HEAT-RELATED INJURIES/ILLNESSES, SYMPTOMS, FIRST AID, HEAT INDEX, and WORK/REST RATIO CONSIDERATIONS

We encourage employees and volunteers to take the National Conservation Training Center’s self-study, online course – CSP3122, Heat Stress.

HEAT-RELATED INJURIES/ILLNESSES

HEAT CRAMPS: Heat cramps happen when individuals sweat a lot during strenuous activity. The sweating depletes the body’s salt and moisture levels, and low salt levels in muscles cause painful cramps. Heat cramps may also be a symptom of heat exhaustion.

Symptoms:
- Muscle cramps, pain, or spasms in the abdomen, arms, or legs

First Aid:
- Stop all activity and sit in a cool place.
- Drink clear juice or an electrolyte/sports beverage, or drink water with food. Avoid salt tablets.
- Do not return to strenuous work until a few hours after the cramps subside.
- Seek medical attention if you have the following: heart problems, are on a low sodium diet, or cramps do not subside within 1 hour.

HEAT EXHAUSTION: Heat exhaustion is the body’s response to an excessive loss of water and salt, usually through sweating. The elderly and people with high blood pressure, those working in hot environments, and those who don't properly hydrate are most prone to heat exhaustion. Heat exhaustion left untreated will progress to heat stroke. To learn more about heat exhaustion see the Centers for Disease Control’s (CDC) website.

Symptoms:
- Heavy sweating
- Headache
- Nausea
- Vertigo
- Weakness
- Thirst
- Giddiness
- Low volume of urine that is dark in color

First Aid:
- Rest in a cool area.
- Drink plenty of water or electrolyte/sports drinks.
- Take a cool shower, bath, or sponge bath.
HEAT STROKE: Heat stroke is the most serious heat-related illness. HEAT STROKE IS A MEDICAL EMERGENCY. Immediate medical help is needed! It occurs when the body becomes unable to control its temperature. The body’s temperature rises rapidly, the sweating mechanism fails, and the body is unable to cool down. When heat stroke occurs, the body temperature can rise to 106°F or higher within 10 to 15 minutes. Heat stroke can cause death or permanent disability if the person doesn’t get medical treatment.

Symptoms:
- Fast breathing
- Confusion
- Irrational behavior
- Headache
- Loss of consciousness
- Convulsions
- Lack of sweating (usually)
- Hot, dry skin
- Abnormally high body temperature

First Aid:
- Request immediate emergency medical services.
- Move the worker to a shaded, cool area.
- Remove outer clothing.
- Cool the worker by any means possible, preferably by immersion in cold water or shower, or by using cold wet towels.
- Do not force liquids.
- Monitor breathing and prepare to administer cardiopulmonary resuscitation (CPR).

PROTECT YOURSELF WHEN WORKING IN HOT WEATHER

Avoid heavy exertion, extreme heat, sun exposure, and high humidity when possible. When this isn’t possible, take the following preventive measures:

- Monitor your physical condition and that of your coworkers for signs and symptoms of heat illness.
- Be aware that protective clothing or Personal Protective Equipment (PPE) may increase the risk of heat-related illness.
- Wear light-colored, loose-fitting, breathable clothing such as cotton or moisture wicking fabrics. Avoid non-breathable synthetic clothing.
- Gradually build up to heavy work.
- Schedule heavy work during the coolest part of the day.
- Take more breaks when doing heavier work in high heat and humidity.
  - Take breaks in the shade or a cool area.
- Drink water frequently. Drink enough water so that you never become thirsty.
- Monitor the color and amount of urine output. Normal pale yellow to deep amber urine is a good indicator of hydration status for most workers, but urine color can also be affected by diet, medication, illnesses, or other disorders. See the National Interagency Fire Center’s poster “Are You Hydrated?” and the National Institute for Occupational
GUIDANCE FOR DETERMINING WORK IN HIGH HEAT ENVIRONMENTS

Some factors that you should consider regarding the effects of exertion and heat stress include:

- Heat index
- If workers are acclimatized to the conditions
- Physical demands of the job or tasks (i.e., whether the work is light, moderate, or heavy)
- Total length of time a worker is engaged in the activity
- Type of PPE and clothing that commonly is or must be used
- Other hazards associated with the job
- Ergonomics of the task
- Other tasks being concurrently accomplished
- Skill and training of the workers performing the task
- Workers’ physical and aerobic conditioning
- Workers’ personal factors that contribute to heat stress susceptibility like unhealthy diet, obesity, and alcohol consumption
- Availability of assistance from coworkers or mechanical devices to reduce the amount of effort necessary
- Workers’ perceptions of how much strain or effort is necessary
- If work is conducive to use work/rest considerations

