**Surface Water and Groundwater… what can they carry???**

**Earth Science**

Water is a truly amazing and unique substance. Not only is it the only material on Earth that commonly appears as a solid, a liquid, and a gas… it is also referred to as a “universal solvent”.

What is a “solvent”? A solvent is a substance that other materials can dissolve in. Have you ever added salt to water? Sugar to water? Food coloring to water? Water has an exceptional ability to pull substances apart, on an atomic/molecular level, and then keep those atoms and molecules swimming around between the water molecules in a way that makes it seem that they have disappeared!! When the water moves from one place to another, the materials that are dissolved in the water also move… and in this way, water is able to move mountains, slowly and steadily!

Water also has the ability to push and pull matter. Have you ever been to the ocean on a day when the waves were large, big enough to knock you down and roll you around in the surf?? That demonstrates how effective water can be in moving substances around. Have you ever seen a river or stream that is brown and muddy? The reason that the water is brown and muddy is because… the water is carrying—pushing and pulling—little particles of dirt and clay. This is different from dissolving a substance… the mud and dirt and clay haven’t dissolved (they aren’t broken into individual atoms and molecules), but are simply small enough to be carried by the force of the water. The faster water moves, and the greater the volume of water moved, the easier it is for water to carry bigger and bigger sizes of dirt and mud and clay… little pebbles, small rocks, sand. This is yet one more way that rain and snow and mountain streams are able to erode hills down to nothing, carrying them to the ocean in the process.

Please power up your laptops and go to the following site:

<http://en.wikibooks.org/wiki/High_School_Earth_Science/Water_Erosion_and_Deposition>

You will find some background information on ways that water can move matter around. Please use it to complete the following:

Define each term in a way that explains how they differ from each other.

Dissolved Load-

Suspended Load-

Bed Load-

So water is pretty good at moving stuff around. Rivers, lakes, and streams in Maine pick up different materials and chemicals and move them towards the ocean at a fairly speedy rate (compared to groundwater). Many of the materials found in water are naturally occurring substances (like clay and mud and minerals) that pose no threat to the environment. Sometimes, however, water can contain things that are not healthy. For example….

When is the last time that you took a cup, walked over to a lake or river or stream, dipped your cup in, and then drank down the water in the cup? My guess is that you have NEVER done that, because you have been taught that drinking water from lakes and streams and rivers is not safe unless it is “treated”… that is, unless something is first done to the water to make it safe for human consumption. What is in the water that might not be good for you?

Pathogens and harmful bacteria

Naturally occurring substances (like Uranium) that can be harmful

Toxic chemicals

Fertilizers, pesticides, and other agricultural chemicals and wastes

Gross stuff that has washed into the water after a rainstorm (like oil or road salts or animal waste)

Sewage and other substances that have been placed into the ground

All of these things… and many more… are easily carried around in water. So how dirty is Maine’s water?

Please do a Google search on “freshwater fish safe eating guidelines Maine”. Open the link for Maine.gov, and read the first two statements.

Based on the recommendations, how much fish from Maine’s lakes and rivers should **Pregnant and nursing women, women who may get pregnant, and children under age 8, be eating?**

What are the recommendations for other adults and children older than 8?

What chemical is causing health officials in Maine to make these recommendations?

Do a quick search to see if you can find out where the mercury in Maine’s lakes and rivers is coming from. (in-state, or out-of-state)

How is the mercury getting into the water?

What are three other toxic chemicals found in Maine’s freshwater fish? What is the source of these chemicals?

Do another Google search, this time on something like “dioxin rivers Maine”. Find a good source to answer the questions below:

What are three health dangers of dioxin in humans?

Are dioxins dangerous to fish and animals?

What connection did researchers make between dioxin in the Penobscot River and bald eagles?

What is the most significant source of the dioxin that is found in Maine’s freshwater?

Go back to the Maine.gov “guidelines for eating freshwater fish” website and scroll down to the bottom of the page. Notice that certain rivers in Maine have special restrictions on eating fish from their waters. Based on your answer to the previous question, what is your best guess as to why fish from these particular rivers might be especially toxic?

***Can groundwater be polluted?***

Go to the website “groundwater.org” and hover over the “get informed” link at the top of the page. Hover over “Threats to our groundwater” in the drop down menu and click on “groundwater contamination”, and then read the first three paragraphs about groundwater contamination.

What does the expression “groundwater contamination” refer to?

What are four specific contaminants that have been found to pollute groundwater supplies?

What is a “septic system”?

What happens to liquids as they move through a septic system?

What happens if a septic system doesn’t work correctly? Be specific!!!

What are the 6 sources of groundwater contamination that are listed at the bottom of the page?

a. b. c.

d. e. f.

When groundwater gets contaminated, it is extremely difficult to clean up, and the costs of the clean up can be gigantic. Perform a quick Google search and explain the challenges of cleaning polluted groundwater in the space below.