

Backcountry Operations: Clothing, Weather, Hygiene



Image © 2012 CC Attribution Share Alike Some rights reserved by Ray Terrill



Unit 15, Backcountry operations: Clothing, Weather, Hygiene
Date Last Updated: February 20, 2020

This presentation Copyright © 2017 Paul J. Morris Some Rights Reserved.

This work is licensed under a Creative Commons Attribution-ShareAlike 4.0 International License. This material may be freely reproduced and used under the terms of the Creative Commons Attribution-ShareAlike License.

This presentation includes images that have been made available under CC-BY and CC-BY-SA licenses, and material from the public domain.

This presentation is not a complete manual for search and rescue response. The materials are not meant to replace field training by competent search and rescue leaders or to replace actual experience. NEWSAR and the authors and contributors do not endorse any specific equipment mentioned or shown in this program. The authors, contributors, and NEWSAR take no responsibility for the use of this guide or the information contained within. The authors, contributors, and NEWSAR take no responsibility and cannot be held liable for statements made by instructors who use this presentation. It is the duty of every community, organization, volunteer group, and agency, to obtain the knowledge, skills, and proficiency to perform and maintain effective search and rescue management and operations. The information presented in this presentation serves as part of a beginning outline and body of knowledge for proper search and rescue response programs at the community level.

A course presented using this material may only be represented as a NEWSAR course, and may only use NEWSAR marks if presented by an authorized NEWSAR instructor under the auspices of NEWSAR. No authorization for the use of NEWSAR marks is given or implied by this document.



SAR can be physically demanding.
Physical fitness is important.

Lost person incidents can happen in all weathers.

You need to be dressed and equipt to both search and remain comfortable and focused on the search in all weathers.

In a response to a lost person incident you may find yourself in a situation where you need to stay overnight outdoors.

You need to understand your own capabilities and limitations (and those of your gear).

Be prepared, and understand how to stay comfortable outdoors.

Fitness

- One possible benchmark: US Forest Service Wildland Firefighter Moderate Work Capacity Test (NWCG PMS 307)
 - 2 mile hike
 - with 25 lb pack
 - in 30 minutes (4 mile per hour pace)

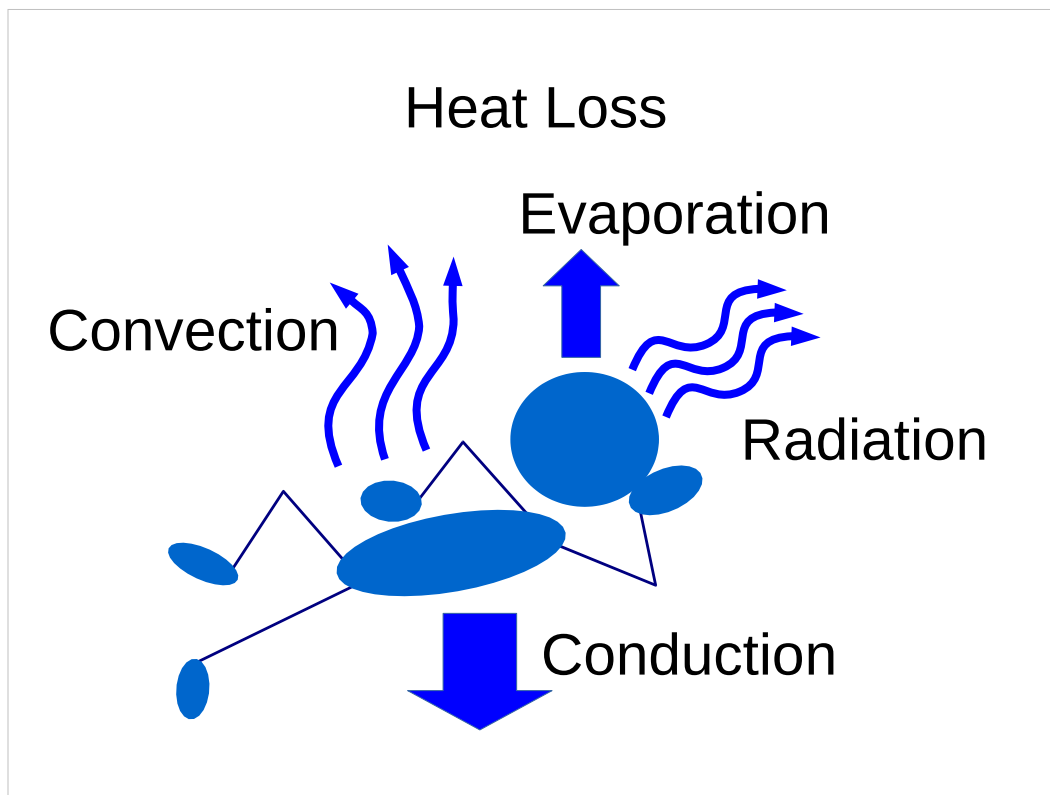
How fit? Consider the mission: Typically: Hiking, off trail, in irregular terrain at a walking pace, carrying a 24 hour pack for 4-8 hours. In a litter carryout, add a 30-40 pound load.



