Water &
Water Filtration

Orange County Council

High Adventure Training

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How much water should be carried on a trek?

- Drink ½ liter of water per hour of moderately strenuous activity in a moderately hot climate, with a target of 4-5 liters a day while backpacking in the mountains (*Source: NOLS Wilderness Medicine*)

- Weight of carrying water:
  - 1 full Nalgeen (1 Liter) = ~2lbs
  - 4 Nalgeens (4 Liters) = ~ 1 gallon … or effectively ~8lbs if carried all at once

- 2 liters is the practical weight limit for most young scouts < 13 years old

Water is key to a happy trek!

- Good hydration is key to positively treating and controlling heat and cold illnesses − in addition to altitude sickness

- FACT: Scouts forget to drink water on the trail! Always.

- Monitor urine quantity and color − clear is best … dark urine is a sign of dehydration

- On a hike, if you are drinking water when you are thirsty … then you are likely drinking too little and too late

Does the season effect the amount of water to carry / drink

- Guidelines above generally apply always

- Summer heat will cause sweat … which requires more water to replenish

- Winter cold will also drive dehydration during strenuous activities … which requires more water to replenish … though a person may not “feel” particularly thirsty

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Is the water safe to drink in the Sierras (or our local mountains)?

We hope your visits to your National Forests will be enjoyable, and they will be if you avoid hazards that may be encountered in the great outdoors.

A HIDDEN HAZARD

One hidden hazard you should know about is a disease that may be contracted from drinking untreated "natural" water. The disease is an intestinal disorder called **GIARDIASIS** (gee-ar-dye-a-sis). It can cause you severe discomfort.

The disease is caused by a microscopic organism, Giardia Lamblia. The cystic form of giardia may be found in mountain streams and lakes. These natural waters may be clear, cold and free running. They can look, smell, and taste good. You may see wildlife drinking without hesitation from these sources. All of these indicators sometimes lead people to mistakenly assume that natural waters are safe to drink. Giardia may or may not be present, but there is no way to tell by looking at the water.

DISEASE-SYMPTOMS AND TREATMENT

Although giardiasis can be incapacitating, it is not usually life threatening. After ingestion by humans, giardia normally attach themselves to the small intestine. Disease symptoms usually include diarrhea, increased gas, loss of appetite, abdominal cramps, and bloating. Weight loss may occur from nausea and loss of appetite. These discomforts may first appear a few days to a few week after ingestion of giardia, and may last up to 6 weeks.

Most people are unaware that they have been infected and have often returned home from vacations before the onset of symptoms, but if you have drunk untreated water you should suspect giardiasis and so inform your doctor.

With proper diagnosis the disease is curable with medication prescribed by a physician. If you think you might not remember the word "giardiasis", save this brochure to show to your doctor.

PROTECT YOURSELF

There are several ways for you to treat raw water to make it safe to drink. The most certain treatment to destroy giardia is to boil water for at least 1 minute. Boiling also will destroy other organisms causing waterborne disease. At high altitudes (above 10,000 feet), you should maintain the boil for 3 to 5 minutes for an added margin of safety.

CHEMICAL DISINFECTANTS

Chemical disinfectants such as iodine or chlorine tablets or drops are not yet considered as reliable as heat in killing giardia, although these products work well against most waterborne bacteria and viruses that cause disease. The amount of iodine or chlorine necessary to kill giardia depends on water temperature, PH, turbidity, and contact time between the chemical and the parasite.

Until current research determines the right amount of chemical and duration of contact time that will work against giardia under a variety of water conditions, chemicals cannot be recommended for routine disinfections of water for giardia. In an emergency where chemical disinfection is necessary, use an iodine-based product, since iodine is often more effective that chlorine. If possible, filter or strain the water first, and then allow the iodine to work at least 30 minutes before you drink the water. If the water is cold or cloudy, wait at least an hour, or use more iodine

USDA United States Department of Agriculture

Forest Service
Pacific Southwest Region
www.r5.fs.fed.us/

Sierra
National
Forest

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So beautiful . . .
So serene . . .

Guess where that deer just left its lunch and morning coffee?

WATER FILTERS

Some portable water filters claim to remove Giardia cysts, but few have been tested in unbiased laboratories. Check product literature to ensure that the filter will remove particles as small as 1 micron in diameter and cannot be easily contaminated by unfiltered water. Charcoal filters are not effective in removing Giardia, and some filters that do remove Giardia may not remove bacterial and viral agents that cause diarrhea. So you may still need to use chemicals disinfectants in the filtered water. For short trips, take a supply of water from home or other domestic source.

HARMFUL MICROORGANISMS

Protozoans, bacteria and virus are our number one concern.

Protozoans measure about 1–300 microns and are better identified through a microscope. By comparison the diameter of a hair is about 50–120 microns.

Cryptosporidium and giardia can be filtered with most water filters.

Viruses like hepatitis A are even smaller and present the bigger threat. raveling outside the United States necessitate carrying water filters capable of separating or destroying the pathogen. Virus can be destroyed or excluded by boiling, special filter, chemicals and ultraviolet light.

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Pump Filters
- Very common
- Water can be pulled from seeps and shallows
- Filters water through an inner cartridge that must be cleaned and can be replaced
- Screws onto typical Nalgeen bottles and is very useable by scouts
- Can be heavier & bulkier than other options

Gravity Filters
- Very popular in recent years
- No work, but must be hung … and is slower than pumping
- Good for producing larger volumes of water
- "Dirty" bag typically requires deeper, flowing water to fill than some other options
- Requires "backflushing" every use or two
- Light weight

Squeeze Filters
- Very easy to use … and scout friendly
- Inexpensive
- Can be used as a squeeze filter or a gravity filter
- Requires "backflushing" every use or two
- Light weight

Chemical Purification
- Iodine and Chlorine tablets most common
- Kills viruses
- Can leave a "bad" taste in the water
- Takes time … up to 30 minutes

Ultraviolet Purifier
- Kills organisms by irradiation
- Filter must stay in water for a period of time (1+ minutes) and some filters alert you when ready
- Water must be relatively clear for it to work
- Requires batteries
- Light weight

Boiling
- Often necessary in snow conditions
- Environmental Protection Agency recommends 1 minute of rolling boil < 6600', 3 minutes if higher in elevation
- Requires extra fuel

- Can melt snow … and then filter through other products as a hybrid

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Additional Tips

- Let the scouts filter!
- Keep “clean” and “dirty” containers clearly marked and separate
- Collect water from running sources; avoid still & murky water
- Use foldable “water buckets” to bring the water to camp for pump filtering
- Use a “pre-filter” if sediment is in the water … to extend the life and flow of your filter
- Remember − your hands are getting wet from the “dirty” source when filtering; keep clean separate from dirty
- Do not collect water by human activity or grazing farm animals
- Greenish water typically contains algae and protozoans which can clog your filter. Consider using a coffee filter or cheese cloth as a pre-filter.
- Check with local rangers and Internet blog postings to anticipate likely water sources along your trek
- 0.1 micron filters are required to remove protozoa and bacteria
- Freezing temperatures will rupture a wet filter − which can be common in the evening in the California deserts & mountains. Scouts are famous for leaving wet filters out in the evening after using them at the end of the day. When the water freezes, it expands, and this stretches/ breaks the 0.1 micron filter fibers. To protect from this happening, put the filter in your sleeping bag … or at the very least, within your tent.