

Heat Waves and Hot Weather in North Carolina

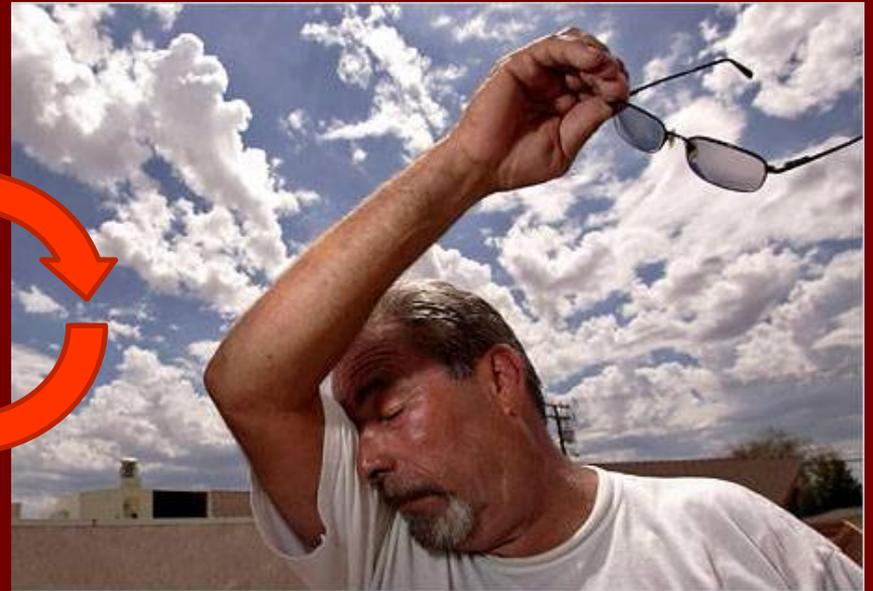
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University of North Carolina at Chapel Hill

What is a heat wave?

Heat waves can be defined meteorologically...

...or by the impact they have on our lives



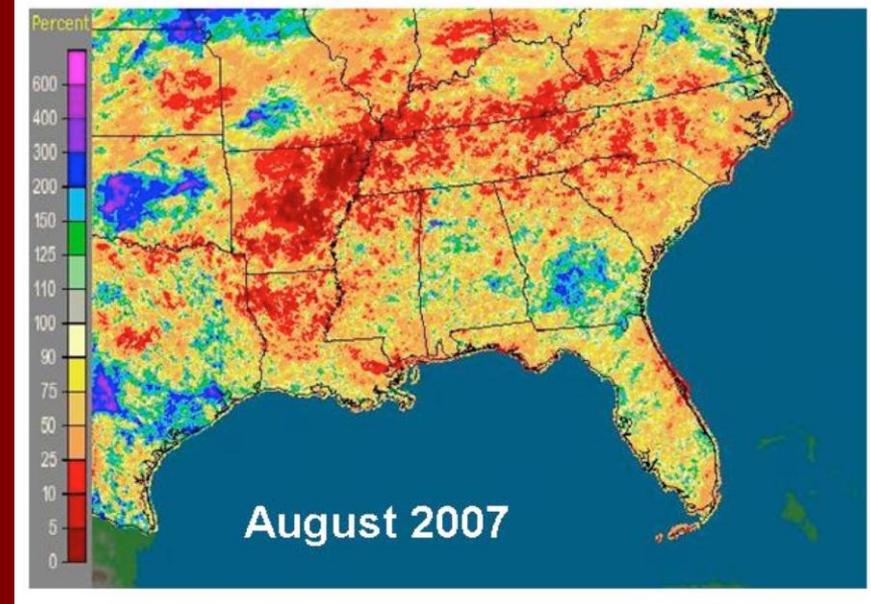
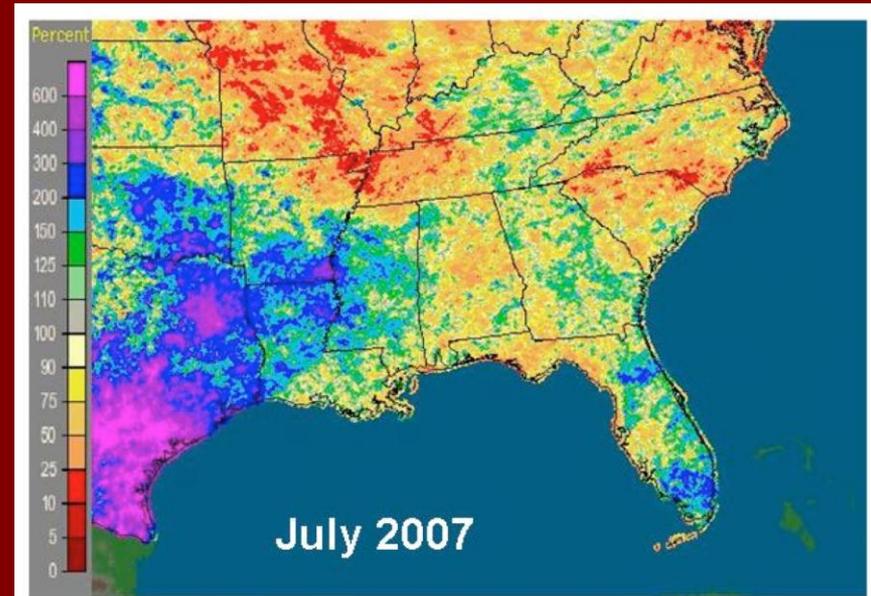
What Contributes to Extreme Heat in North Carolina?