Look comfortable?

Title of the image is: Cold, wet, miserable.

By what means do you lose body heat?



By conduction – heat being conducted to colder ground (surfaces) that you are touching.

By convection (and bulk transport) – warm air near your body being moved in bulk away.

By evaporation – sweat or other moisture on your body evaporating, taking heat to change from liquid to vapor.

And by radiation – heat radiating from your body.

These can be good things or bad – if it is too hot out, heat loss is good. Why do we sweat? If it is too cool out, heat loss is a problem.

- Air is a good insulator
 - Unless it is moving
- Water is good at conducting heat
 - Evaporating water is very good at removing heat.
- The ground is good at conducting heat

- To stay warm:
 - Stay Dry
 - Trap air next to your body
- To stay cool:
 - Let moisture evaporate from your skin
 - Let air get moved away from your skin

Key concepts for controlling heat loss:

Air is a good insulator.

Unless it is moving, convection/bulk transport of air are good at removing heat.

Water is good at conducting heat. Things that are wet are poor insulators.

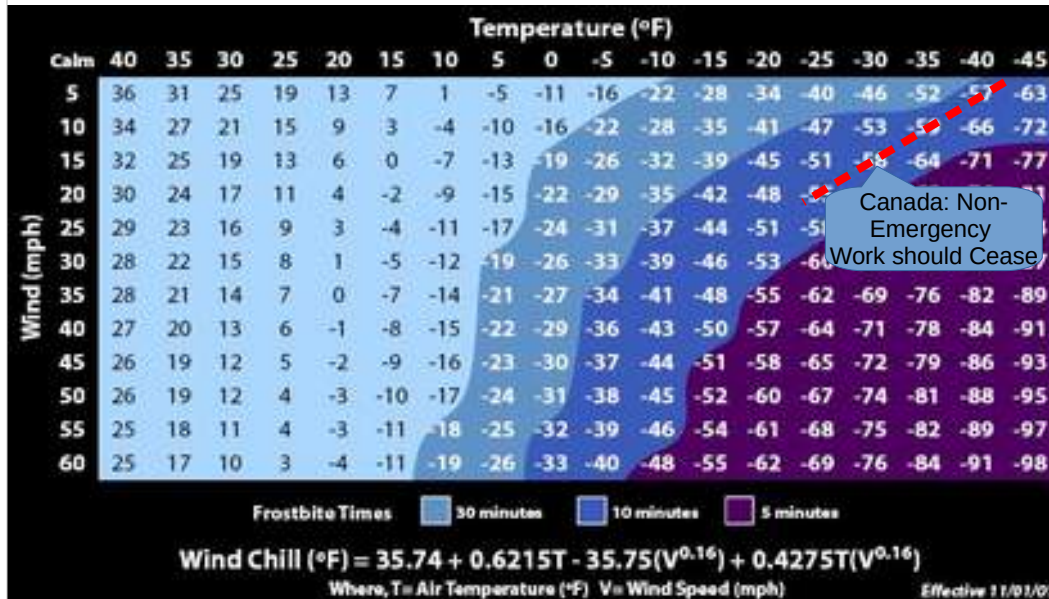
Evaporating water is good at removing heat – it takes lots of heat to change water from a liquid to a gas.

The ground (rock, soil, damp leaves, etc, tends to be good at conducting heat).

So Exploit these key concepts to stay warm or cool:
 Stay warm: Stay dry, trap air (insulator) next to your skin.

Stay cool: Let moisture evaporate from your skin, let the wind transport air away from your skin.