NATIONAL WEATHER SERVICE HEAT INDEX

The heat index is the scientific relationship between air temperature and the relative humidity. The higher the heat index, the hotter the weather feels, since sweat does not rapidly evaporate and cool the skin. The National Weather Service (NWS) issues heat alerts based on the heat index values, as seen in the chart below. The heat index is a measure of how hot it feels when relative humidity is taken into account with the actual air temperature. Since heat index values were devised for shady, light wind conditions, exposure to full sunshine can increase heat index values by up to 15°F.
NWS uses four bands of color associated with four risk levels. The risk level-related measures in the following table have been modified by OSHA for use on work sites (see 242 FW 10, section 10.14B Table 10-2).

<table>
<thead>
<tr>
<th>Heat Index</th>
<th>Risk Level</th>
<th>Protective Measure</th>
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<tbody>
<tr>
<td>Less than 91°F</td>
<td>Lower (caution)</td>
<td>Basic safety and health planning</td>
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<tr>
<td>91°F to 103°F</td>
<td>Moderate</td>
<td>Implement precautions and heighten awareness</td>
</tr>
<tr>
<td>103°F to 115°F</td>
<td>High</td>
<td>Additional precautions to protect workers</td>
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<tr>
<td>Greater than 115°F</td>
<td>Very High to Extreme</td>
<td>Even more aggressive protective measures</td>
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</tbody>
</table>

NWS may issue heat alerts:
- **Excessive Heat Warning – Take Action!** Issued within 12 hours of the onset of extremely dangerous heat conditions. The general rule of thumb for this warning is when the maximum heat index temperature is expected to be 105°F or higher for at least 2 days and night time temperatures will not drop below 75°F; however, these criteria vary across the country, especially for areas not accustomed to extreme heat conditions.
- **Excessive Heat Watch – Be Prepared!** Issued when conditions are favorable for an excessive heat event in the next 24 to 72 hours. A watch is used when the risk of a heat wave has increased, but its occurrence and timing are uncertain.

- **Heat Advisory – Take Action!** Issued within 12 hours of the onset of extremely dangerous heat conditions. The general rule of thumb for this advisory is when the maximum heat temperature is expected to be 100°F or higher for at least 2 days, and night time air temperatures will not drop below 75°F; however, these criteria vary across the country, especially for areas not accustomed to dangerous heat conditions.

- **Excessive Heat Outlook.** Issued when the potential exists for an excessive heat event in the next 3-7 days.

**Work/Rest Ratio Guidance**

These work/rest ratios serve as guidance and are based on the premise that workers are wearing normal clothes, physically fit, well-rested, fully hydrated, under age 40, have adequate water intake, and there is 30% relative humidity and natural ventilation with perceptible air movement. Workers who are wearing PPE, not acclimatized, or in poor health will need a work/rest schedule that takes their conditions into consideration when determining the minutes of work/rest.

**Adjust the current temperature based on weather conditions as described below.**

Adjust the temperature reading as follows before going to the temperature column in the work/rest ratios table:

- Full sun (no clouds): Add 13°

**Example of workloads:**

**Light** – Walking on a straight, flat surface at a strolling pace without much of a load; riding in a motorized vehicle; performing paperwork.

**Moderate** – Walking on a softer surface at a purposeful pace and performing moderate work, such as scaling hills, carrying equipment and supplies, lawn mowing on a flat surface, canoeing and kayaking at a leisurely pace.

**Heavy** – Manual labor such as digging, climbing, chopping wood, using a chainsaw, clearing brush, carrying heavy materials.

- Partly cloudy/overcast: Add 7°
- No shadows visible/work is in shade or at night: No adjustment

If relative humidity is:

- 10%: Subtract 8°
- 20%: Subtract 4°
- 30%: No adjustment
- 40%: Add 3°
- 50%: Add 6°
- 60%: Add 9°
<table>
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<tr>
<th>Adjusted Temperature (°F)*</th>
<th>Light Work (minutes work/rest)</th>
<th>Moderate Work (minutes work/rest)</th>
<th>Heavy Work (minutes work/rest)</th>
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** High levels of heat stress; consider rescheduling activities.

**Example:** As an example, if the outside temperature is 93°F, the relative humidity is 40%, and moderate work is occurring under partly cloudy skies, we add 3°F for the relative humidity and 7°F for the partly cloudy skies, which makes the adjusted temperature 103°F. The guidance for this adjusted temperature if doing moderate work is 30 minutes of work followed by 30 minutes of rest.