Surface Conditions

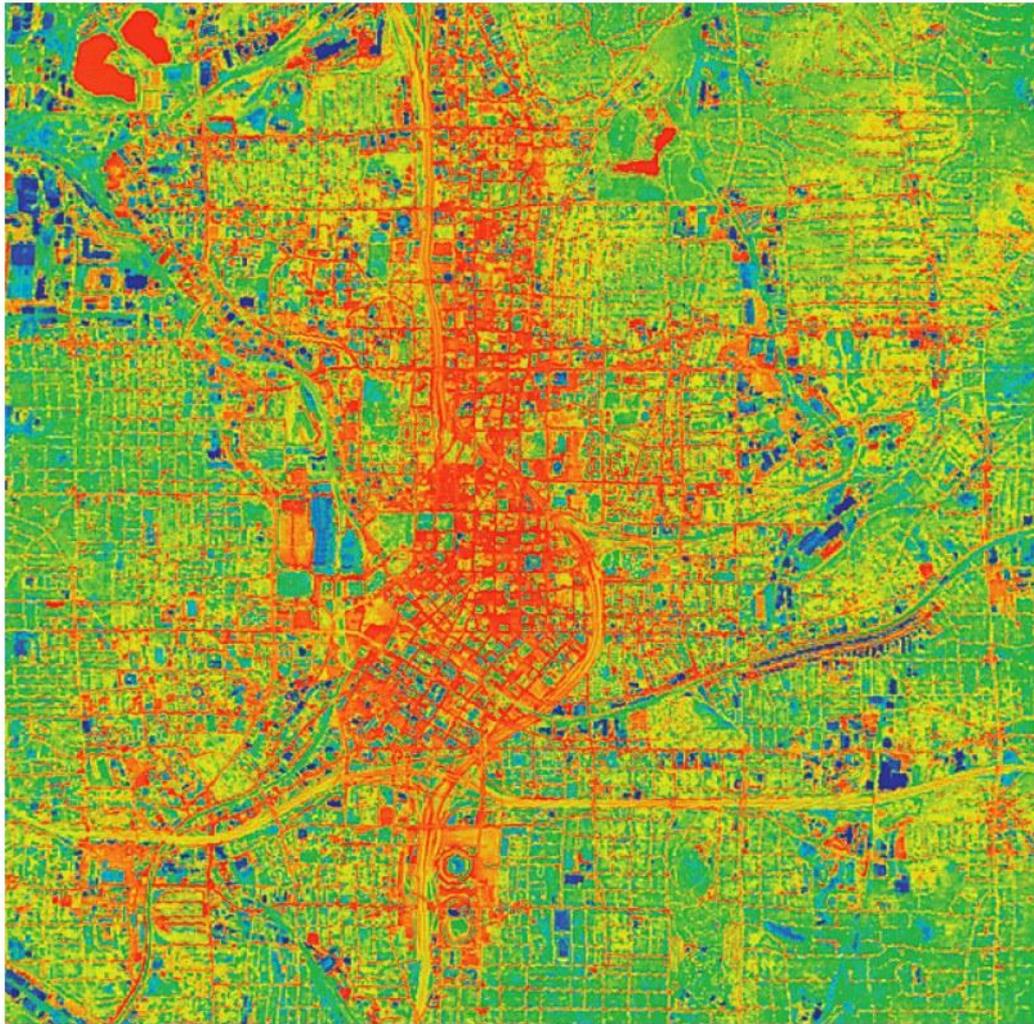
A dry surface, both in situ and upwind, leads to lower evapotranspiration and a greater sensible heat flux

