Welcome to the NWS Heat Workshop

November 18, 2020

Introduction to the Public Program

Michelle Hawkins, PhD
Severe, Fire, Public, and Winter Weather Services Branch Chief

Kimberly McMahon
Public Weather Services Program Lead

Danielle Nagele, PhD
Public Weather Services Program Coordinator

Vanessa Pearce
Public Weather Services Program NRAP / WFO Wichita, KS Meteorologist

Service Program Team Members

AR - Lindsay Tardif-Huber

PR - Elizabeth Vickery

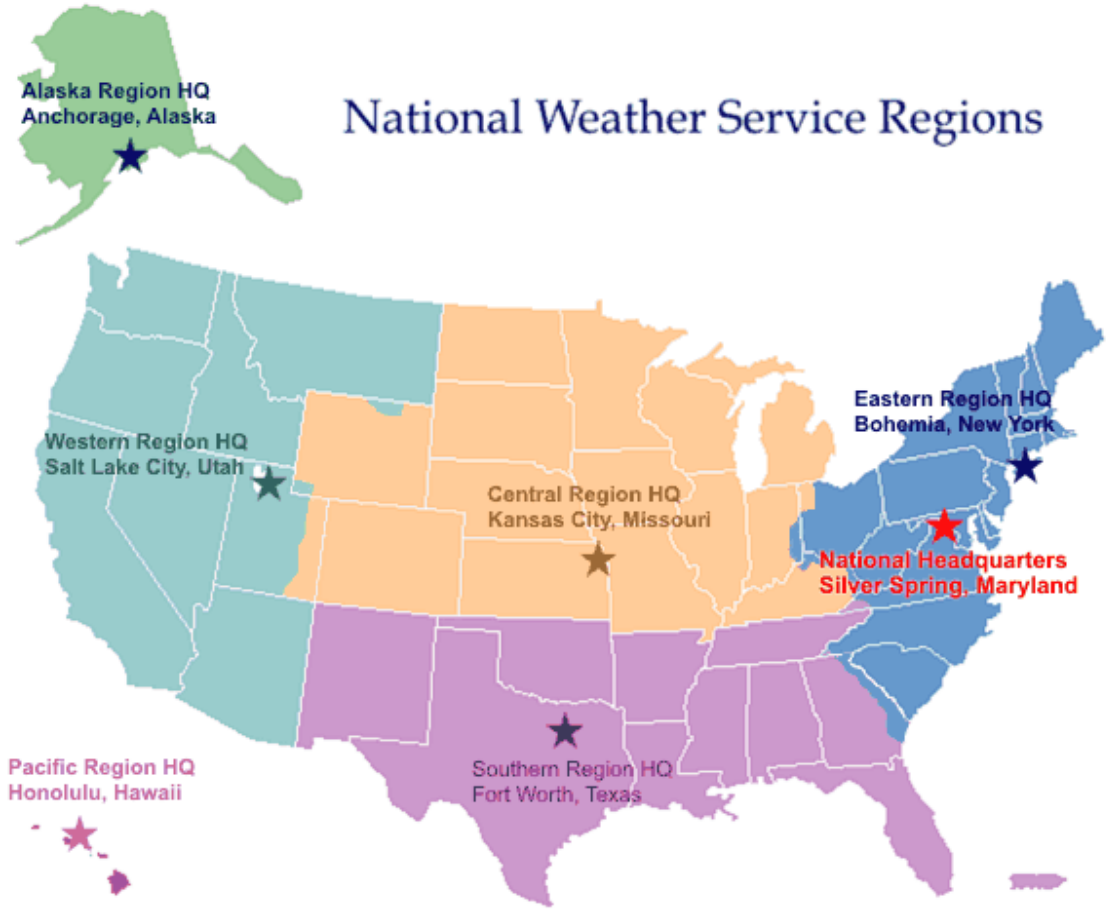
WR - Claudia Bell & Andrea Bair

CR - Derek Deroche

SR - Melinda Bailey

ER - John Koch

NCEP/WPC = Greg Carbin, Dave Novak, Alex Lamers,
Peter Suprenant, Jessica Doelling



Presenters...

Overview of Current NWS Heat Services:

NWS HQ - Danielle Nagele

NIHHIS Federal Partner Panel:

NIHHIS - Hunter Jones & Juli Trtanj

CDC - Paul Schramm

NIH - Jim Remington

ECCC - Didier Davignon and Melissa MacDonald

OSHA - Michael Hodgson

Heat Case Study Presenters...

SR WFO New Orleans & Shreveport, LA - Danielle Manning & Charlie Woodrum, WCMs

Partner - Mel Gaspard, LA EM & Kenyatta Esters, LA Dept. of Health

WR WFO Phoenix, AZ - Paul Iniguez, SOO

Partner - Matthew Roach, AZ Dept. of Health Services

CR WFO Wichita, KS - Chance Hayes, WCM & Vanessa Pearce, Meteorologist

Partner - Keri Korthals, Butler County EM

ER WFO Burlington, VT - Scott Whittier, WCM

Partner - Jared Ulmer, VT Dept. of Health

Logistics

Moderator, Scribe, & Timekeeper

Rules of Engagement:

- Lines will be muted.
- Use the **Question Box** in ToGoWebinar to input your questions and comments. The moderator will track and read aloud your questions at the appropriate times.
  - Any questions in the Question Box we do not get to, will be archived to be answered after the workshop.
- If you are having side discussions, you are not listening.

We are recording! Recording and other materials will be shared.

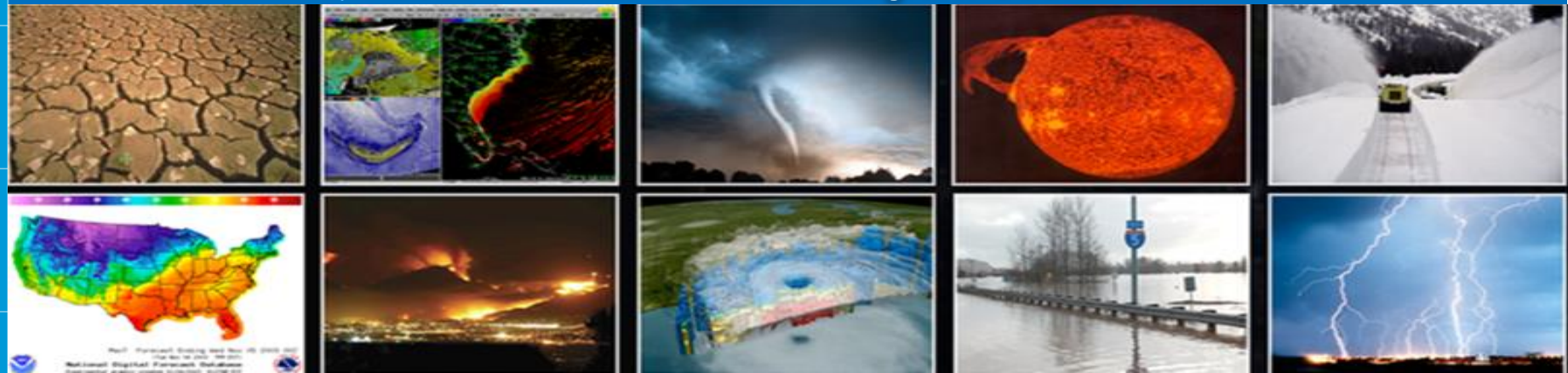
Public Weather Services Program

Analyze, Forecasts, and Support Office

NOAA National Weather Service

Danielle Nagele

Public Weather Services Program Coordinator



Outline:

- Overview of NWS
- Current operational heat products and services
- Legacy heat products
- Future heat tools
- Outreach and engagement materials
- Path forward

NOAA National Weather Service

Aviation Weather Center
Kansas City, MO

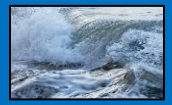
Storm Prediction Center
Norman, OK

National Hurricane Center
Miami, FL

Weather Prediction Center
College Park, MD

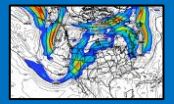
Climate Prediction Center
College Park, MD

National Water Center
Tuskaloosa, AL



Ocean
Prediction Center
College Park, MD

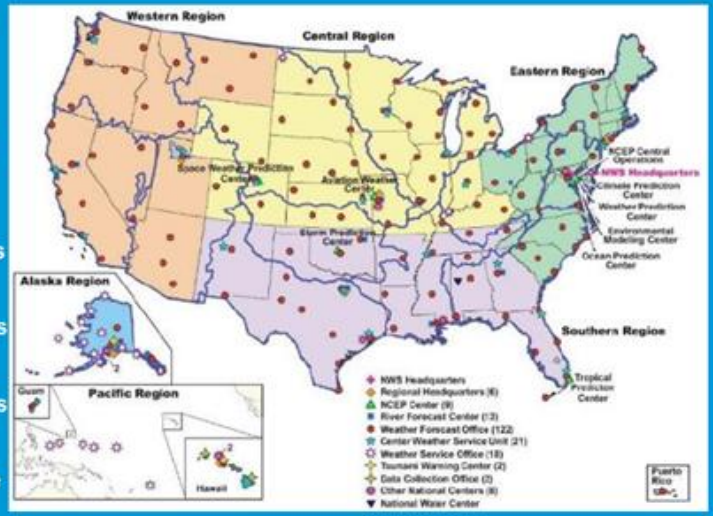
Space Weather
Prediction Center
Boulder, CO



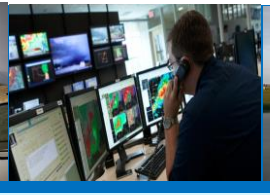
Environmental
Modeling Center
College Park, MD

NCEP Central Operations
College Park, MD
(Supercomputers in Reston & Orlando)

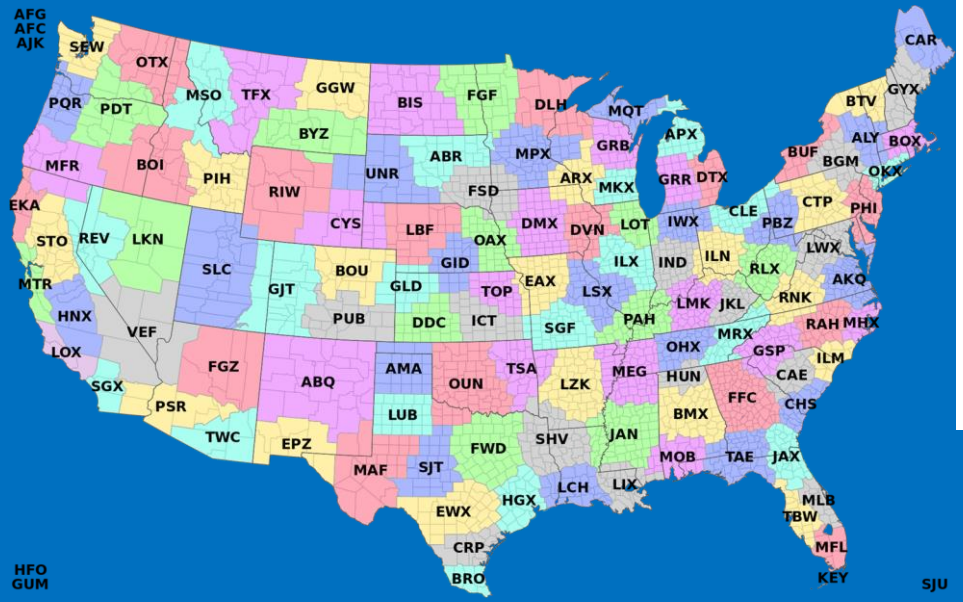
- National HQ & 6 Regional HQ
- 10 National Centers for Environmental Prediction
- 2 Tsunami Warning Centers
- 122 Weather Forecast Centers
- 13 River Forecast Centers
- 21 Center Weather Service Units

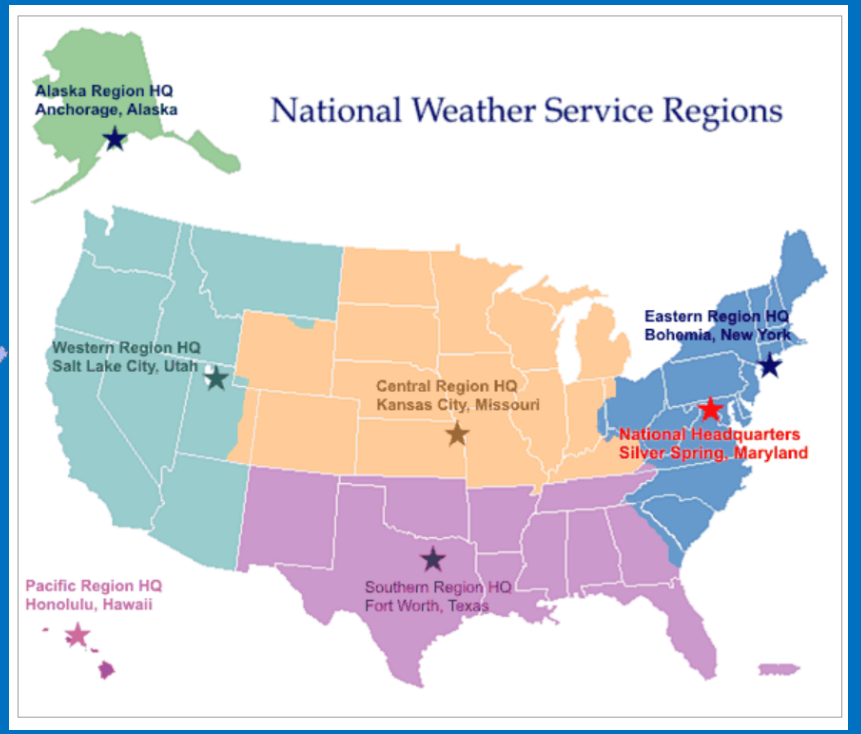


- Science & Technology Integration
- Observations
- Central Processing
- Dissemination
- Analyze, Forecast & Support

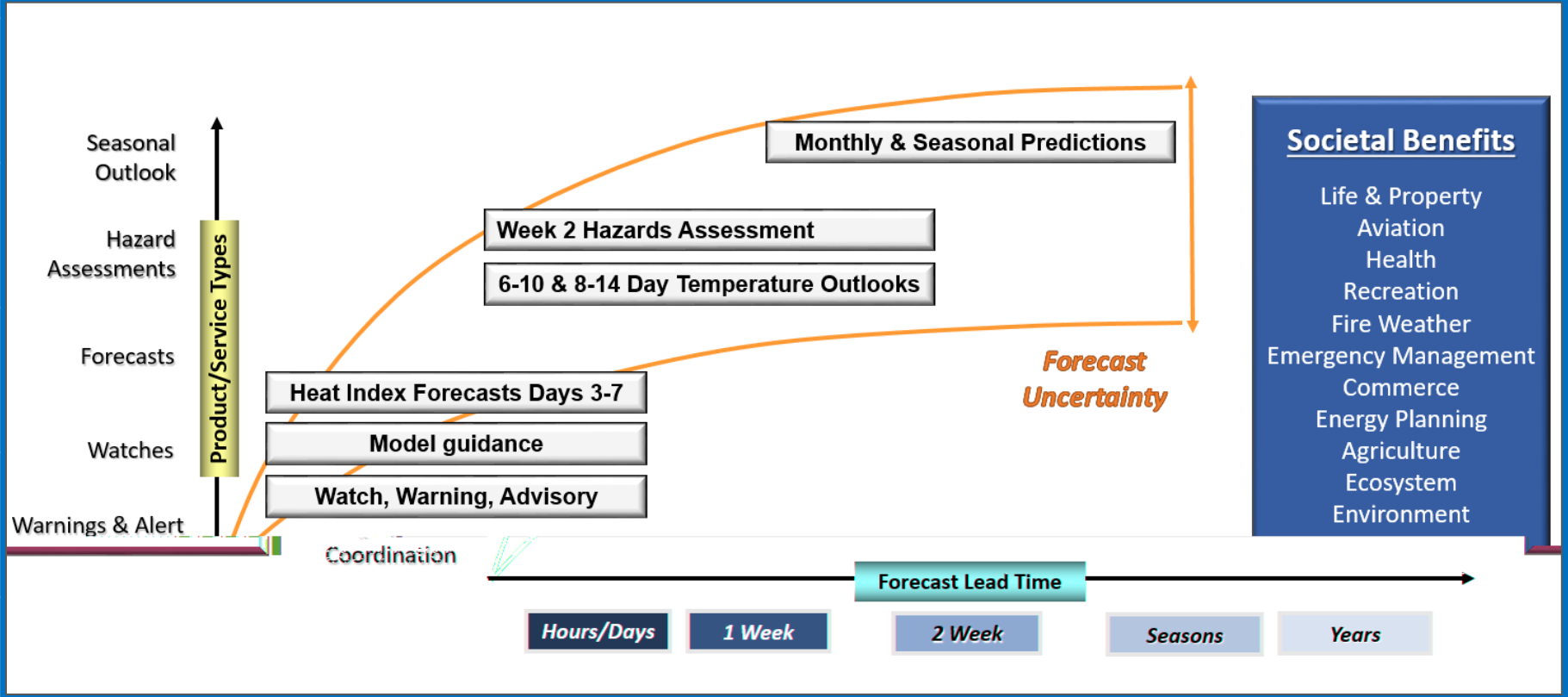


NWS Regions and WFOs

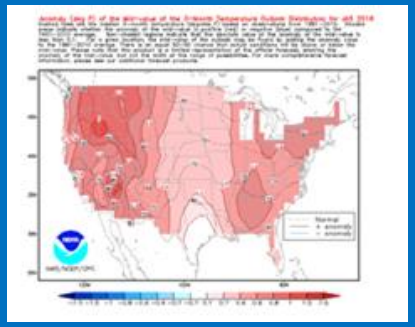


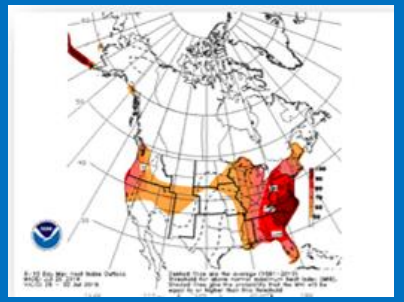


Operational Heat Products and Services



Long-Range and Climate:





Climate Prediction Center (CPC):

- 6-10 & 8-14 day Temperature Outlooks
- Maximum Heat Index Outlooks (April – Sept.)
- Week-2 Temperature Outlook
  - Advanced lead time for high-impact events
  - Potential Hazards for days 3-14
  - Much above normal temperatures: Temperature may approach/exceed the top 1/8 of historical range
  - Excessive heat – HI may reach heat indices greater than 105F
- Monthly and Seasonal Outlooks
- Probability of Exceedance Maps

Short- to- Medium-Range:

Weather Forecast Office (WFO) & Weather Prediction Center (WPC)

WFO & WPC expertise and model guidance → Forecasts displayed on National Digital Forecast Database (NDFD) → Impact Based Decision Support Services (IDSS) & Watch, Warning, Advisory (WWA)

Forecasters use their skills and expertise to manipulate model guidance to create forecast. Models include:

- Global Forecast System (GFS)
- North American Mesoscale Model (NAM)
- EU Centre for Medium Range Weather Forecasts (ECMWF)

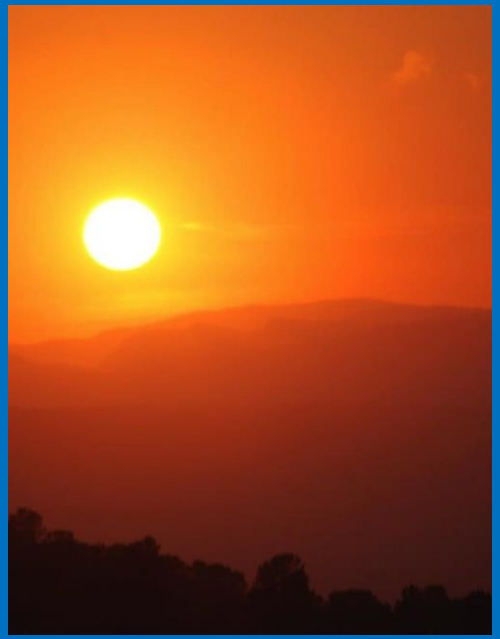
Gridded forecasts of weather elements displayed on NDFD:

- Temperature, heat index, dewpoint, cloud cover, wind speed, etc.

Heat WWA products provide information on upcoming or occurring heat events

IDSS - Targeted forecast advice and interpretive services to support core partners

Legacy Heat Products



Heat Index

- Issued daily May - September
- Deterministic forecast and probability of exceedance of max/mean/min Heat Index

Kalkstein Heat/Health Warning System

- Developed in the 1990s to help public health officials, meteorologists, and others predict, respond, and mitigate the impacts of heat waves
- Combines climatological information with health statistics (ie, CDC mortality data)
- Some NWS WFOs utilize this method; 10-15 WFOs have system at their disposal

NWS Heat Watch, Warning, Advisory (WWA)

Excessive Heat **Watch**	Conditions favorable for an excessive heat event to meet/exceed local heat warning criteria in the next 24 to 72 hrs
Heat **Advisory**	Heat Index values forecast to meet/exceed local heat advisory criteria for one to two days. **North**: HI>100 **South**: HI >105 Min nighttime lows >/=75
Excessive Heat **Warning**	Heat Index values forecast to meet or exceed locally defined warning criteria for at least two days. **North**: HI>105 **South**: HI >110 Min nighttime lows >/=75

Future Heat Tools

Wet Bulb Globe Temperature (WBGT)

What is it?

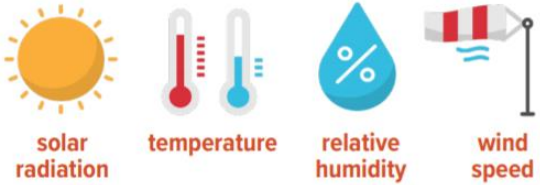
- Estimates the effect of temperature, humidity, wind, and solar radiation on the human body
- Effective indicator of heat stress for active populations

What are the benefits?

- Particularly useful for outdoor workers, athletes, people exercising or active outdoors, etc.
- Can help establish guidelines for activity modifications during exercise or outdoor work

Experimental in NDFD: https://digital.mdl.nws.noaa.gov/
WBGT Handout

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



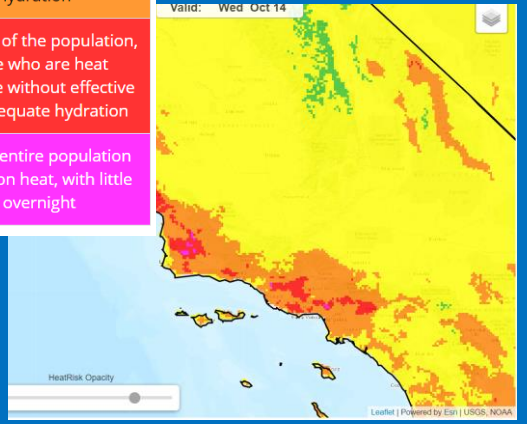
Future Heat Tools

HeatRisk

What does it take into account?

- How above normal temps are for a location
- Time of the year
- Duration of unusual heat
- Overnight temps
- Difference between lows and highs

Category	Level	Meaning
Green	0	No Elevated Risk
Yellow	1	Low Risk for those extremely sensitive to heat, especially those without effective cooling and/or adequate hydration
Orange	2	Moderate Risk for those who are sensitive to heat, especially those without effective cooling and/or adequate hydration
Red	3	High Risk for much of the population, especially those who are heat sensitive and those without effective cooling and/or adequate hydration
Magenta	4	Very High Risk for entire population due to long duration heat, with little to no relief overnight



What are the benefits?

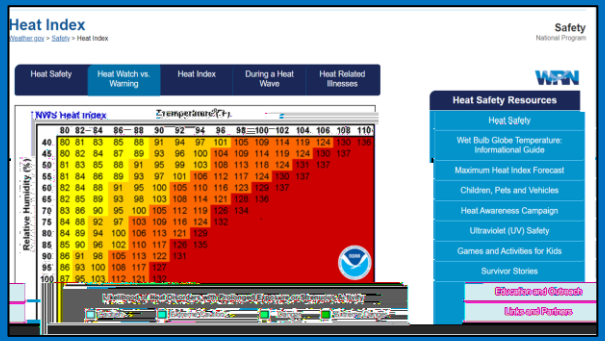
- Helps people understand what forecasted heat means to them
- Provides heat risk guidance for decision makers and heat sensitive populations who may need to take action below NWS heat product levels

Prototype in NWS Western Region

Outreach & Engagement Materials

Seasonal Safety Campaigns

Heat Safety Website



Agency collaborations: OSHA messaging in NWS heat products

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 lightweight and loose fitting clothing when possible. 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 9 1 1.

Social Media - National and Local

Graphics

Tentative Path Forward

November 2020	End of FY21	End of FY22	End of FY23 & beyond
Hold NWS Workshop • Use of NWS heat-related tools • Partner perspective on heat events, actions, and thresholds • Gaps and opportunities in NWS heat products, services, and messaging.	**Completion of NWS National Heat Strategy** • Analyze and Incorporate results of Workshop • Engagement and planning around heat messaging	**Test and refine elements of Heat Strategy** • Renaming of heat WWA products • Continue to elevate HeatRisk and potential for expanding • Develop communications strategy	**Fully implement Heat Strategy** • WBGT operational • Policy guidance updates as necessary • Fully updated outreach and education materials

Questions?

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Public Program NRAP

NIHHIS Federal Partner Panel

NWS Heat Workshop

November 18, 2020

Paul Schramm

CDC Centers for Disease Control and Prevention

Panel Moderator:
Hunter Jones

NIHHIS National Integrated Heat Health Information System

Jim Remington

NIH National Institutes of Health
Turning Discovery Into Health

Aaron Tustin

OSHA® Occupational Safety and Health Administration
www.osha.gov

Didier Davignon and Melissa MacDonald

Government of Canada / Gouvernement du Canada

Integrated Climate, Weather, and Health Information for:

Heat Health Planning, Preparedness, Response

Juli Trtanj

NOAA One Health and Integrated Climate Research Lead

National Integrated Heat Health Information System (NIHHIS)

NOAA Research / Climate Program Office

Hunter Jones

Climate & Health Projects Manager

National Integrated Heat Health Information System (NIHHIS)

NOAA Research / Climate Program Office

nihhis.cpo.noaa.gov

National Integrated Heat Health Information System

- NOAA and CDC launched the National Integrated Heat Health Information System (NIHHIS) in June of 2015 to address heat across timescales
- NIHHIS quickly grew to include representation from several agencies (right) in an interagency working group. The group launched the NIHHIS portal and began harmonizing information and guidance.
- NIHHIS has also launched regional, trans-boundary pilots to understand local decision-making contexts and needs, and to improve the information.

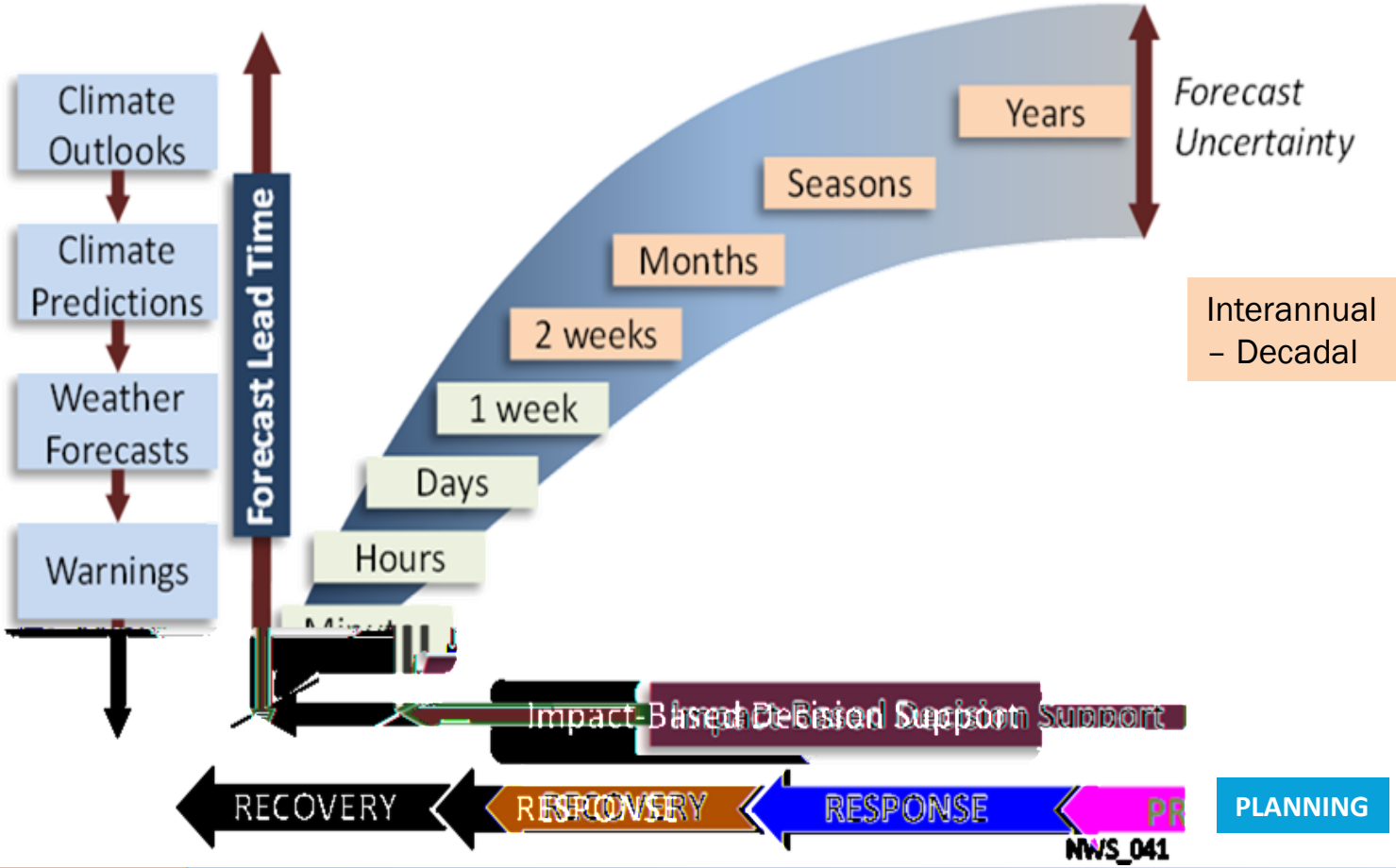
Ongoing activities include:

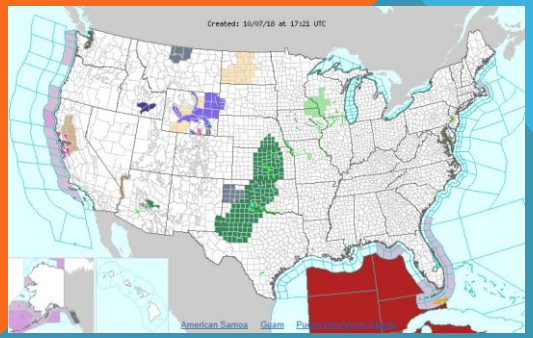
- 'Decision calendar' exercises to understand multi-disciplinary needs in the Northeast,
- New prototype products combining existing data,
- National projects to improve the utility of information such as Urban Heat Island campaigns.

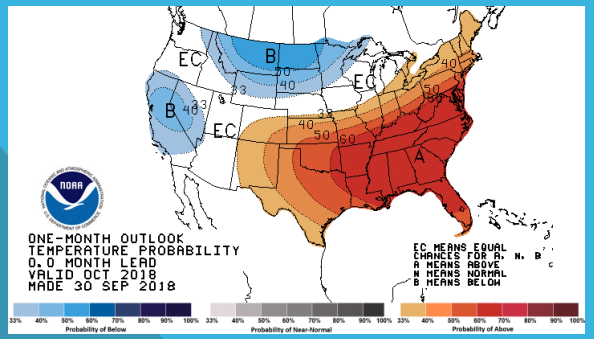
The National Integrated Heat Health Information System weaves together existing pieces, identifies information needs and helps to develop needed climate services.