Wind Chill

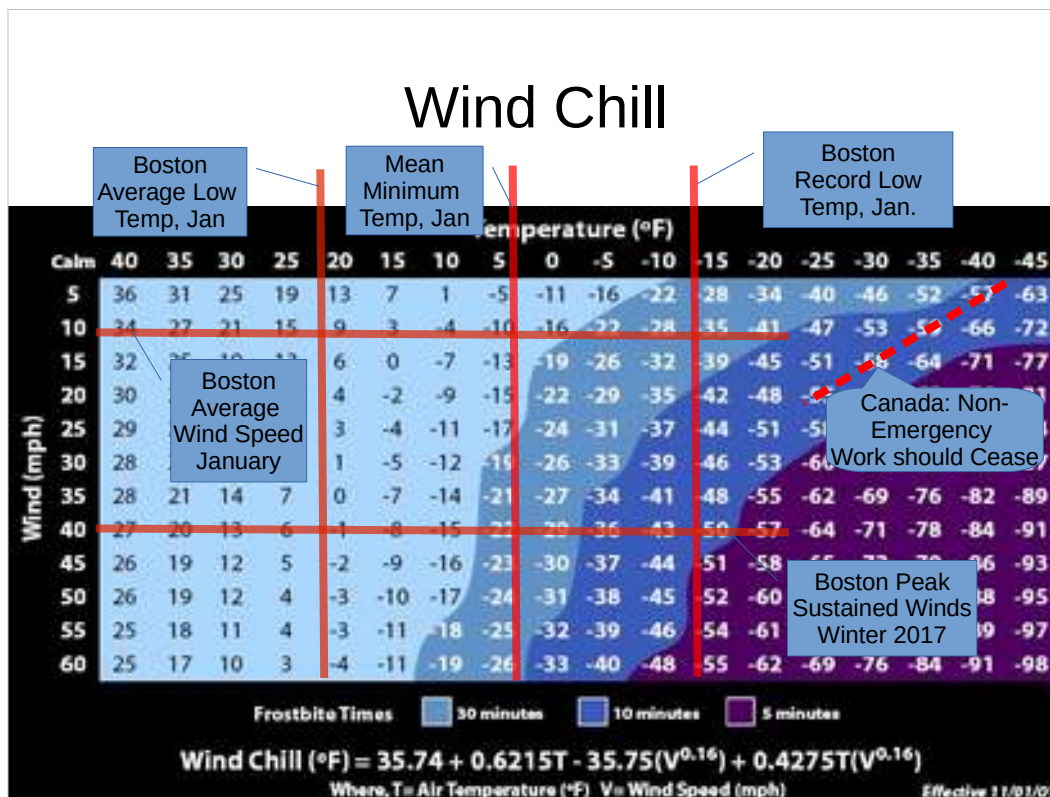


Air is a good insulator – unless it is moving.

Convection – air next to your body warming and rising because it is warm, or (usually more significantly) Bulk Transport, air next to your body warming and getting moved away by the wind removes heat from your body. In cold weather – wind chill (chart from NWS). Your body warms the air next to your skin, the colder it is the more heat you lose to the air, the more the wind is blowing, the more the air you just warmed up with your skin is being carried away and replaced with cold air. The more the wind is blowing, the colder it feels – and the more heat you are losing.

If your skin loses heat too rapidly it can freeze – thus frostbite.

In Canada, there is a recommendation that all non emergency work should cease below wind chill conditions that run about down the middle of the frostbite in 10 minutes region of this chart.



Now consider typical conditions in your area of operations.

Here are average January low temperatures and wind speeds in Boston (meeting at around a wind chill of 10 degrees F), and mean minimum temperature (and record low temperature) along with the peak sustained wind speeds in the winter of 2017.

In New England, in January, operations into wind chill conditions that get into the time to frostbite for exposed skin of 30 minutes are very plausible. Conditions down into the time to frostbite of 10 minutes are possible.

Search assignments are likely to be several hours in duration. In New England, you need to plan to have workable winter clothing for search operations into exposure periods where frostbite of exposed skin can be anticipated within the time of an operational assignment.

Adjust to Change

- The Environment Changes
- Your Activity Levels Change

But, if you just bundle up very warm, and go trekking through the woods, what happens?

You are exerting yourself and you sweat. What is sweat next to your skin? What does it do?

Your means of keeping warm or cool - your clothing system needs to be able to adjust to change.



Thus, wear layers.

Here is an example of a military clothing layering system.

As your activity level and the weather changes, you can add or remove layers.

Layered clothing – with ventilation

You can open or close layers.

You can open or close ventilation openings (e.g. armpit zippers).

Wicking



For layers: Think three functions: Wicking, Warmth, Wet/Wind

Innermost layer: Wicking: Draw moisture away from your body.

Why?

(Water is good at conducting heat. Air is a good insulator.)

This is the ECWCS GEN III: Lightweight Cold Weather Undershirt/Drawers, “silk weight” polyester.



Warmth:

Layers for warmth.

Add more when you are inactive (before you start feeling cold).



Wet/Wind: Outer shell.

Outer shell to block wind or water.

Why block wind? (block bulk transport of warm air from your body)

Why block water? (water conducts heat away from your body, you want to trap air in dry fabric as insulation).

Here's a shell with breathable fabric – lets humid air out, doesn't let water in (when clean).

Also has zippers in the armpits – ways of increasing and decreasing ventilation (open zippers, loosen cuffs, pull up sleeves, - tune ventilation to your activity).

Fabrics

- Polyester
- Acrylic
- Nylon
- Silk
- Wool
- Cotton

Layers of what?

“Cotton Kills”

Cotton traps water, water is a good conductor of heat.

Cotton is also a poor insulator when wet.

Wool can hold water, but is still a good insulator when wet.

Polyester, Acrylic, Polypropylene: Don't hold water well, are good insulators in the wet (fabrics with hollow fibers very good at insulation when wet)

Rayon (and other cellulose based fibers) behave like cotton.



Good footwear for SAR?

Not.

Graphics Source: Open clip art.



Suitable footwear: Ankle support, waterproof, good traction. Flexible (these might be too heavy).