Rainfall anomalies leading up to and associated with the August 2007 heat wave

Red = less than 25% of normal rainfall

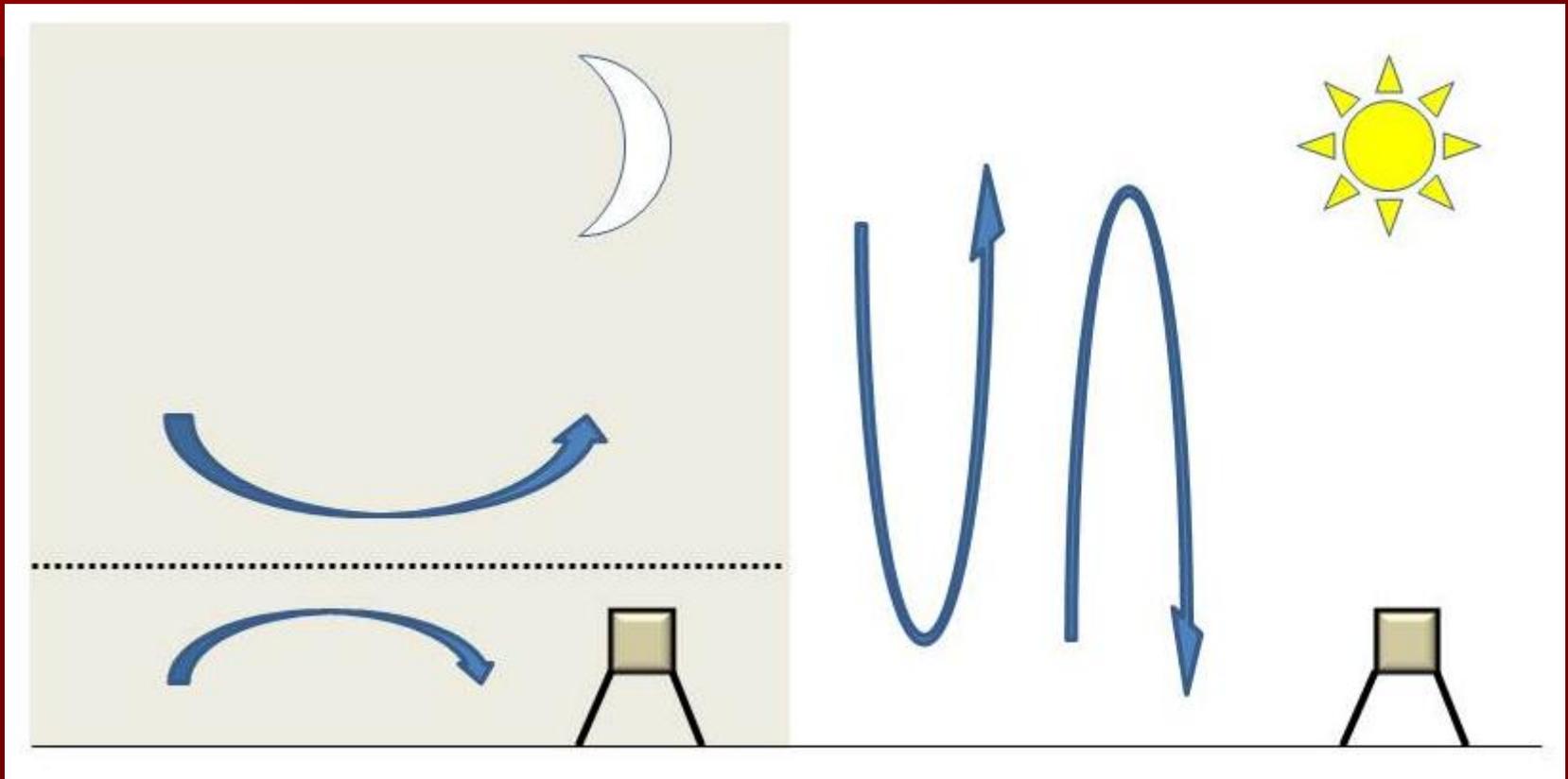


“Urban Heat Island”



This image, taken at night in May, over downtown Atlanta, Georgia, shows the urban heat island. The main city area, in tones of red and yellow, is clearly warmer than the suburban area, in blue and green. The street pattern of asphalt pavement is shown very clearly as a red grid, with many of the downtown squares filled with red. (Courtesy NASA/EPA)