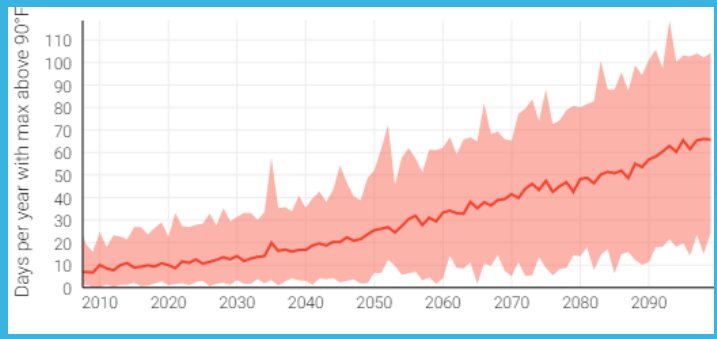
NIHHIS will facilitate an integrated approach to providing a suite of decision support services to reduce heat related illness and death

UNDERSTANDING DECISION TIMESCALES



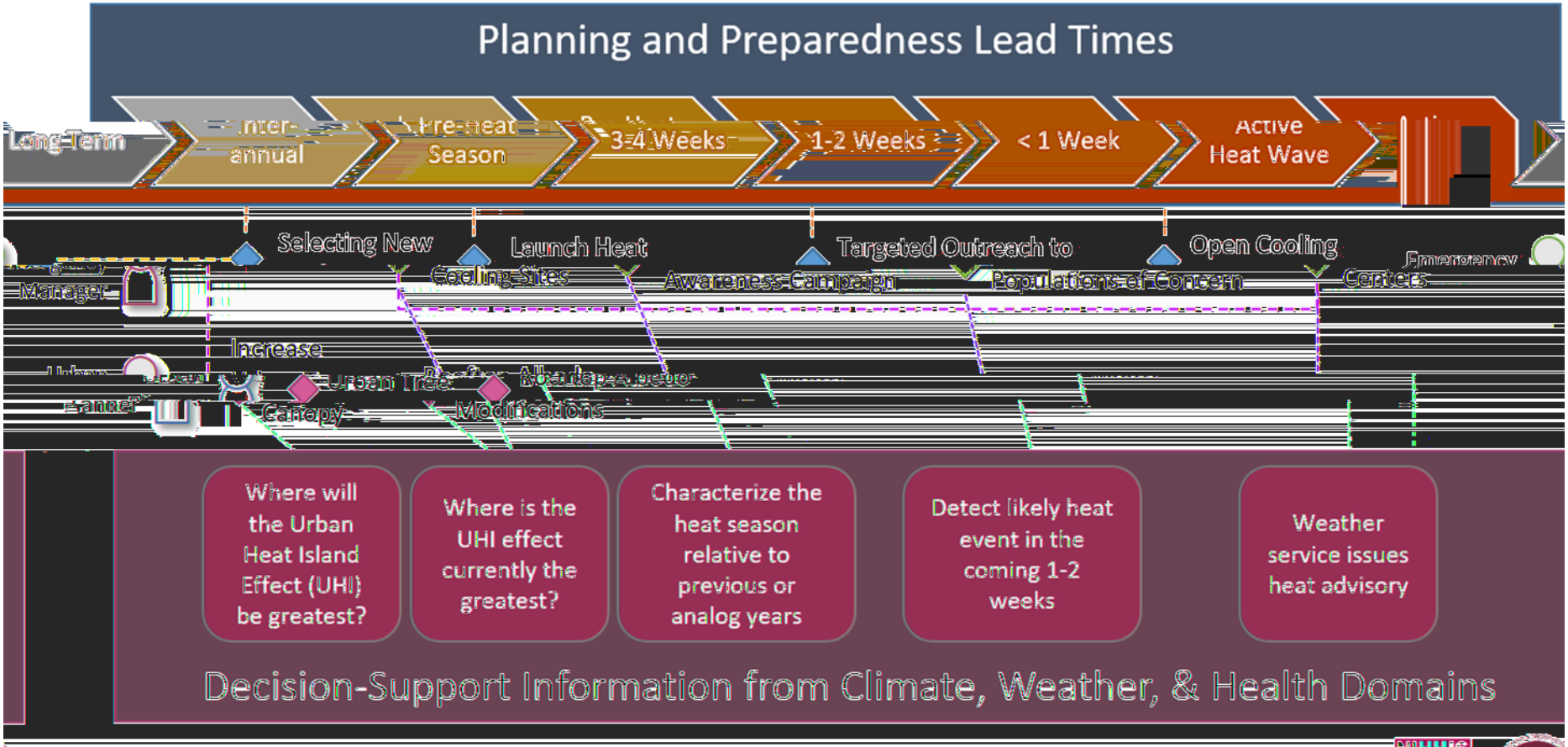




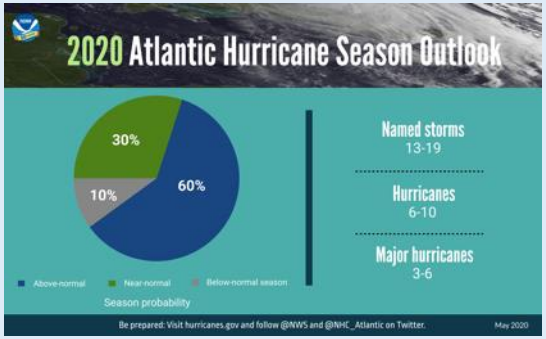


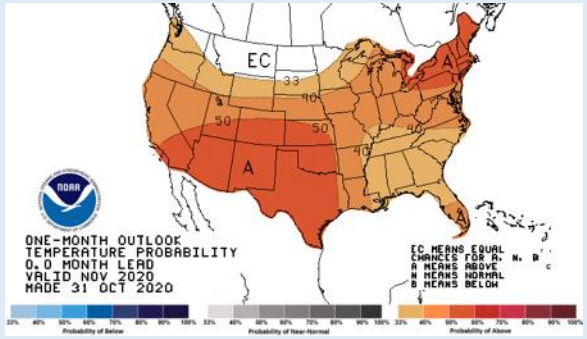
Mapping Decision Needs to Climate and Weather Services

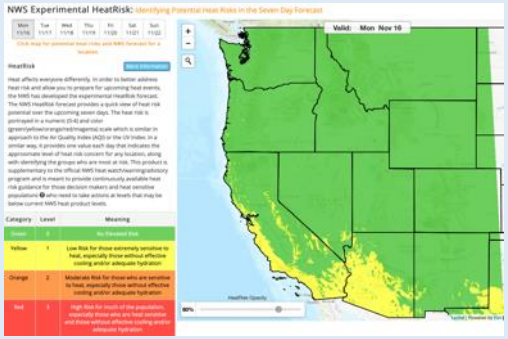
Decision Calendars are **boundary objects** – tools that allow decision makers, climate service providers, researchers, and others to work together to identify and document explicit information and research needs.



Jones, H. M., Mecray, E. L., Birkel, S. D., Conlon, K. C., Kinney, P. L., Silva, V. B. S., … Rogers, T. M. S. (2019). ***Understanding Decision Context to Improve Heat Health Information****. BAMS, 100(8), ES221–ES225. doi:10.1175/bams-d-19-0042.1*







Climate and Health Monitor & Outlook (August 2020 Heat Prediction)

Information about predicted dangerous high heat days, heat waves, and heat exposure to vulnerable population segments, based on the NOAA/CPC climate forecast for the forecast period.

Filter by State: (All)

Filter by County: (All)

Filter by Forecast Tercile: (All)

How to use this tool: The CHMO Heat Outlook Tool is designed to let users explore predicted heat event indicators and vulnerable population demographics a different geographic levels. The three filters to the left can be used to filter geographically based on **State**, **County**, or **Forecast Tercile**. Demographic statisti reflect the active geography filters (national, state, or counties). Hover over a county on the map to see specific heat event indicators for the forecast period and use the **Change Map** filter to visualize select indicators in the map.

Demographics

320,742,485
Total Population

6.1%
19,692,222
Population Under 5

15.3%
48,914,198
Population Over 65

8.4%
26,897,862
Population 65+ in Poverty

1.9%
6,160,503
Population Over 85

Heat Exceedance Days by County

Change Map: Heat Exceedance Days

0 1 2 3 4 5 6 7 8

© 2020 Mapbox © OpenStreetMap

Mora County, New Mexico ('Above' Tercile)

This map shows the predicted number of days in the forecast period that will exceed the red threshold temperature. In Aug-20 the average number of heat exceedance days is predicted to be **12** with a min and max between **5** and **22** days. For comparison, the 'middle tercile' forecast number of heat exceedance days is **5**.

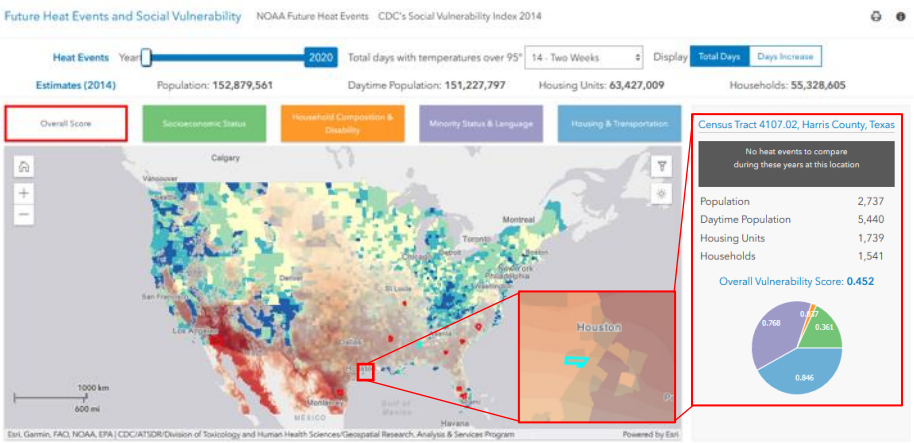
Predicted Exposure Events

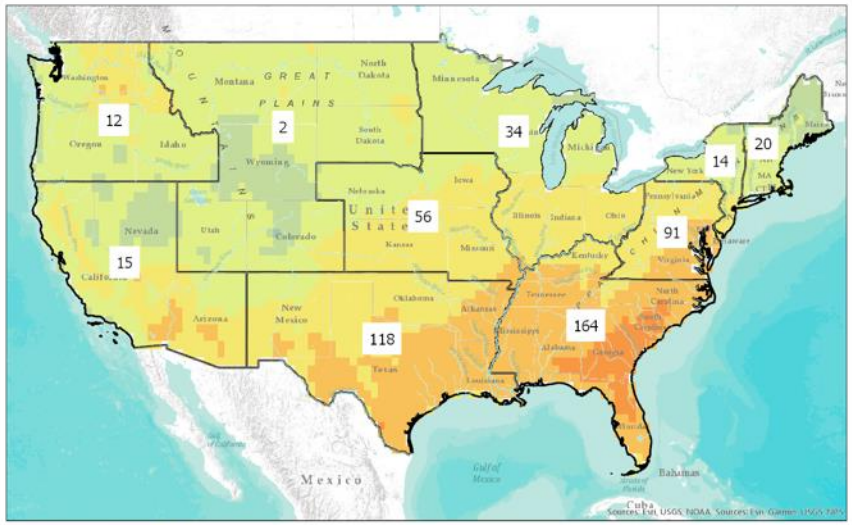
Average heat wave count (middle tercile is 1.0): **2.0**
Average heat wave duration (middle tercile is 2.6): **9.4 days**
Average heat wave intensity (middle tercile is 39.4°F): **62.4°F**
Maximum heat wave temperature (middle tercile is 96.0°F): **97.6°F**
Maximum minimum (nightly) temperature (middle tercile is 58.7°F): **61.8°F**

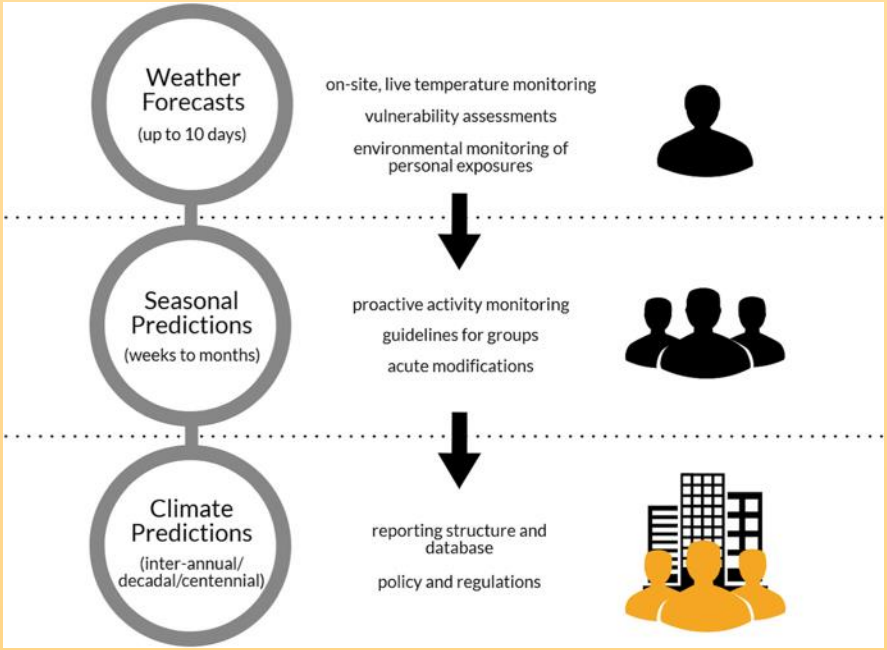
Exposure Event Definitions

'his is an experimental product developed by the USGCRP's Climate Health Monitoring Outlook (CHMO) Team, ba ogy, click here.

NIHHIS Information Prototypes at Climate and Weather Timescales, with CDC Data

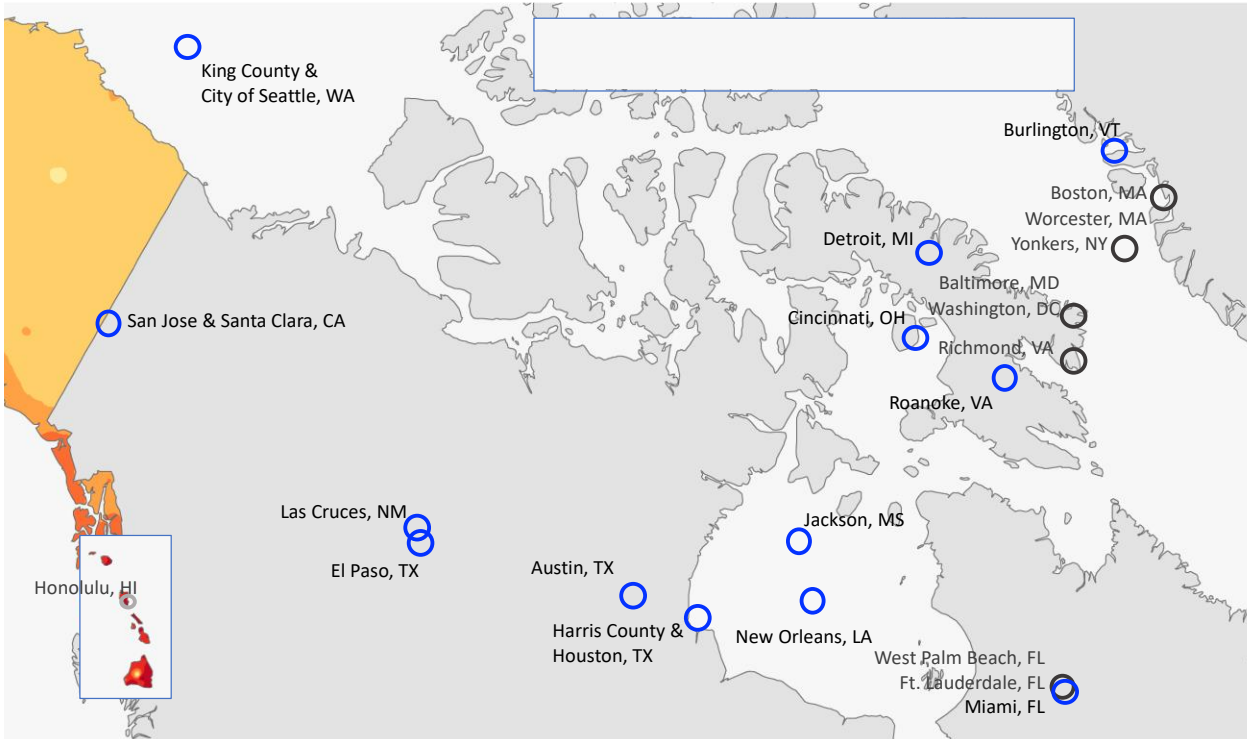


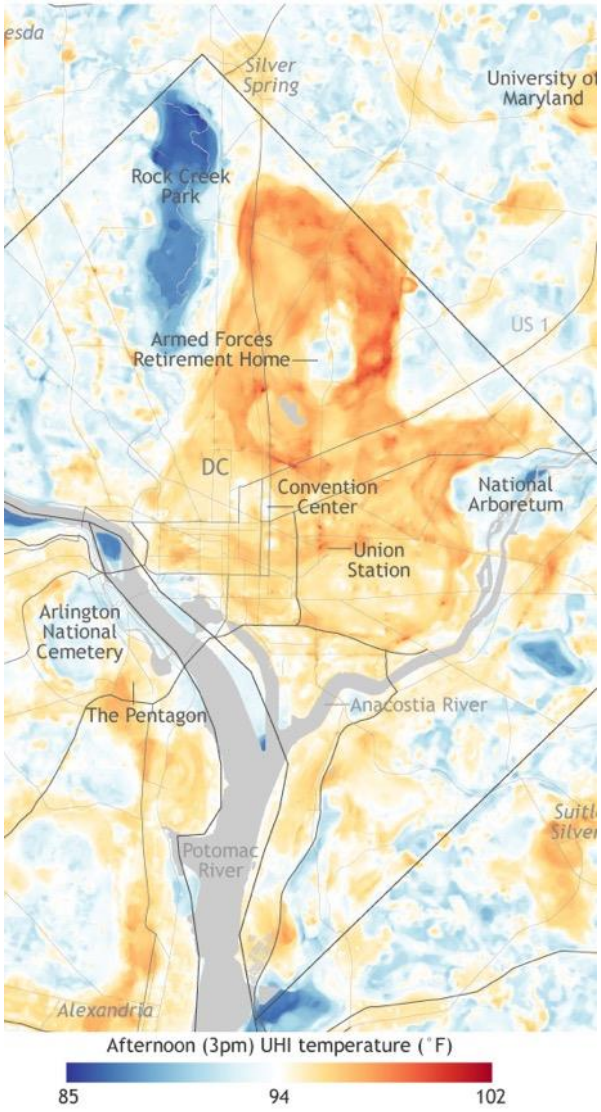




Hosokawa, Y., Casa, D. J., Trtanj, J. M., Belval, L. N., Deuster, P. A., Giltz, S. M., … Williams, W. J. (2019). ***Activity modification in heat: critical assessment of guidelines across athletic, occupational, and military settings in the USA****.*
International Journal of Biometeorology, 63(3), 405–427. https://doi.org/10.1007/s00484-019-01673-6

NIHHIS-CAPA Community Science Urban Heat Island Field Campaigns

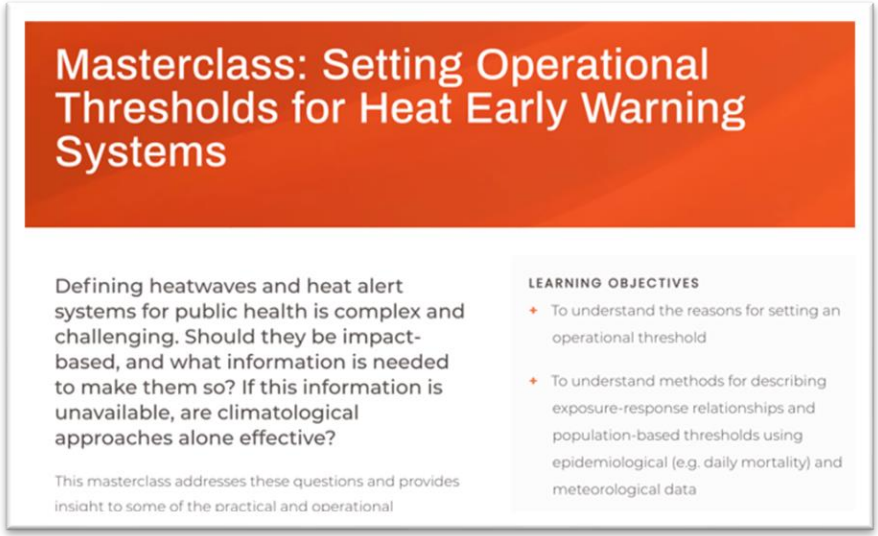




NIHHIS-CAPA
UHI Campaigns
2018-2020

GHHIN and the Extended Heat Health Community

The Global Heat Health Information Network is a critical source of experiential information and experts that can inform the NWS Heat Strategy and that would benefit from the expertise of NWS as well.



GHHIN is an independent, voluntary, and member-driven forum of scientists, practitioners, and policy makers focused on improving capacity to protect populations from the avoidable health risks of extreme heat in our changing climate.

GLOBAL HEAT HEALTH INFORMATION NETWORK

ghhin.org

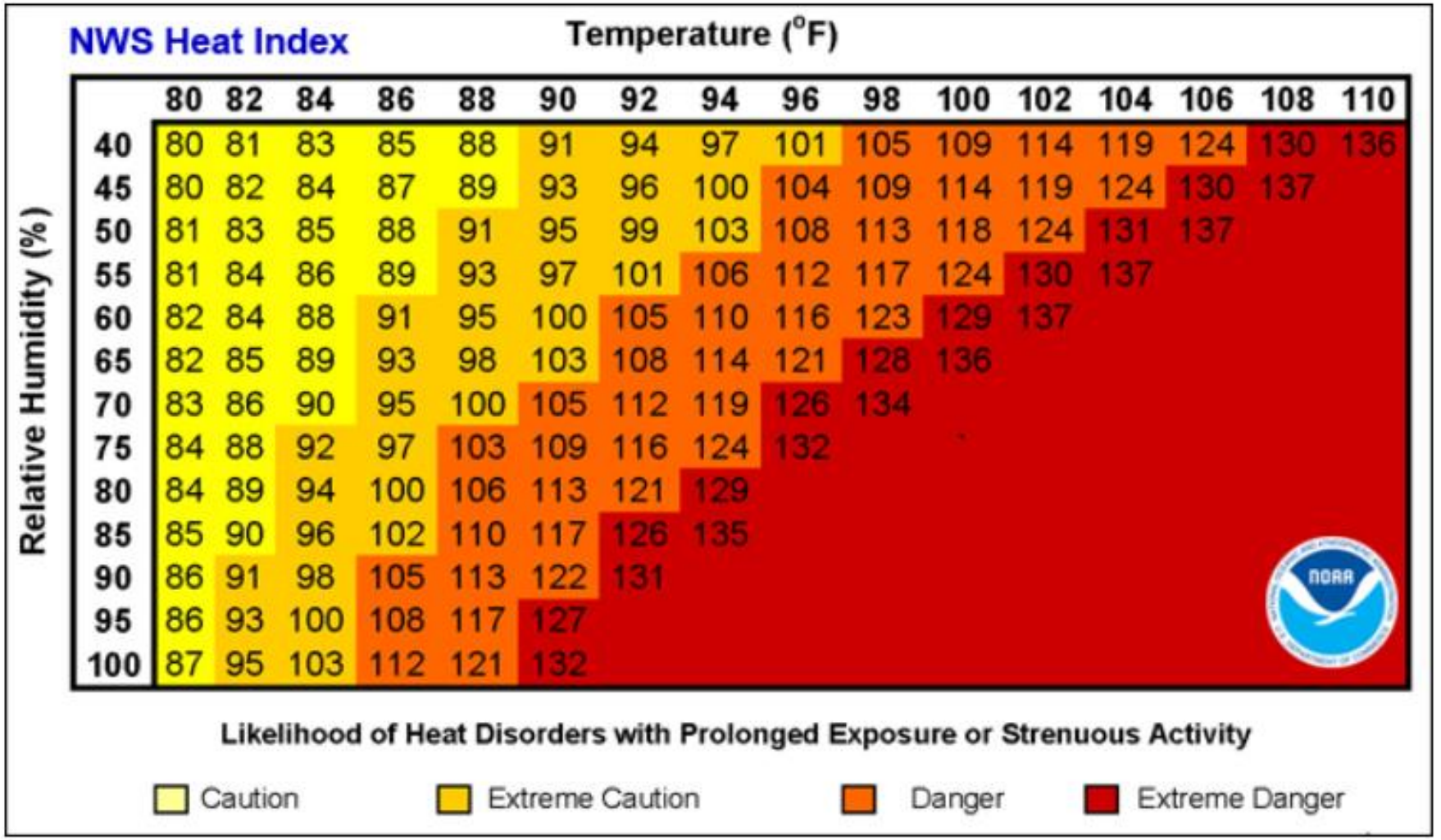
NIHHIS Federal Partner Panel

CDC, NIEHS, OSHA, ECCC

12:45 - 12:50	12:50 - 1:10	1:10 - 1:50	1:50 - 2:00
• NIHHIS Panel Intro	• Panelist Introductions	• Panel Q&A	• Audience Q&A

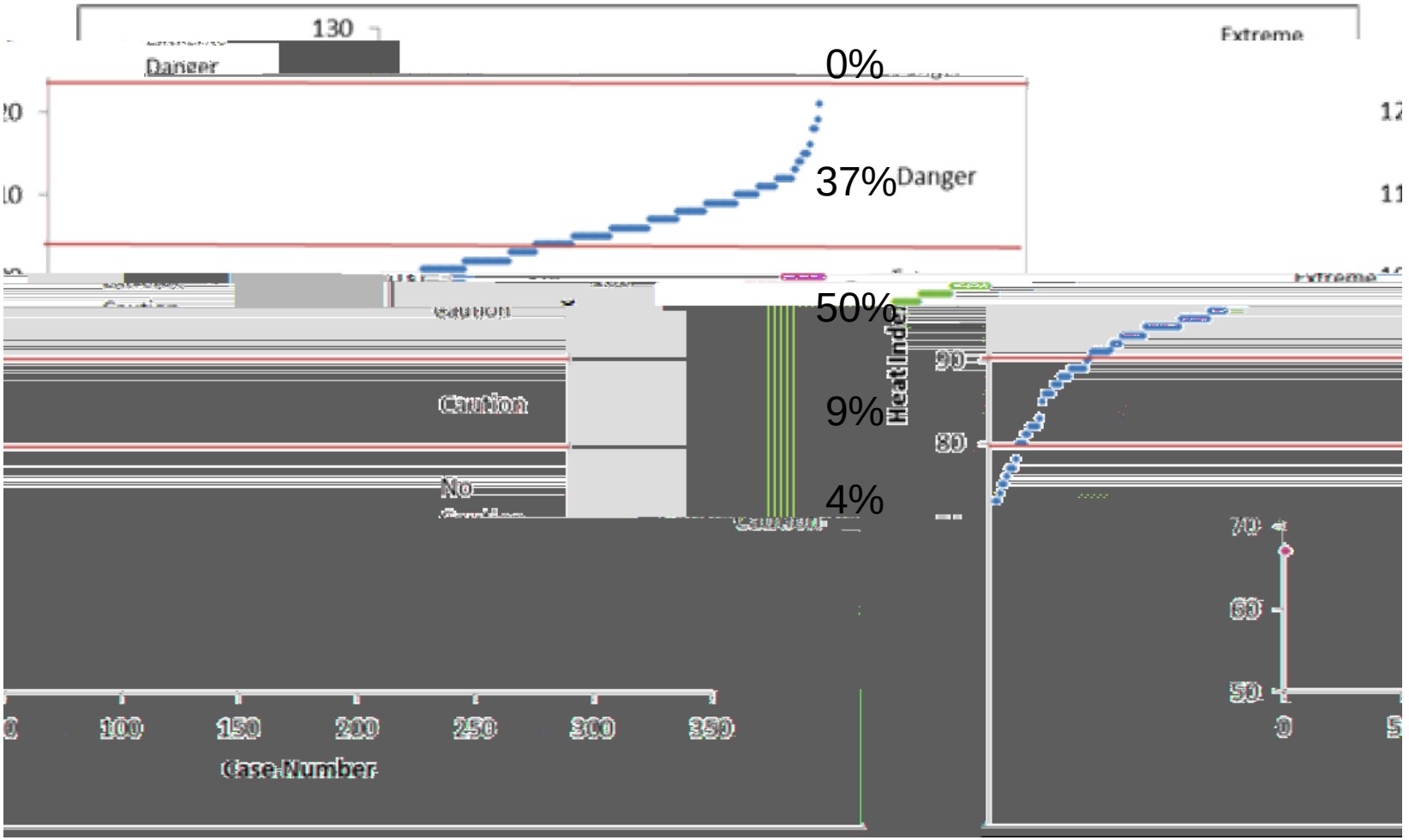
- **Paul Schramm**, MS, MPH
  Climate Science Team Lead
  Climate and Health Program Manager, National Center for Environmental Health, Centers for Disease Control and Prevention (CDC)
- **Jim Remington**, Program Analyst, Worker Education and Training Branch, National Institute of Environmental Health Sciences (NIEHS), National Institutes of Health (NIH)
- **Aaron Tustin**, Medical Officer, Office of Occupational Medicine and Nursing, Occupational Safety and Health Administration (OSHA)
- **Melissa MacDonald**, Meteorologist, Environment and Climate Change Canada (ECCC)
- **Didier Davignon**, National Coordinator, Public Health and Environmental Forecast Products, Environment and Climate Change Canada (ECCC)

SLIDES FROM PANELISTS



OSHA Occupational Safety and Health Administration

Figure 4-2. Heat Index of N=327 U.S. Occupational Heat-Related Deaths, 2000-2010 with NOAA Heat Index Categories



Source: Gubernot. 2015. Occupational Heat-related Mortality in the United States, 2000-2010: Epidemiology and Policy Recommendations. (DrPH dissertation)

OSHA Occupational Safety and Health Administration

Cal/OSHA Outdoor Heat Standard

Cal/OSHA | Heat Illness Prevention

Heat Illness Prevention

▶ español

California employers are required to take these four steps to prevent heat illness:

1. **Training**
   Train all employees and supervisors about heat illness prevention.
2. **Water**
   Provide enough fresh water so that each employee can drink at least 1 quart per hour, or four 8 ounce glasses, of water per hour, and *encourage them to do so.*
3. **Shade**
   Provide access to shade and encourage employees to take a cool-down rest in the shade for at least 5 minutes. *They should not wait until they feel sick to cool down.*
4. **Planning**
   Develop and implement written procedures for complying with the Cal/OSHA Heat Illness Prevention Standard.

- 80˚ F – threshold for requirement to provide shade
- 95˚ F – threshold for “High-heat procedures” to protect workers

OSHA® Occupational Safety and Health Administration

Acclimatization Status

72% of deaths occurred in workers with **less than seven days** on the job.