Gaiters to mitigate hazard from ticks (these can also be treated with permethrin).



© 2006 CC-BY Some rights reserved by Gunnar Grimnes



Do you think this person could focus their attention on a search assignment?

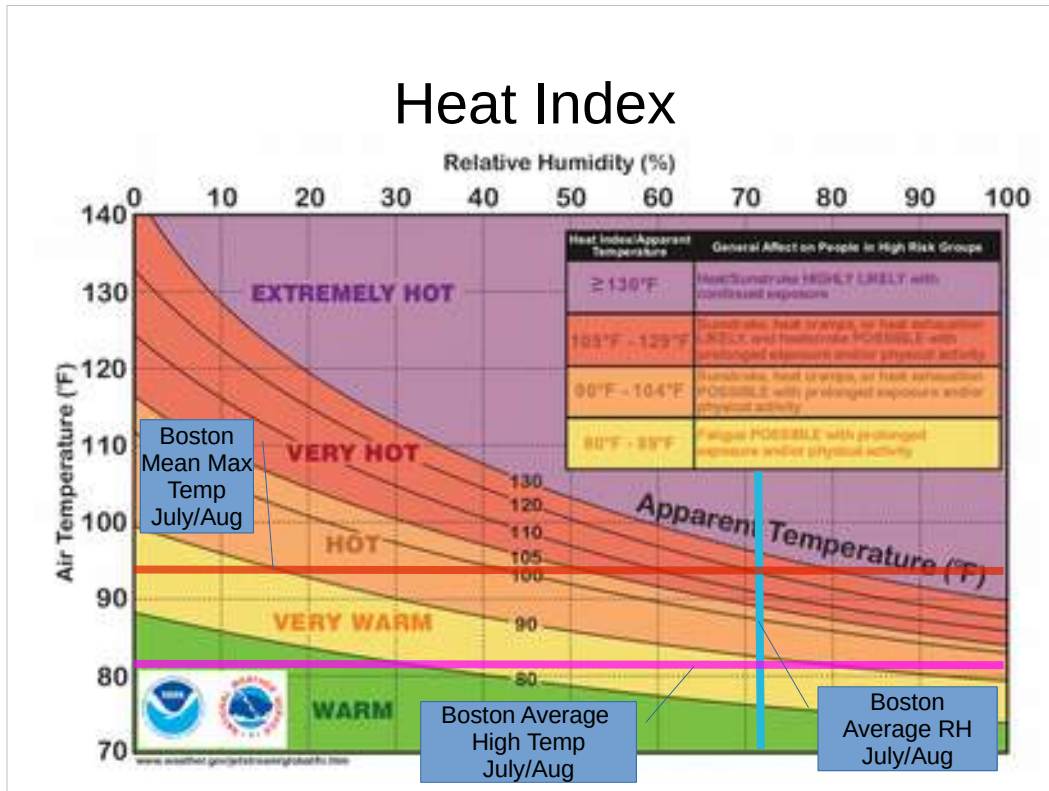
Keep your feet comfy.

Good fit is important.

Breaking in your boots is important.

Dry socks are important.

Heat Index



How about hot weather operations?

New England summers can get hot.

What are the risks of working in the heat?

What can you do to mitigate those risks?