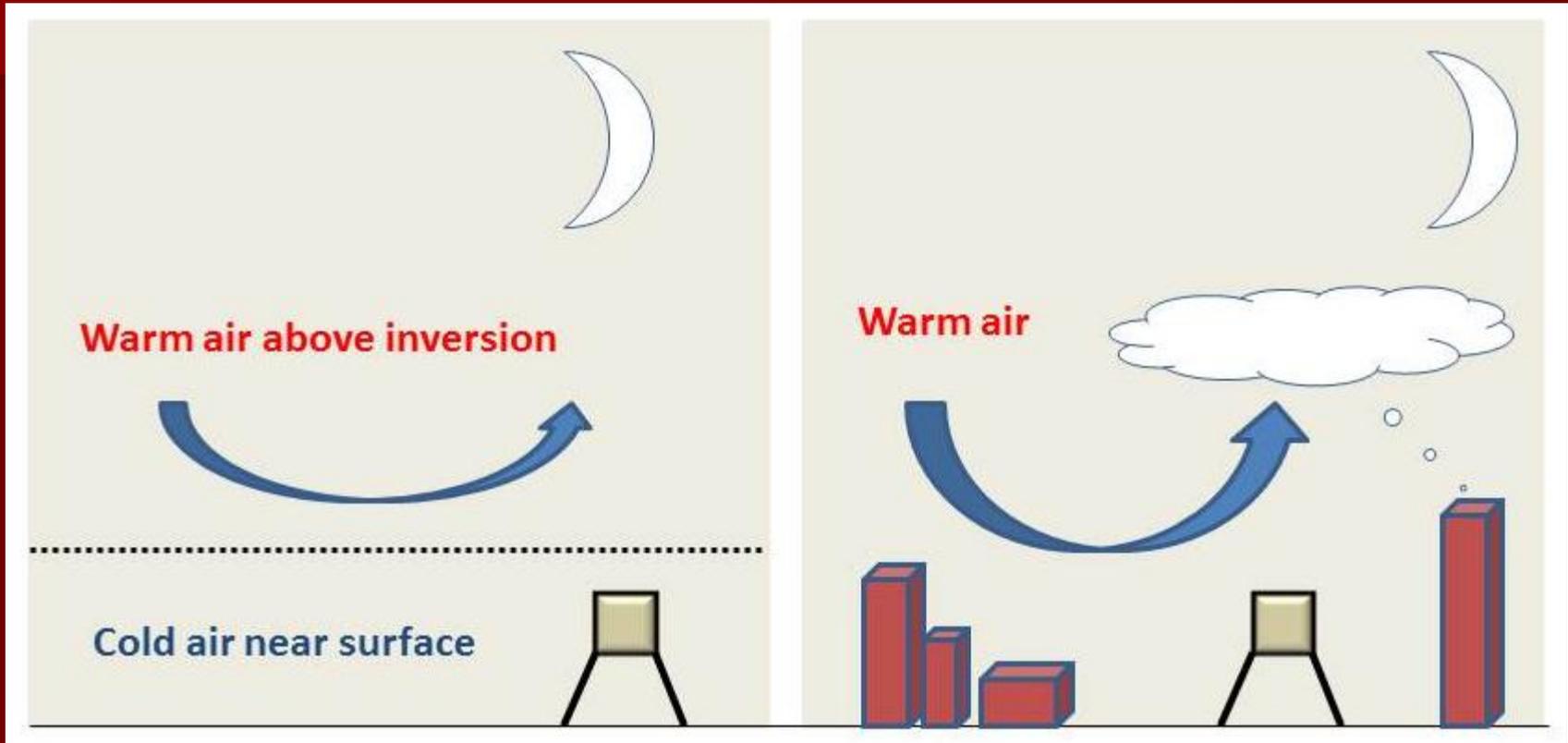
Day vs. Night Surface Temperature



Nighttime

Daytime

Night Surface Temperature



Nighttime undeveloped

Nighttime developed

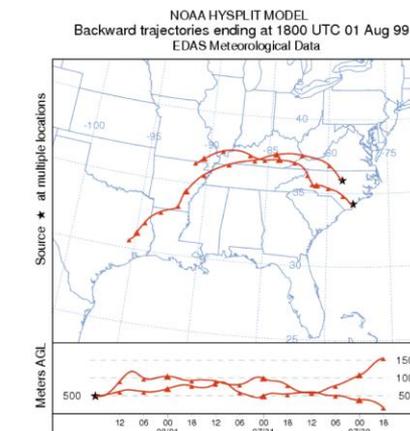
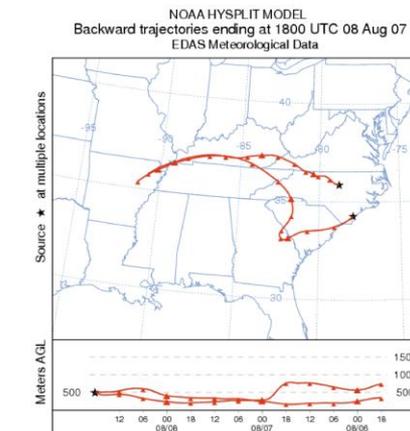
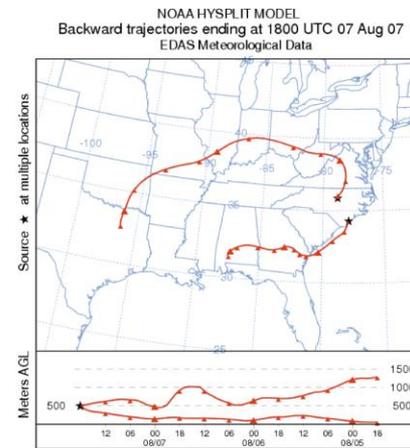
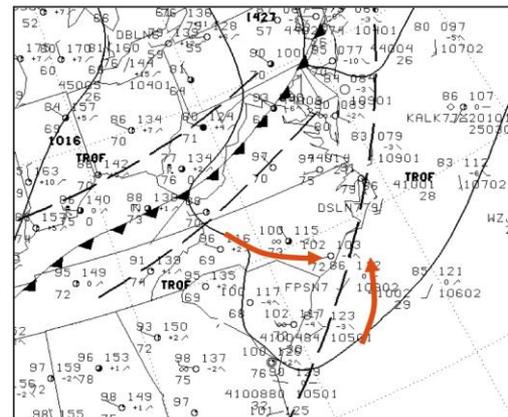
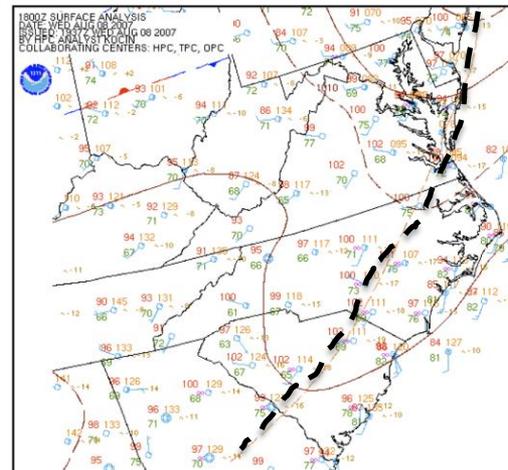
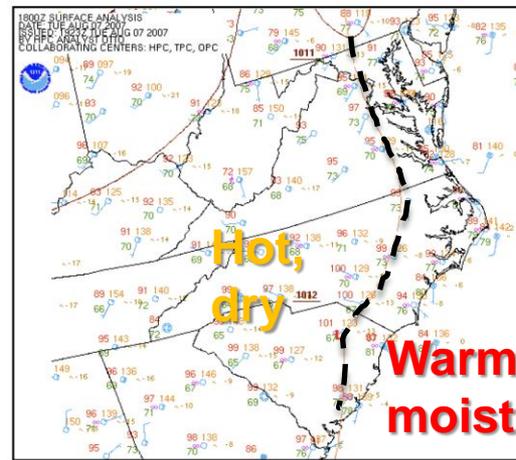
Coastal Effects and Positioning of the “Thermal Trough”