Days on job	Deaths, %	Non-fatal heat illnesses, %
First day	45%	3%
2 – 7 days	27%	16%
8 – 14 days	5%	3%
More than 14 days	23%	77%

OSHA Occupational Safety and Health Administration

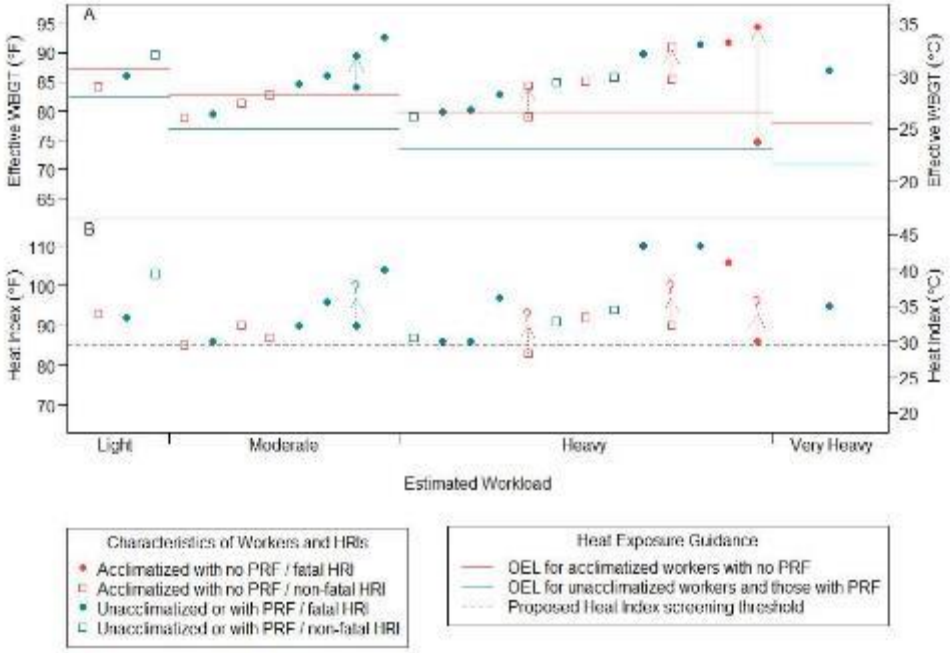
Clinical Features of Heat Stroke Cases (n = 27)

Characteristic	Value
Fatal, %	85%
Kidney failure, %	83%
Liver failure, %	60%
Elevated CK, %	50%
Highest recorded CK, median (range)	25,530 (234 – 55,940)
DIC, %	39%
Seizure, %	19%

OSHA Occupational Safety and Health Administration

Study #1: OOMN Enforcement Consultations (n = 25 outdoor HRIs)

- Main Conclusions
  1. WBGT limits (NIOSH/ACGIH) had 100% sensitivity for detecting fatal conditions.
  2. Fatalities occurred when Heat Index was as low as 86˚ F (30˚ C).



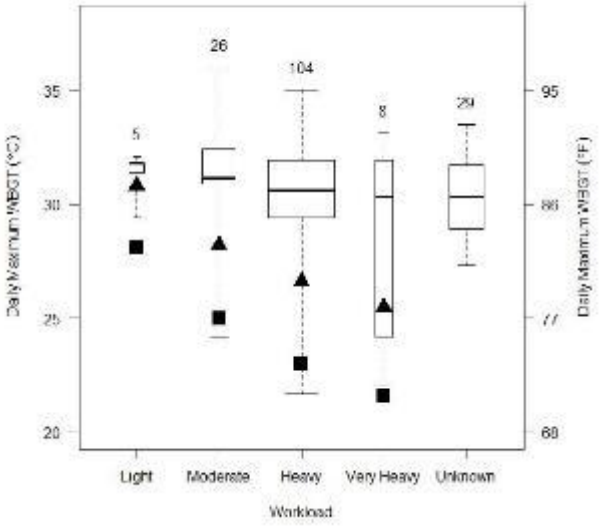
Tustin et al., MMWR 2018.

OSHA Occupational Safety and Health Administration

Study #2: Severe Injury Reports (n = 234 outdoor HRIs)

- Main Conclusions
  1. WBGT limits (NIOSH/ACGIH) had 92-100% sensitivity.
  2. Recommended Heat Index screening threshold: 80˚ F (27˚ C).

Validation of WBGT-based OELs



Tustin et al., in preparation.

OSHA Occupational Safety and Health Administration

References

- ACGIH. 2017. Heat stress and strain: TLVs.
- Arbury et al. MMWR 2014;63(31):661-665.
- Arbury et al. JOEM 2016;58(4):359-363.
- Gubernot. 2015. Occupational Heat-Related Mortality in the United States, 2000-2010: Epidemiology and Policy Recommendations. [DrPH dissertation]
- Hunter. Diseases of Occupations. 6th Edition.
- Leon and Helwig. J Appl Physiol 2010;109:1980-1988.
- NIOSH. 2016. Criteria for a Recommended Standard: Occupational Exposure to Heat and Hot Environments.
- Tustin et al. MMWR 2018;67(26):733-737.

OSHA Occupational Safety and Health Administration

NIHHIS Federal Partner Panel

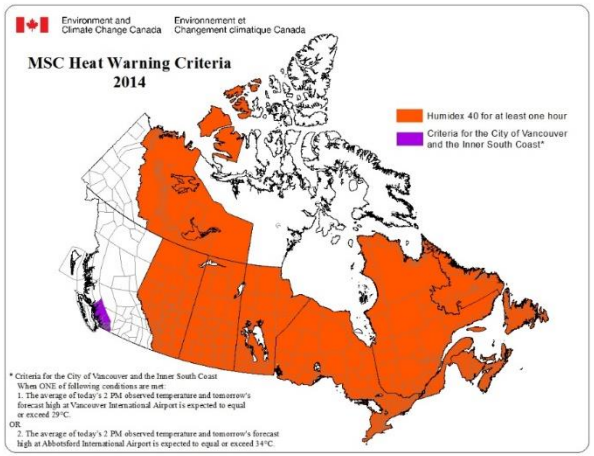
CDC, NIEHS, OSHA, ECCC

CDC	NIEHS	OSHA	ECCC
• Paul Schramm	• Jim Remington	• Aaron Tustin	• Melissa MacDonald • Didier Davignon

Panel Questions (2.5 Minutes per agency per question)

- How does your agency use current NWS heat services?
  - Specific to ECCC: How do your partners and clients use ECCC heat services?
- What is your agency's biggest challenge with respect to heat related hazards?
- How do you see collaboration between your agency and NWS going forward?
  - Specific to ECCC: how do you see your collaboration and services changing with your partners/clients in the future?
- How do you envision working with NWS and NIHHIS in the future to address data and product needs?

Heat Warning Modernization



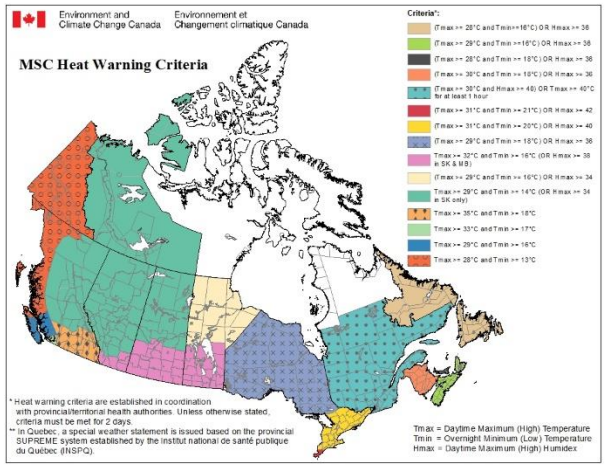
Heat-health analysis by Health Canada

OR

95th Percentile guidance

Criteria Decisions:

- Duration
- Relief from heat overnight
- T_a, best modelled predictor



Why

- Single national climatological based criteria
- Recent heat-related mortality and Public Health interest in communicating heat risk and reducing those risks (**H**eat**A**lert**R**esponse**S**ystem)

Engagement

- Partnership with Health Canada and Public Health (Prov/Terr and Municipal)

Results

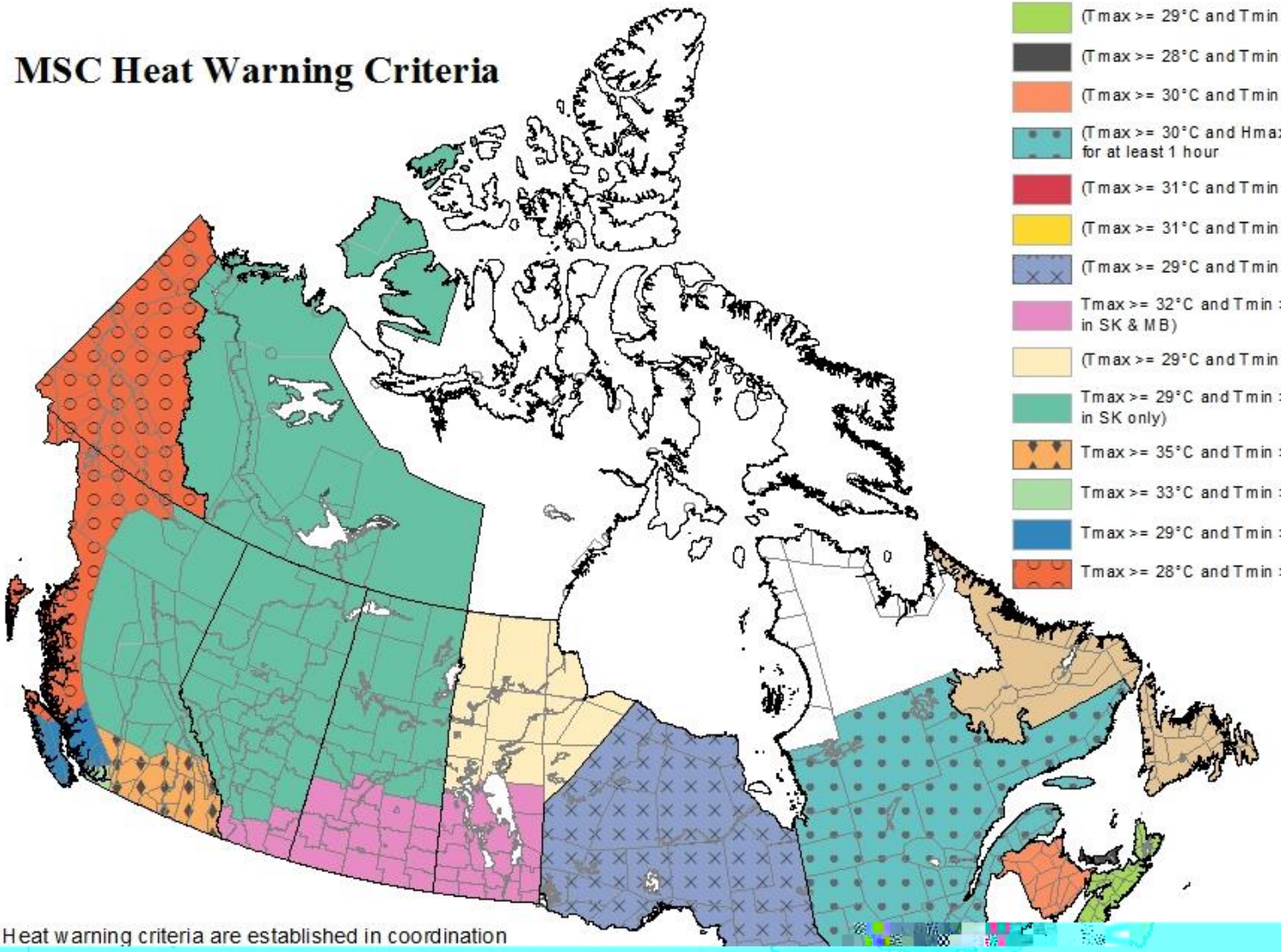
- An evidence based heat warnings service
- Coherent communications
- Part of a chain of actions to reduce heat-health risk
- Early Notification system to support partners' needs

Development Considerations

- Warning Fatigue
- Operationalization – balance of forecasting resources with partner demand
- Communicating the changes to the public and partners
- Developing a National Standard level of service
- Integrating the system into current HARS

Environment and Climate Change Canada | Environnement et Changement climatique Canada

MSC Heat Warning Criteria



* Heat warning criteria are established in coordination with provincial/territorial health authorities. Unless otherwise stated, criteria must be met for 2 days.
In Quebec, a special weather statement is issued based on the provincial SUPREME system established by the Institut national de santé publique du Québec (INSPQ).

Tmax = Daytime Maximum (High) Temperature
Tmin = Overnight Minimum (Low) Temperature
Hmax = Daytime Maximum (High) Humidex

Local Heat Event Report

Summer 2020 in the Southwest

NWS WFO Phoenix, AZ

NWS Partners: AZ Dept. of Health Services

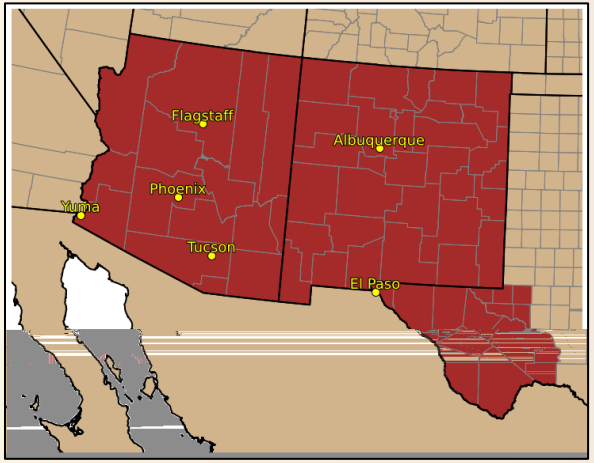
NWS Public Program Heat Workshop

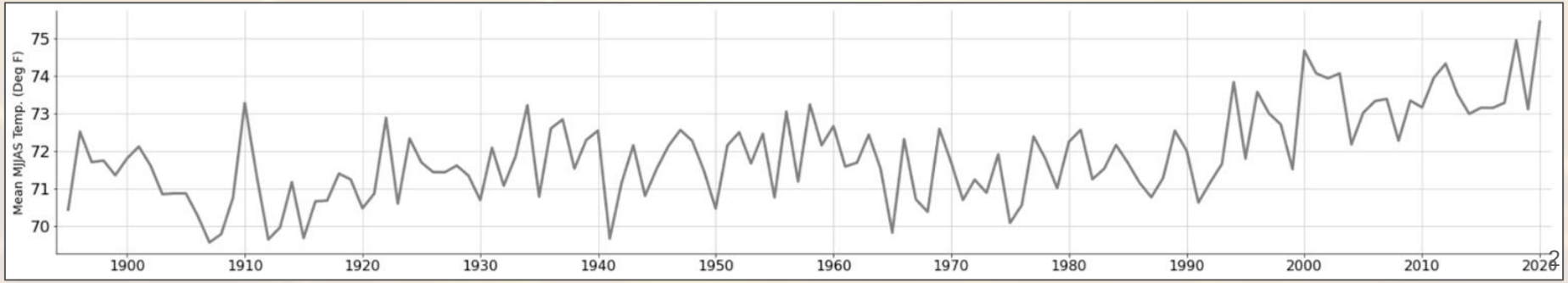
Wednesday, November 18, 2020

Meteorology Brief - Summer 2020

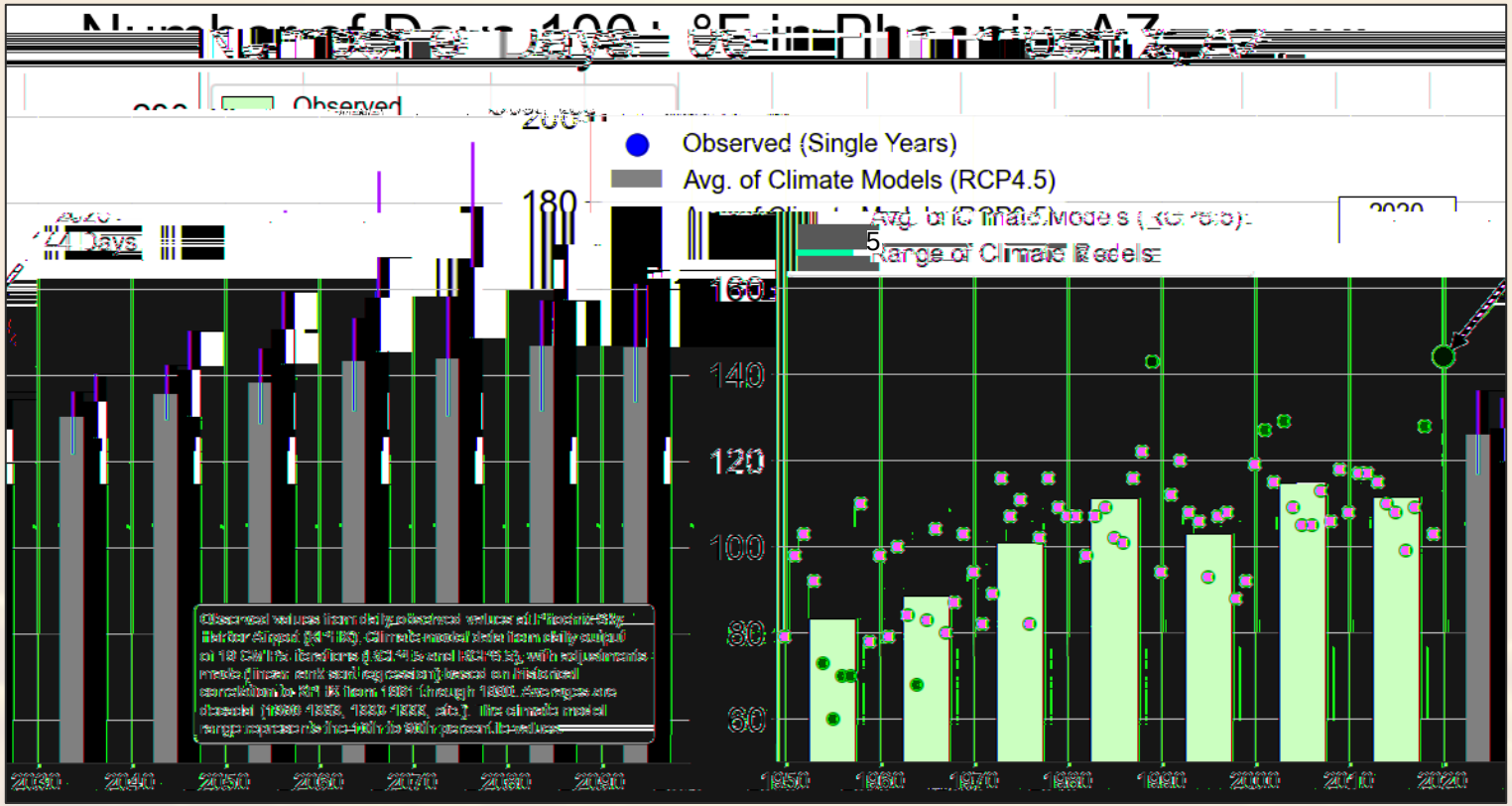
The heat season in the Southwest typically extends from May through September.

This heat season was the hottest on record across the Southwest.

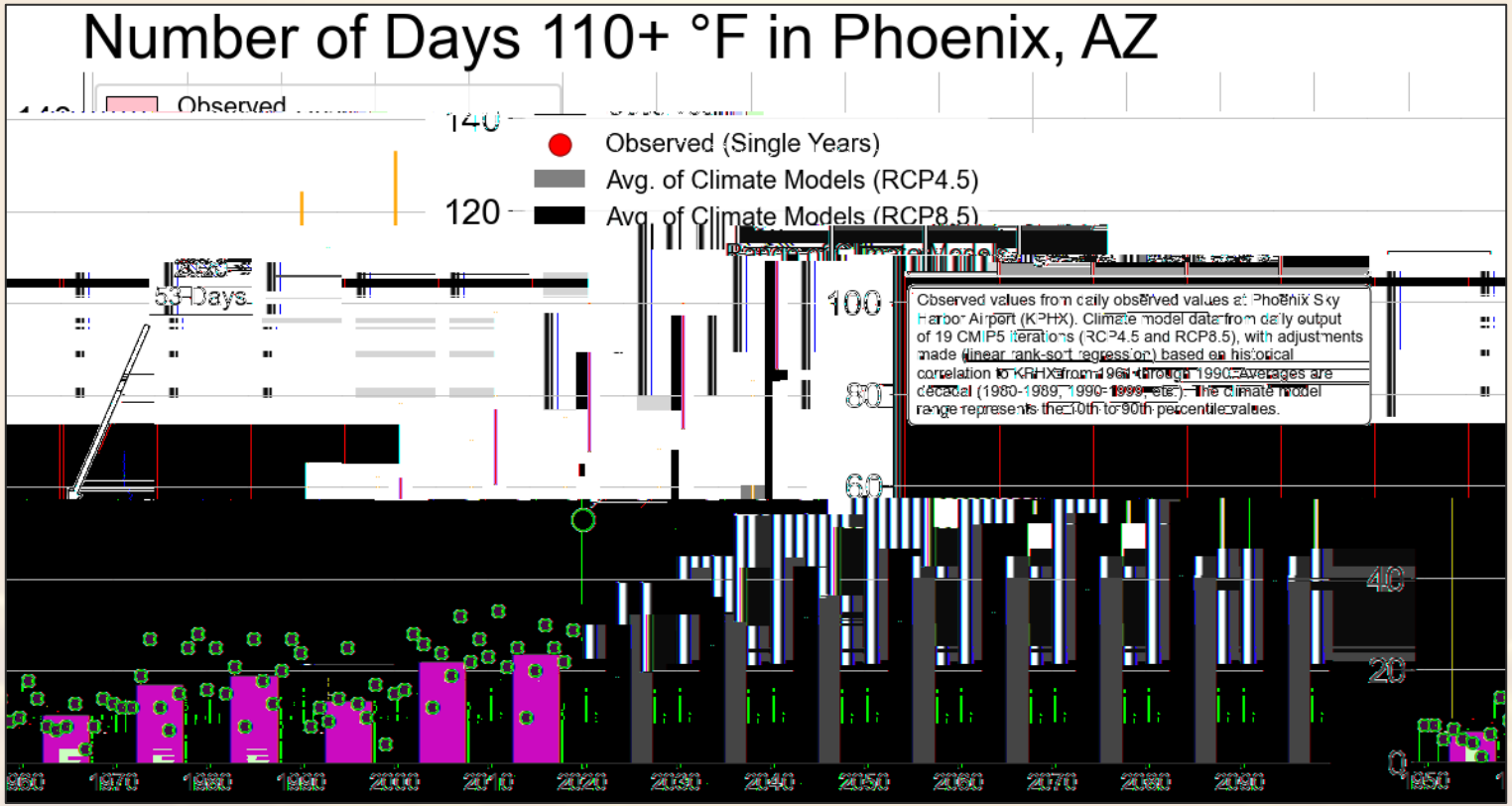




Meteorology Brief - Summer 2020



Meteorology Brief - Summer 2020



Before - Pre-Season Activity

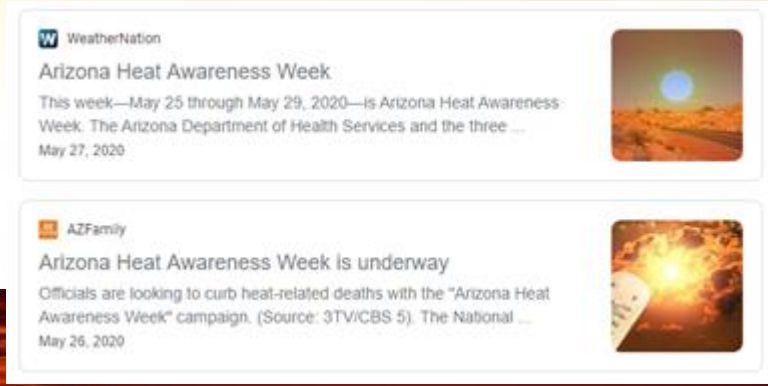
Activities performed by prior to the heat season:

- Arizona Heat Workshop (Early Spring)
- Interaction with EM/Health Partners
  EM Roadshows, Meeting/Workshop Attendance
- Internal Readiness Training
- HeatRisk Development

Before - Pre-Season Activity

Activities performed by prior to the heat season:

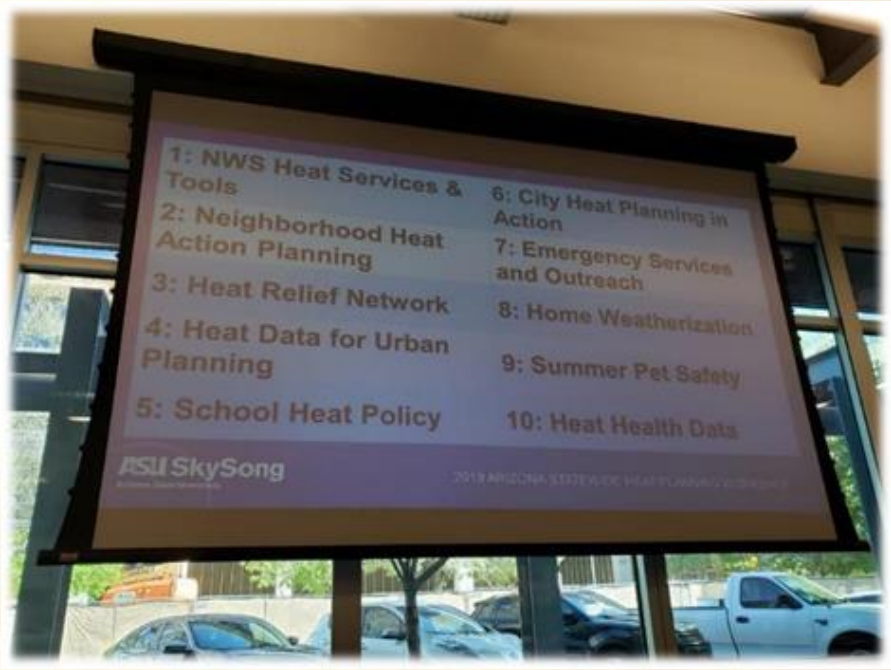
- Heat Awareness Week
  Late May; Governor's Declaration



Before - Pre-Season Activity

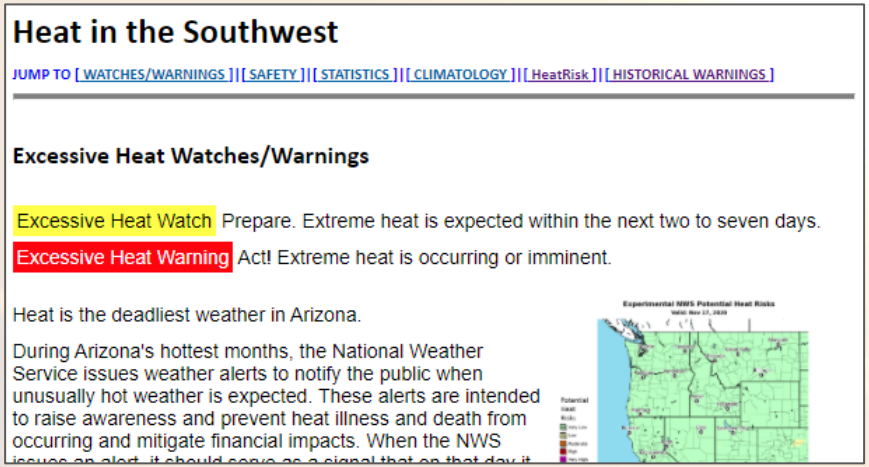
Challenges:

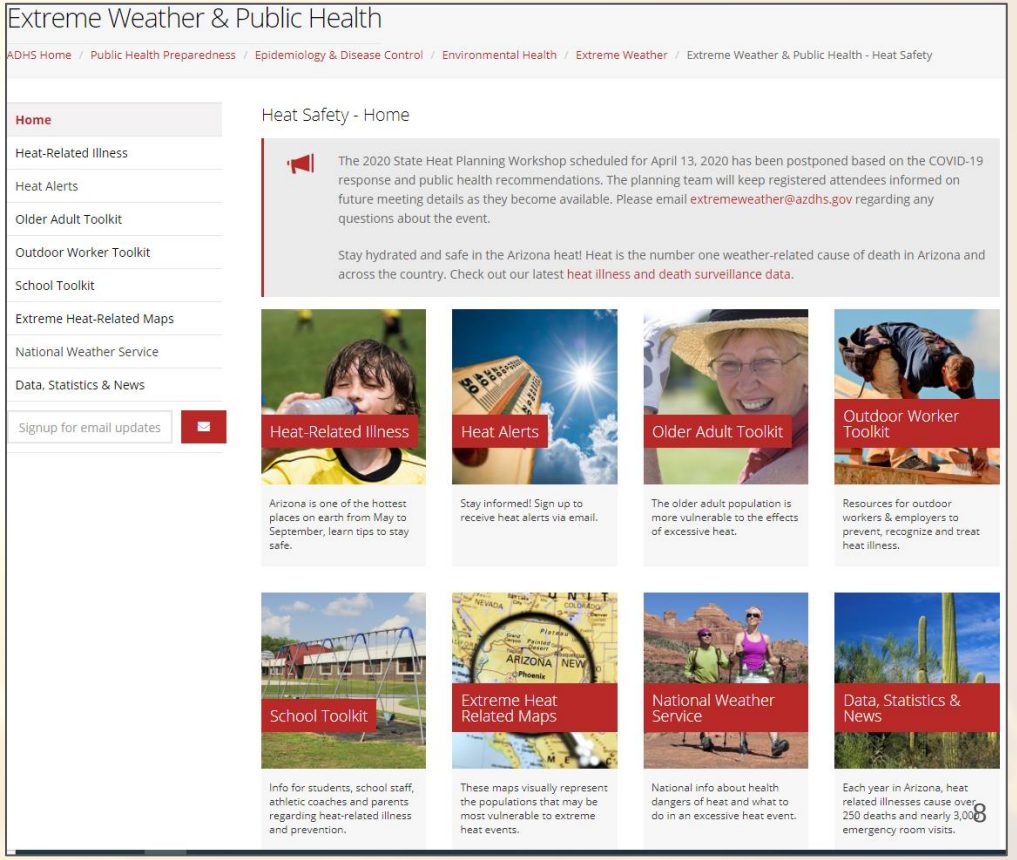
- 2020 Pre-Season Workshop canceled due to COVID.
- Preparing for extreme heat in a hot climate (on top of COVID impacts).
- Understanding the extremely broad and deep societal impacts of heat.