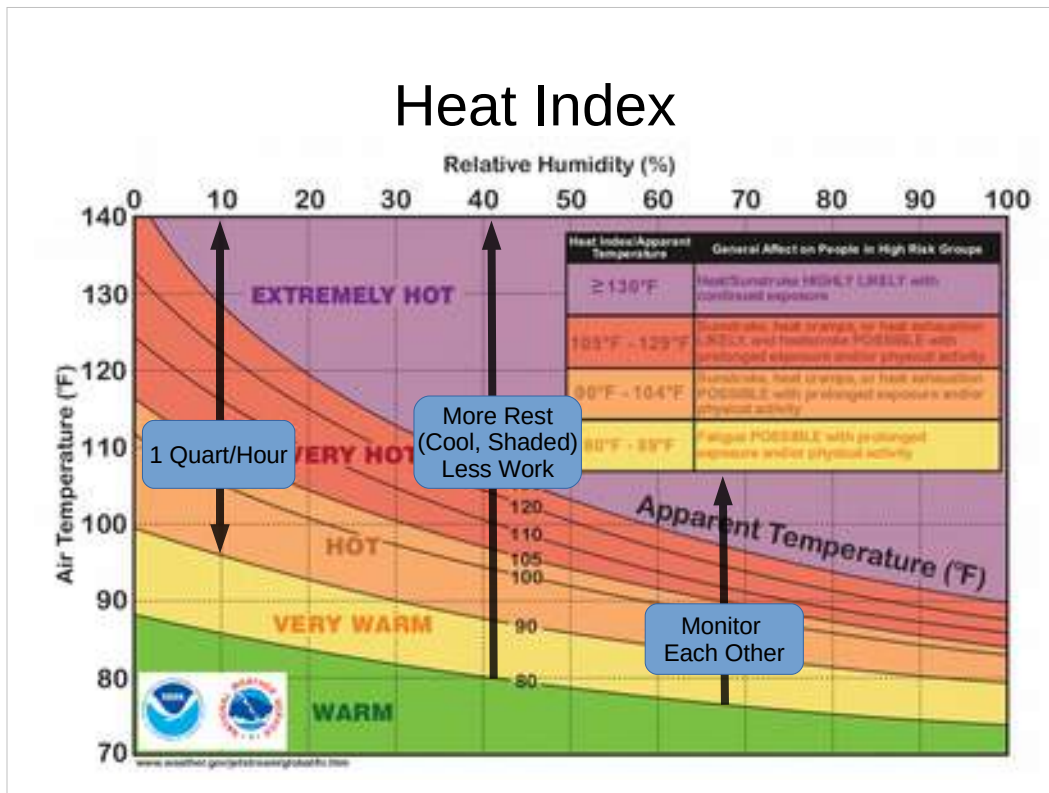
Hydrate



Drink plenty fluids when working in hot weather.

Aim for about 1 quart per hour.

Avoid Caffeine.



Three things we can do when it is hot:

Hydrate.

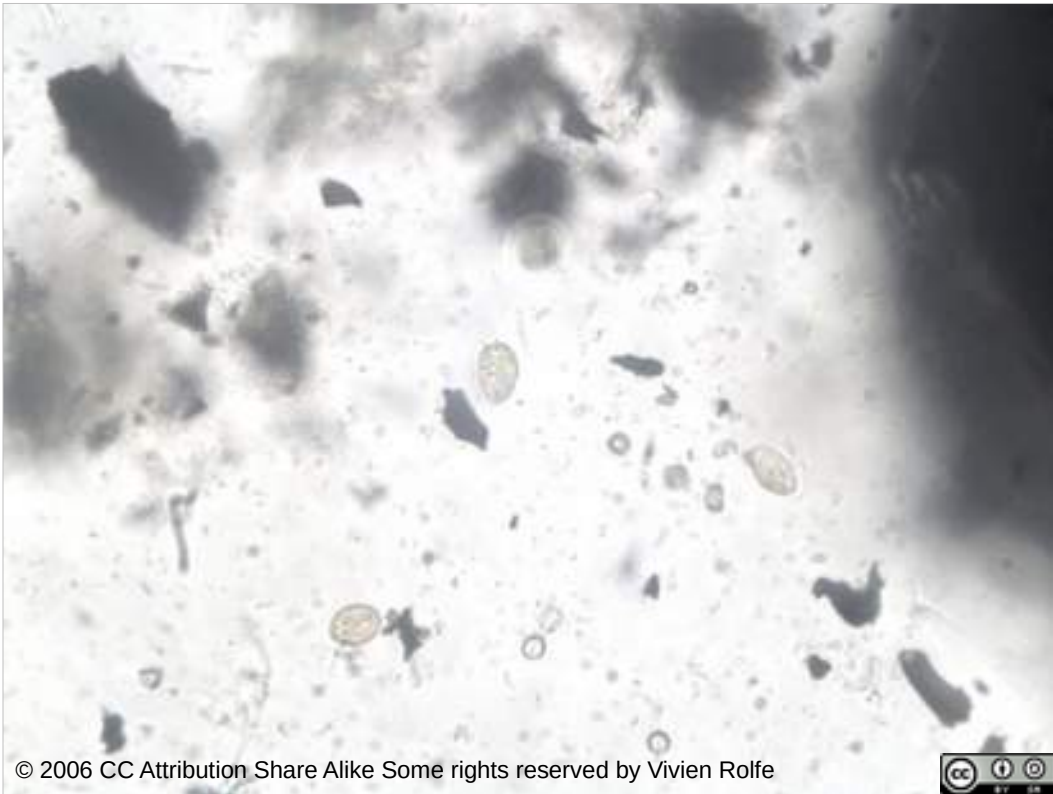
Regular rest periods (in cool shade) while working – take regular breaks (in the shade) when working in conditions with a heat index over about 90. The higher the heat index, the more rest relative to work.

Keep an eye on each other: Monitor each other for signs of heat illness.