Influence the boundary layer wind direction:

Hot, dry continental air vs. warm, moist maritime air

Affects solar insolation (cloud cover)

Inland penetration of the sea breeze helps moderate afternoon temperatures along the coast

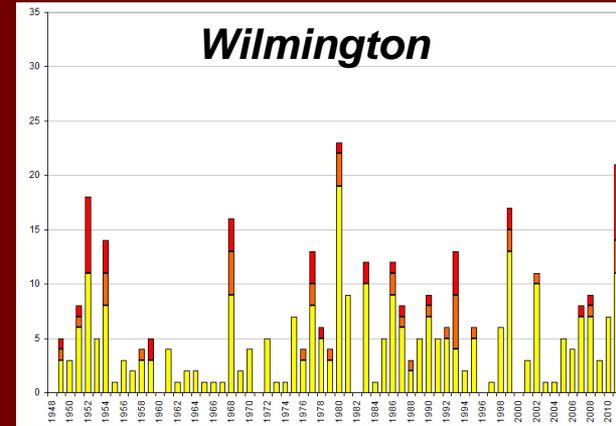
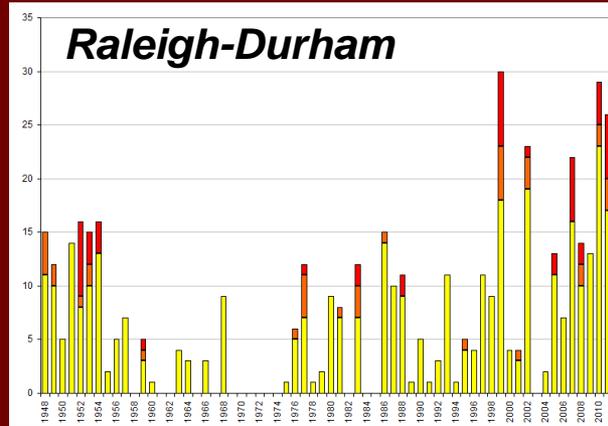
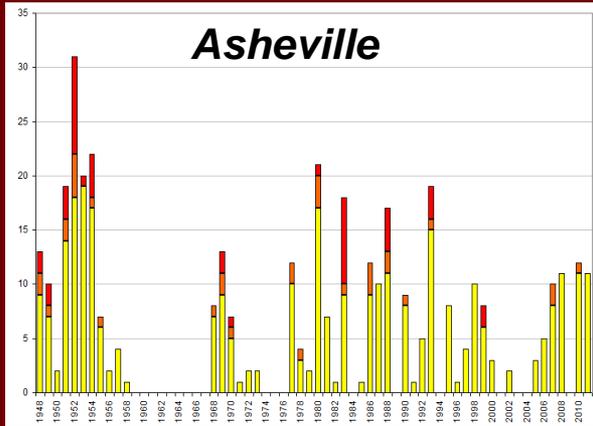


Frequency of Extreme Summer Heat in North Carolina:

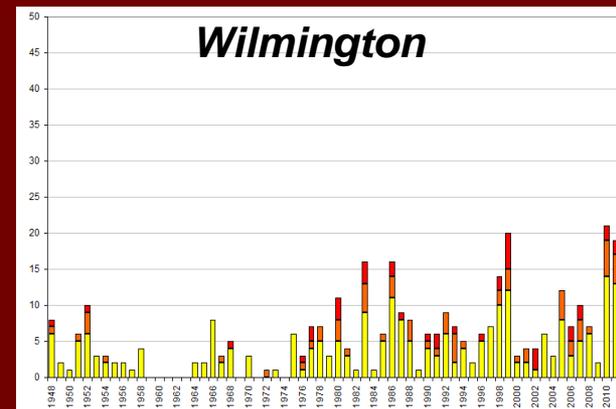
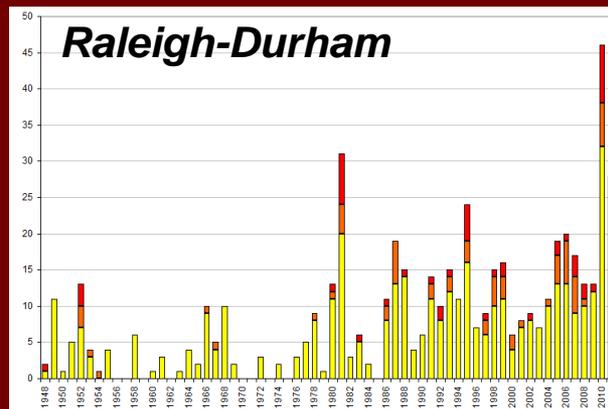
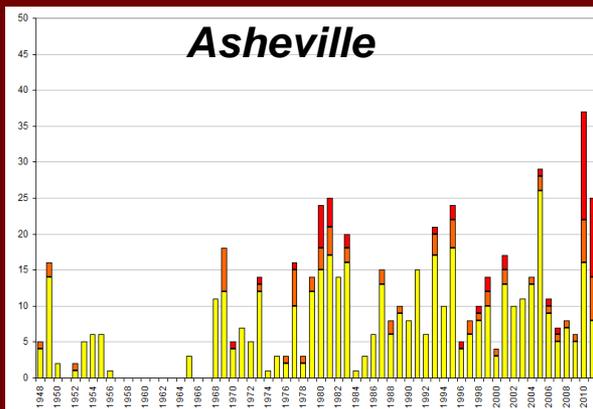
Is the recent heat part of a long-term trend?

Frequency of Extreme Heat Days During Summer Months (1948-2011)

Daily Maximum Temperature Extremes



Daily Minimum Temperature Extremes



Forecasting for Extreme Heat

- NOAA's Watch, Warning, & Advisory Products:
 - Based on the **heat index (HI)**: combines air temperature and humidity to obtain an estimate of how it “feels” to the human body
 - National Weather Service (NWS) will initiate alert procedures when the HI is expected to exceed **105°** or 100° (depending on local climate) for at least **2 consecutive days** or exceed 115° for at least 1 hour
 - HI values forecast at 3-hour intervals out to 72-hours
 - **IMPORTANT**: HI temperatures are for shady conditions! If in direct sunlight, add as much as 15°

“When you just can’t sweat it out”

NOAA's National Weather Service

Heat Index

Temperature (°F)

Relative Humidity (%)	Temperature (°F)															
	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	126	130					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

- Caution
- Extreme Caution
- Danger
- Extreme Danger

Each NWS office can issue the following products as warranted:

- Excessive Heat Watch
 - Conditions favorable in the next 12-36 hours
 - Intensity and timing of heat uncertain
 - Begin preparations
- Excessive Heat Advisory
 - Extreme heat expected in next 12-36 hours
 - HI $\geq 105^{\circ}\text{F}$ expected for at least 3 hours
 - Conditions may pose serious threat if action not taken
- Excessive Heat Warning
 - Same as advisory, except threshold is $\geq 110^{\circ}$
 - Conditions pose serious threat to life and property



Wilmington, NC

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Point and Click Forecast Map (Description)

Click on the map below for the latest forecast.



[Read watches, warnings & advisories](#)



- Heat Advisory
- Special Weather Statement
- Hazardous Weather Outlook

Last map update: Fri, Aug. 5, 2011 at 12:02:33 pm EDT

Choose from the options below for other ways to view your NWS forecast

[Text Forecasts](#)



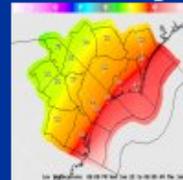
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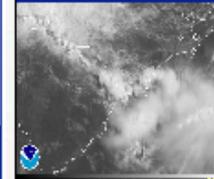
Watches/Warnings



Wilmington Radar



Satellite



Surface Analysis



339 am EDT sun Aug 7 2011

...Heat advisory in effect from noon today to 9 PM EDT this evening...

The National Weather Service in Raleigh has issued a heat advisory...which is in effect from noon today to 9 PM EDT this evening.

* Location...southern Piedmont...coastal plain...and sandhills

* temperatures and heat index...high temperatures this afternoon are expected to be in the upper 90s with heat indices of 105 to 108 expected.

