Purifying Drinking Water

You've just filled your canteen with "pure" mountain water. Don't drink it yet. Just around the bend upstream there could be a decomposing skunk or raccoon. You always dig your camp latrine at least 200 feet from a water source to prevent contamination. Does everybody else? Without the support of modern medicine, wilderness survival depends on maintaining good health. It only takes one drop of contaminated water to make you ill.

Risks of Untreated Water. Of the many waterborne problems you may develop, the most common is diarrhea. In a survival situation, diarrhea may prove fatal. It causes dehydration and makes hygiene very difficult, increasing the risk of further unpleasant infections, and destroys the will to live. Experts estimate that at least 90% of the surface water in the United States, even in the most remote areas, is contaminated with the illness-causing protozoa Cryptosporidium and Giardia lamblia. Bacteria such as Campylobacter, E. coli and Salmonella are also common. The risk of infection from waterborne viruses, such as Poliovirus and Rotovirus, while lower than that of protozoa or bacteria, increases dramatically during a natural disaster such as a flood or earthquake, when municipal sewage systems can contaminate drinking water supplies. Lakes and streams in high traffic wilderness recreation areas where people swim, bathe or defecate in or near a water source can contain harmful viruses. You should also be concerned about viruses if you're in a third world country with poor sanitation and the water you're eyeing suspiciously may be contaminated with sewage from the people living upstream. A Marine Corps veteran of the Vietnam War relates the story of filling the lister bag for his unit's canteens from a stream, only to later discover that the source of the stream was a rice paddy fertilized with human feces. One of the most common waterborne pathogens, Giardia lamblia, is transmitted from an infected animal (some thirty species of animals, including humans, have been identified as carriers) who excretes the parasite in the form of cysts, which can survive for months in water as cold as 32 degrees. When infected body waste is deposited in or seeps into a water supply that is then consumed by another animal or person, giardiasis may result, and can cause explosive diarrhea, bloating, cramps, nausea, and vomiting. Treatment is with drugs that produce their own unpleasant side effects; fortunately many people seem to recover spontaneously without medical intervention. Many physicians haven't had enough experience with giardiasis to diagnose it correctly. If untreated, the disease may go on for years. Incubation time is 1 to 2 weeks, though some people have gone as long as two months before getting sick. Less than half of the people who drink water heavily contaminated with Giardia cysts actually become infected, and less than a quarter of those develop symptoms, although they may be carriers. Some people cite these statistics to downplay the threat, but why take a chance, when avoiding the risk is so easy? Always assume that water found in the wilderness is contaminated and use one of the three basic methods (boiling, chemical treatment or filtration) to purify it. However, these methods will not desalinate salt water or remove most chemical pollutants. Water can be polluted with chemicals by nature as well as by man. Water that has sat too long in a depression in a tree or brown icicles hanging from tree branches may have absorbed too much tannin from the bark to be drinkable (however, tannin-stained water can be boiled down to make a very effective antiseptic which, unlike synthetic astringents, actually promotes

healing).

Boiling. Boiling is the most reliable method of treating drinking water and will kill Giardia and every other waterborne pathogen that might be lurking in the murk. Most organisms are killed instantly when water reaches the boiling point. Another 5 minutes ensures the purity of your drinking water even at high altitudes. However, the water will still be dirty unless it has been filtered. An improvised pre-filter can be fashioned from a cloth sack suspended from a tripod of tree branches. Charcoal from from your campfire can help filtration, but don't use ashes since this will produce poisonous lye. This type of filtering will make the water more clear but will not kill microorganisms; it still must be boiled. Make sure you have plenty of extra fuel and allow extra time for drinking water to cool. The flat taste that boiled water has can be reduced by pouring it back and forth between two containers. Improvised containers for boiling water can be found in nature or fashioned from natural materials. Kettles for use over flames can be made from bark. Although flammable, it will not burn unless the flames reach above the water line. Bark can be made more pliable either by soaking or gently warming by the fire. The inside of the bark is the most durable side, and forms the outside of the container which is simply made by folding. Rock boiling is done by placing rocks heated in a fire into a container of water. Don't heat rocks found in a stream bed or other damp place since they may have water trapped inside and could explode when heated. Glass-like rocks like flint or obsidian should also be avoided. Handle the hot rocks with tongs fashioned from a springy green branch. Tap off any ash before dropping the rocks into the water. Continue adding rocks until the water boils. "Used" rocks can be returned to the fire. This method can also be used for cooking soups and stews. Cauldrons used for rock boiling can be natural depressions in rocks or trees that will hold water. You can also dig a pit if the ground is non-porous or clay-like enough to hold a puddle. Line the pit with cloth or non-poisonous leaves to reduce sediment and skim the boiled water off the top. You can make a bowl for rock boiling by burning and carving a large piece of wood. Hold a small hot coal in place with a twig and blow on it (through a reed if available) until it flares and burns the larger piece. Then scrape away the charred parts with your knife or a sharp stone. Repeat until it looks like a bowl. If you have some extra time and a lot of patience, you can start with a log and make a canoe instead of a bowl with this technique. Suspended animal skins can also be used for rock boiling; leave the legs and feet on for convenient anchor points.