canhaz giardia? © 2006 CC-BY-ND Some rights reserved by mack reed

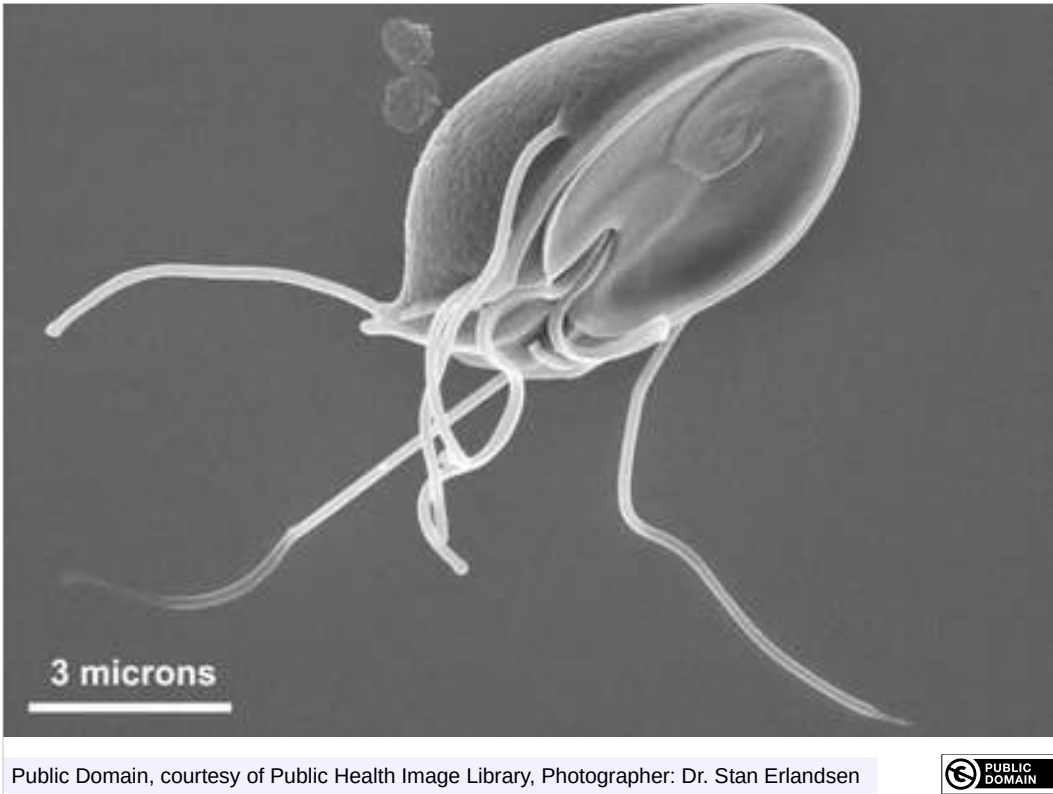
Do you want to drink from here?



Not untreated, not unless you want to get sick.

Why?

Here's Giardia in water.



Public Domain, courtesy of Public Health Image Library, Photographer: Dr. Stan Erlandsen



Here's a close up.

One of the many things you need to worry about being in untreated water.



© 2011 CC-BY Some rights reserved by Larry Smith



Beaver Fever. Widespread in new england. You don't want to drink untreated water.



CDC preferred method for disinfecting water: boil it.

Water Disinfection

- **Boiling:** Rolling boil for 1 minute minimum
 - If over 2000 m altitude, boil for 3 minutes minimum.
- **Combined Chemical Disinfection and Filtration**
 - Filtering: ≤ 1 micron (cyst reduction/removal filter)
Protozoans, some bacteria, not viruses. (“if you can’t make it clear you can’t make it clean”)
 - Chemicals: Iodine, Chlorine, Chlorine Dioxide
Some protozoans, bacteria, viruses.

Specifically CDC recommends: Rolling boil for at least 1 minute. If over 2000m (6500 feet (anywhere in New England this high?)), boil for at least 3 minutes.

You can also both filter and chemically treat
You need to use both together.

Water Disinfection

- UV treatment (combined filtration and UV treatment)
 - Limited to clear water
 - If you can't make it clear you can't make it clean
 - Pre-filter water
 - Follow manufacturer's directions.