* Timing...the heat will be most dangerous this afternoon.

* Impacts...prolonged exposure to these hot and humid conditions can quickly lead to dehydration and heat related illnesses.

Precautionary/preparedness actions...

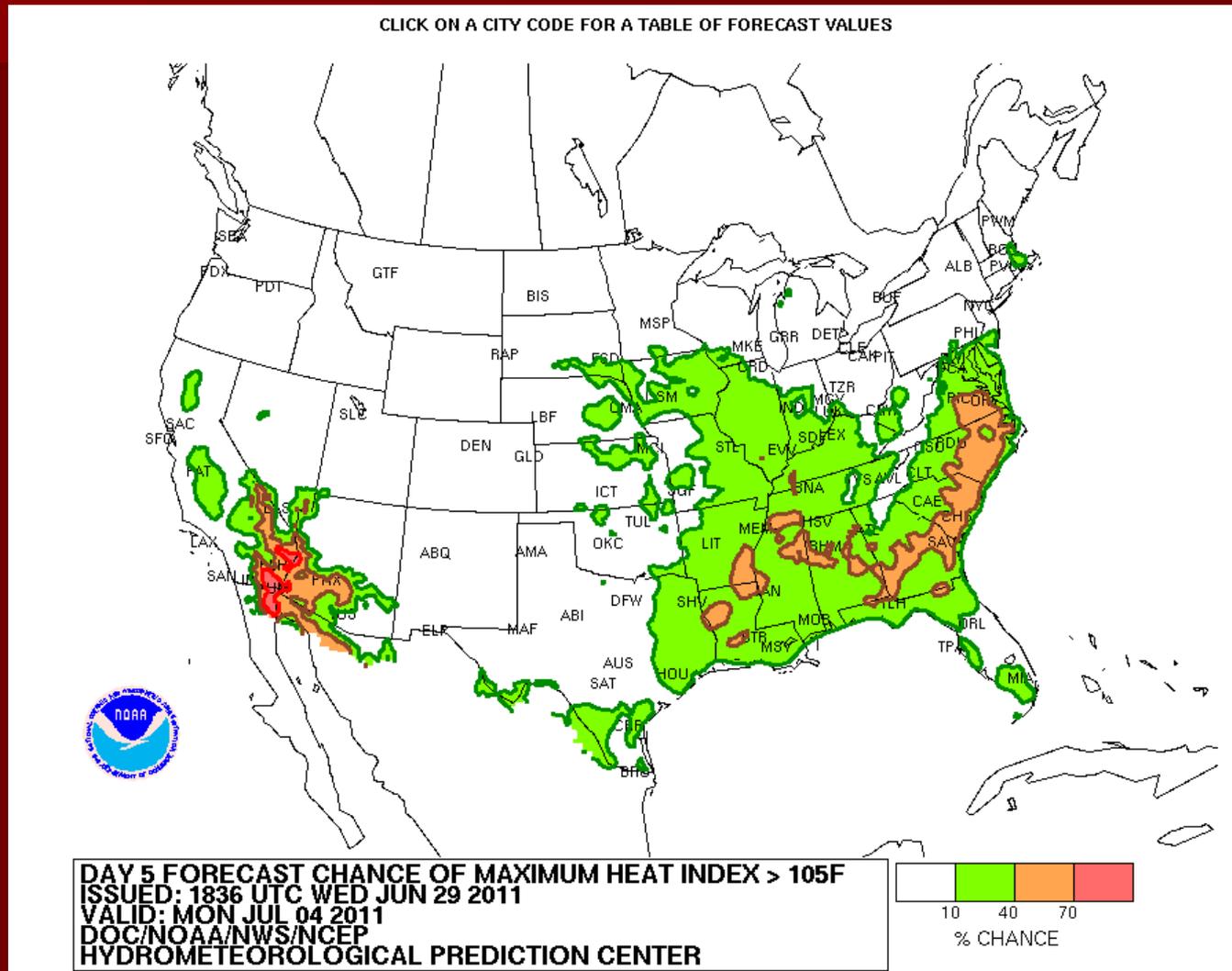
A heat advisory means that a period of hot temperatures is expected. Hot temperatures and high humidity will combine to create a situation in which heat illnesses are possible. Drink plenty of fluids...stay in an air-conditioned room...stay out of the sun...and check up on relatives and neighbors.

Take extra precautions if you work or spend time outside. When possible... reschedule strenuous activities to early morning or evening. Know the signs and symptoms of heat exhaustion and heat stroke. Wear light weight and loose fitting clothing when possible and drink plenty of water.

