



November 18-20, 2016

Backcountry water treatment

All water sources in the backcountry, pristine-looking lakes, fast-flowing creeks and glacier-fed streams can be contaminated by birds, animals or humans. Simply put, if your water is from an untreated source, you should treat it before you drink it, cook with it or use it to brush your teeth.

The cleaner the water is at the start, the more effective any treatment method will be. When you select a water source, avoid standing water if you can and use the clearest water available. If you have to collect water that looks cloudy or muddy, let it settle in a pot or bucket and skim or siphon off the clearer water to treat it.

Pathogens

Waterborne pathogens (disease-causing micro-organisms) of most concern:

- Protozoa include cryptosporidium and giardia (the cause of giardiasis or beaver fever). Protozoa are increasingly widespread in North America. They are larger than one micron.
- Bacteria exist in water all over the world. Most are harmless, but some cause sicknesses such as diarrhea and dysentery. Most bacteria are about 1.0 micron in size, but some, like disease-causing campylobacter, can be as small as 0.2 microns.
- Viruses cause hepatitis, polio and other diseases. They can be present in any water contaminated by human waste. Most viruses are in the 0.1 micron range, but can be as small as 0.002 microns.

Treatment methods compared	protozoa	bacteria	viruses	particulate
boiling	yes	yes	yes	no
iodine/chlorine	most	yes	yes	no
chlorine dioxide/mixed oxidants	yes	yes	yes	no
0.5mi filter and pre-filter	yes	most	no	yes
0.2mi filter and pre-filter	yes	yes	no	yes
0.1mi filter and iodine/chlorine	yes	yes	yes	yes
ultraviolet (UV) light	yes	yes	yes	no
UV light and pre-filter	yes	yes	yes	yes



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Treatment methods: boiling

Enough heat will destroy all pathogens, but it's not a popular method as it consumes time and fuel and boiled water has a flat taste. So, except for cooking water, most people choose to treat their water with filters, chemicals or both.

- Recommended times range from 3 to 10 minutes.
- Higher elevations require slightly longer boil times.

Chemical treatments

These don't require any pumping to use, but they do require time to act – from a few minutes to several hours, depending on how cold or dirty the water is and which pathogens you want protection against. Chemicals are effective against bacteria and viruses. But some protozoa, including some cryptosporidium, are resistant.

Chemicals are good for short-term use: a few days or a few weeks. For many, the health risk associated with small amounts of exposure to chemicals is outweighed by the benefit of protection against pathogens. But for pregnant women, young children or anyone with a pre-existing health problems, this may not be true. It's best to consult your doctor before using chemical water treatments.

- **Chlorine** kills many of the micro-organisms that help you digest food, resulting in digestive trouble. In water, chlorine also forms some by-products that are suspected carcinogens.
- **Iodine** comes in easy-to-use drops or tablets, though many people don't like the taste and odour it adds to the water.
- **Chlorine dioxide** is unstable, so you prepare it in the field by mixing two component chemicals. Since the active ingredients in chlorine dioxide break down quickly, it usually won't kill beneficial micro-organisms in your digestive system. It doesn't leave any unpleasant taste or odour in your treated water.

Filters

Filters strain out pathogens when water is forced through them. They remove protozoa and some larger bacteria and at 0.2 micron, also remove smaller bacteria such as campylobacter. Viruses are many times smaller than bacteria, so most filters cannot remove them.

- Filters can fail or be damaged by impact. Many people carry compact water treatment tablets as a back-up.
- Great where viruses are not a concern or for occasional users, small groups and short trips.
- For protection against viruses, you can treat water with iodine then filter it. A filter with a carbon stage can remove between 90 to 98% of iodine.



ADVENTURE CAMPING

What's a Guider to do? The girls want to adventure camp and/or trip.

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Purifiers

These have one or more filter stages that trap larger pathogens, together with an iodine resin or another element that inactivates viruses.

- High-end purifiers do not introduce chemicals into the water.
- Economical over the long term. Suited to frequent users, extended trips and larger groups.

UV light purifiers

Portable devices designed to treat 0.5 or 1L of water at a time. By beaming UV light through water, they damage the DNA of microbes, pathogens and viruses. It's the same technology used in commercial bottling plants and municipal water systems.

- They avoid the taste, health concerns and waiting times of chemical treatments.
- Don't require pumping and don't need to be disassembled and dried when you return home.
- Cloudy water must be filtered before you use UV.
- Most use batteries, so you'll need to carry spares or a solar re-charging system.

Care

Filters should be taken apart and left to air-dry to help prevent mildew and bacteria growth. They can be cleaned many times with a brush before needing to be replaced, but clean them only when necessary to prolong their life.

Silty water (often found in glacial regions) clogs filters and makes pumps more difficult to operate. To make pumping easier, let any silt settle for an hour or two before pumping the water.

Cost effectiveness

Generally, the lower the initial cost for a treatment method, the higher the cost of each litre treated.

- If you camp occasionally and in a small group, a moderately priced filter with a semi-disposable cartridge, combined with a small chlorine dioxide kit, may be fine.
- If you camp frequently or with a large group, it may be more economical in the long run to buy a more expensive filter.
- Inexpensive filters clean up to 100 litres or so. A high-end filter might clean thousands of litres.
- A UV purifier with rechargeable batteries can treat 3,000-8,000 litres.