Image © 2015 CC-BY Some rights reserved by SuSanA Secretariat



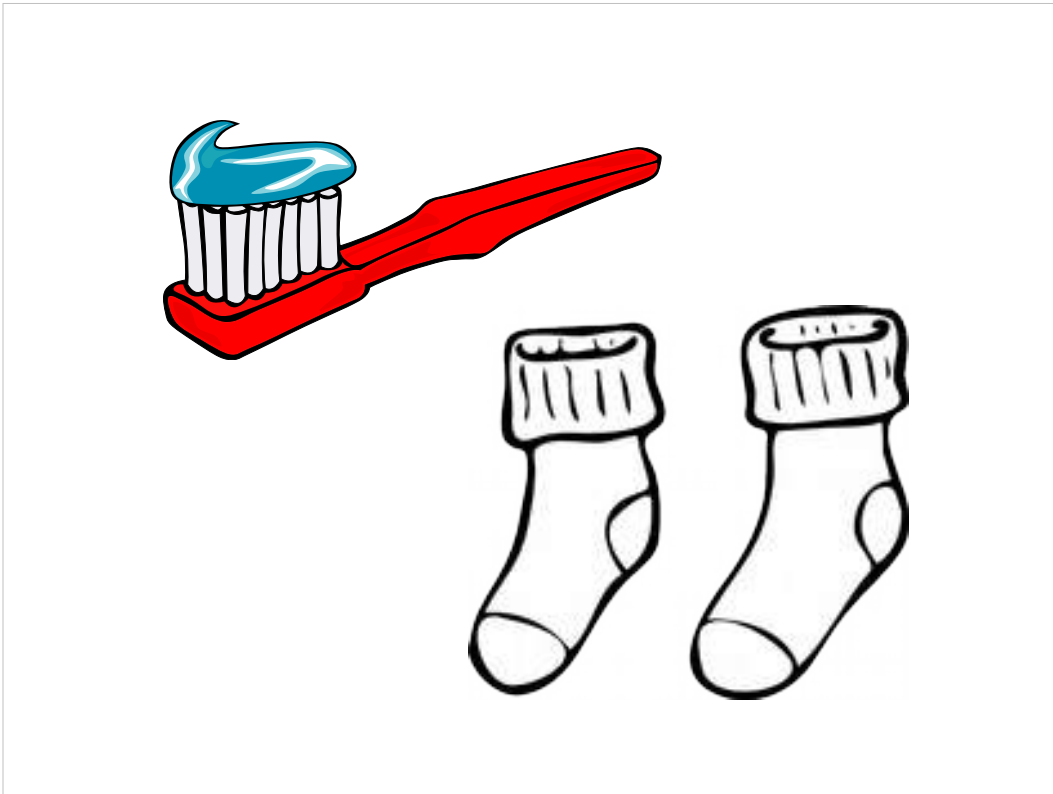
Or you can use filtration and UV treatment.

UV treatment methods don't work with muddy water.

Filter it first, then UV treat. Follow manufacturer's directions for the UV treatment equipment.

Handout: CDC guidelines

Either Boil for 1 minute minimum (CDC recommendation), or combined chemical disinfection and filtration, or combined UV treatment and filtration.



Toothbrushing is also key for hygiene.

Staying overnight, either in the field, or away from home: Change your socks, brush your teeth. You'll be a happier, healthier, more comfortable, more effective searcher.

Most toothpastes contain the artificial sweetener Xylitol. It is toxic for dogs. You might overnight with a canine, consider careful selection of toothpaste and food for your 24 hour or 72 hour pack supplies.

Graphics Source: Open clip art

Toilet

- Bury human waste 8” deep and at least 200 feet from natural waters.
- Wash hands
 - Before handling food
 - Before eating
 - After using the toilet

If you are out in an extended search you may end up needing to toilet in the woods.

Pick a spot more than 200 feet from natural waters.

Bury at least 8” deep.

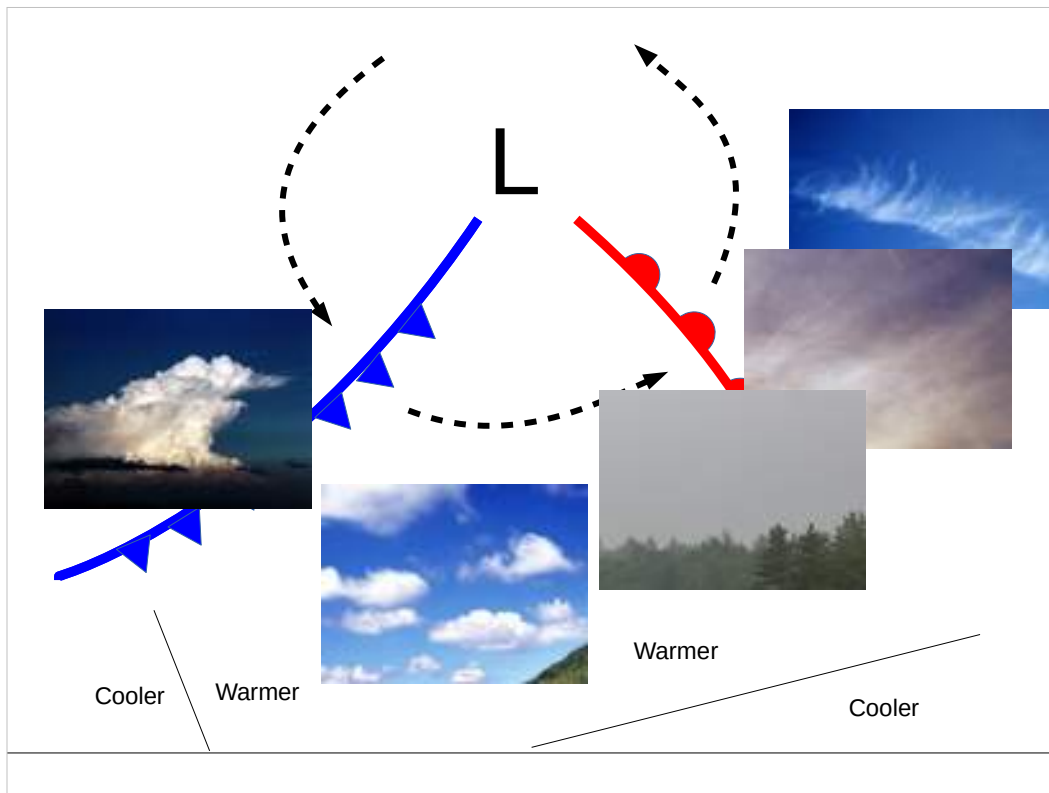
Wash hands.