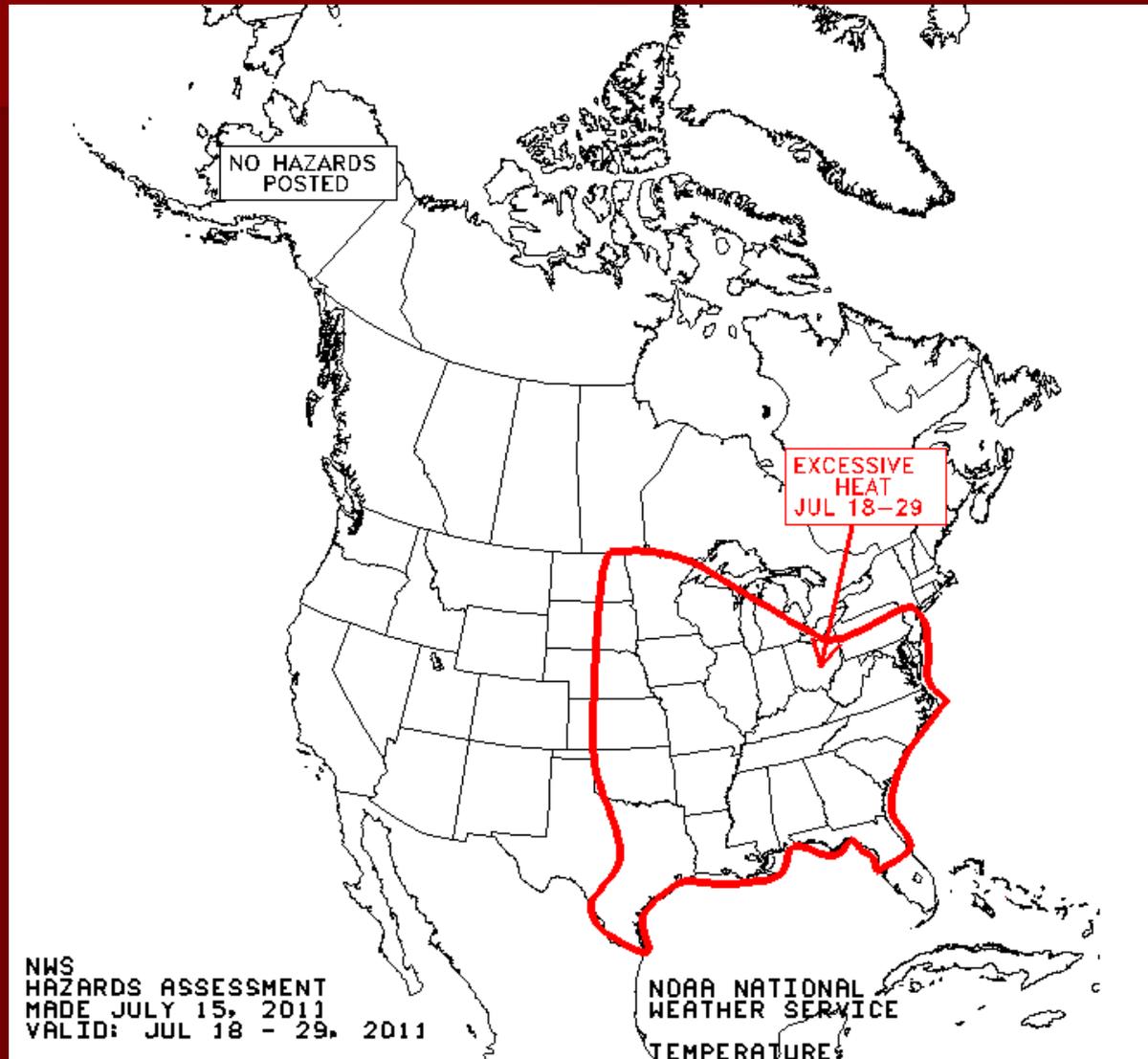
To reduce risk during outdoor work the occupational safety and health administration recommends scheduling frequent rest breaks in shaded or air conditioned environments. Anyone overcome by heat should be moved to a cool and shaded location. Heat stroke is an emergency - call 911.

Includes
statements on
risk and safety
during extreme
heat/humid

NOAA's Hydrometeorological Prediction Center also issues Excessive Heat Outlooks (3-7 days)



NOAA's Climate Prediction Center is also working with the NWS to produce extended range heat wave forecasts...



Summary

- Periods of extreme heat are meteorological in nature, but “heat waves” are really defined by their impacts
- Heat waves often occur over broad areas (e.g. eastern U.S.), but there is much regional to local scale variability, and therefore differences in coping capacity
- Long-term trends in extreme heat vary considerably across NC – local conditions are the main drivers!
- NOAA provides both extended range and local forecasts that can help people and communities prepare for heat waves – Are they being used? Can they be improved?

Resources

- NOAA/NWS Forecasts (find your office):
 - <http://www.nws.noaa.gov>
- NOAA/NWS Guidelines
 - <http://www.nws.noaa.gov/om/heat>
 - <http://www.noaawatch.gov/themes/heat.php>
 - Also links to CDC, OSHA, and EPA resources
- Raleigh NWS: “Beat the H-E-A-T”
 - Hydrate – Education – Act Quickly – Take it Easy
 - <http://www.erh.noaa.gov/er/rah/heat>