REI: How to Choose a Water Filter or Purifier, Part 1

Is it possible to drink straight from backcountry streams and never become ill? Yes.

Is it possible to drive down a large city's main boulevard, ignore a few red lights and never have a fender-bender? Yes.

Is either practice worth the accompanying risks? In our opinion, no.

The Murky Truth About Clear Water

Free-flowing mountain streams, for all their beauty and clarity, are not always the fountains of purity we imagine them to be. Backcountry water sources — crystal-clear rivers, lakes and streams — sometimes harbor microscopic pathogens (disease-causing agents) that are tough to pronounce, difficult to spell and, for many people, awful to ingest.

Giardia lamblia. Cryptosporidium. Campylobacter jejuni. Hepatitis A. All are members of an invisible fluvial zoo that may be present in pristine-looking backcountry water.

How do they get there? When water becomes tainted by animal or human feces. What impact could such microbes have? They can leave you reeling with diarrhea, abdominal cramps, nausea, weight loss and fatigue. How long might these symptoms last? Between 4 and 6 weeks. Maybe longer. Ugh.

More details on waterborne pests, and techniques you can use to defeat them, are explained in our Water Treatment clinic. In this presentation our goal is to provide guidance on the water-treatment strategy favored by most wilderness travelers — using a water filter or purifier.

Explaining Water Filters and Purifiers

Portable water filters and purifiers both operate on the same mechanical principle. Using a hand pump and intake hose, both slurp up "raw" water from a lake or stream and force it through an internal element (a filtering "medium"). This medium traps suspended elements — from fine sediment to invisible microorganisms—before dispensing clean water into a container of your choice.

What's the Difference?

Some definitions:

Water filter—A microbiological device that removes bacteria (e.g., Campylobacter jejuni) and protozoan cysts (Giardia lamblia, cryptosporidium) from contaminated water.

Water purifier—A microbiological device that removes bacteria, protozoan cysts **and viruses** (e.g., hepatitis A) from contaminated water.

Viruses are infinitesimal organisms too tiny to be trapped by a filter. Devices identified as "purifiers" usually cause water to interact with iodine (often in the form of iodine resins), which can render viruses inactive. Another purifier uses a positive electrostatic charge in its filter medium to capture viruses.

Viruses:

- may exist in water wherever there is a reasonable chance of human fecal contamination;
- are believed to be less prevalent in North American wilderness water sources than protozoan cysts or bacteria, but may be a greater threat in less developed countries.

Over time, filters have proven that they reliably protect wilderness travelers from the most common waterborne pathogens found in the North American backcountry: giardia and cryptosporidium. Still, purifiers and their antiviral feature offer an elevated level of security.

To fully disinfect suspect water using a water filter, the Centers for Disease Control and Prevention recommends 1) mechanically filtering the water, 2) treating it with a halogen (chlorine or an iodine solution), 3) letting it sit 15 to 60 minutes, 4) then drinking. For more details on this process, and a discussion of what pathogens may be found in backcountry water, refer to our Water Treatment clinic.

The difference between water filters and purifiers can seem arcane. We examine some of the more technical points in a separate discussion.

The main clinic continues here.

REI: How to Choose Water Filters or Purifiers, Part 2

What Really Matters

In an ideal world, a water filter or purifier will be:

- Simple to use
- Easy to pump
- Capable of sustaining a steady, generous flow
- Effective against waterborne pathogens
- Slow to clog, easy to clean
- Long-lasting

How can you tell if a filter or purifier delivers in these areas? Look for clues in the specification chart that accompanies each product description.

Understanding Specification Charts

Here's how to interpret the information:

Filter medium — This is the cartridge that actually traps pathogens (plus silt and other debris). The composition of the medium contributes greatly to the quality (and cost) of a device. Medium materials include:

> **Ceramic:** This is an effective, high-quality earthen material that can be cleaned many times before it needs a replacement. A ceramic cartridge captures most particles within .005 of an inch of its surface, so it's easy to brush away clogged pores and expose new ones. Cartridges themselves are fragile and require careful handling. Ceramic elements are the longest-lasting mediums and make a good choice for frequent backcountry visitors.
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> **Ceramic with a carbon core:** This additional layer helps filter out the taste of halogens (chlorine and iodine) plus some organic chemicals, herbicides and pesticides.
>
> **Fiberglass (or glass fiber):** As effective as ceramic in straining out pathogens, but not as long-lasting.
>
> **Structured matrix, or labyrinth:** A dense, honeycombed material that effectively captures pathogens.
>
> **Iodine resin:** A chemical layer integrated with a purifier's filtering medium that deactivates viruses, though it does not actually remove them.

Field cleanable — A desirable feature. This means you may open the filter to brush or scrub the filter medium and increase water flow. Clogging should not cause you alarm; it shows the filter or purifier is working. Ceramic filter media can usually accept dozens of cleanings. Some models can be cleaned through backwashing (feeding clean water through the filter in reverse) but you need ample clean water in order to do so.

> **Longevity:** How long will a filter or purifier last? Ceramic filters that can accept cleaning will last the longest, but the life of any filter depends on the **clarity of water** you pump through it. If possible, seek out clear water in still pools. You're likely to find less sediment in such water than in rushing water. Use Use a prefilter if your device includes one. Manufacturers sometimes include an estimate of the number of liters a filter or purifier is expected to treat effectively.

Pump force — The higher the number, the harder it is to pump. The Katadyn Pocket Filter, for example, has a pump force number of 16.5. While this is one of the longest-lasting filters available, it really gives users a workout as they pump.