Before - Pre-Season Activity

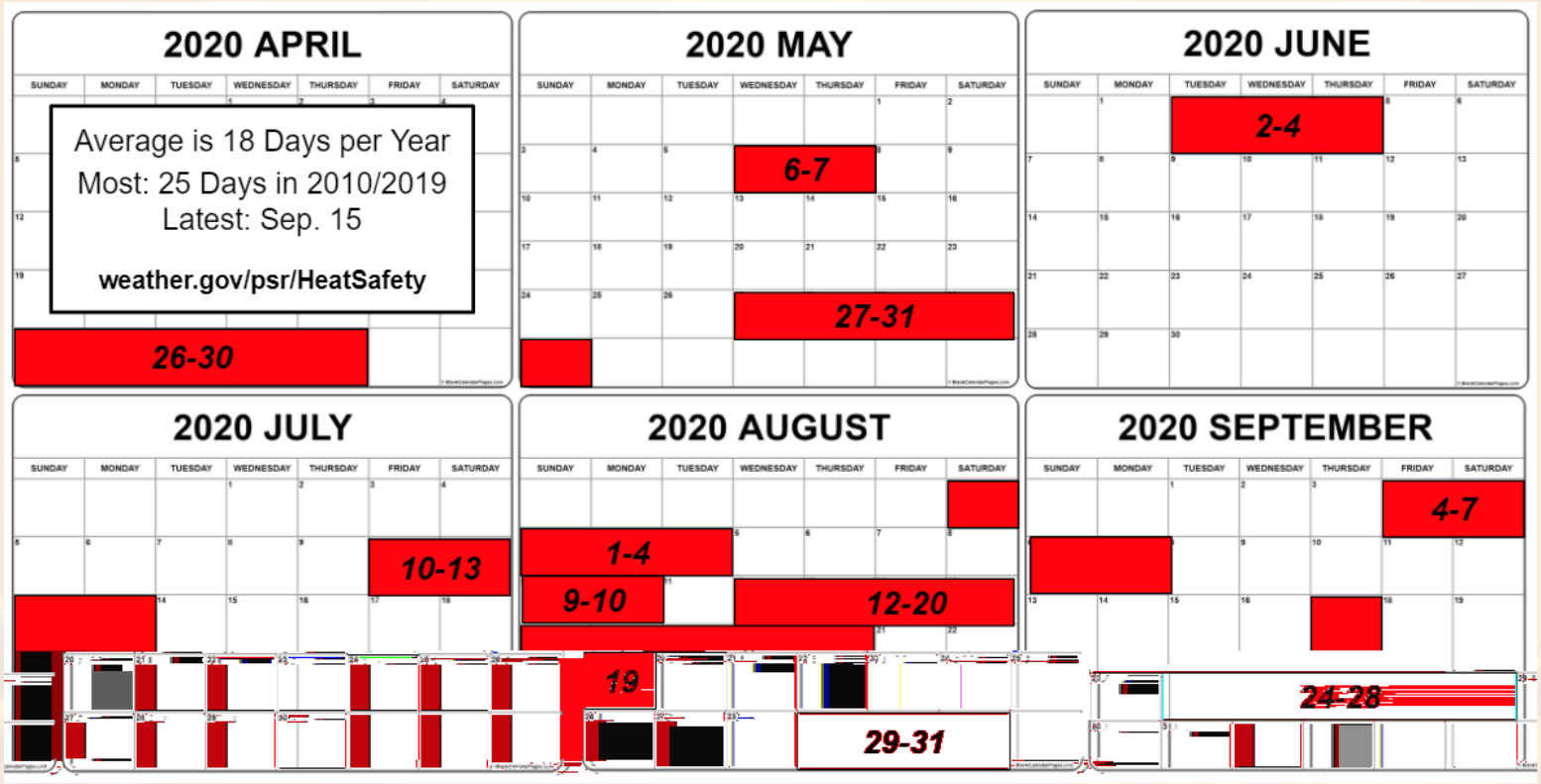
- Website promotion with plethora of information.





During - Progressing Through the Summer

EH.W Days



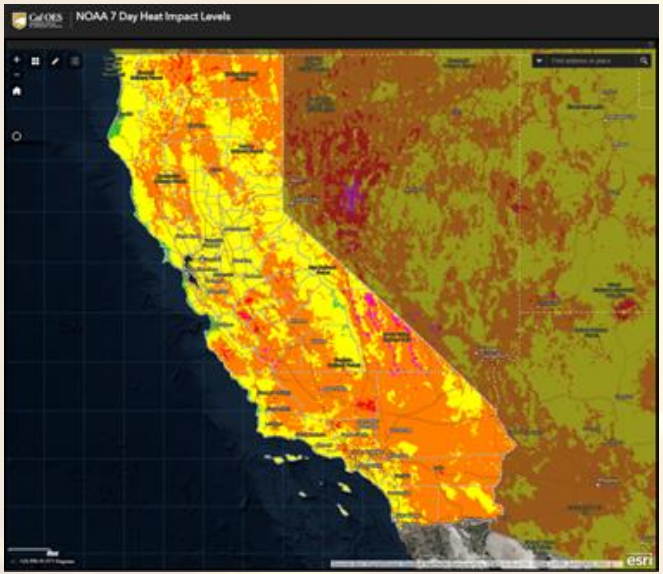
Excessive Heat Watch/Warning Avg Lead Time: 5.3 / 4.0 Days

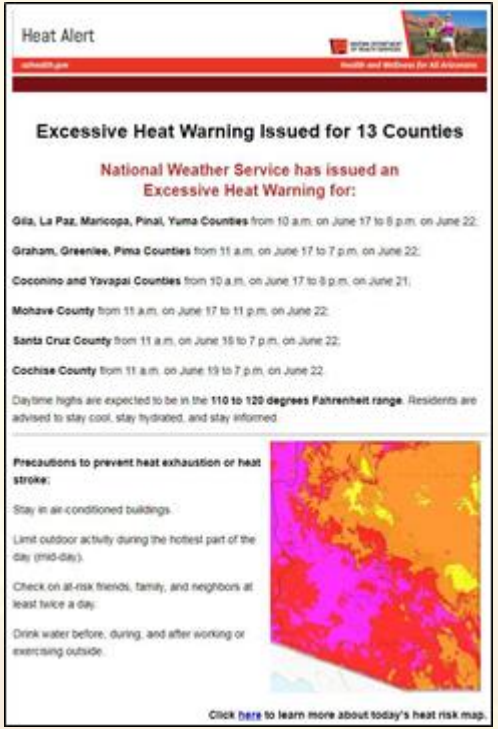
During - Progressing Through the Summer

Extensive Media/Social Media Engagement

- NWS Phoenix: ~150 Media Interviews
- @NWSPhoenix: 13M Impressions (Heat)

During - Partner Messaging




Heat Alert

Excessive Heat Warning Issued for 13 Counties

National Weather Service has issued an Excessive Heat Warning for:

Gila, La Paz, Maricopa, Pinal, Yuma Counties from 10 a.m. on June 17 to 8 p.m. on June 22;

Graham, Greenlee, Pima Counties from 11 a.m. on June 17 to 7 p.m. on June 22;

Coconino and Yavapai Counties from 10 a.m. on June 17 to 8 p.m. on June 21;

Mohave County from 11 a.m. on June 17 to 11 p.m. on June 22;

Santa Cruz County from 11 a.m. on June 18 to 7 p.m. on June 22;

Cochise County from 11 a.m. on June 19 to 7 p.m. on June 22

Daytime highs are expected to be in the **110 to 120 degrees Fahrenheit range**. Residents are advised to stay cool, stay hydrated, and stay informed.

Precautions to prevent heat exhaustion or heat stroke:

Stay in air-conditioned buildings.

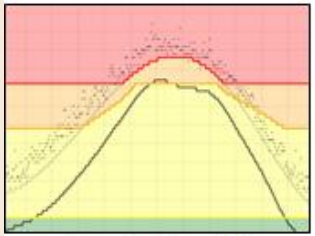
Limit outdoor activity during the hottest part of the day (mid-day).

Check on at-risk friends, family, and neighbors at least twice a day.

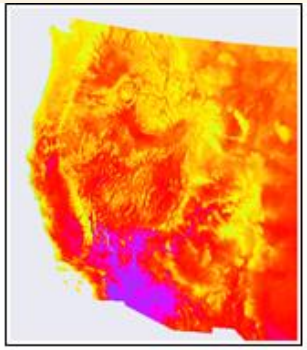
Drink water before, during, and after working or exercising outside.

Click here to learn more about today's heat risk map.

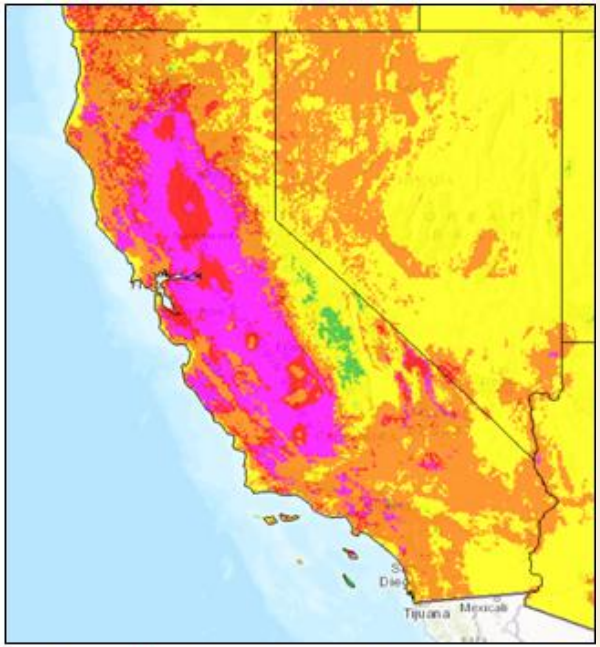
HeatRisk Review



Determine Thresholds



OSU PRISM Normals



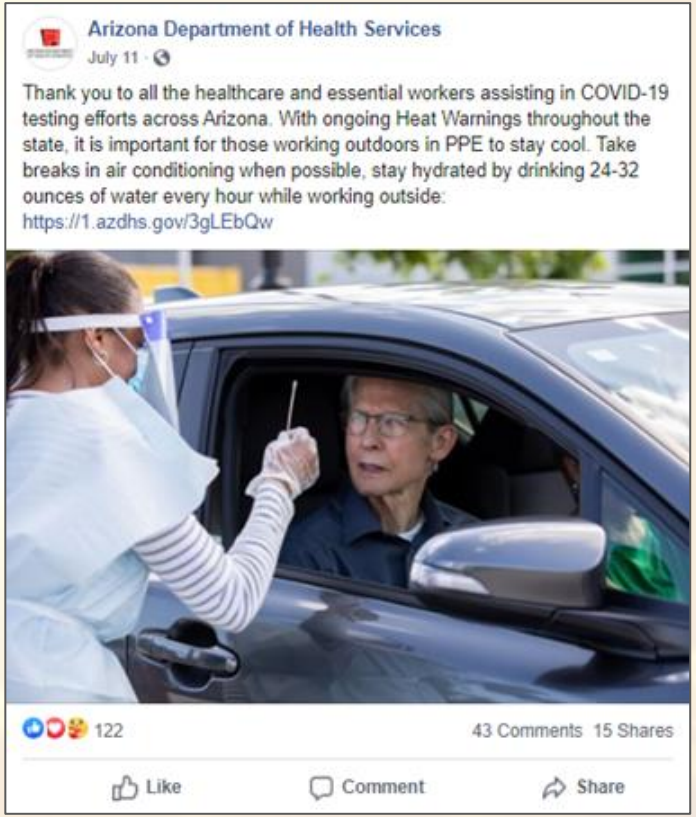
Algorithm Combines MaxT & MinT Values into Final HeatRisk Product

4000+ Stations

https://www.wrh.noaa.gov/wrh/hil/historical/

Daily MaxT and MinT Heat Impact Levels

COVID-19 Heat and Combined Safety Messaging



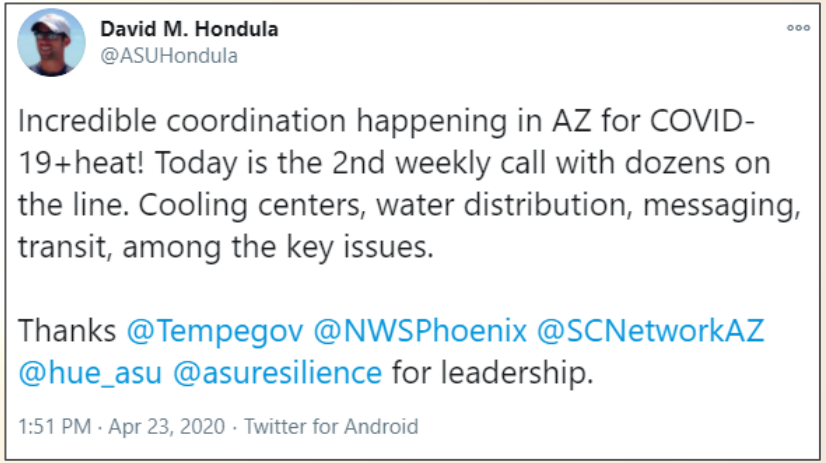
Distributing Heat Safety Materials to Outdoor & Drive Up COVID-19 Testing Sites

During - Progressing Through the Summer

Heat Preparedness & Resilience Workgroup

- Purpose: Weekly calls to *“share heat forecasts and warnings from [NWS] and local efforts with heat preparedness and response among active stakeholder organizations”.*

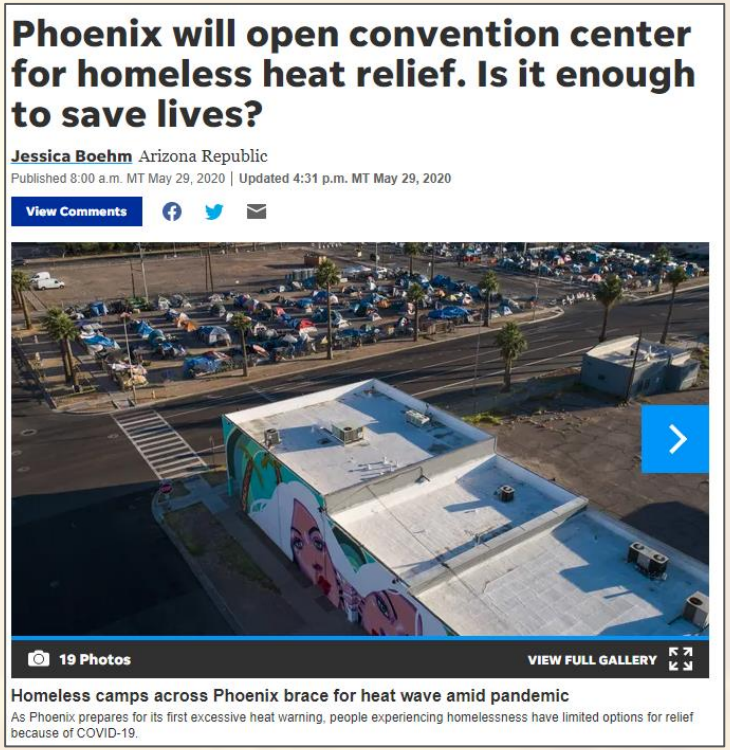
- New Activity in 2020. Partnership with ASU, NWS, ADHS, counties, & municipalities.



During - Progressing Through the Summer

Challenges This Season:

- Persistence of Heat Season
  Early Onset, Late Demise, Intensity (changing climate…)
- COVID impacts to community actions.
  - Reduced number of designated cooling centers.
  - Reduction in cooling center capacity/hours.
  - Reduction in “soft” cooling centers (businesses with indoor seating areas).
- Variety or Lack of Partner/Community Triggers
  - Ex: Some shelters extend hours based on EH.W.
  - Ex: Disparity of heat plans across school districts.



Phoenix will open convention center for homeless heat relief. Is it enough to save lives?

Jessica Boehm Arizona Republic

Published 8:00 a.m. MT May 29, 2020 | Updated 4:31 p.m. MT May 29, 2020

View Comments

19 Photos VIEW FULL GALLERY

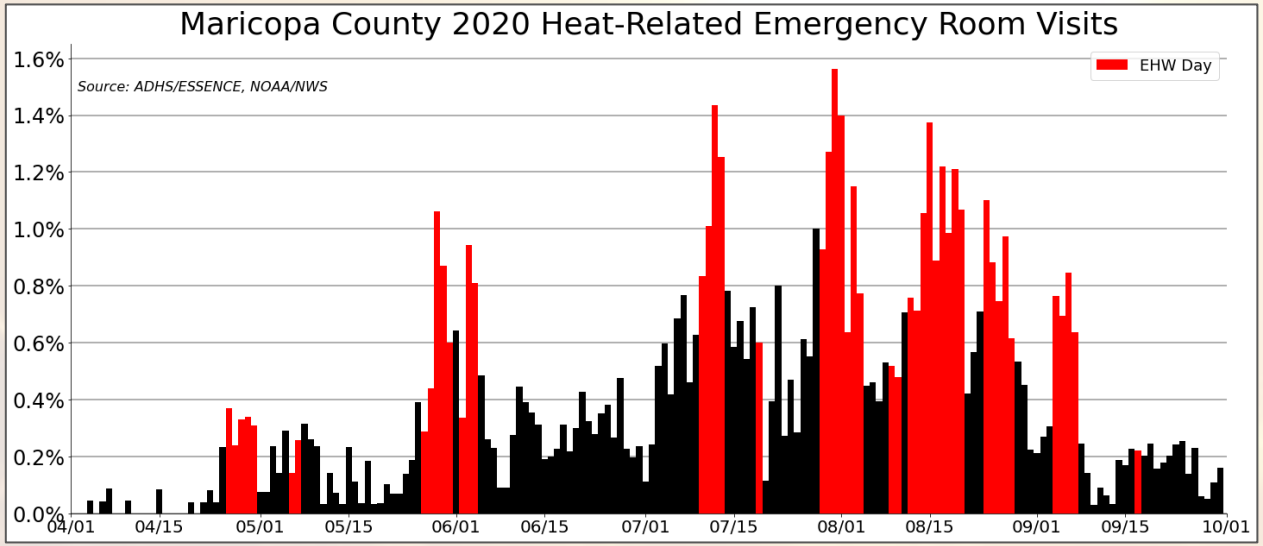
Homeless camps across Phoenix brace for heat wave amid pandemic

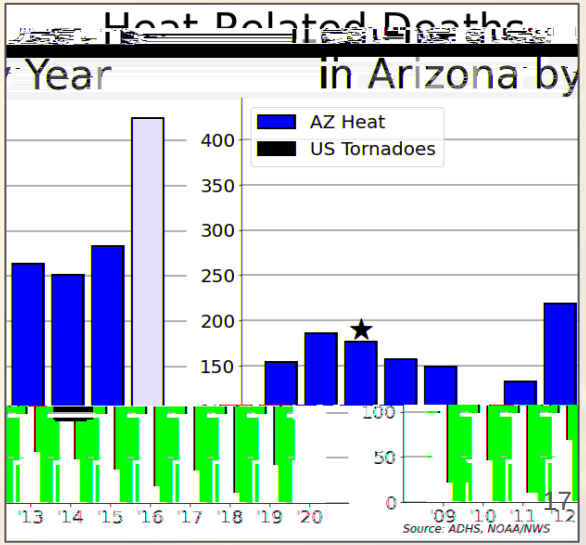
As Phoenix prepares for its first excessive heat warning, people experiencing homelessness have limited options for relief because of COVID-19.

After (Heat Season Finally Ends)

Important to understand that heat impacts are **multifaceted** and not all track exclusively with Excessive Heat Warning issuances.

Record number of heat-associated deaths expected this year.

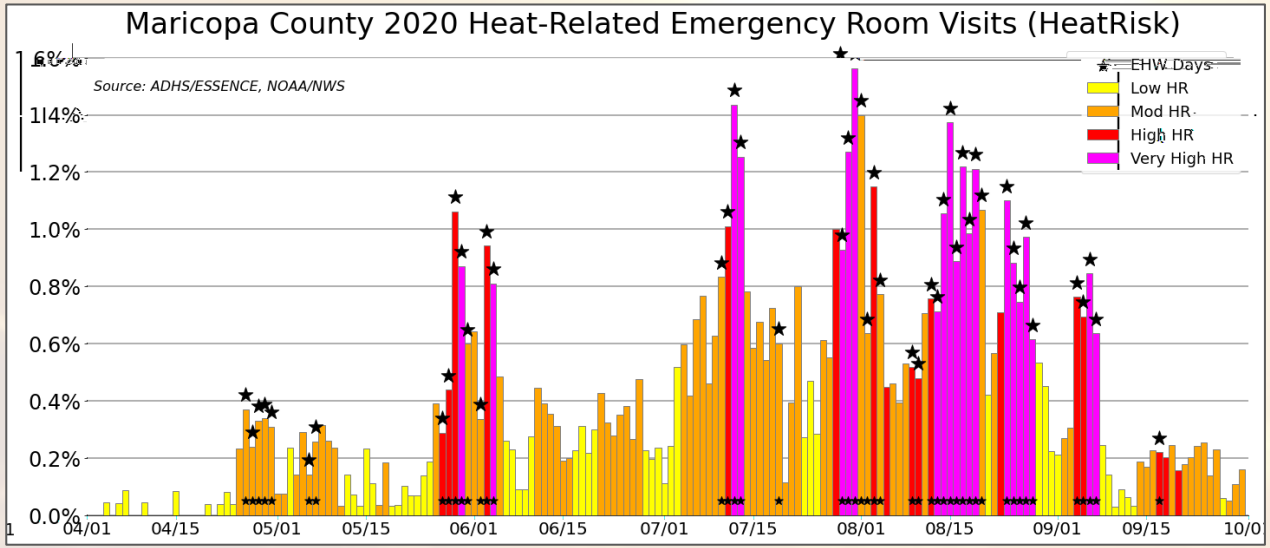


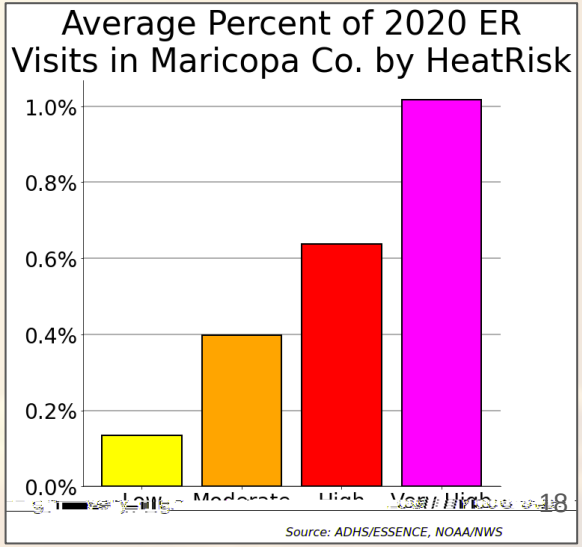


After (Heat Season Finally Ends)

Important to understand that heat impacts are **multifaceted** though some impacts do track with Excessive Heat Warning issuances.

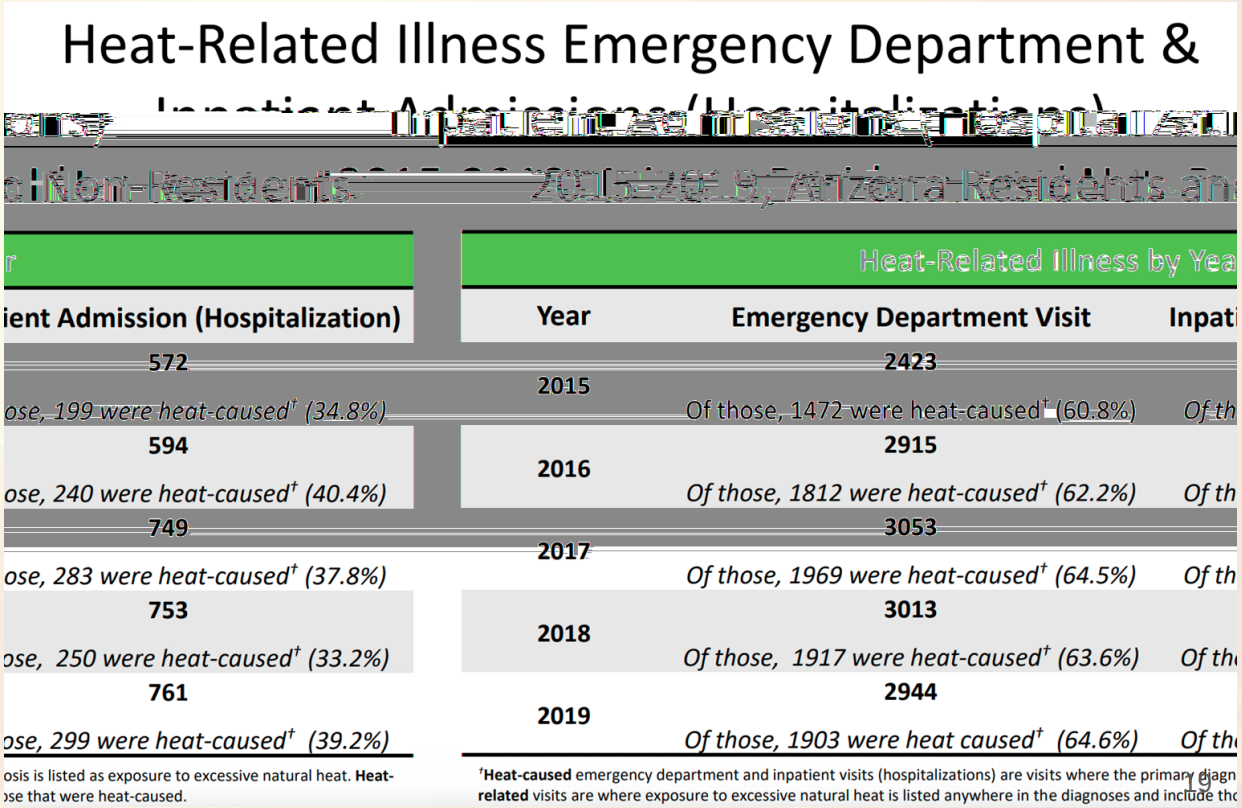
Utility of HeatRisk as a threat indicator worked.





After (Heat Season Finally Ends)

- Expect 2020 to exceed all historical heat-related illness emergency department and inpatient admissions
- Preliminary 2020 Heat ED visits 3,834 using syndromic surveillance through 9/30/20



Heat-Related Illness Emergency Department &

Heat-Related Illness by Yea

Year	Emergency Department Visit	Inpati
2015	2423 Of those, 1472 were heat-caused† (60.8%)	Of th
2016	2915 Of those, 1812 were heat-caused† (62.2%)	Of th
2017	3053 Of those, 1969 were heat-caused† (64.5%)	Of th
2018	3013 Of those, 1917 were heat-caused† (63.6%)	Of th
2019	2944 Of those, 1903 were heat caused† (64.6%)	Of th

ient Admission (Hospitalization)

572
ose, 199 were heat-caused† (34.8%)

594
ose, 240 were heat-caused† (40.4%)

749
ose, 283 were heat-caused† (37.8%)

753
ose, 250 were heat-caused† (33.2%)

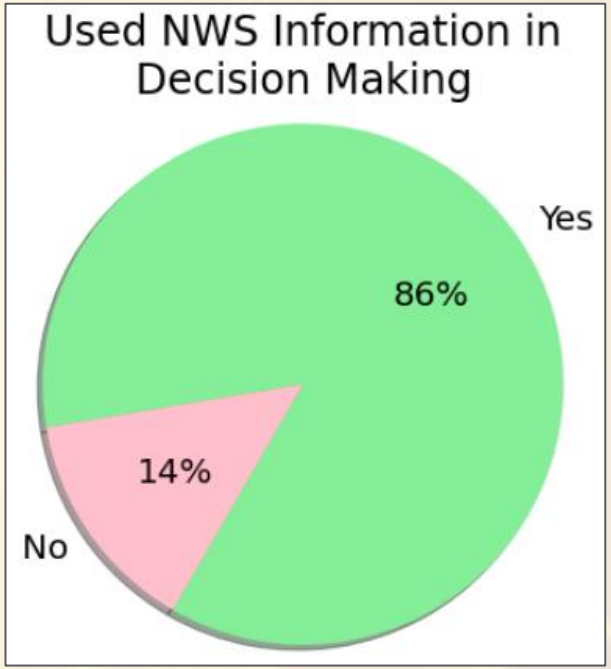
761
ose, 299 were heat-caused† (39.2%)

osis is listed as exposure to excessive natural heat. **Heat-**
se that were heat-caused.

†**Heat-caused** emergency department and inpatient visits (hospitalizations) are visits where the primary diagn
related visits are where exposure to excessive natural heat is listed anywhere in the diagnoses and include tho

After (Heat Season Finally Ends)

- ASU poll & focus groups to get feedback on the weekly heat-health calls. Participants appreciated hearing how other communities were responding to the heat (info sharing).
- Still many groups/organizations not fully engaged (schools, businesses, further away counties, Governor's office, media).
- Desire to hear more from utility companies, about AC repair options, LIHEAP, engage more on policy side.



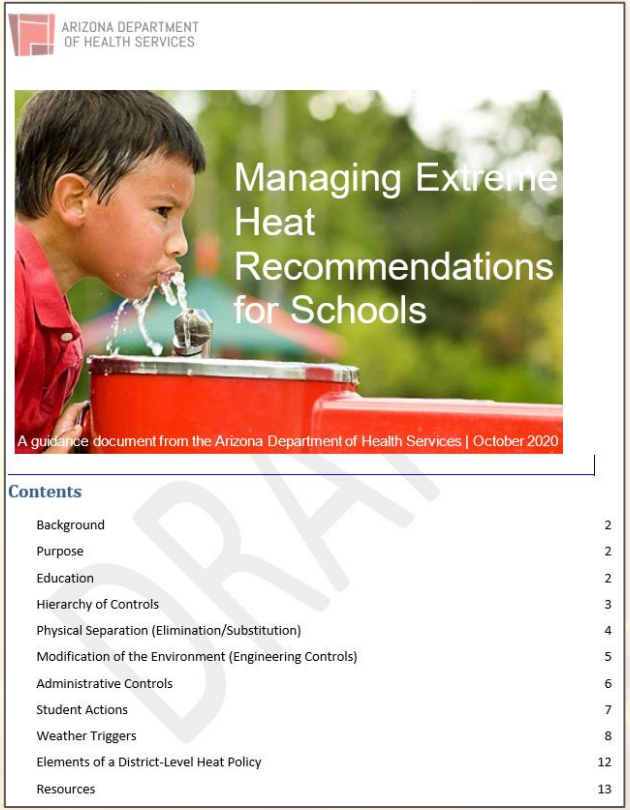
Off-Season Actions

- Planning virtual postseason partner’s workshop (December).
- Greater involvement underway with Maricopa County’s ongoing process of updating the Hazard Mitigation Plan.
- ADHS finalizing school heat plan.
- Always working to expand participation for the next season. Will hold preseason workshop (likely virtual).

AZ School Heat Policy Drafting & Threshold Dev.

- Matching school-age children emergency department visits to daily temperature to identify thresholds for highest attributable risk.

- Increased risk was found below heat warning temperatures.


ARIZONA DEPARTMENT OF HEALTH SERVICES

Managing Extreme Heat Recommendations for Schools

A guidance document from the Arizona Department of Health Services | October 2020

Contents

AZ School Heat Policy - Tiered Response

Time to Take Action/Season	Action to Take
Early on in anticipation of policy implementation Pre-heat season, spring	Environmental modification: • Plant trees • Install artificial shading • Install water fountains and water misters *Consider checking functionality of the water fountains, misters and artificial shading periodically and do upgrades, maintenance (e.g. misters cleaned, landscaping), or replacements as needed. These activities can occur anytime during the cooler season. Create a "water wise" environment and do not run the misters when children are not around to avoid wastage of water.
Lowest positive attributable risk by climate zone • Basin and Range – 81-85 °F • Colorado Plateau – 76-80 °F • Transition Zone– 76-80 °F Pre-heat season, spring	Education of supervisory staff, health professional staff, parents and students on heat-related illness prevention, recognition, and treatment. Sign up for Heat Alerts or be aware of how to receive them.
One category below highest positive attributable risk for climate zone	Administrative control – Acclimation period, scheduled rest/hydration, recess before lunch, move activities during the cooler part of day. Student actions – use of sunscreen, lightweight clothing and frequent hydration.
Highest attributable risk for climate zone	Physical separation – Avoid outdoor play using indoor cooled space for all physical activity.

