Lecture Material - Wet n' Wild Watersheds

Put important information on the board. I have outlined a few things in the material but you can put what you feel is important on the board so that the students have the information in their notes.

Start class off by asking the students- "When was the last time you were on a stream or a river?"
Ask a few students what they were doing on the stream or river. Then ask them if they ever thought about were all the water came from and were does it go.

Have a short discussion with the students to see where they think the water comes from and were it goes.

Where does all that water come from?
In Pennsylvania there are almost 65,000 miles of streams. These streams range in size from small trickles to large rivers. All 65,000 miles of these streams receive their water from something called a watershed.

Watershed- the land area through which any water moves, or drains, to reach a stream.

There are many different types of watersheds in PA. Some are completely forested while some contain a mixture of forest, farmland, towns, and roads. Some are steep and some are flat. The terrain in which the watershed lies determines the shape of a watershed. Some watersheds are very large while others are very small. Watersheds are broken down by the size and number of streams they contain.

First Order Stream - a head water stream, no other streams flow into a first order stream. It receives its water from ground water and runoff. A first order stream lies in a first order basin which is a small watershed for that stream.

Second Order Stream- a second order stream is formed when 2 first order streams come together to form a large stream.

Third Order Stream- a third order stream is formed when 2 second order streams come together to form an even larger stream.

Fourth Order Stream- a fourth order stream is formed when 2 third order streams come together to form an even larger stream.

This process continues on up to about a sixth order stream.

Each order has its own little watershed that feeds each stream. When you add up all of these little watersheds you get one giant watershed that drains the entire area.

Pennsylvania has six different watersheds which all ends up in the ocean. They are

1. Lake Erie Watershed
2. Ohio River Watershed
3. Genesee River Watershed
4. Susquehanna River Watershed
5. Delaware River Watershed
6. Potomac River Watershed

Where do the watersheds get their water?
Watersheds receive their water from a process called the water cycle. The water cycle is simply a process in which water gets recycled so that it can be used over and over again. The water cycle consists of 3 processes.

Precipitation- rain, sleet, snow, hail. Water condenses in the atmosphere and falls to earth when the air can no longer hold it.

Transpiration- plants use water and then release it in this process. The plants lose the water to the air through water vapor.

Evaporation- the sun turns water into water vapor, which goes into the atmosphere to fall as precipitation.

The water cycle starts when the sun evaporates water and plants transpire water. This water is in the form of water vapor, which is a gas that goes up into the atmosphere. The water is store in clouds until the water condenses back to a liquid and falls out of the sky as precipitation. The precipitation is used by plants, runs off into streams, sinks into groundwater, or is evaporated by the sun. The process starts all over again.

This constant cycle of water is what supplies watersheds with their water.

(discuss with the students if they think the same water keeps falling on the same watershed- no it doesn't, clouds are moved by air currents so water that is evaporated in one area falls on different area)

When the water seeps into the ground it is called groundwater. The water gets stored in the ground until it comes out on the surface at places called springs. This is usually the source of a headwater stream. Once the water is above ground it is called surface water.

What kind of watershed has the best quality water?
(ask student this question and have them discuss which one they think and why)

A forested watershed has the best quality of water. (ask students if they know why)

A forested watershed has the best quality of water because almost all of the water entering a stream from a forested watershed comes from the soil. The soil in a forest is very porous which causes the rain water to sink in quickly before it has a chance to run over the surface. When the rainwater sinks it the soil and plant roots help to filter the

water. By the time the water reaches the stream it has been filtered. This is why forested streams have extremely clear water in them. The soft floor of a forest also cushions the falling rain so that it does not loosen the soil up causing it to erode into the stream. These clear, forested streams provide 80% of our drinking water in PA.

(Ask the students what they think would happen to a watershed if the forests were interrupted.)

Peoples affect on watersheds

People affect watersheds in many ways. These include pollution from acid rain, clearing of forests, paving of large areas, pollution from runoff of fields and parking lots, and altering stream flows because of development.

Clearing of forests is one of the worst ways people can affect watersheds. If you remember from before, 80% of our drinking water comes from forested watersheds. If we remove the forest there is nothing left to filter the water so water quality will go down. There will also be no trees or plants to use up some of the rainfall so most of it will runoff into the stream carrying debris with it which lowers water quality even more.

Forested watersheds can be logged, just not completely. They also must be logged in a manner that will not hurt the watershed. Several steps can be taken to limit the impact of logging on a watershed. They include:

1. Leaving a riparian zone around the stream. This is just leaving a certain area on either side of the stream alone. You do not cut trees there or drive equipment. This zone will help protect the stream from runoff and help filter the water.
2. Use logging methods that do not impact the watershed. This would include putting drainage ditches and water bars or culverts on the logging roads to keep runoff from reaching the stream. This also reduces erosion on the logging site. Erosion is a big cause of water pollution. (sediment) Reseeding landings and skid trails is also a good practice to keep erosion down.
3. Use cutting methods that leave trees behind to help hold the soil in place and to soak up some of the water to reduce runoff.

(Discuss with the students any local logging operations and practices they may be taking to limit their affect on the watershed.)

Watershed management does not end in the forest though. You must manage them carefully in farmlands as well. A farmer must be careful of the chemicals he uses on his fields because these chemicals can end up in the watershed. When it rains the chemicals are carried to the stream in runoff. In the stream the chemicals can have adverse affects on plants and animals.

(Discuss with the students ways in which a farmer can limit runoff on his farm. Things such as riparian zones around streams, application of the chemical in low quantities to avoid runoff, do not apply chemical near stream, etc.)

Wrap the lesson up with an overview of what has been learned and have the students ask any questions they might have. Leave it open to discussion so that the students can be exposed to different viewpoints.

Give the worksheet as homework.