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TEACHER GUIDE

WATER QUALITY & DISTRIBUTION GRADES 3-5

COMMON MISCONCEPTIONS

- **There is plenty of water available for any use.**
3% of all water distributed throughout the Earth is freshwater. Many living things depend on this type of water for survival. With such a small percentage available (and not considering whether some of this water is poor quality), there is not plenty of water for use.
- **Oceans will never be polluted because they have a very large volume of water.**
Even though oceans contain large volumes of water, they can be polluted. Surface runoff can make its way to oceans, and debris can be found floating in the water. Although the ocean water may not change colors or appear to be polluted, if the nasty polluting material is consumed by aquatic life, it can make its way through the food chain. This can directly affect human health.
- **Any type of water that is clear and free of debris is good water quality.**
It is hard to tell whether water is of poor quality just by looking at it. There are types of surface runoff, or chemicals, that can pollute a body of water without it being obvious. Some of these chemicals are only detectable by taking a water sample and measuring just how much is present.

WATER QUALITY

Water quality measures how suitable water is for a prescribed use. This is measured by looking at the physical and biological characteristics of water. It is important to consider the quality of water because water has so many uses. For example, people use water for recreation, drinking, fishing, agriculture, and industry. When using scientific methods to determine the quality of water, results are not only intended to confirm whether the tested water is of good quality or not. So it is important to think about what the water is being used for when assessing whether water is of good or bad quality. For example, water that is filtered and prepared to re-enter a body of water may not be of good quality if used as drinking water. This is because drinking water must not only be strongly filtered but also further carefully cleaned to meet standards that confirm it is safe for people to consume.

WATER TREATMENT

Water is used for many purposes at home, such as to flush the toilet, cook with, or even to wash dishes and clothes. When water is used at home or in a public place it travels to a water treatment plant for processing and cleaning. While at the treatment plant, water is purified and sanitized before it is reused in homes and public places. There are many different stages that this water will go through at a treatment plant before it is ready to be reused. Upon first arrival, water flows through a screen where large floating objects, or debris, are removed. This is called primary treatment, as solids are removed during this stage. Not a lot of chemicals or other pollutants are removed at this stage. During secondary treatment, biological processes get rid of certain substances that were missed during primary treatment. Lastly, the highest level of treatment is tertiary treatment. This is any type of process that goes beyond what primary and secondary treatment processes do. For example, some water treatment plants will add chlorine to the water to disinfect it before it is discharged for use. Other plants may remove specific pollutants, like nitrogen or phosphorus. These compounds can cause eutrophication when found in excess in water. Eutrophication is a type of pollution that can decrease oxygen content in a body of water. Algal blooms are formed because of eutrophication.

ACTIVATED CHARCOAL

This is a type of material commonly used in filtration devices or for filtration in general. Also known as activated carbon, this is simply carbon that has been treated with oxygen. When this treatment occurs, a porous form of charcoal is made. It ends up resembling a black sponge with several tiny holes. These holes increase the surface area of charcoal, which allows it to adsorb a wide range of pollutants. Adsorbing is the process of adhering dissolved solids - or molecules of gas and liquids - to a surface. Adsorption works when the pollutants chemically bind to the carbon. Over time these openings, or active sites on the carbon, get filled with the pollutants. When this happens the activated charcoal filter is less effective. This is why the filter you use in home water filters must be replaced or recharged after a period of time.

WATER DISTRIBUTION ON EARTH

97% of all water on Earth's surface is found in the oceans. This water is salty. The remaining 3% is freshwater, which is distributed into varying amounts. Specifically, 68% of that freshwater is trapped in glaciers and icecaps. 30% of this freshwater is trapped below you as groundwater. This means no matter where you are standing on Earth, it is a possibility that, at a given depth, the ground below you contains water. The remaining percent of freshwater is surface water such as rivers, lakes, and swamps. Unfortunately most of the water, which comes from oceans, is not available for use. Much of the water that people use comes from rivers or groundwater. Therefore, a lot of the water used is transported to a water treatment plant, where it is cleaned so that it can be reused.