AZ School Heat Policy - Thresholds by Climate Zone

Climate Zone		Percent of Heat-Attributable Emergency Department Visits by Daily Maximum Temperature Ranges (°F) (8 AM to 8 PM)							
		(76 to 80)	(81 to 85)	(86 to 90)	(91 to 95)	(96 to 100)	(101 to 105)	(106 to 110)	(>=111)
Basin and Range	Pre-heat Season	1%	4%	8%	15%	21%	27%	18%	5%
Transition Zone		11%	16%	29%	26%	9%	1%	0%	0%
Colorado Plateau		21%	30%	19%	5%	0%	0%	0%	0%

AZ School Heat Policy - Heat-Risk By Age Group

Age Group	County		Percent of Heat-Attributable Emergency Department Visits By Daily Maximum Temperature Ranges (°F) (8 AM to 8 PM)							
			(76 to 80)	(81 to 85)	(86 to 90)	(91 to 95)	(96 to 100)	(101 to 105)	(106 to 110)	(>=111)
5-10	Maricopa	Pre-heat Season	0%	4%	10%	16%	23%	29%	14%	3%
	Pima		3%	7%	15%	26%	29%	17%	4%	0%
11-18	Maricopa		0%	2%	5%	11%	19%	30%	24%	8%
	Pima		2%	5%	13%	25%	31%	20%	5%	0%

ADHS Heat Emergency Response Plan

ARIZONA DEPARTMENT OF HEALTH SERVICES

Extreme Heat Incident Annex

Arizona Department of Health Services

Office of Environmental Health; in collaboration with

Bureau of Public Health Emergency Preparedness

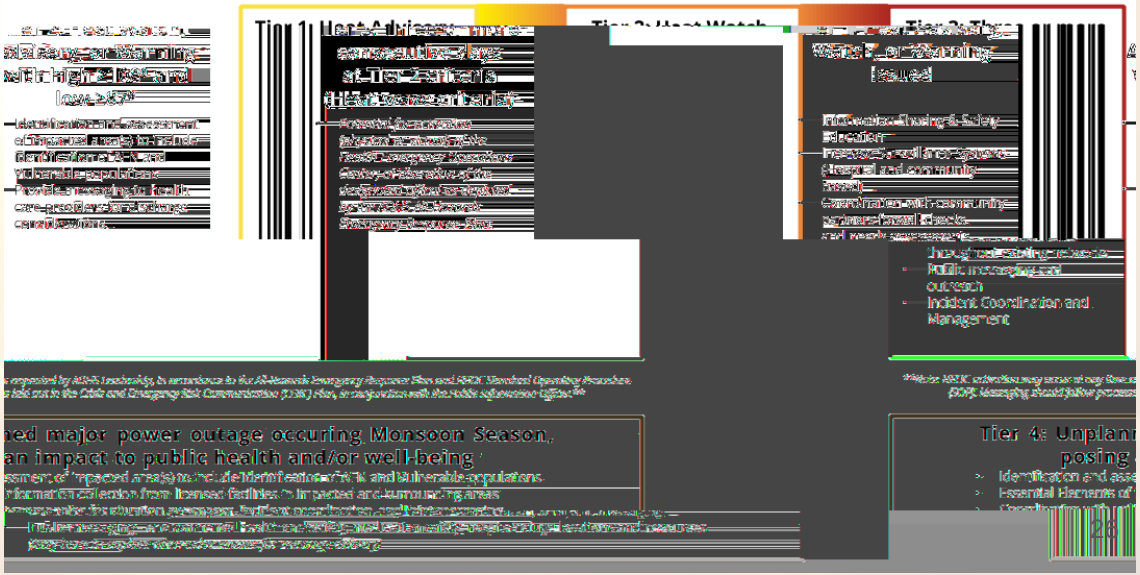
June 2018

Concept of Operations

Response Activation Levels, Thresholds, and Activities

Tier 0: Preparedness & Recovery

- Risk assessment/Situation monitoring
- Community partnership building
- Community engagement to foster public health, medical, and mental/behavioral health networks
- Coordination and promotion of training and guidance for community engagement in preparedness and recovery efforts



Key Takeaways / Closing Remarks

Include information from both NWS and partners

- This summer was very challenging due to the confluence of persistent record heat and impacts from COVID. Burden is unmatched in the region’s modern history.

- Heat-related impacts occur well below Heat Warning thresholds (e.g. school plans).

- Ongoing dialogue with partners helps improve engagement.

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NWS WFO Phoenix, AZ

NWS Partners: AZ Dept. of Health Services

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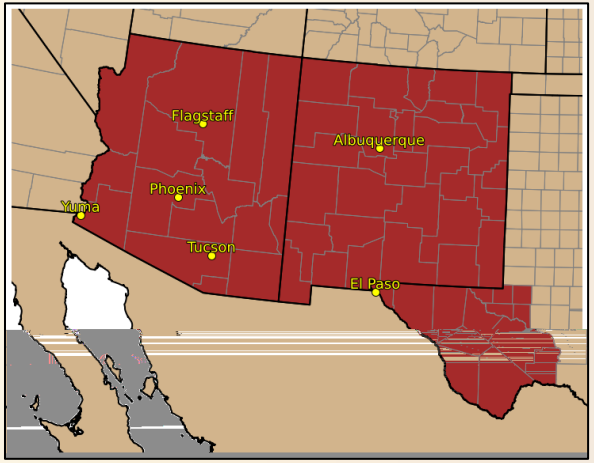
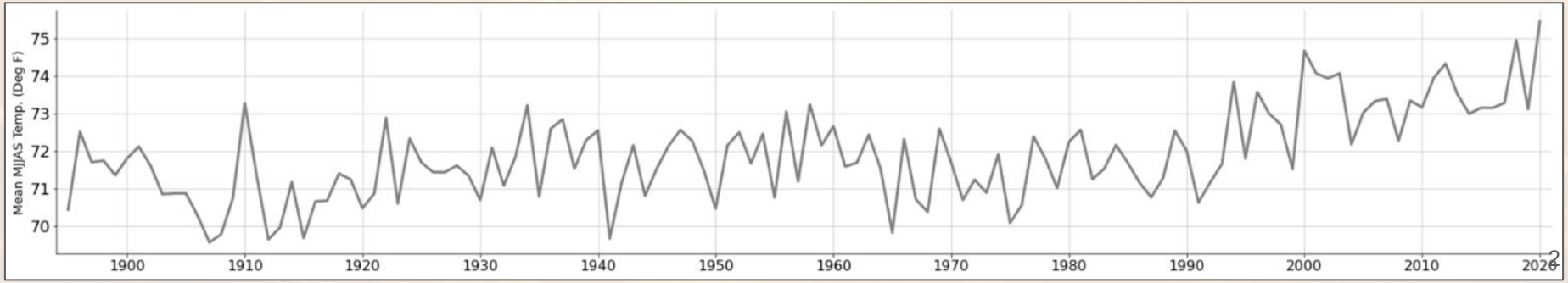
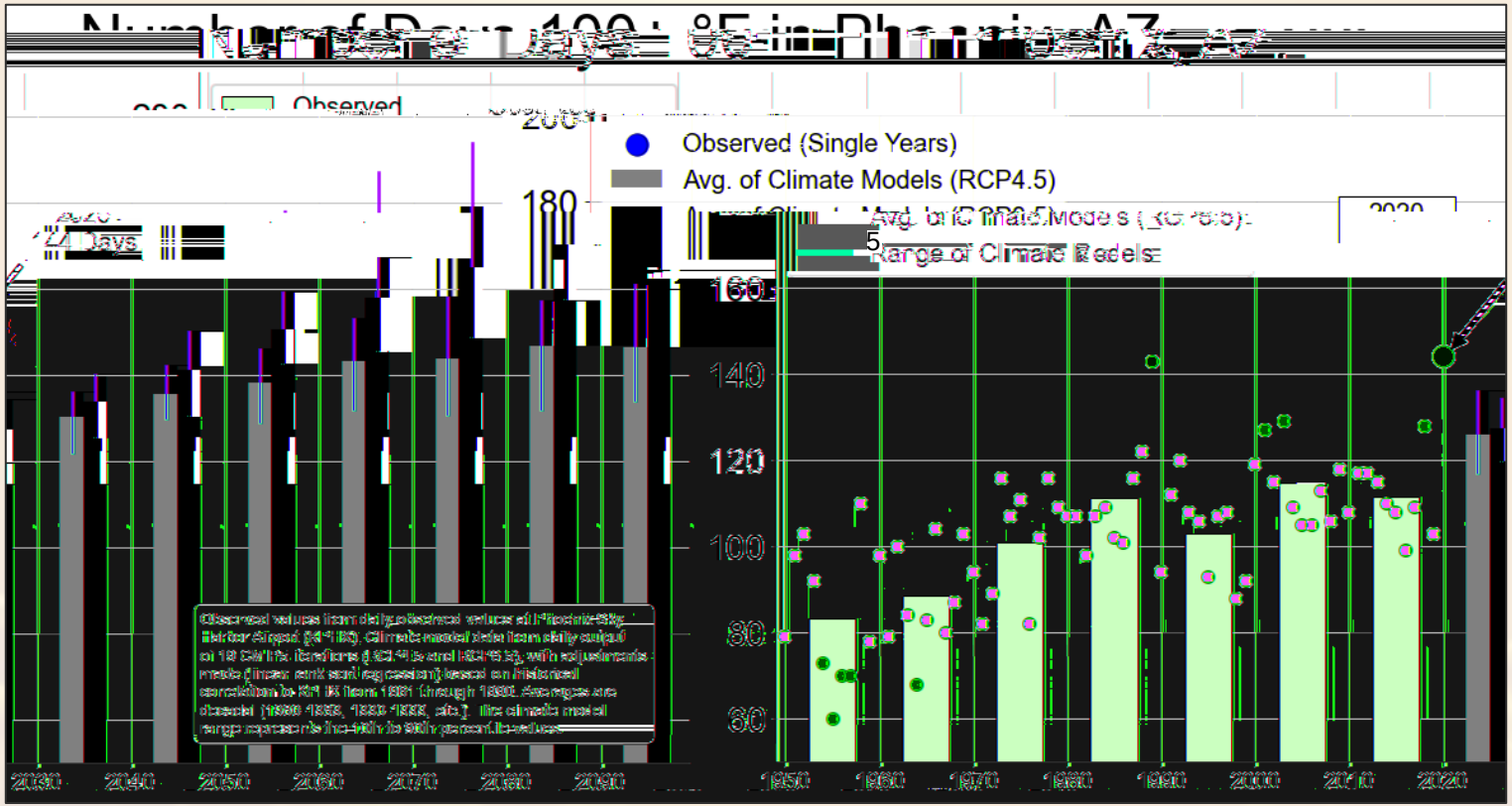
The heat season in the Southwest typically extends from May through September.

This heat season was the hottest on record across the Southwest.

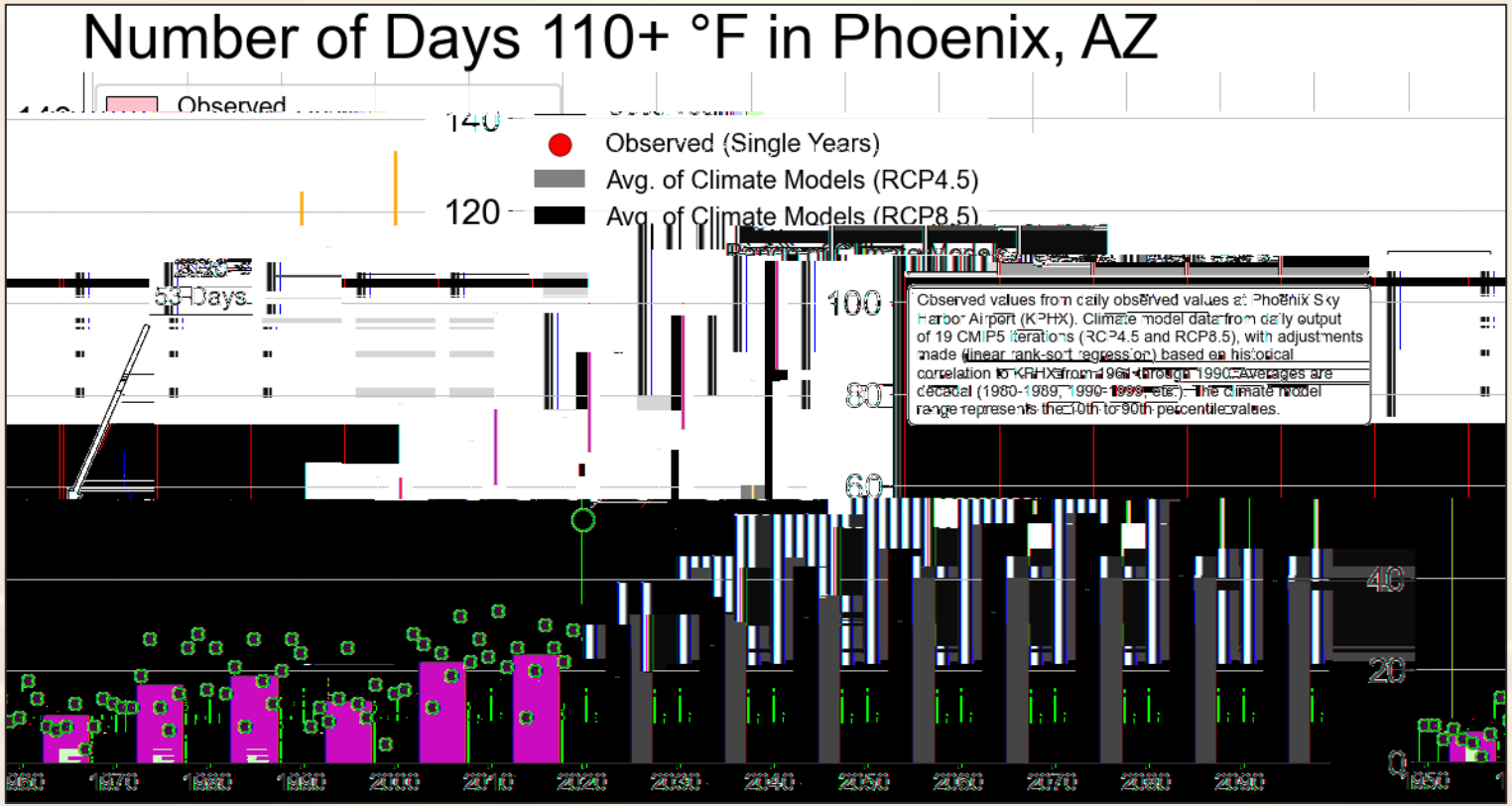




Meteorology Brief - Summer 2020



Meteorology Brief - Summer 2020



Before - Pre-Season Activity

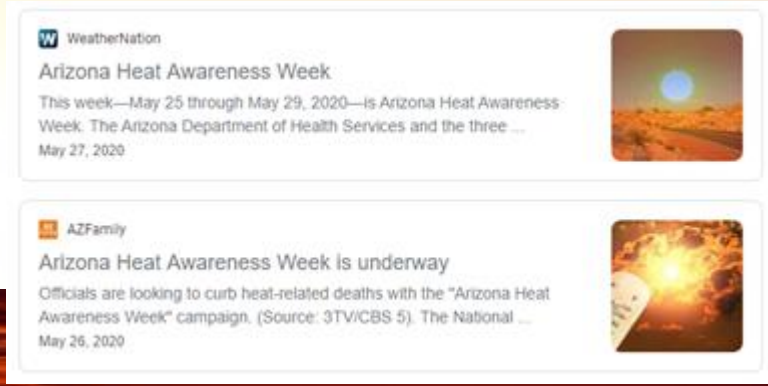
Activities performed by prior to the heat season:

- Arizona Heat Workshop (Early Spring)
- Interaction with EM/Health Partners
  EM Roadshows, Meeting/Workshop Attendance
- Internal Readiness Training
- HeatRisk Development

Before - Pre-Season Activity

Activities performed by prior to the heat season:

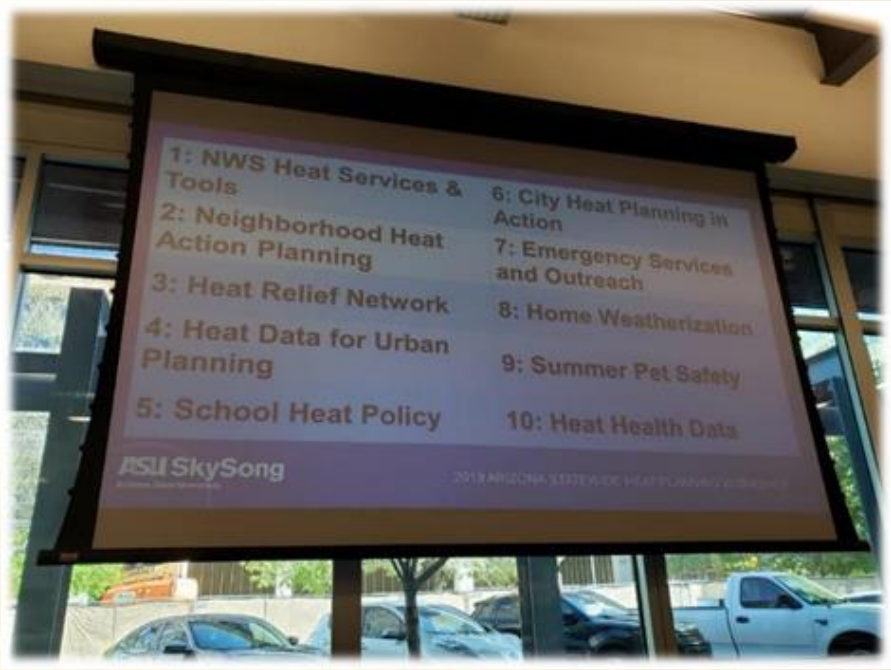
- Heat Awareness Week
  Late May; Governor's Declaration



Before - Pre-Season Activity

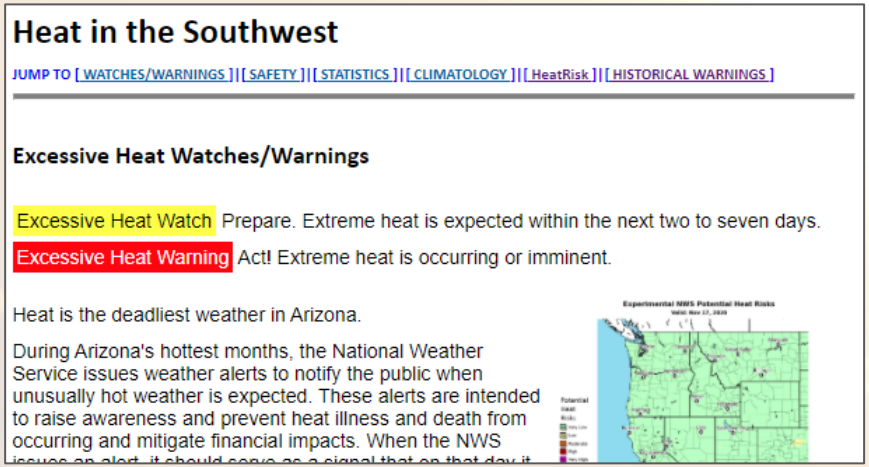
Challenges:

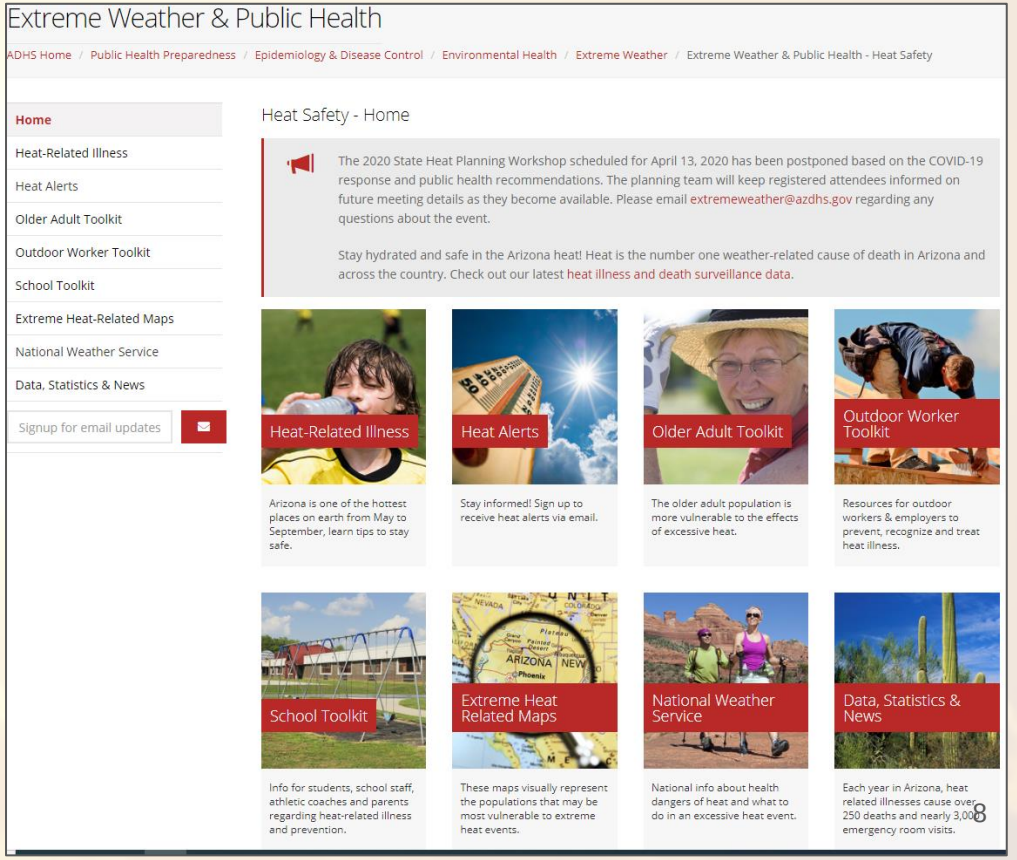
- 2020 Pre-Season Workshop canceled due to COVID.
- Preparing for extreme heat in a hot climate (on top of COVID impacts).
- Understanding the extremely broad and deep societal impacts of heat.



Before - Pre-Season Activity

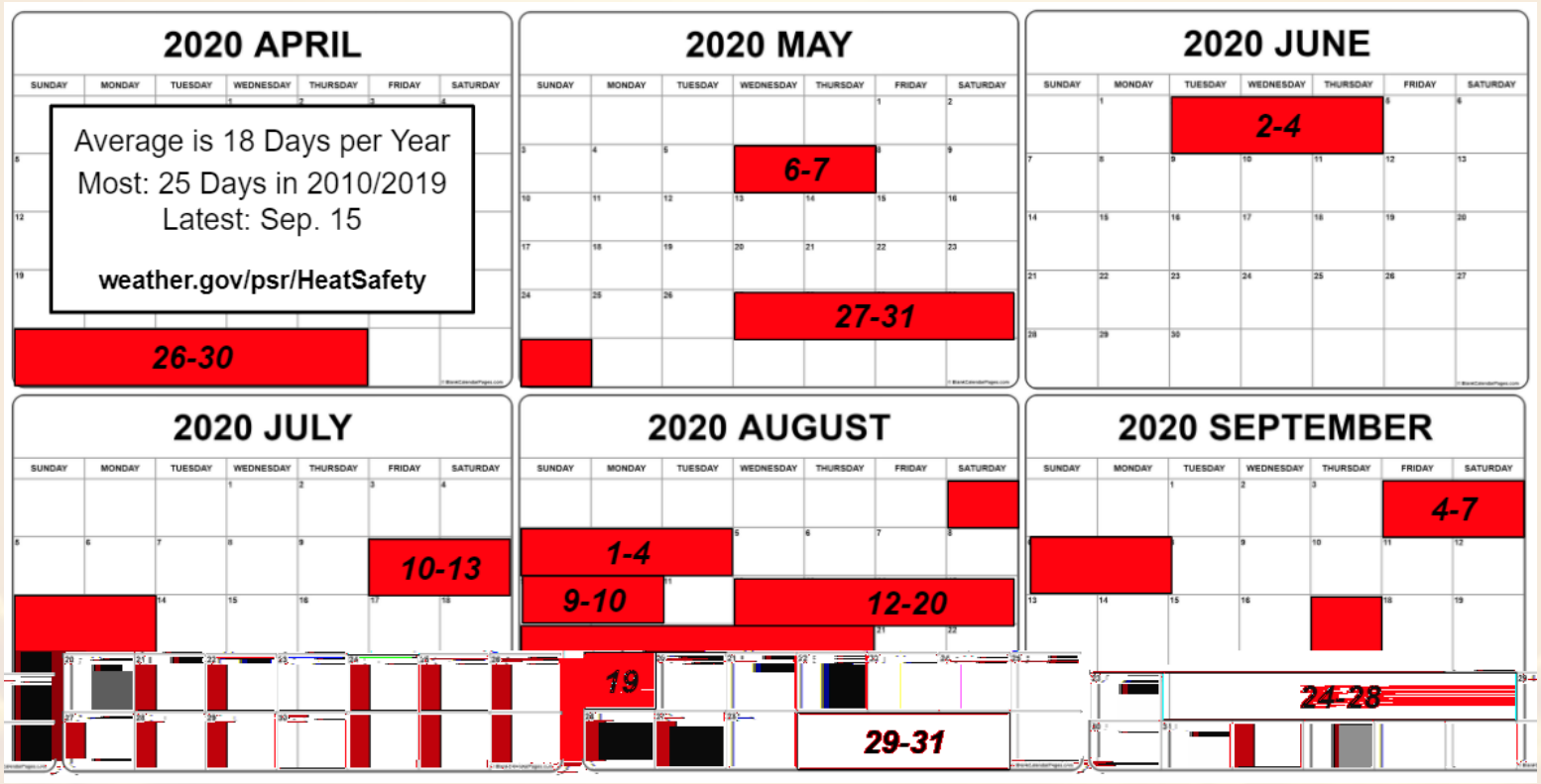
- Website promotion with plethora of information.





During - Progressing Through the Summer

EH.W Days



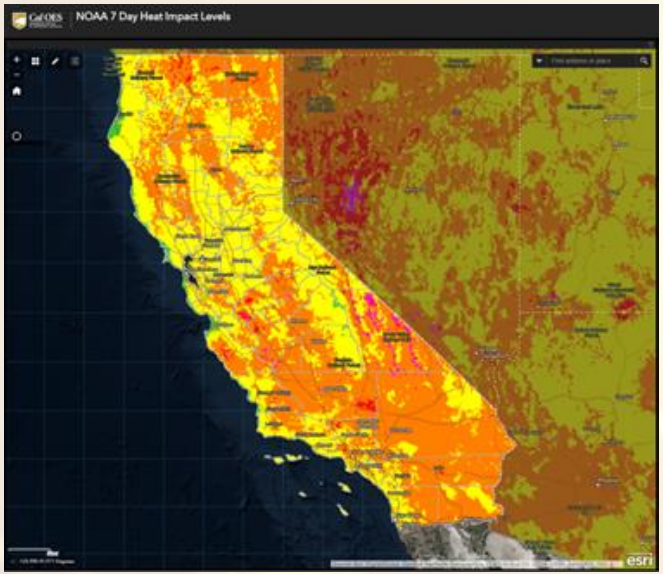
Excessive Heat Watch/Warning Avg Lead Time: 5.3 / 4.0 Days

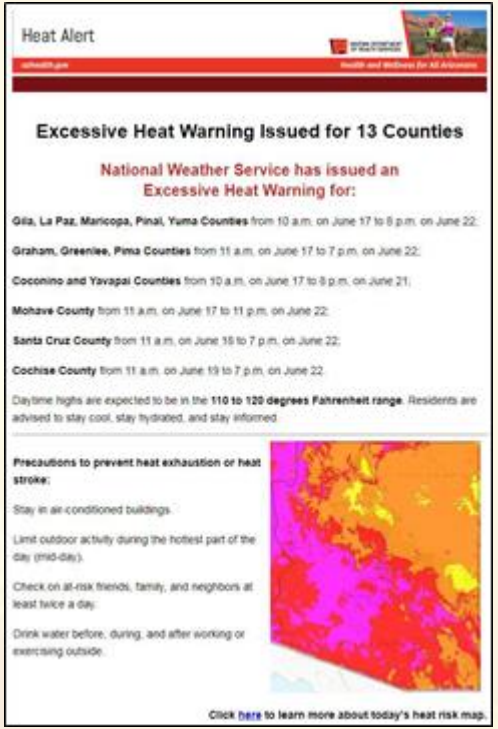
During - Progressing Through the Summer

Extensive Media/Social Media Engagement

- NWS Phoenix: ~150 Media Interviews
- @NWSPhoenix: 13M Impressions (Heat)

During - Partner Messaging




Heat Alert

Excessive Heat Warning Issued for 13 Counties

National Weather Service has issued an Excessive Heat Warning for:

Gila, La Paz, Maricopa, Pinal, Yuma Counties from 10 a.m. on June 17 to 8 p.m. on June 22;

Graham, Greenlee, Pima Counties from 11 a.m. on June 17 to 7 p.m. on June 22;

Coconino and Yavapai Counties from 10 a.m. on June 17 to 8 p.m. on June 21;

Mohave County from 11 a.m. on June 17 to 11 p.m. on June 22;

Santa Cruz County from 11 a.m. on June 18 to 7 p.m. on June 22;

Cochise County from 11 a.m. on June 19 to 7 p.m. on June 22

Daytime highs are expected to be in the **110 to 120 degrees Fahrenheit range**. Residents are advised to stay cool, stay hydrated, and stay informed.

Precautions to prevent heat exhaustion or heat stroke:

Stay in air-conditioned buildings.

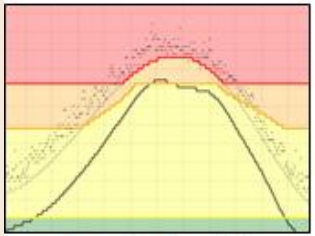
Limit outdoor activity during the hottest part of the day (mid-day).

Check on at-risk friends, family, and neighbors at least twice a day.

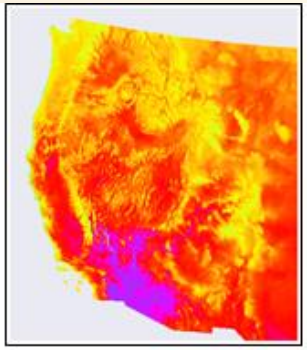
Drink water before, during, and after working or exercising outside.

Click here to learn more about today's heat risk map.

