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Lesson Plan 3: Water Filters and Purifiers – How do I choose?

Essential Question: How do I choose a what to treat my water in the backcountry?

Goals and Outcomes: By the end of this lesson, students will be able to:

1. Discuss why we need to treat our water in the backcountry
2. Explain the difference between water filters and purifiers
3. Compare and contrast the pros and cons of different types of filters and purifiers
4. Demonstrate how to properly use the water filters discussed in the teaching event

Participant Prerequisites: For this lesson, the students are not required to have any previous knowledge on water filter or purification systems.

Resources:
Time: This lesson plan should take no 15-20 minutes
Equipment: The instructor should have an example of each type of water treatment mentioned for students to use and practice with, including: a gravity filter, a pump filter, a UV purifier, water tablets or drops.

Background: The instructor should have complete knowledge of why we treat our water, how and what tools we use and how those tools work.

Water in the backcountry can be clean sometimes, especially snow melt that is high in the mountains; however, we can never be sure of this just by looking at it. It is always a better idea to treat your water than risk the illnesses that may come with ingesting the pathogens, bacteria or protozoa that could be in the water. Viruses are especially a concern due to their small size, making them difficult to strain out. Bacteria and protozoa can be filtered out, where the water is pushed through a filter but viruses need to be killed through purifying, usually with chemicals or UV light. To compare, filters strain out particulate matter, protozoa and bacteria but do not have small enough pores to catch viruses. Purification is usually done with chemicals or UV and does not filter out particulates but does disassemble or kill viruses, bacteria and protozoa with the downside of negatively affecting the taste. Filters will usually treat water more quickly than chemicals but are not cheap. It is a good rule of thumb to bring a filter and some sort of purification to be safe (note that some filters do have chemicals to also purify).

As far as filters go, pumps and gravity filters have their own pros and cons. Pumps can filter water directly to your bottle and allow you to get water from shallow sources quickly while gravity filters might take more time and would be challenging to fill up in a shallow creek. Both are great for treating large amounts of water.

Hikers overall are usually concerned about effectiveness, weight and maintenance of their water treatment. Gravity filters and pumps can range from a couple of ounces to over a pound and require simple field maintenance while chemical treatments are lightweight with no

maintenance but take a lot of time to filter the water and would not be best to use with large groups.

Teaching Methods:

1. The instructor will lead a discussion on the following:
    a. Why do we treat our water?
        i. Pathogens, protozoa, viruses
        ii. We want water to be clean and to taste good
    b. How do we get the bad things out?
        i. Filter vs. purifying
            1. Filters push water through a system that removes particulates, bacteria, protozoa but NOT viruses
            2. Purifiers (chemicals / UV) kill or disassemble viruses + bacteria and protozoa but do not filter out particulates (silt, leaves, etc.)
    c. What are the different types of filters and purifiers and what are some pros and cons?
        i. Gravity filters: gather water in bladder let gravity do the work
            1. Pros – filter a lot of water in short time, don't filter viruses
            2. Cons – not always a place to hang, heavy, hard to gather water if shallow creek, don't filter viruses
        ii. Pump filters: put pump in moving water and pump water to bottle
            1. Pros – filter a lot of water, can gather from shallow water
            2. Cons – pumping can be tiring, don't filter viruses, can take longer to filter large amounts
        iii. UV light: purify water by scrambling virus DNA and killing bacteria and protozoa
            1. Pros – lightweight, efficient
            2. Cons – expensive, require batteries, do not change water taste
        iv. Iodine / chlorine tablets: effectively eliminate viruses, bacteria and protozoa by putting tabs in correct amount of water
            1. Pros – lightweight, effective
            2. Cons – effect water taste, take a long time, don't filter large amounts quickly
    d. How do I get the clean water?
        i. Pumps and gravity filters: gather water from a running stream if possible; avoid still water since bacteria and viruses can sit
        ii. If using system that does not filter out particulates (UV, chemical tablets) use bandana or purchased pre filter to remove silt and leaf debris
2. Activity: The instructor will have the students practice using the water treatments systems mentioned in this lesson plan.
    a. Divide the group into equal sections depending on how many available water filters or purifiers there are and tell them to gather water to practice! The students should be within range where the instructor can give feedback as needed.

3. Questions? The instructor will ask the students if they have any questions.
4. Assessment of Student Learning:
    a. The instructor will lead a discussion asking the following:
        i. Why do we need to filter out water?
        ii. What is the difference between filtering and purifying and why does that matter?
        iii. What are some pros and cons of different types of water treatment?
5. Closing: The instructor will conclude by reviewing the outcomes and main points:
    a. Why treat water?
    b. Purifiers? Filters?
    c. Moving forward: how will I personally treat my water?