Also, wash hands before eating and before handling food.



If you need to camp, seek high ground.

Avoid pretty flat meadows next to streams...



How do you find out what the weather is going to do?

Forecasts.

Also simple model that may let you make short term forecasts by observing the weather: Frontal theory.

Low pressure area, air circulating around (counter clockwise in the northern hemisphere).

Warm front – warm air wedging up (rises) over cooler air.
Characteristic sequence of clouds over hours to days – high wispy, thickening, lowering, eventually raining.

Then warm front passes – nice weather, puffy clouds.

Then a cold front comes, cold air wedging under warm;
Sudden line of thunderstorms, then cools and clears.



High wispy clouds, wind from SW.

What is starting to approach?

Warm front.

May rain later, but probably not for a day or so.



Thickening, high clouds, alto-stratus.



Thickening and lowering more – to stratus.

Won't be that long before rain.



Then to heavy, sustained rain (or snow).



Then the front passes, sunny, clear, warmer.

Puffy cumulus clouds.



© 2011 CC-BY Some rights reserved by Evan Blaser

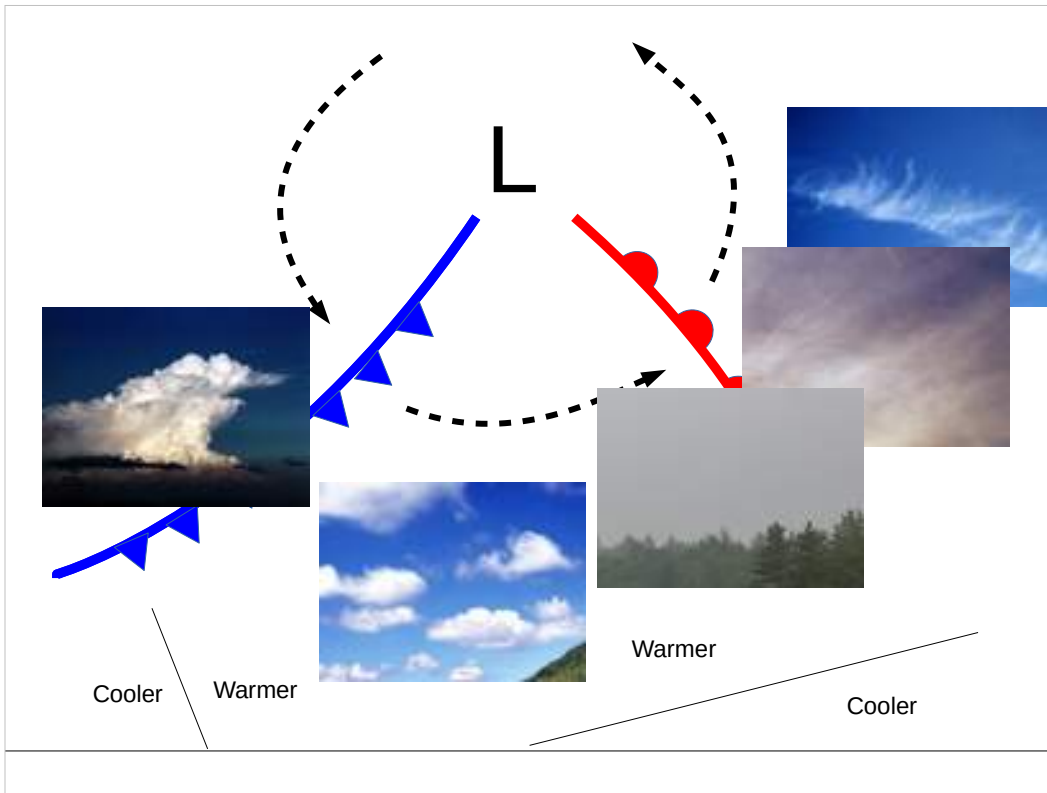


What's happening here?

The next cold front is approaching, and with it, thunderstorms.

What are some hazards associated with this?

What do you do when you hear thunder?



Frontal theory lets you put wind direction and how the clouds are changing together to think of where you are with respect to low pressure systems, and from there make a rough weather forecast in mid-latitudes.



This presentation Copyright © 2017 Paul J. Morris Some Rights Reserved.

This work is licensed under a Creative Commons Attribution-ShareAlike 4.0 International License. This material may be freely reproduced and used under the terms of the Creative Commons Attribution-ShareAlike License.

This presentation includes images that have been made available under CC-BY and CC-BY-SA licenses, and material from the public domain. Attributions are noted on individual slides. These contributions to the commons are very gratefully acknowledged.