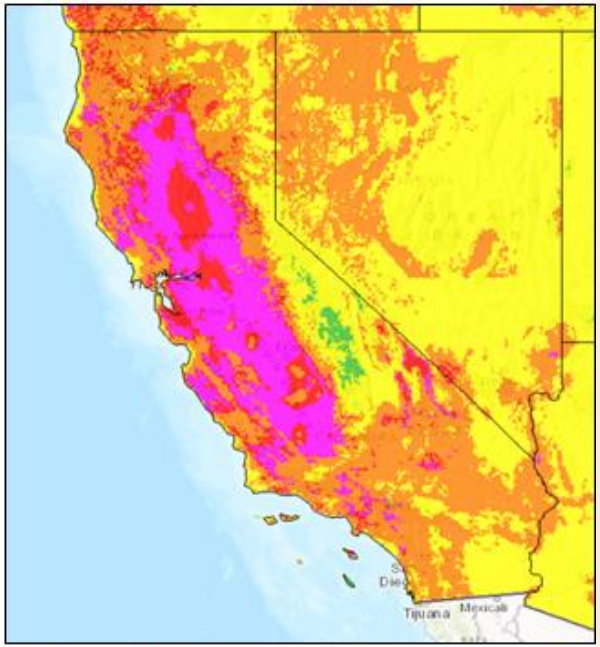
HeatRisk Review



Determine Thresholds



OSU PRISM Normals



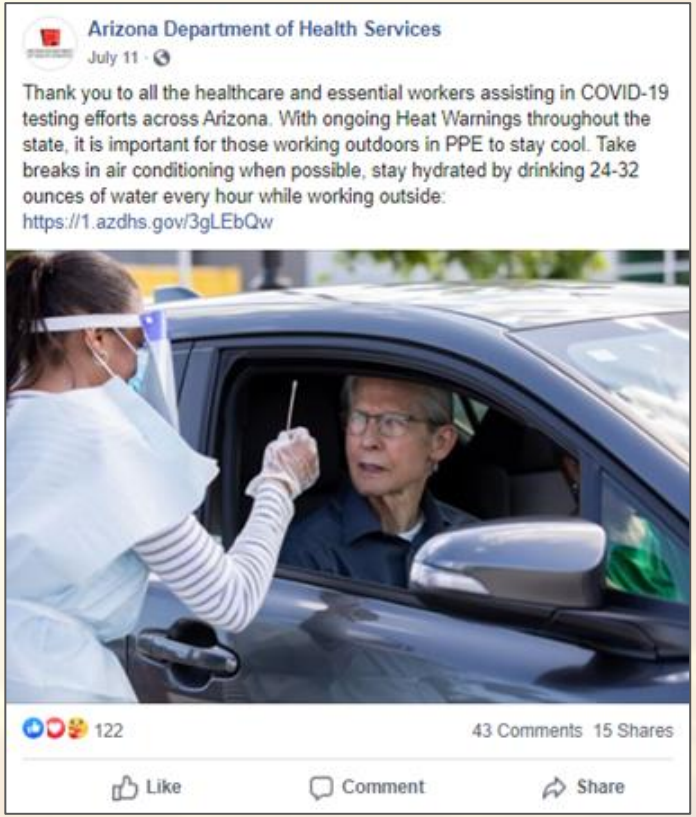
Algorithm Combines MaxT & MinT Values into Final HeatRisk Product

4000+ Stations

https://www.wrh.noaa.gov/wrh/hil/historical/

Daily MaxT and MinT Heat Impact Levels

COVID-19 Heat and Combined Safety Messaging



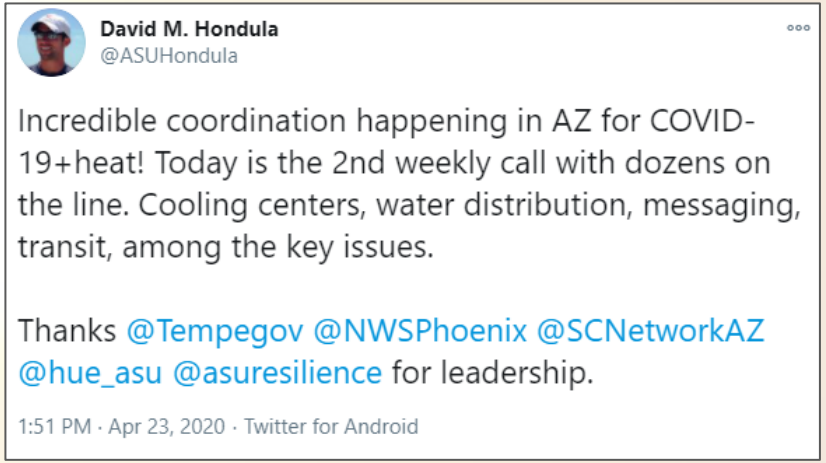
Distributing Heat Safety Materials to Outdoor & Drive Up COVID-19 Testing Sites

During - Progressing Through the Summer

Heat Preparedness & Resilience Workgroup

- Purpose: Weekly calls to *“share heat forecasts and warnings from [NWS] and local efforts with heat preparedness and response among active stakeholder organizations”.*

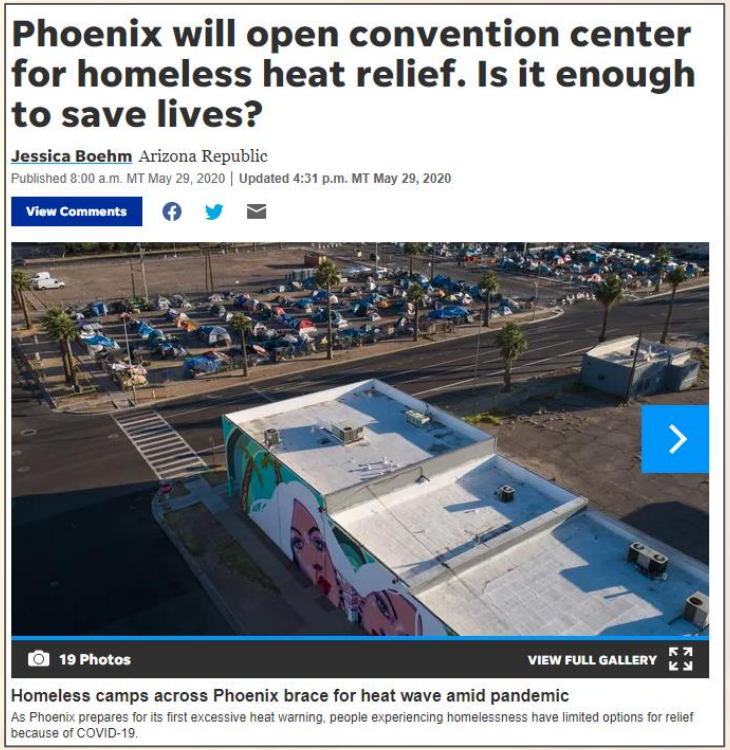
- New Activity in 2020. Partnership with ASU, NWS, ADHS, counties, & municipalities.



During - Progressing Through the Summer

Challenges This Season:

- Persistence of Heat Season
  Early Onset, Late Demise, Intensity (changing climate…)
- COVID impacts to community actions.
  - Reduced number of designated cooling centers.
  - Reduction in cooling center capacity/hours.
  - Reduction in “soft” cooling centers (businesses with indoor seating areas).
- Variety or Lack of Partner/Community Triggers
  - Ex: Some shelters extend hours based on EH.W.
  - Ex: Disparity of heat plans across school districts.



Phoenix will open convention center for homeless heat relief. Is it enough to save lives?

Jessica Boehm Arizona Republic

Published 8:00 a.m. MT May 29, 2020 | Updated 4:31 p.m. MT May 29, 2020

View Comments

19 Photos VIEW FULL GALLERY

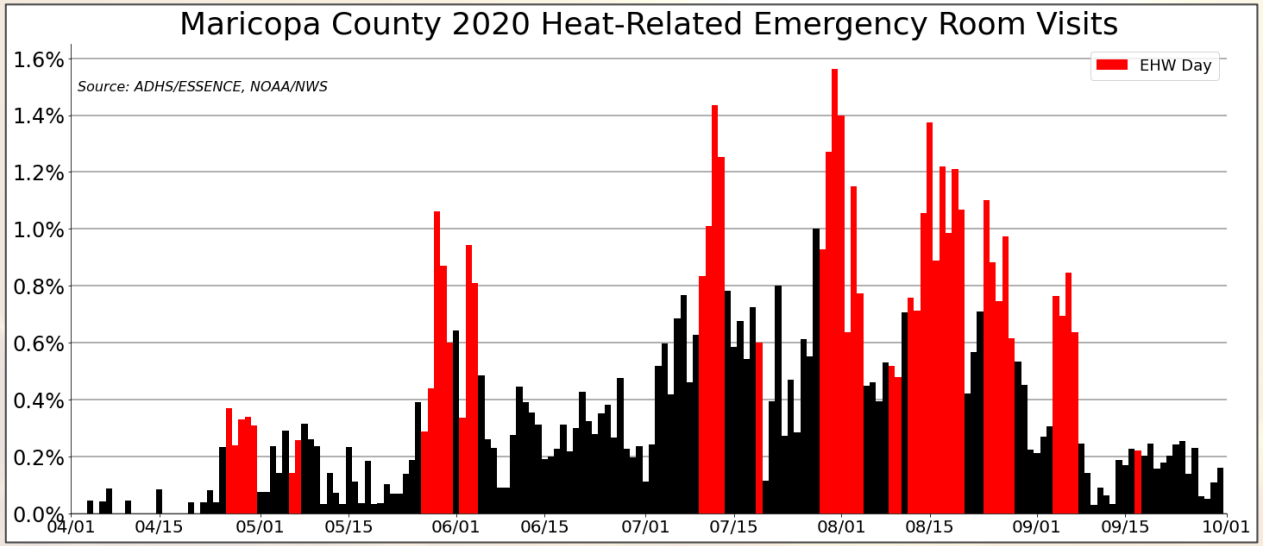
Homeless camps across Phoenix brace for heat wave amid pandemic

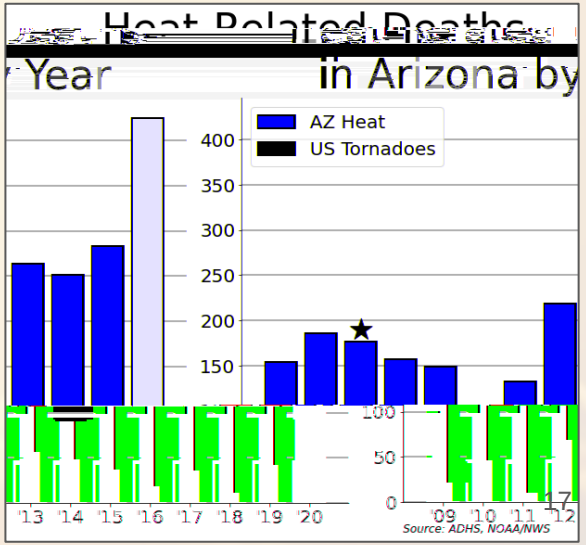
As Phoenix prepares for its first excessive heat warning, people experiencing homelessness have limited options for relief because of COVID-19.

After (Heat Season Finally Ends)

Important to understand that heat impacts are **multifaceted** and not all track exclusively with Excessive Heat Warning issuances.

Record number of heat-associated deaths expected this year.

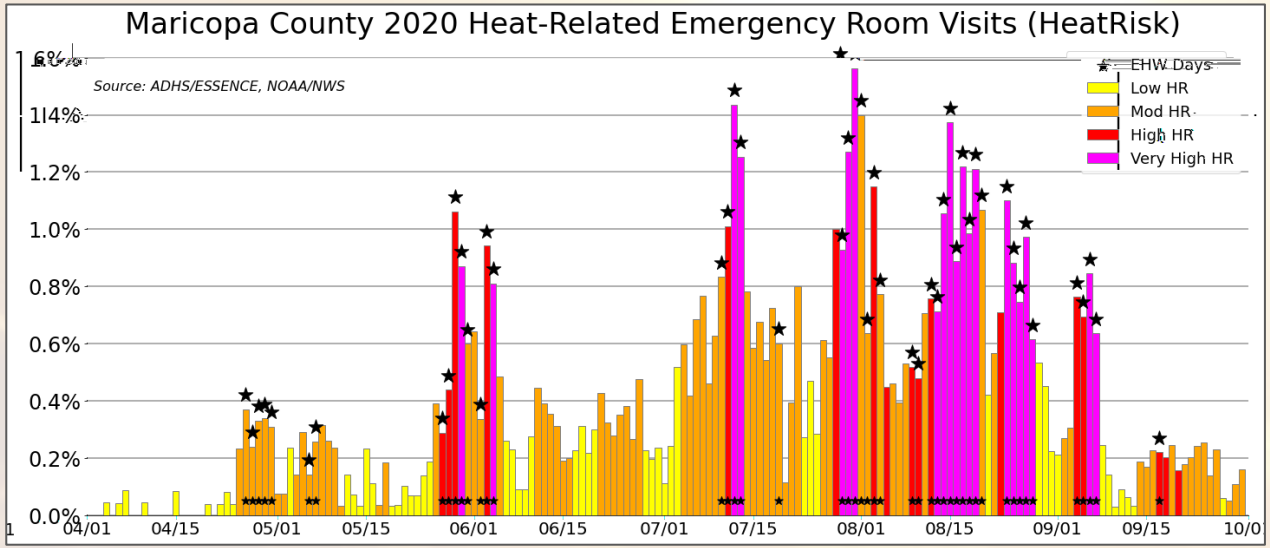


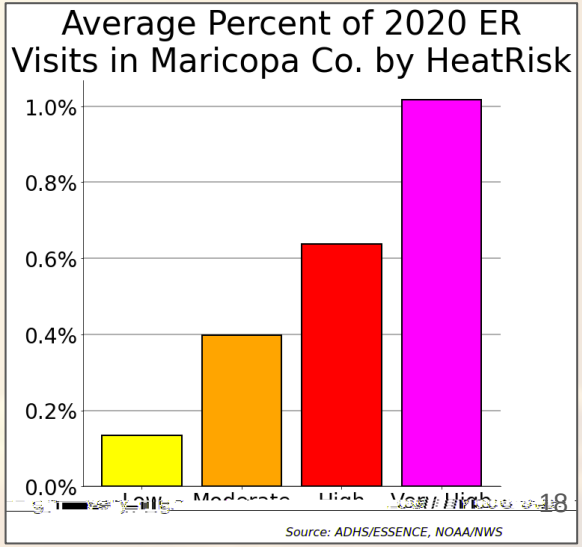


After (Heat Season Finally Ends)

Important to understand that heat impacts are **multifaceted** though some impacts do track with Excessive Heat Warning issuances.

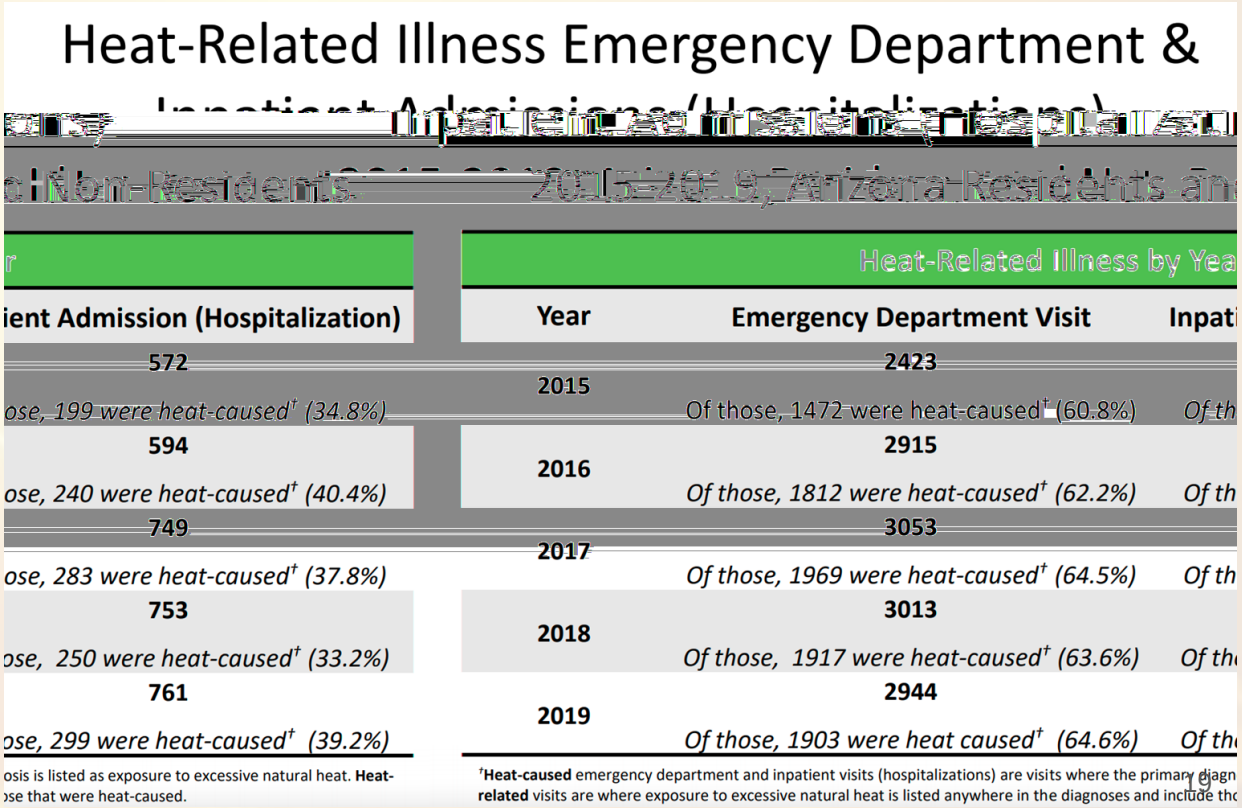
Utility of HeatRisk as a threat indicator worked.





After (Heat Season Finally Ends)

- Expect 2020 to exceed all historical heat-related illness emergency department and inpatient admissions
- Preliminary 2020 Heat ED visits 3,834 using syndromic surveillance through 9/30/20



Heat-Related Illness Emergency Department &

Heat-Related Illness by Yea

Year	Emergency Department Visit	Inpati
2015	2423 Of those, 1472 were heat-caused† (60.8%)	Of th
2016	2915 Of those, 1812 were heat-caused† (62.2%)	Of th
2017	3053 Of those, 1969 were heat-caused† (64.5%)	Of th
2018	3013 Of those, 1917 were heat-caused† (63.6%)	Of th
2019	2944 Of those, 1903 were heat caused† (64.6%)	Of th

ient Admission (Hospitalization)

572
ose, 199 were heat-caused† (34.8%)

594
ose, 240 were heat-caused† (40.4%)

749
ose, 283 were heat-caused† (37.8%)

753
ose, 250 were heat-caused† (33.2%)

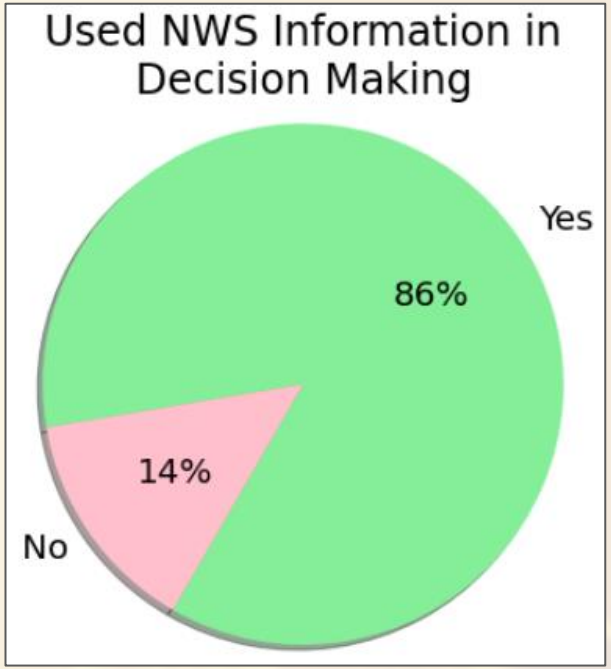
761
ose, 299 were heat-caused† (39.2%)

osis is listed as exposure to excessive natural heat. **Heat-**
se that were heat-caused.

†**Heat-caused** emergency department and inpatient visits (hospitalizations) are visits where the primary diagn
related visits are where exposure to excessive natural heat is listed anywhere in the diagnoses and include tho

After (Heat Season Finally Ends)

- ASU poll & focus groups to get feedback on the weekly heat-health calls. Participants appreciated hearing how other communities were responding to the heat (info sharing).
- Still many groups/organizations not fully engaged (schools, businesses, further away counties, Governor's office, media).
- Desire to hear more from utility companies, about AC repair options, LIHEAP, engage more on policy side.



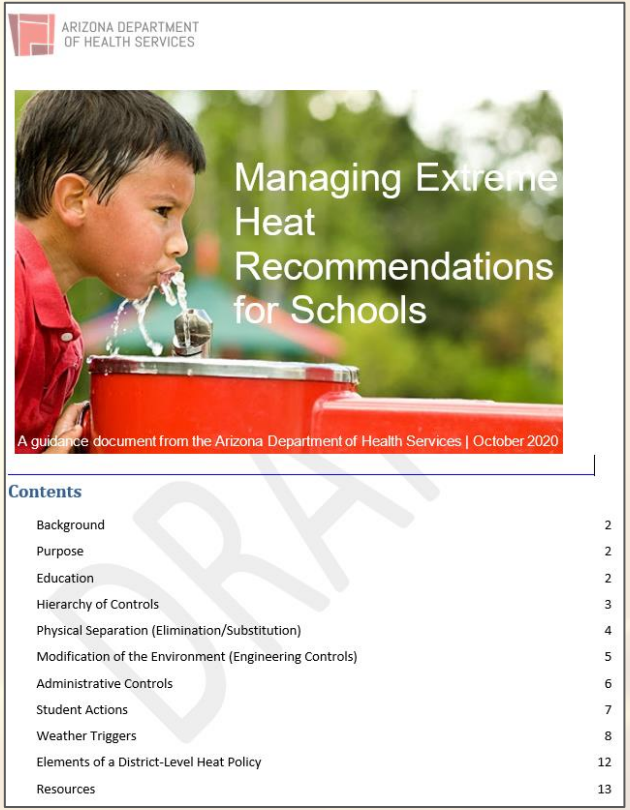
Off-Season Actions

- Planning virtual postseason partner’s workshop (December).
- Greater involvement underway with Maricopa County’s ongoing process of updating the Hazard Mitigation Plan.
- ADHS finalizing school heat plan.
- Always working to expand participation for the next season. Will hold preseason workshop (likely virtual).

AZ School Heat Policy Drafting & Threshold Dev.

- Matching school-age children emergency department visits to daily temperature to identify thresholds for highest attributable risk.

- Increased risk was found below heat warning temperatures.


ARIZONA DEPARTMENT OF HEALTH SERVICES

Managing Extreme Heat Recommendations for Schools

A guidance document from the Arizona Department of Health Services | October 2020

Contents

AZ School Heat Policy - Tiered Response

Time to Take Action/Season	Action to Take
Early on in anticipation of policy implementation Pre-heat season, spring	Environmental modification: • Plant trees • Install artificial shading • Install water fountains and water misters *Consider checking functionality of the water fountains, misters and artificial shading periodically and do upgrades, maintenance (e.g. misters cleaned, landscaping), or replacements as needed. These activities can occur anytime during the cooler season. Create a "water wise" environment and do not run the misters when children are not around to avoid wastage of water.
Lowest positive attributable risk by climate zone • Basin and Range – 81-85 °F • Colorado Plateau – 76-80 °F • Transition Zone– 76-80 °F Pre-heat season, spring	Education of supervisory staff, health professional staff, parents and students on heat-related illness prevention, recognition, and treatment. Sign up for Heat Alerts or be aware of how to receive them.
One category below highest positive attributable risk for climate zone	Administrative control – Acclimation period, scheduled rest/hydration, recess before lunch, move activities during the cooler part of day. Student actions – use of sunscreen, lightweight clothing and frequent hydration.
Highest attributable risk for climate zone	Physical separation – Avoid outdoor play using indoor cooled space for all physical activity.

AZ School Heat Policy - Thresholds by Climate Zone

Climate Zone		Percent of Heat-Attributable Emergency Department Visits by Daily Maximum Temperature Ranges (°F) (8 AM to 8 PM)							
		(76 to 80)	(81 to 85)	(86 to 90)	(91 to 95)	(96 to 100)	(101 to 105)	(106 to 110)	(>=111)
Basin and Range	Pre-heat Season	1%	4%	8%	15%	21%	27%	18%	5%
Transition Zone		11%	16%	29%	26%	9%	1%	0%	0%
Colorado Plateau		21%	30%	19%	5%	0%	0%	0%	0%

AZ School Heat Policy - Heat-Risk By Age Group

Age Group	County		Percent of Heat-Attributable Emergency Department Visits By Daily Maximum Temperature Ranges (°F) (8 AM to 8 PM)							
			(76 to 80)	(81 to 85)	(86 to 90)	(91 to 95)	(96 to 100)	(101 to 105)	(106 to 110)	(>=111)
5-10	Maricopa	Pre-heat Season	0%	4%	10%	16%	23%	29%	14%	3%
	Pima		3%	7%	15%	26%	29%	17%	4%	0%
11-18	Maricopa		0%	2%	5%	11%	19%	30%	24%	8%
	Pima		2%	5%	13%	25%	31%	20%	5%	0%

ADHS Heat Emergency Response Plan

ARIZONA DEPARTMENT OF HEALTH SERVICES

Extreme Heat Incident Annex

Arizona Department of Health Services

Office of Environmental Health; in collaboration with

Bureau of Public Health Emergency Preparedness

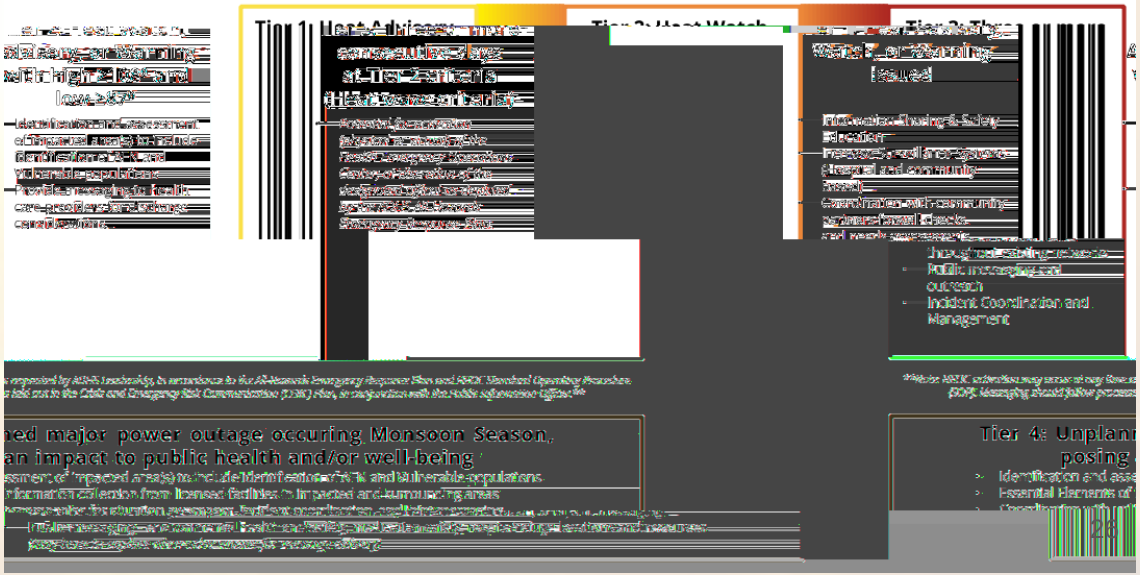
June 2018

Concept of Operations

Response Activation Levels, Thresholds, and Activities

Tier 0: Preparedness & Recovery

- Risk assessment/Situation monitoring
- Community partnership building
- Community engagement to foster public health, medical, and mental/behavioral health networks
- Coordination and promotion of training and guidance for community engagement in preparedness and recovery efforts



Key Takeaways / Closing Remarks

Include information from both NWS and partners

- This summer was very challenging due to the confluence of persistent record heat and impacts from COVID. Burden is unmatched in the region’s modern history.

- Heat-related impacts occur well below Heat Warning thresholds (e.g. school plans).

- Ongoing dialogue with partners helps improve engagement.

Local Heat Event Report

July 2018 & 2019 at El Dorado Lake, KS

NWS Wichita
Butler County Emergency Management

NWS Public Program Heat Workshop
Wednesday, November 18, 2020

Event Brief

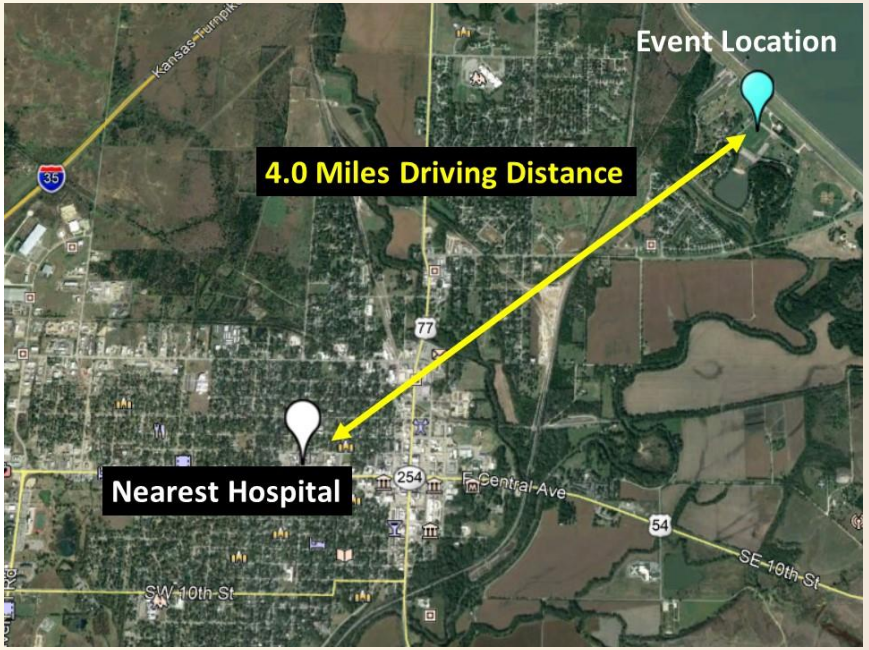
- Two-day outdoor music festival at the El Dorado State Park, just outside of El Dorado, KS

- Operational periods on the two event days:
  - 2018: 1200 hrs. to 0300 hrs. x 2 days (Friday and Saturday)
  - 2019: 1100 hrs. to 0000 hrs. x 2 days (Friday and Saturday)
  - 2019 added a small Thursday evening concert, but organizers only requested one ambulance on standby

- Total emergency services/incident command staffing:
  - 160 in 2018
  - 130 in 2019

Medical Capabilities Brief

- EMS – ALS with a physician on site
- Technical rescue/dive team
- Medical first aid tent (climate controlled)
- Mobile medical teams
- 2 dedicated ALS transport units

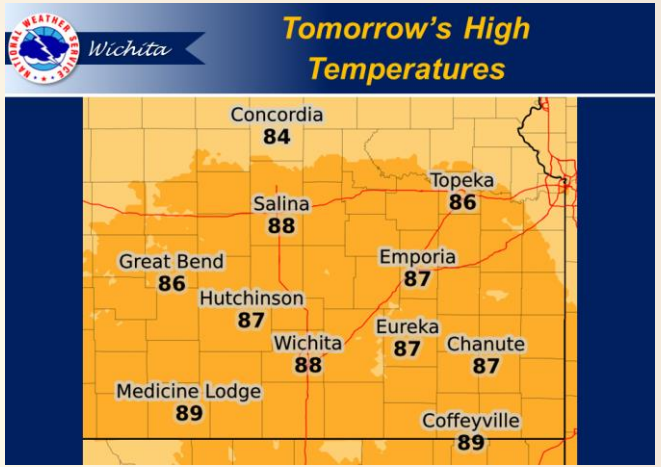


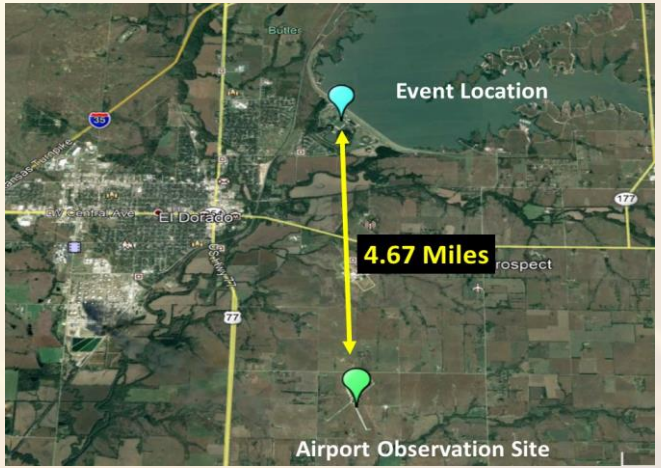
- Closest hospital is in El Dorado: 4 miles
- Closest Level I Trauma Center in Wichita: ~35 miles

Meteorology Brief -

- 2018
  - Temperatures: 80s and low 90s (below or near seasonal normals)
  - Varied based on location per field experiment
    - Readings taken over multiple surfaces
      - Heat indices: 88-100
      - Wet Bulb Globe Temperature (WBGT): 82-86
      - Light winds (calm to 7 mph)
  - Thunderstorm chances overnight with potential for severe storms