Chemical treatment. Purifying water with household bleach is recommended in the emergency checklist of the phone book (10 drops per gallon or a teaspoon per 5 gallon container, mix and let stand for 30 minutes). While this is better than nothing, chlorine bleach is not totally effective. Much better are emergency drinking water germicidal tablets containing tetraglycine hydroperiodide, which releases iodine when dissolved in water. Iodine tablets don't weigh very much or take up much space and using them is simple. Add 1 tablet to 1 quart or liter of water and cap loosely to allow a small amount of leakage. Wait 3 minutes. Shake container to allow screw threads on the closure to be moistened, then tighten cap. Wait 10 minutes before drinking. For Giardia control, or if of poor quality (very cloudy) or very cold (which most mountain water is), use 2 tablets per 1 quart or liter of water and wait 20 minutes before drinking. Iodine tablets give water a distinct taste, which you can mitigate by leaving the container open to breathe for an hour. Filtration through an activated carbon filter can also reduce the iodine taste. The manufacturer of "Potable Aqua" iodine tablets also makes an iodine neutralizer to eliminate the taste. You can mask the taste by adding a little Nutrasweet Kool-Aid which, unlike Kool-Aid sweetened with

sugar, weighs next to nothing. The lemonade flavor is quite palatable and not overpoweringly sweet when mixed at half-strength. Aside from the unpleasant taste there are other disadvantages you should consider. While iodine tablets kill all viruses and bacteria, they are less effective against Giardia and virtually powerless against Cryptosporidium. Iodine tablets are probably the most expensive method of treating water (other than boiling with a butane camp stove), especially if you add a chemical neutralizer or Kool-Aid. Be aware that some people are allergic to iodine and persons with thyroid trouble or pregnant women are advised to consult their doctor before use. Iodine should not harm you so long as its use is confined to a few times per year and should not be used for more than a few days at a time. Iodine tablets also lose their strength over time and must be replaced periodically. The manufacturer of "Potable Aqua" iodine tablets recommends that you do not keep an opened bottle more than one year and states that unopened bottles should remain effective up to four years. Finally, disgusting muddy water treated with iodine tablets stays disgusting and muddy.

Filtration. Don't like the notion of gunking up that "pure" wilderness water with Kool-Aid and can't stand the taste of iodine? Filtering water can be done almost as fast as chemical treatment and it does not introduce a bad taste. Make sure the filtering apparatus you buy either can be easily cleaned or has a replaceable filter cartridge or element. Filter pores must be 0.4 microns or less in size to be effective against Giardia. The $20 filter from the camping section of the local discount store with a 1 micron filter may not seem like such a bargain when you are squatting in the bushes with diarrhea. Some filters like the AccuFilter canteen insert (which fits either 1 or 2 quart G.I. canteens), the SweetWater Guardian and the Pur Explorer contain an activated carbon component which removes many organic compounds such as pesticides. Microporous filters do not strain out viruses, which are much smaller than bacteria. Manufacturers of filters that work solely on a microporous principle, without the chemical disinfection necessary to kill viruses, assert that viruses simply aren't an issue in wilderness areas in North America. They're probably right, at least most of the time. However, the AccuFilter canteen insert and the Pur Explorer are hybrid filters that contain both a microporous filter and a mass of iodinated resin beads. As the water flows past the beads, enough iodine is released to kill viruses so long as the concentration of viruses is moderate. There is an optional ViralGuard cartridge sold for the SweetWater Guardian which also contains iodinated resin. The filtered water has a slight iodine taste, but it's not as noticeable as when using iodine tablets. The capacity of filter elements before they must be replaced varies widely, but filtering very dirty water with lots of debris and particles reduces their longevity. Straining water through a fine weave cloth while filling a spare canteen is a good idea to extend the life of the filter used to pump the treated water into a second canteen you will drink from. SweetWater sells a 4 micron pre-filter called the Silt Stopper for their Guardian system, but it should be useful for the intake line of any filter. In terms of cost, generally the more you pay for a filter the longer it should last, which lowers the cost per canteen full. The AccuFilter canteen insert costs $16, but is only good for 20 gallons. The Pur Pioneer (0.5 microns) costs $30 and comes with two filter elements (that cost $5 per pair separately) each good for about 12 gallons. Although the Pur Pioneer comes with an outlet hose that clips to any container, it can also screw directly onto the 1 quart Nalgene wide-mouth drinking bottle favored by many hikers. The SweetWater Guardian (0.3 microns) costs $50 and comes with a replaceable element ($20-$25 each) good for 200 gallons. The optional SweetWater ViralGuard cartridge costs $25 and is good for 90 gallons. The Pur Scout costs $45 and is good for 250 gallons ($30 replacement element). The Katadyn Mini Filter costs $150 and is good for 2000 gallons (replacement element $65). The capacity of the

above mentioned filters is with clean water and with regular cleaning of the units (usually about every 20 gallons). The Pur Explorer is a hybrid filter with iodinated resin to kill viruses, activated carbon to remove both iodine taste and organic compounds, and a microporous filter effective against bacteria and protozoa like Giardia and Cryptosporidium. It is also very easy to clean, having a built-in brush and a self cleaning back-flush mode to remove silt and debris from the pump unit. The Pur Explorer is probably the most effective, lowest cost to use filter available at a cost of $120, good for 500 gallons (replacement element $45). A good water filter will not only remove whatever critters may be present, but also the inevitable sand and silt.

Always purifying your drinking water will help insure your health and keep you in the field to continue your Militia mission, whatever it might be.