A few additional considerations not listed in spec charts include:

Effectiveness — All of the filters and purifiers in REI's product mix will knock out larger microorganisms such as giardia and cryptosporidia. So what do you get for choosing a more expensive filter? Usually a longer-lasting filter medium, cleanability features and maybe a more efficient pump handle. Which filter is right for you? Here's a basic guide:

- If you're a recreational backpacker, someone who takes 1 or 2 overnight trips per year, an inexpensive filter will serve you well. Still, be careful about what type of water you send through it. Make it as clear as possible and the filter will last longer.
- If you visit the wilderness regularly, seek out a field-cleanable model designed to provide years of service
- People who explore terrain closer to urban areas, at lower elevations and who travel outside the United States and Canada are candidates for a purifier.

Pore size — A familiar benchmark for determining a filter's effectiveness is to establish that it is a "point-2 (0.2-micron) filter." The number refers to the size of the pores (openings) in a filter medium. It's not a bad gauge, since the smallest bacteria measure 0.2 microns, yet some microbiologists will tell you it is a simplistic standard. Factors such as maximum flow rate, minimum wall thickness and adsorptive capacity can influence such a conclusion. Arguments can be made to show that a 0.3- or 0.4-micron filter can be as effective at trapping the particles as a 0.2-micron filter.

> **Tip:** Look for "absolute" pore size (the largest and least effective holes) when evaluating filters, not "nominal" pore size.

Adsorption — When filter media block particles while clean water streams through, the process is known as "sieving." When particles stick to the media in the manner of a magnet, this is "adsorption." Activated carbon, found in some filters and purifiers, is especially effective at adsorption.

Product Summaries

Here are brief performance overviews of the filters and purifiers carried at REI. Our product mix occasionally varies from the lineup shown here.

MSR WaterWorks II
A popular filter that may offer the finest microfiltration of any device found on this list. Its ceramic filter medium (which screens out protozoan cysts and bacteria) includes a carbon core (which removes elements such as pesticides and chlorine) and is embellished by an ultra-fine membrane captures the tiniest bacteria (0.2 microns). It's field-maintainable, long-lasting and the pump is easy to use. Its clear housing makes for interesting viewing while the filter is in action, too.

MSR MiniWorks
A lighter, more compact version of the WaterWorks II. It includes the carbon core but lacks the added membrane. A lot of filter (cleanable, too) for a good price.

Pur Explorer
A popular purifier-class device that uses iodine resins to deal with viruses. Independent testing showed that it's capable of producing a flow of 1.39 liters per minute — and that's terrific output. Twist the handle a quarter-turn and it becomes a brush that can abrade the glassfiber medium and prolong its life. Its exit filter, the "Stop Top," is a carbon-filled cap that can be fitted into water bottles and eliminate any iodine aftertaste.

PUR Scout
This purifier is a lighter version of the Explorer, without the built-in brushing function. Its filter medium can still be cleaned in the field.

PUR Voyageur
A reliable, lightweight (12.5 ounces), affordable purifier that performs well with proper care. Once clogged, its

filter media must be replaced.

PUR Hiker
One of the all-time easiest filters to use and, for its reliability, a great value.

PUR Pioneer
A dependable filter for beginners and short-haul casual users. Easy to use, but its glassfiber disks can clog quickly in water with above-average sediment.

Katadyn Pocket Filter
This Swiss-made ceramic filter is a standard-bearer for durability and reliability. Its silver-impregnated core helps retard any bacterial growth when not in use. The manufacturer estimates that it can produce up to 13,000 gallons of clean water and its ceramic cartridge can be cleaned up to 300 times. Drawbacks: It's heavy and it can be a chore to operate. But what a workhorse.

Katadyn Mini Filter
A lighter, less elaborate version of the Pocket Filter, though its ceramic filter offers the same silver impregnation found on its big brother. Expected lifetime: 2,000 gallons.

First Need Purifier
This unit's proprietary "structured matrix" design is "electricaly charged" and uses sieving and adsorption to produce its purified output. You can use this unit's stuff sack to convert it into a drip filter when you're in camp. Over time, clogging can be a problem with this noncleanable device.

SweetWater Guardian
Light, fast and safe, many people enjoy this filter's long-handled pumping mechanism.

Sweetwater Walkabout
Popular among users who prefer a small, lightweight, inexpensive filter. Reliable, though not as long-lasting as some models, and a little tougher to pump.

Exstream Squeeze Bottles
This product line is the first to satisfy the EPA protocol, which is why this is the first water bottle/purifier REI has ever offered. As a purifier, it produces a somewhat thin flow, but so what? At last, a dependable device that allows you to safely dip and sip at midday without taking the time to break out your filter.

Other Considerations

Replacement cartridges are available for all of the filters and purifiers REI carries. They cost roughly one-half of the original unit's cost.

Some models **attach directly** to specific **water bottles,** which is a nice touch. It can prevent a heartbreaking spill in the field.

If you're visiting places where **turbid water** is a factor (say, the desert southwest), a cleanable ceramic filter should be tops on your list. The same goes if you'll be filtering for a **group.**

Avoid filtering water in area where **animal or human activity** is obvious.

Try and filter water from **still, clear water** sources. Many microorganisms tend to sink to the bottom of still water; a turbulent stream keeps them suspended.

Rather than filter directly from the stream or lake, **put water in a pot** and filter from that. This gives you a chance to examine exactly how the water looks before you send it through your filter. This helps prevent clogging. If the water is cloudy, let it sit in the pot for an hour or so, then skim the clearest water off the top.

Don't save the first few streams of output from your filter. They don't taste as fresh.

When you clean your filter, recognize you are handling a **potentially contaminated object.** Don't handle food or put your hands to your mouth after cleaning your filter.

Follow manufacturer instructions for cleaning and **storage.** At home, consider pumping a weak bleach-and-water solution through the filter to sterilize it. If you can disassemble your unit, allow it to **dry out completely** before storing it.