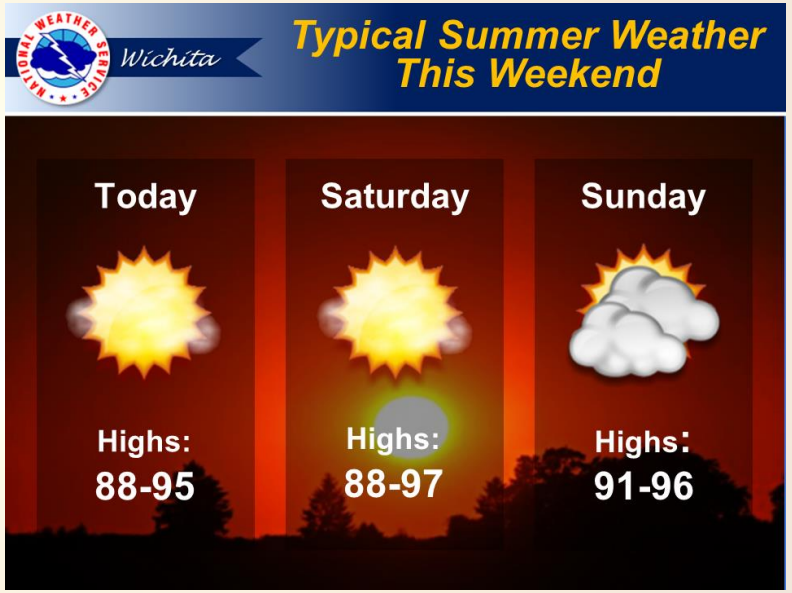
First day of festival forecast





Meteorology Brief -

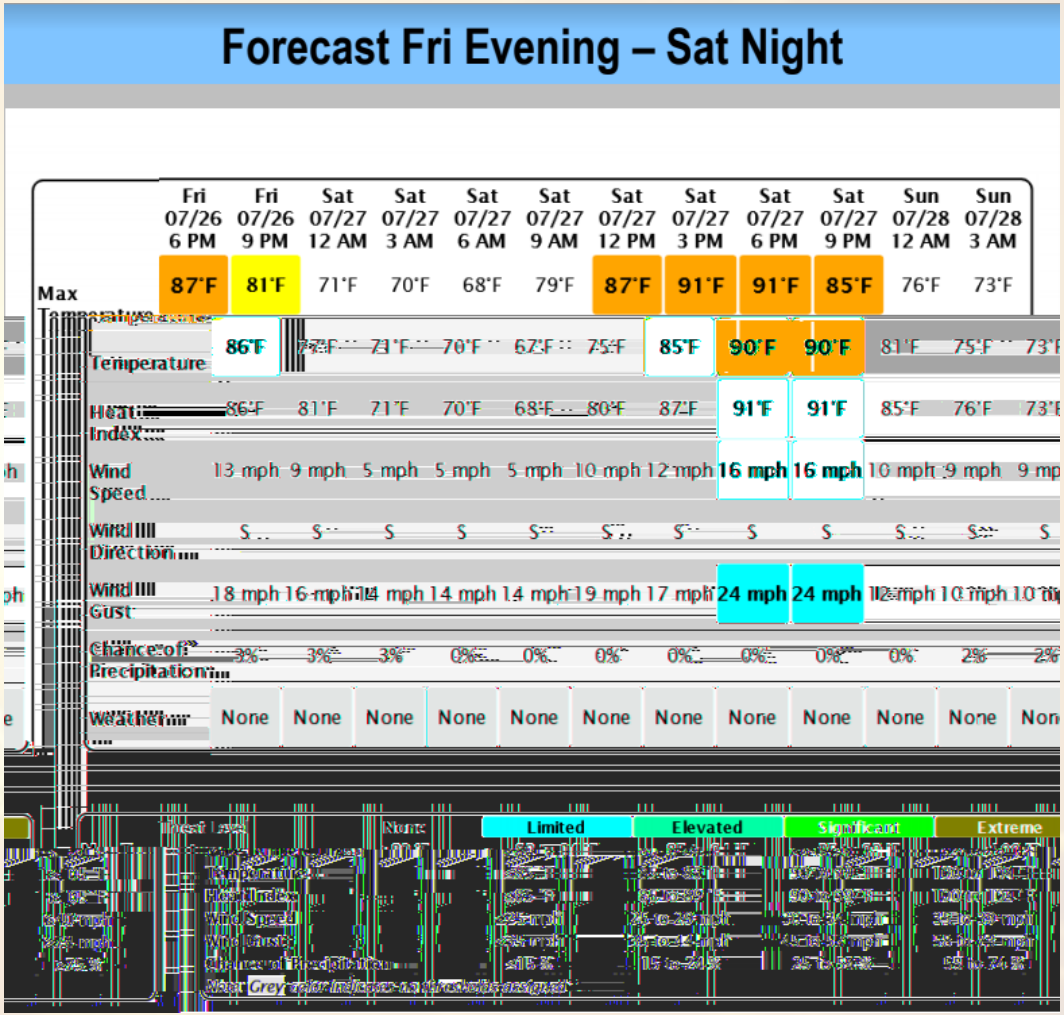
- 2019
  - Temperatures: around seasonal normal (91)
  - Heat indices: 85-90
  - Wet Bulb Globe Temperature: 78-83
    - Readings taken over same surface
  - Breezy in the afternoon (wind speeds around 15 mph with gusts to 25 mph)



Before

- Participation in planning team leading up to event – regular meetings conducted between January and July
- Input into the Severe Weather Addendum to the IAP
- Morning briefing packets during the week of the event in both 2018 and 2019 (for pre-planning and protection of on-site personnel performing set-up)
    - Threat matrix – overview of forecast for days of event with thresholds highlighted (2019 only)

- **Thresholds -**
  - Apparent Temp
    - 90, 95, 100, 105
  - WBGT
    - 80, 85, 88, 90



During: Situational Concerns

- Time of year
- Setting of the event
- Cumulative exposure to elements
- Larger attendance, many staying on site in tents or campers
  - 8,000 in 2017
  - 12,000 in 2018
  - 6,000 in 2019
- Alcohol sales on site with a history of LOTS of consumption
- Apparel of on-duty emergency services personnel
- Emergency services roles and posting locations
- Beach with water recreation during first several hours of the event each day (also coupled with alcohol sales and consumption)

During -

- Continuous NWS onsite support during the event (during the county's operational periods)

- Brought Kestrel device to monitor conditions on site
  - Performed local heat study over various surfaces in 2018
  - Provided Wet Bulb Globe Temperature

- Participation in the daily operational briefing during the event

During: Operational Concerns

- Ensuring sufficient staffing in the medical branch (both onsite treatment and with transport capabilities)
- Ensuring sufficient medical supplies on hand (i.e. IV supplies and fluids for treating heat exposure)
- Informing decisions: treating on site vs transporting to hospitals
- Establishing rest and rehab plans for emergency services personnel
  - Frequency and length of rest periods
  - Needed supplies (water, Gatorade, food)

During the event -

- Heat incidents resulted in evolution of services
  - Adjusted thresholds
  - Monitored and relayed WBGT

After

- NWS participation in the After Action Review following the event
- Lessons learned:
  - Adjustments to heat thresholds and parameters - added to threat matrix
  - Projecting medical staff and services based on previous years

- Enhanced interest by NWS meteorologists to work with partners to make the event WeatherReady

After Event Debrief...

1. Educational opportunity on new tools
2. Opportunity to understand impacts and thresholds/trigger points

Key Takeaways / Closing Remarks -

- Involvement of NWS from start of planning process thru After Action Review
- Modify thresholds on the fly as needed
- Microclimates across site can impact support
  - Bring equipment to measure and monitor local conditions
  - Airport is more open in nature than festival site
    - Ie. winds at the festival were lower based on proximity and features, various surfaces, crowd, etc.
- Educational opportunity for both NWS and partner

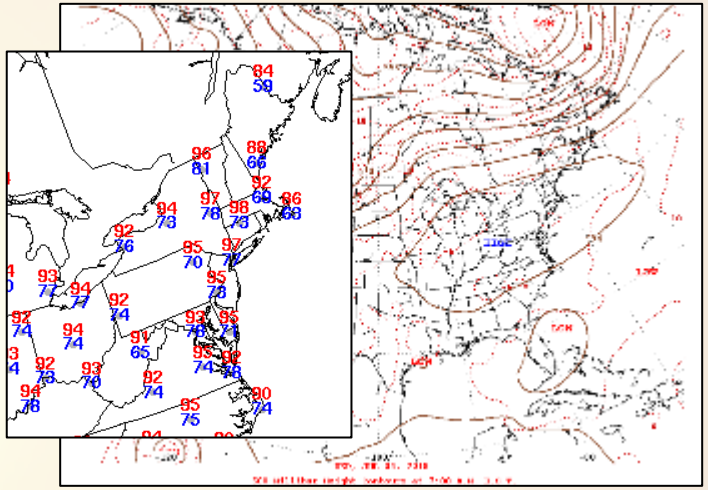
ER/NWS Burlington Heat Event Report
June 30 – July 5, 2018 Heat Wave

Scott Whittier, WCM - NWS Burlington, VT
Jared Ulmer, Climate & Health Program Manager - VT Dept of Health

NWS Public Program Heat Workshop
Wednesday, November 18, 2020

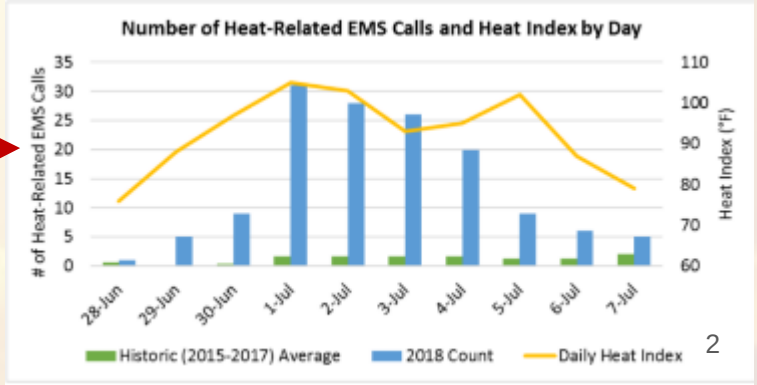
Meteorology Brief – June 30 - July 5, 2018 Heatwave

Massive heat ridge builds across much of the eastern CONUS with temperatues in the mid-upper 90s and southwest flow delivering dewpoints into the 60s/70s.

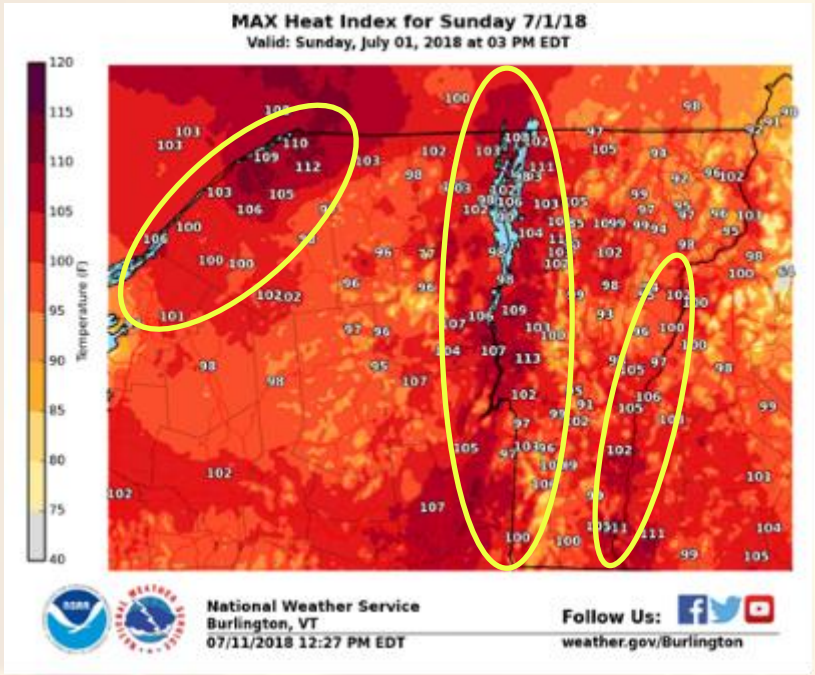


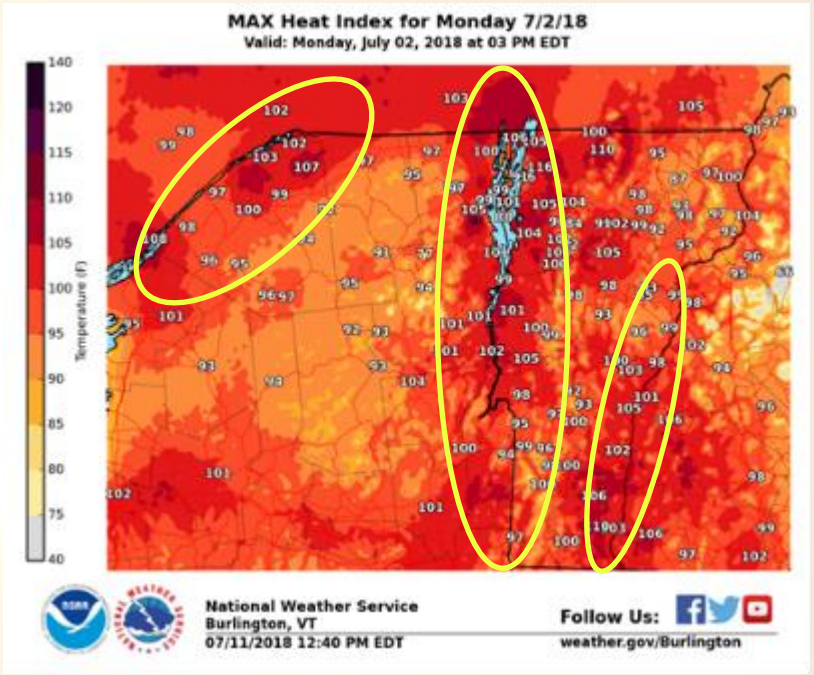
- **Normal High: 80° Normal Low: 60°**
- **Preceding 5-7 days – Highs were only in the 60s to lower 70s.**
- Burlington's 6-Day Max Temperature ~ 94.8°F
- Burlington's Warmest 6-Day Avg Mean Temperature ~ 83.5°F
- Burlington's Warmest 6-Day Min Temperature ~ 72.2°F
- Burlington's First ever ≥ 80°F low temperature (80° - July 2nd)
- **First Ever Excessive Heat Warning Issued for CWA**

- **In VT -** Directly heat-related health impacts were 4 deaths, >100 emergency department visits, and >140 EMS calls.
- Still researching "attributable" impacts – basically, an estimate of excess deaths & emergency department visits that can statistically be attributed to the heat wave.
- Commentary on 2018 Heat Wave – Preparing for Hot Weather in a Cold State.



Meteorology Brief – Observed Conditions

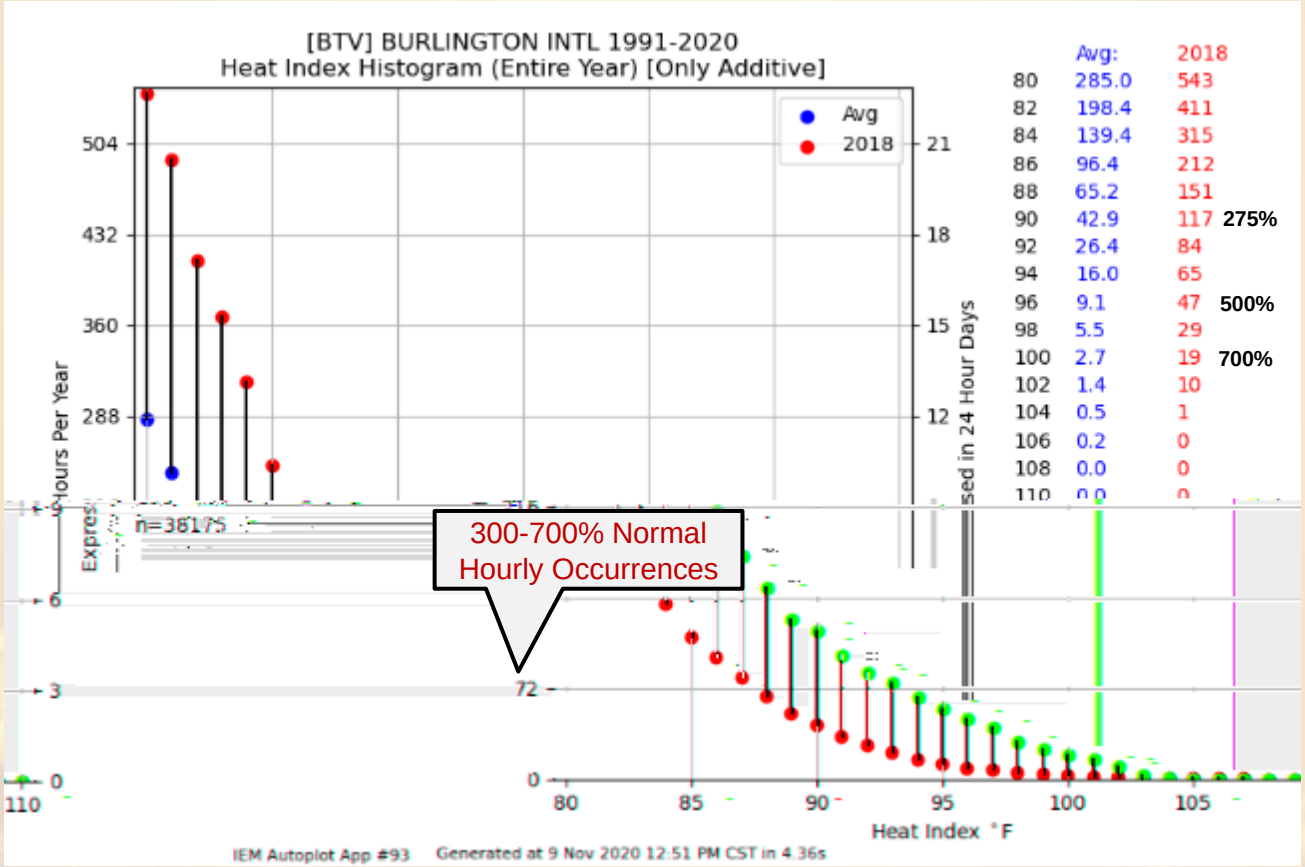




Sunday, July 1st - High temperatures in the lower to upper 90s with oppressive dew points in the low to mid 70s created heat index values in the 100 to 110° range. ****First ever Excessive Heat Warning for VT****

Monday, July 2nd - High temperatures in the upper 80s to mid-90s with significant dew points in the upper 60s to lower 70s created heat index values in the mid-90s to lower 100s.

NWS Burlington Heat Index History



Before the event (Months/Years)

- VT Dept of Health and (VDH) and other state health departments/organizations received grant money from the Centers for Disease Control (CDC) beginning in 2012, to study and respond to expected climate change impacts on health.

- VDH's heat & health report (published in 2016) identified the following:
  - From May-September, heat-related health risks were much higher on days when the statewide average temperature reaches 87°F or hotter. On such hot days:
    - **heat-related illnesses occurred eight times more frequently**
    - there was **one additional death each day** among individuals aged 65 and older.
  - **Vermonters may be particularly sensitive to heat: limited opportunities to acclimate to heat, not used to modifying behaviors because of heat, many buildings not designed to deal with summer heat**
  - From 1981-2010 there were 7 days/year when the statewide average reached 87°F or hotter. The Vermont State Climate Office projected 15-20 such hot days/year by mid-century and 20-34 by the end of the century.

Before (Months/Years) - cont'd

- **VDH reached out to BTV** in the Spring of 2016 and the **Northeast Heat Consortium reached out to ER MSD** in the Fall of 2016 to review Heat headlines. (Health Departments from ME,NH,RI, Brown Univ).

- **First priority,** while awaiting any criteria changes. NWS Burlington worked very closely with VDH on heat messaging and joint press releases prior/during events and a Heat Safety Awareness Day.

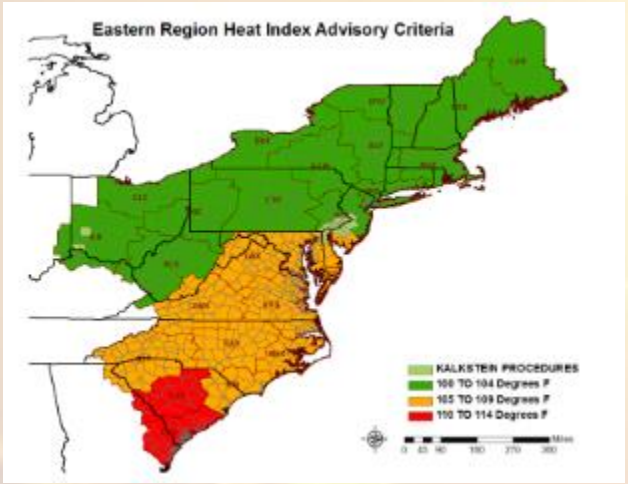
- **Second priority -** NWS Burlington configured their EHWO Excessive Heat Graphic/Legend with close collaboration/input from VDH to **alert the more vulnerable at lower thresholds – up to 7 days**.

- NWS New England Sub-Regional offices (ALY,BOX,BTV,CAR,GYX,OKX) invited the Northeast Heat Consortium to our First Biennial Meeting in the fall of 2016 and worked closely with ER MSD on **lowering Heat Advisory thresholds for the 2017 season and re-evaluated for the 2018 season**
    - Looked at Climatology (1985-2015) for # Days Heat Index ≥ 95°F per year across New England/NY.

NWS Eastern Region Heat Advisory Criteria Progression

Worked with NWS Offices serving New England as well as Northeast Health Departments and NE Heat Consortium between 2016-2018

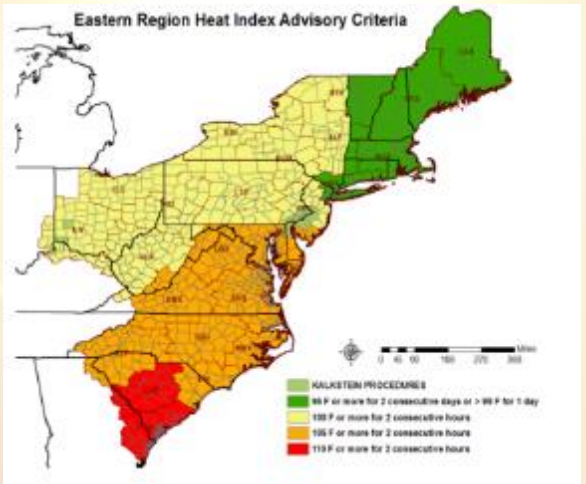
2016



Heat Index (HI)
100-104 degrees for 2 Consecutive Hours

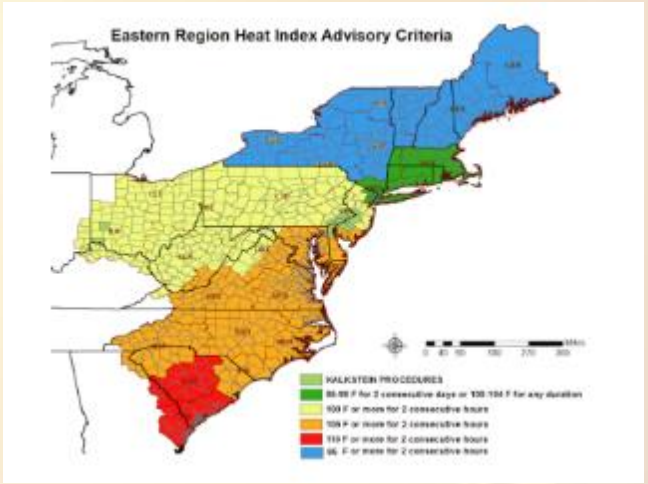
2017

Looked at Climatology (1985-2015) for # Days Heat Index ≥ 95°F per year across New England/NY.



Heat Index (HI)
95-99 degrees for 2 Consecutive Days or
100-104 degrees for 2 Consecutive Hours

2018



Heat Index (HI)
95-104 degrees for 2 Consecutive Hours

NWS Burlington Heat Headline History

Year	Days with Heat Advisories	Days with Excessive Heat Warnings
2007-09	0	0
2010	3	0
2011	1	0
2012	1	0
2013	1	0
2014	0	0
2015	0	0
2016	0	0
2017	0	0
2018	**9 (5)***	**1***
2019	2	0
2020	4	0

Lowering the criteria did not lead into too many headlines, struck a nice balance.

Heat Advisory Criteria before 2018: Heat Index between 100-104°F
Heat Advisory Criteria 2018 and beyond: Heat Index 95-104°F
Excessive Heat Warning : Heat Index ≥ 105°F

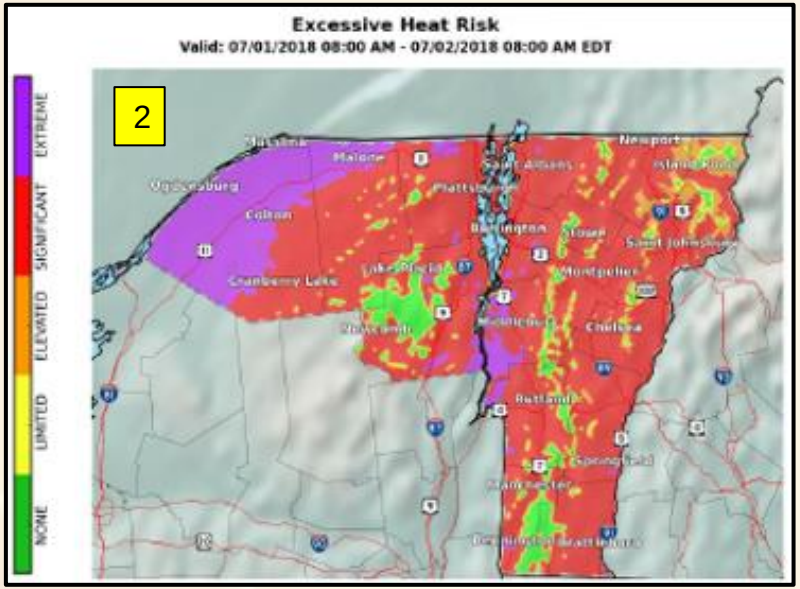
July 2018 was the 2nd Warmest on Record and 3rd Warmest Summer of Record
July 2020 and Summer of 2020 was the Warmest on Record

Equivalent to Climatology for Philadelphia, PA ~300+ miles SOUTH

Rank	Year	Mean Avg Temperature
1	2020	72.3
2	1949	72.2
3	2018	72.1
4	2005	71.5
5	2016	71.4
-	1995	71.4
7	1901	71.2
8	1899	71.0
9	2012	70.9
-	1999	70.9
-	1895	70.9
12	1900	70.8
13	1955	70.6
14	2019	70.4

Normal Summer = 68.4°F

NWS Burlington EHWO Excessive Heat Product



1

24 Hr. Hazards	Day 1	Tue	Wed	Thu	Fri	Sat	Sun
Tornado							
Hail							
Thunderstorm Wind Gus							
Aviat							
Seve Thunder							
Flood							
Lightning							
Fire Weather							
Fog							
Non Thunderstorm Winds							
Excessive Heat							
Snow & Sleet							
Ice Accumulation							
Frost & Freeze							
Excessive Cold							

Quick “Heads-up” to potential hazards 7 days in advance

These thresholds were obtained working closely with VDH based upon a recent Heat-related hospitalization study.

64% of Heat-related ED Visits occurred with BTV Max HI < 90°F

3

Excessive Heat Legend — Excessive Heat Safety Tips

Risk Level	Definition
None	Maximum heat index < 80 degrees F.
Limited	Maximum heat index 80 to 89 degrees F.
Elevated	Maximum heat index 90 to 94 degrees F.
Significant	Maximum heat index 95 to 104 degrees F.
Extreme	Maximum heat index greater than or equal to 105 degrees F.

Future versions will include potential impacts for each risk level based on VDH research.

Advisory

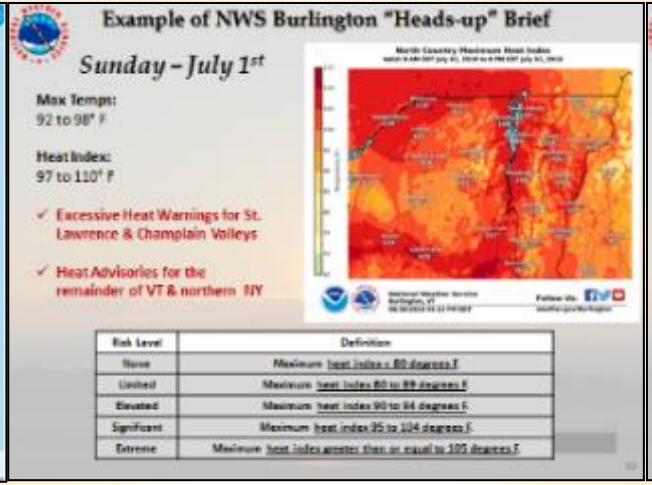
Warning

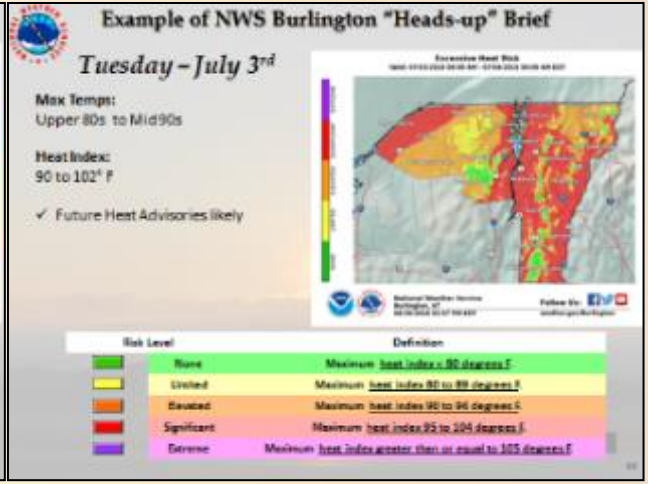
Before (Immediately leading up to THIS event)

Initial messaging leading up to the heat event:

- NWS Burlington issued twice daily Briefing e-mails to ALL core partners, more than 3 days prior to the event due to forecaster confidence, “severity”, weekend timing of the heat and potential impacts.
- NWS Burlington collaborated early and often with VDH on upcoming heat wave and messaging including joint press releases, utilized multiple dissemination methods, as well as sharing each other social media posts.
- NWS Burlington interacted with utilities and other agencies, addressing any concerns for unified messaging.

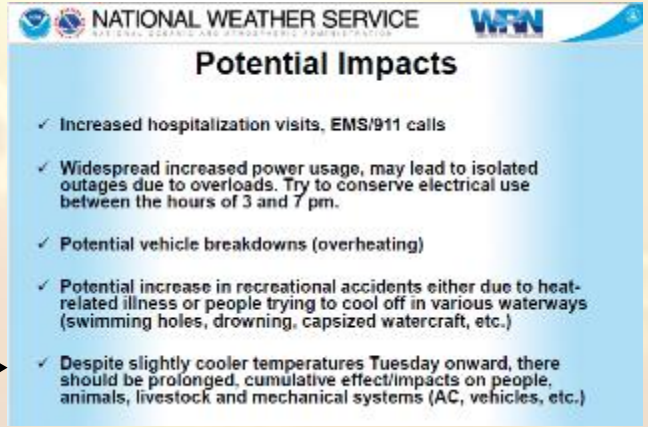
Example of NWS Burlington "Heads-up" Brief





Sent to Local, State EMDs and Agencies twice daily from June 26th through July 5th

- Heat Index slides for each day June 29th – July 5th
- Combination of SAC Grid Image Maker in the near term and the EHWO Excessive Heat images for Days 3-7.
- Potential Impacts and Heat Safety Messages including numerous links



NATIONAL WEATHER SERVICE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

WRN WEATHER-READY NATION

Heat Safety Links

- **NWS Heat Safety**
  - https://www.weather.gov/safety/heat
- **VT Dept. of Health Heat Safety**
  - http://healthvermont.gov/climate/heat
- **FEMA Extreme Heat**
  - https://www.ready.gov/heat
- **Centers for Disease Control and Prevention**
  - https://www.cdc.gov/disasters/extremeheat/index.html

Joint Press Release between NWS and VT Department of Health

VERMONT
DEPARTMENT OF HEALTH
healthvermont.gov

Contacts: Scott Whittier, WCM - NWS Burlington, VT (802) 658-0150
Communication Office - Department of Health (802) 863-7281

FOR IMMEDIATE RELEASE:
June 28, 2018

Keep Your Cool as Summer Heats Up
"Stay Cool, Find Shade, Don't Over Exert and Drink Plenty of Water"

BURLINGTON, VT – Summer is truly heating up, with high temperatures forecast to be in the 90s for much of Vermont this weekend into early next week. Heat can cause serious illness and can be deadly. Especially since an extended period of hot weather is uncommon in Vermont, taking some basic precautions can help you stay safe and healthy.

