800 HEAT STRESS DAYS

USACE CLIMATE PREPAREDNESS AND RESILIENCE

Background

- Heat stress is estimated using the Wet Bulb-Black Globe Temperature (WBGT) and is evaluated for risks to soldier health and safety during training, and for working conditions with increasing temperature and humidity.
- Heat stress days are computed from the maximum daily WBGT from future climate projections as the annual number of days with WBGT equal or greater than 90 F (32.2 C).
- When WBGT > 90 F, hard work and training is recommended for 10 minutes, with 50 minutes rest.

THIS INDICATOR MEASURES THE DAYS WITH MAXIMUM HEAT STRESS CALCULATED FROM MAXIMUM WET BULB-BLACK GLOBE TEMPERATURE (WBGT) FROM TEMPERATURE, HUMIDITY, WIND, AND SOLAR RADIATION.

Data Sources

Data Source	Description	Spatial Resolution	Temporal Resolution
Coupled Model Intercomparison Project (CMIP-5) output[2]	Temperature within 4-digit hydrologic code (HUC-4) watersheds	HUC-4 watersheds	2035-2064 and 2070-2099

This Indicator Was Used to Assess Vulnerability

Business Line	Importance Weight (Can vary from 1 to 2)
Hazards and Safety	1

Calculation

- Use daily temperature, humidity, wind speed, and solar radiation for the daytime maximum, averaged over each HUC-6 watershed.
- Calculate the wet bulb-black globe temperature (WBGT) for each daily maximum, using wet bulb temperature equation by Stull1 (2011) and black globe temperature by Lemke and Kjellstrom2 (2012).
- Count the number of days with maximum WBGT > 32.2 C (90 F) for each year, and determine the days over each HUC-4 watershed by areaweighted averaging the HUC-6 watershed values. Calculate mean heat stress days for each scenario and time period.
- Calculate the increase or decrease in heat stress days from the base historical period to each time period for each future scenario projection.

[1] Stull, R. 2011. Wet-bulb temperature from relative humidity and air temperature. Journal of Applied Meteorology and Climatology 50:2267-2269.
[2] Lemke, B., and T. Kjellstrom. 2012. Calculating workplace WBGT from meteorological data: a tool for climate change assessment. Industrial Health 50:267-278.

LOW

WBGT categories

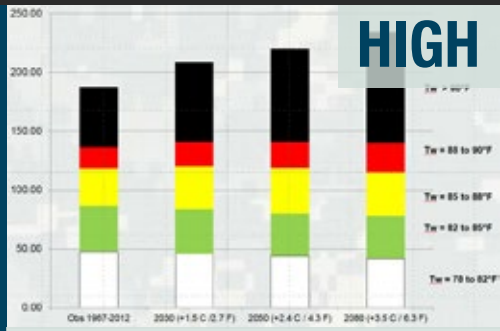
Category	WBGT, °F	WBGT, °C	Flag color
1	< 82	< 27.8	White
2	82-84.9	27.8-29.3	Green
3	85-87.9	29.4-31.0	Yellow
4	88-89.9	31.1-32.1	Red
5	=> 90	=> 32.2	Black

Heat Stress Categories - HPC

LOW INDICATOR VALUE
Low heat safety risks to soldiers in training or working in warm, humid conditions

HIGH INDICATOR VALUE
High heat risks to soldiers and workers, longer seasonal limitations on daytime training.

HIGH



Heat Stress Categories - HPC