links to Various Heat Safety resources

Resources

- NWS Heat Safety Tips and Resources
- NWS Heat Safety Brochure
- NWS Heat Safety (One Pager)
- Vermont Department of Health Hot Weather and Health Impacts
- New York Department of Health – Extreme Heat Advice
- FEMA's Extreme Heat
- CDC Guide to Extreme Heat
- American Red Cross Heat Wave Safety
- Occupational Safety and Health Administration
- National Highway Traffic Safety Administration



Future

- According to VT Department of Health's Heat Vulnerability in Vermont report (May 2016)*, working with the Vermont State Climate office.

- **Hot Day** ~ statewide average temperature ≥87F°
  - Since 2000: **Observed** average is 7-9 days/per year
  - Mid-century: **Forecast** is 15 to 20 days/per year
  - End of century: **Forecast** is 20 to 34 days/per year

*https://www.healthvermont.gov/sites/default/files/documents/2016/12/ENV_EPHT_heat_vulnerability_in_VT_0.pdf

Questions?

- NWS Burlington webpage – www.weather.gov/btv
- NWS Burlington Heat Safety Webpage – www.weather.gov/btv/heat
- **If you need to reach a forecaster 24/7**, then please use the following contacts. 802-658-0150 or nwsbtv.info@noaa.gov
- Scott Whittier – scott.whittier@noaa.gov