During hot weather, it's important to drink more fluids than usual, take extra breaks from strenuous activities, seek shade and cool indoor locations, and check in on loved ones and neighbors.

The Hazards of Excessive Heat

In the northeast, the risk for heat-related illnesses and even death increases as temperatures reach the mid-to-upper 80s and warmer, especially on sunny, humid days. This makes it harder for your body temperature control systems to keep up and your body temperature can get dangerously high.

Muscle cramps, heavy sweating, nausea, headache or light-headedness may all indicate a heat illness. Most heat illnesses can be treated with fluids and by resting in a cooler place. **If symptoms persist or get worse, or someone you are with seems confused or loses consciousness**, dial 9-1-1 and get immediate medical help. Learn more about symptoms and first aid at www.weather.gov/safety/heat-illness.

Certain individuals are at higher risk. People who work or exercise outdoors, older adults and young children, people who are overweight or have a chronic medical condition, people taking certain medications, and people using drugs or alcohol should take extra precautions.

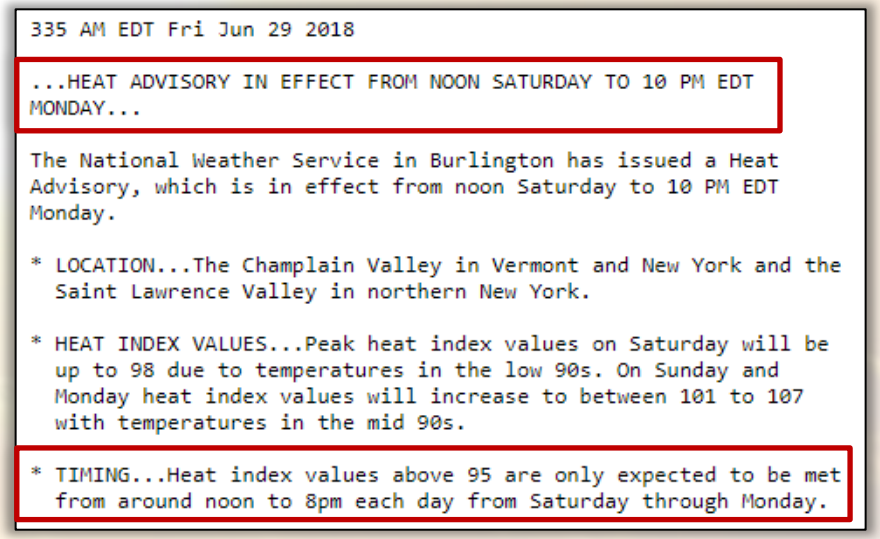
HERE ARE SOME SAFETY TIPS TO BEST COPE WITH THE DANGERS OF HEAT:
Take Action, Be Prepared

- **NEVER** leave children, people with disabilities, older adults, or pets in parked vehicles. **"Look Before You Lock!"**
- Wear lightweight, light-colored clothing to reflect heat and sunlight.
- Drink plenty of water, or non-alcoholic and decaffeinated fluids.
- Seek relief in air-conditioned spaces or other cool and shady places.
- Limit outdoor activities during the hottest part of the day.
- Close window shades during the day, keep windows closed when it is hotter outside than inside, and avoid using appliances and lights that generate heat, if possible.
- Check on loved ones and neighbors, especially those living alone and without air conditioning.

Before (Immediately leading up to THIS event)

NWS Products

- **Due to the likelihood of a multiple day (unprecedented) event bordering numerous CWA's, BTV led collaboration efforts on best way to handle WWA and it was well received by neighboring WFO's.**
  - Merge multiple days (via GFE) and utilize the WHEN (TIMING) bullet for specific timing (Noon to 8 pm) vs. issuing separate headlines for each day. - **KEEP IT SIMPLE!**
  - It limited the confusion of dropping one headline and replacing it with the same for another day.



335 AM EDT Fri Jun 29 2018

...HEAT ADVISORY IN EFFECT FROM NOON SATURDAY TO 10 PM EDT MONDAY...

The National Weather Service in Burlington has issued a Heat Advisory, which is in effect from noon Saturday to 10 PM EDT Monday.

* LOCATION...The Champlain Valley in Vermont and New York and the Saint Lawrence Valley in northern New York.

* HEAT INDEX VALUES...Peak heat index values on Saturday will be up to 98 due to temperatures in the low 90s. On Sunday and Monday heat index values will increase to between 101 to 107 with temperatures in the mid 90s.

* TIMING...Heat index values above 95 are only expected to be met from around noon to 8pm each day from Saturday through Monday.

Before (Immediately leading up to THIS event)

Partner actions/response:

- NWS heads-up briefings anticipating a severe heat event triggered:
  - Initial coordination between NWS, VDH, Vermont Emergency Management (VEM), and VT-211.
  - VDH rapid development of social media templates, translated heat safety info, and partner group alerts, supplementing existing heat safety resources.
  - Initial messaging by VDH, VEM, and news media by TV/radio, social media (#VTHEATSAFETY), email.
  - Followed by much additional messaging by a wide network of partners.

Before continued...

Interactions, messaging, and how operations could have been improved?

- “The detailed heads up briefings, additional email/phone communications were critical in alerting us to the potential severity of the forecast. Due to timing of the event (approaching weekend) –”we needed to get our messaging out before the weekend”, and your forecasts gave us the info and confidence to move forward even several days ahead of the event. “I can’t think of much that could have been improved in terms of communications between NWS & VDH.” - VDH

- In terms of the heat messaging, we may be able to **improve messaging about cumulative impacts** for vulnerable populations. Much of the standard messaging emphasizes peak heat and avoiding strenuous activity during the hottest part of the day. But we also need to message that older adults & other vulnerable populations will be greatly affected both because of the length and severity of the heat…for those that can’t find relief somewhere cool, the heat stress gets cumulatively worse and can be life-threatening. – VDH

- Potential improvement - Dedicated Heat page on BTV website, similar to winter and other phenomena. Incorporating ambient temperatures, Heat Index (HI) and Wet Bulb Global Temperature (WBGT) – similar to RAH. – NWS

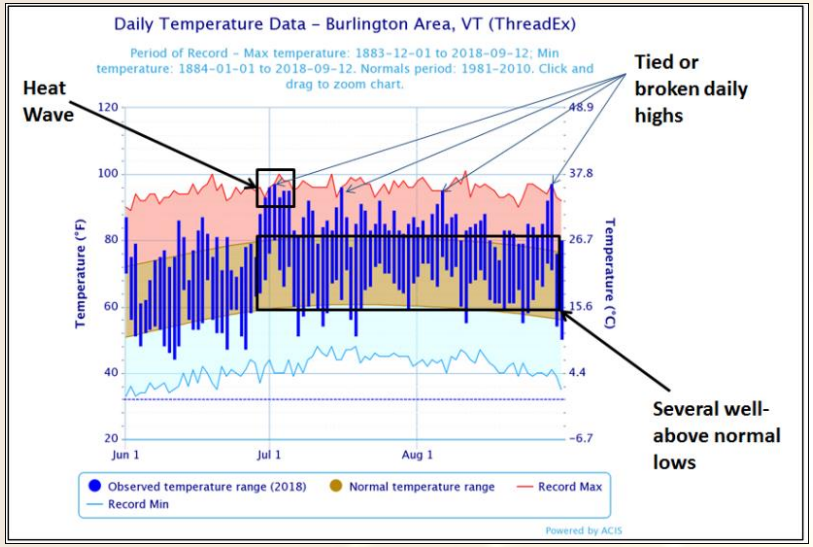
During

Continued messaging - How did messaging evolve? What actions were taken to keep partners informed?

- Ongoing advisory/warning messages and twice daily briefings contributed to additional partner actions being taken during the event: Gov. Scott issued a press release. VEM & VT-211 compiled and advertised all community cooling center locations. VDH tracked heat-related ED visits and EMS calls each day of the heat wave and reported to VEM & the Governor's office. (VDH)

- NWS Products (Headlines and Potential Improvements)
  - **1 – Excessive Heat Warning for 11 zones**. **4 – Heat Advisories**, many for several days in length. ALL 25 zones, including the NY Adirondacks and VT Green Mountains, had some Heat headlines from 29 June – 5 July 2018.
  - The changing severity and coverage of the heat led to expanding/decreasing coverage of Warnings and Advisories "on the fly". Collaboration with neighboring offices was still good, but not as clear as in the beginning stages.
  - Don't get caught in the weeds with specific values. If you witnessed 105 -107° HI on Day 1 and Day 2 was 103 - 105°, **think more impacts rather than criteria…perhaps a cumulative effect**.

Recovery



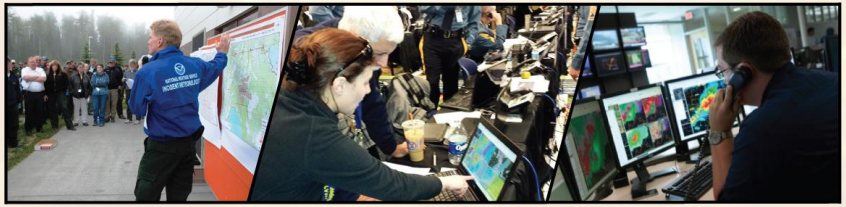
- **High temperatures** went from mid to upper 90s and Heat Indices ≥ 100°F, returning to seasonable upper 70s and lower 80s for a few days. Overnight lows went from 60s/70s to the upper 40s to near 60.
- **Final e-mail** announced the above changes as well as when the next ≥ 90°F day may occur. Otherwise, much of the recovery phase support was providing IDSS (via phone) when requested.
- A Hot Wash did not occur for this event. That's something VEM/VDH should initiate, and NWS would hopefully participate in. We're trying to establish a process for that in our draft Hot Weather Emergency Response Plan. (VDH)

After Event

Feedback? What did each agency learn?

- Positive feedback from VDH, VEM and a request to provide a **For The Record** report to help support their review process.
- VDH and NWS Burlington were very thankful for one another's collaboration efforts set forth just 1-2 years prior to this event. This **"set the plate"** for a smooth and efficient working relationship during this event.
- Yearly meetings and sharing of post event reports can give insight to each others capabilities. NWS Burlington is part of VT's Hot Weather Workgroup.

- **"Agreed.** The more we communicate, the better our communications are. I feel like we have a pretty established, comfortable communication channel now when either of us needs to reach out." Continuing to hold annual or event-specific meetings is also really important. - VDH



After Event Debrief...

1. **How could things have been improved?**
   - Avoid meteorology purism and act based more on impacts for cumulative effects. - NWS
   - More planning, preparedness on the state level for cooling centers and reaching out to and knowing the more vulnerable populations. - VDH

2. **What would the partners like to see regarding heat messaging and hazards?**
   - Ensure hazard messaging aligns with expected impacts, targeted to the right audience(s).
   - **VDH has great concern with the potential elimination of Heat Advisories.**
   - Possibly take into account seasonal acclimation, event length, overnight lows, and other relevant factors. to make sure the advisories happen when truly needed and are directed towards the right audience. - VDH

3. **Was there anything particular or unique about this heat event?**
   - Unprecedented event and during holiday celebrations. Lots of IDSS phone requests from communties hosting holiday celebrations (Festivals, parades, fireworks). - NWS

After Event Debrief...

4. Has COVID-19 impacted partner operations, planning, and decision making?

- VDH and state/local partner capacity is very strained by COVID-19 response. Messaging for any short-lived Heat episodes was very limited, and many preparedness and response activities were compromised. - VDH
- Very little progress was made on ambitious Hot Weather Preparededness workplan with most items have been postponed to 2021 or beyond. – VDH
- Despite 2020 being the Hottest Summer on Record, heat-related ED visits were much lower than 2018:
  - 115 heat-related ED visits in 2020, 104 in 2019, 200 in 2018 for the entire summer period (preliminary syndromic surveillance data).
  - Highest # of daily heat ED visits in 2020 was 7, compared to 29 in 2018.
  - 6-day heat wave in 2020 averaged 3°F cooler and 5% RH less than 6-day heat wave in 2018 (24 heat ED visits during 2020 heat wave; 102 ED visits during 2018 heat wave)
  - COVID likely contributed to some reduced ED visits, as some people continued to avoid non-critical health services during the summer…total ED visits are down about 20% this summer

Key Takeaways / Closing Remarks

VT Department of Health – I think this is another place to emphasize the importance of establishing and maintaining an ongoing relationship b/n NWS, VDH, and other partners. “Your (NWS) openness to using our data and messaging to influence your hazard criteria & communications is not to be taken lightly…and your willingness to collaborate is hugely appreciated!”

We speculate that lack of acclimation was a major factor leading to the severity of 2018 heat wave health impacts. Temps were about 15-20F cooler on average for 2 weeks prior to heat wave. Also there was just a large cumulative impact due to the length of heat wave and warm overnight lows. Six hot days with minimal relief opportunities puts a lot of stress on a body.

NWS Burlington – Working closely with our partners in reviewing NWS criteria had universal benefits (trust, collaboration, mutual respect). Other collaboration efforts that can have great benefits include utilities and transportation to establish criteria for wind, ice and snow loading.

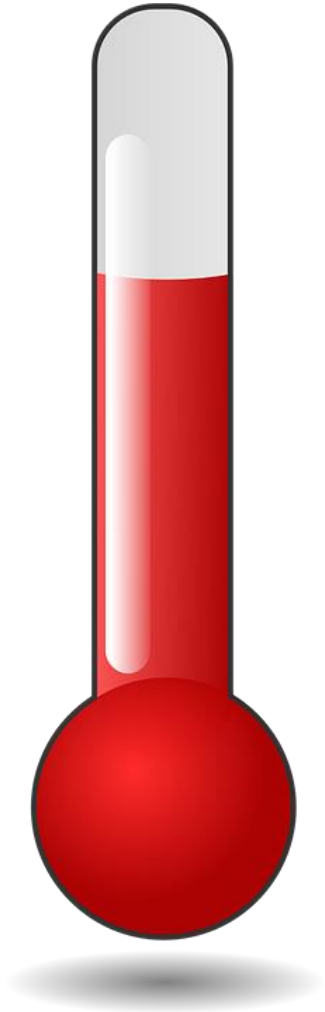
Close collaboration with neighboring offices, perhaps sub-regionally, to help estabish sub-regional criteria.

Thank You

Any questions?

Scott Whittier, WCM - NWS Burlington, VT
scott.whittier@noaa.gov

Jared Ulmer, Climate & Health Program Manager - VT Dept of Health
Jared.Ulmer@vermont.gov



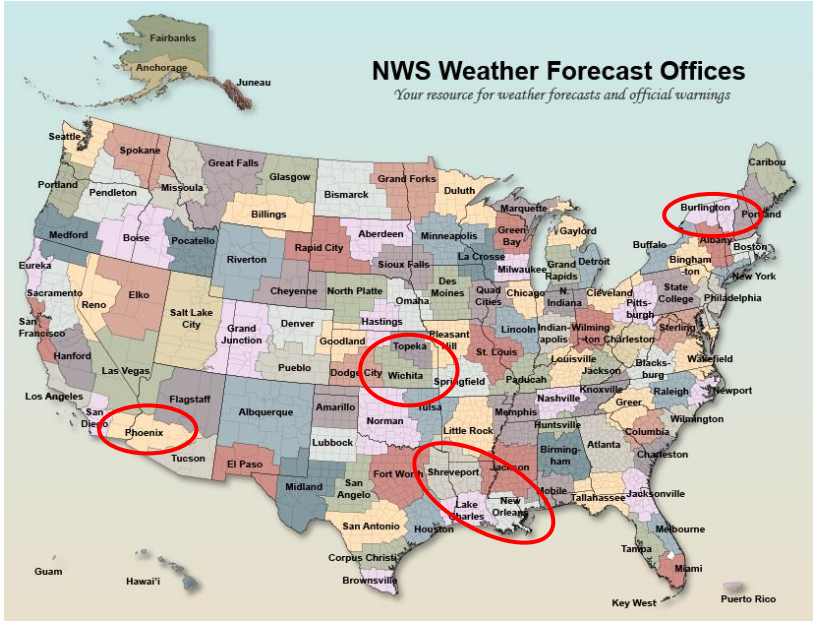
Case Study Summary

NWS Heat Workshop

November 18, 2020

Kim McMahon & Danielle Nagele
NWS AFSO Public Weather Services Program

We've heard...



- **State Level Case from WFOs Shreveport (SHV) & New Orleans (LIX) and Governor's Office of Homeland Security & EM and Louisiana Dept of Health** - Forecasting and messaging heat following a major disaster (heat during a recovery period)

- **Local Urban Case from WFO Phoenix (PSR) and Arizona Dept. of Health Services** - Forecasting and messaging heat in traditionally hot climate

- **Local Rural Case from WFO Wichita (ICT) and Butler County EM** - Planning for heat impacts for a large-scale social event

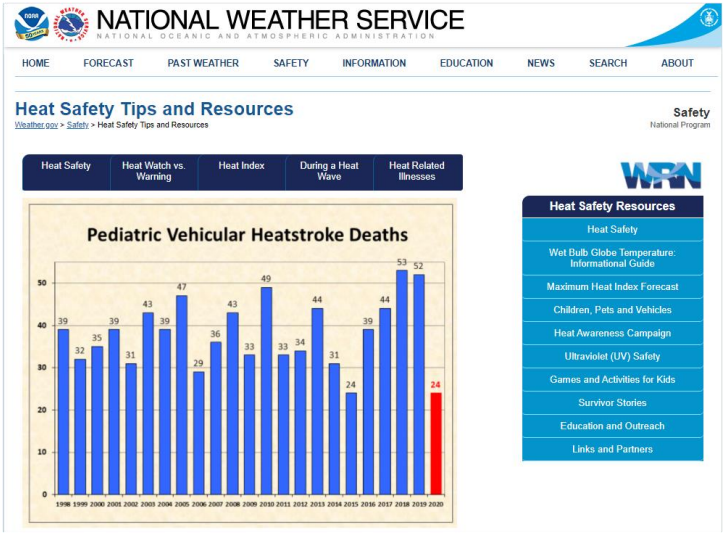
- **State Level Case from WFO Burlington (BTV) and Vermont Dept. of Health** - Record breaking heat wave in the Northeast

Common Challenges:

- **Messaging Challenges on both ends of the spectrum -**
  - AZ: Messaging the hazards/dangers of extreme heat in an area that commonly sees hot temperatures
  - VT: Cool period leading to unprecedented, extended heat for area unaccustomed to heat
  - Warning valid and lead time
    - AZ: Avg 4 day lead time (overlapping heat hazards?)
    - VT: 1 long duration headline with detailed timing in the product.

- **Protecting a Range: First Responders and EMs to Local and Visiting Public -**
  - LA: Utility workers and other relief companies coming from cooler climates to assist with recovery efforts are unaccustomed to heat
  - KS: Those working the event wore heavy equipment (e.g. kevlar vests) and dark uniforms, unlike public

Common Successes



- **Pre-Season & Pre-Event Awareness**
  - AZ: Pre-season - Heat Awareness Week
  - VT: Partnerships built months/years in advance
- **Messaging to Public:**
  - AZ: Extensive Social Media presence
  - VT: Joint Press Release between NWS and VT Dept of Health
  - LA: Adjustments to messaging based on underlying situation (Hurricane recovery)
- **Situational Awareness:**
  - LA: “With thousands of first responders out in the field, heat and weather information was a critical piece in deciding what type of equipment was needed at the different locations”
  - KS: Microclimates across the site can impact support

Common Successes

- **Communication - NWS involvement start to finish of event:**
  - KS: Start of planning through After Action Review of large social event
    - Opportunity to learn for both NWS and partner
  - AZ: Weekly Heat-Health calls with partners
  - LA: Consistent and frequent calls and interactions with partners
- **Impact-based thresholds:**
  - LA: Lowering Heat Advisory criteria temporarily following another event/disaster (e.g. hurricane, wind storm)
  - AZ: Aggressive issuance of Heat headlines
  - KS: Modify thresholds on the fly as needed
  - VT: Situational context - adjusting bullets in message

Key Takeaways: Louisiana

- Strengthen interactions with Dept of Health, in particular develop meaningful heat trigger points during recovery efforts
- Increased collaboration with partners around messaging
  - Partners in the public health and response/relief realms could use additional training on NWS products and services
- Following a major disaster, it’s necessary to collaborate on post-storm messaging - a heat event right after a disaster has unique challenges and protective actions

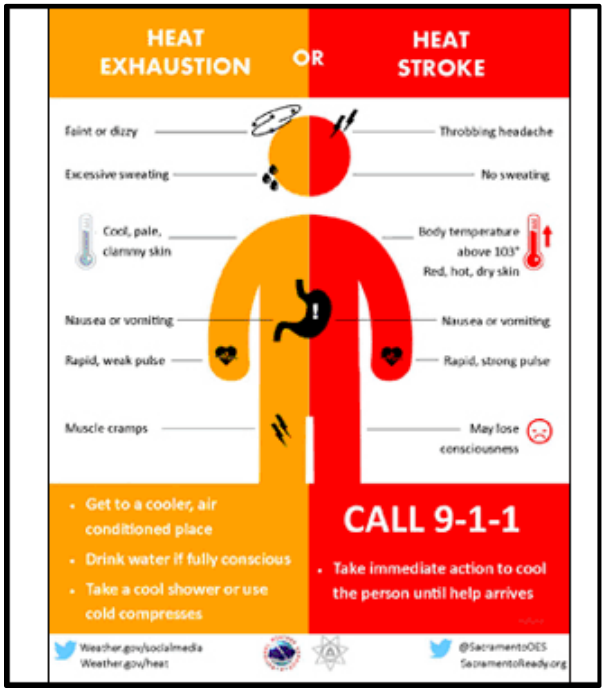
What can be done (if anything) from a national perspective to assist during 'compounding disasters' such as heat events following up wind/tropical events?

Key Takeaways: Phoenix, Arizona

- Cascading Hazards:
  - Persistent Heat and impacts from COVID
    - Variety or Lack of Partner/Community Triggers
- Improving NWS-partner relationships through ongoing engagement and dialogue

How do we still find ways conduct pre-season preparedness during ongoing major hazards such as COVID?

Key Takeaways: Wichita, Kansas

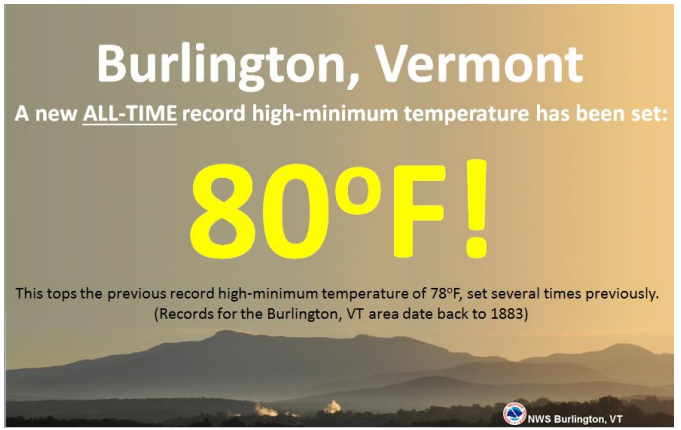


Active involvement with partners

- Before, during and after events
- Learn from one another on tools, services, thresholds and impacts
- Be adaptable

Key Takeaways: Burlington, Vermont

- Building relationship between NWS WFO and core partners long in advance
  - Familiarization of each agency's roles and products and services
  - Trust, collaboration, mutual respect
- Impact-based services
  - Take into account cumulative effects, event length, etc
- Continuous and regular coordination with partners
  - Messaging input and consistency



Questions? Comments?

NOAA National Weather Service

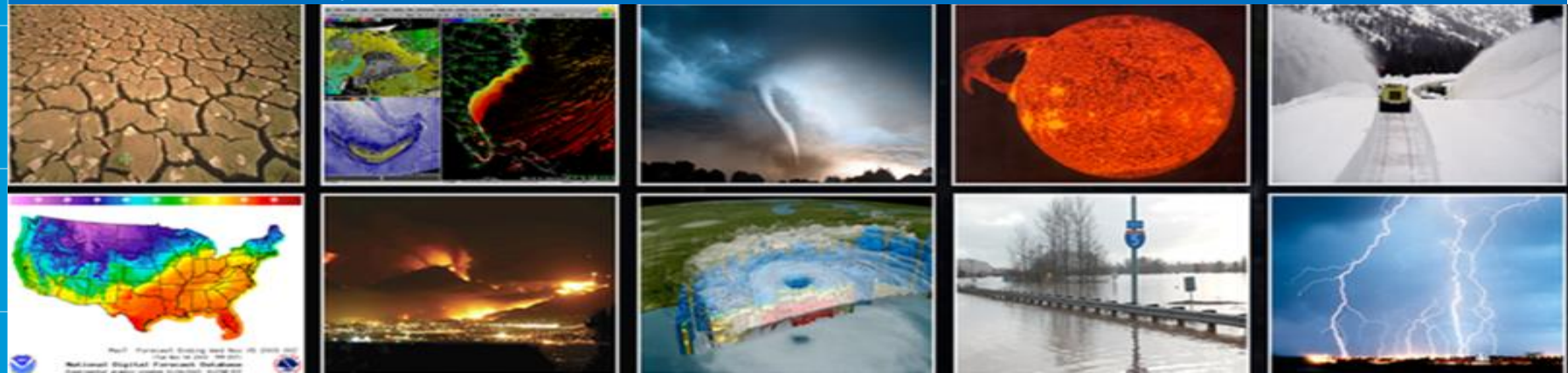
Public Weather Services Program

Analyze, Forecasts, and Support Office

NWS Heat Workshop Wrap-Up

November 18, 2020

Kimberly McMahon
Public Weather Services Program Lead



NWS Heat Workshop Wrap-Up

November 18, 2020

Session
Logistics and Welcome
Overview of Current Heat Services
NIHHIS Federal Partner Panel
2020 Heat Event Case Study Presentations • WFOs Shreveport & New Orleans and LA GOHSEP & LA Dept of Health • WFO Phoenix and AZ Dept of Health Services • WFO Wichita and Butler County EM • WFO Burlington and VT Dept of Health
Case Study Summary

NIHHIS Federal Partner Panel

Centers for Disease Control and Prevention

National Institutes of Health

Occupational Safety and Health Administration

Environment and Climate Change Canada

Heat Event Case Studies

Louisiana:

- WFOs Shreveport (SHV) & New Orleans (LIX)
- Governor's Office of Homeland Security & EM
- Louisiana Dept of Health

Arizona:

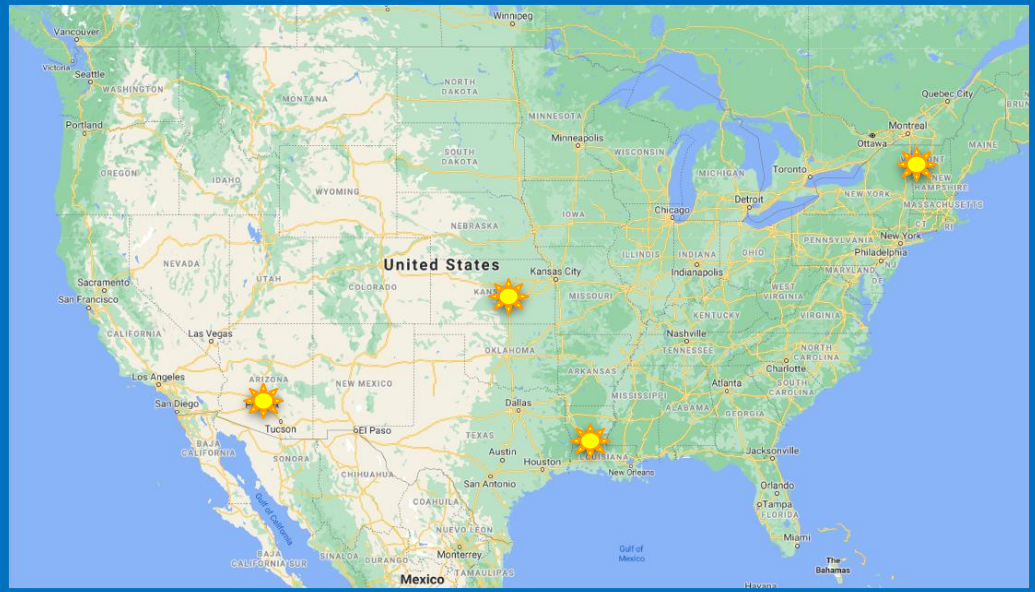
- WFO Phoenix (PSR)
- Arizona Dept. of Health Services

Rural Kansas:

- WFO Wichita (ICT)
- Butler County EM

Vermont:

- WFO Burlington (BTV)
- Vermont Dept. of Health



What stood out to you?

Place your comments in the question box.

- Several presenters and speakers have stated…
  - Morbidity rates, hospitalizations occur outside of NWS Heat headlines (WWA)
  - Impacts start at lower threshold than NWS criteria and tools
- Concerns on warning fatigue.
- AZ Case - number of ER visits or hospitalizations align with increased HeatRisk category
  - Are people not taking precautions?

Federal Partner Panel

- **Greater collaboration on messaging/outreach materials**
  - NWS Heat Safety Page and local WFO pages
  - OSHA information
  - cdc.gov/climateandhealth
- Need for user friendly web tools of NWS climatic and past NWS WWA issuance.
  - Gather specific feedback
  - Share NWS and other partner websites that may meet needs (OSHA)

Tentative Path Forward

Iterative Steps:

Gather information → **Analyze** → **Deve** →

Repeat

November 2020	End of FY21	End of FY22	End of FY23 & beyond
Hold NWS Workshop Consolidate input gathered: • WFO use/communication of Heat products and services • Lessons Learned, Best Practices, Desired path forward • Core Partner understanding and use of NWS Heat products and services ○ Evolving needs and thresholds, fulfilling gaps	**Completion of NWS National Heat Strategy**	Test and refine elements of Heat Strategy	Fully implement Heat Strategy

Questions yet to be answered

Focus on messaging/communicating the hazards of heat:

- Work needed to ensure social science incorporation - what research questions need to be answered?
- Coordination with health experts
- Coordination with messaging partners such as the media, emergency managers, local health officials, etc.

Thank you!

Partners

- Louisiana Governor's Office of Homeland Security - Melton Gaspard
- Louisiana Dept of Health - Kenyatta Esters
- Arizona Dept of Health - Matthew Roach
- Butler County Emergency Management - Keri Korthals
- Vermont Dept of Health - Jared Ulmer

NWS

Analyze, Forecast, and Support Office Leadership:

- Andy Stern
- Eli Jacks
- Michelle Hawkins

NWS Presenters:

- Danielle Nagele
- Danielle Manning
- Charles Woodrum
- Chance Hayes
- Vanessa Pearce
- Scott Whittier
- Paul Iniguez & Larry Hopper

Questions?

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Thank you for attending the NWS Heat Workshop!