Handout courtesy of the Nagatuck River Watershed Association

http://www.naugawatshed.org/What%20is%20a%20watershed.htm

What is a Watershed?

A watershed is an area land from which water ultimately drains into a major river, which then dumps into the ocean or sea.

figure 1- Illustration of a watershed

How a Watershed Works

Understanding the hydrologic (water) cycle is critical to understanding the concept of the watershed. Without the water cycle, watersheds would cease to exist. It is the water cycle at work that gives us, here in New England, the seemingly endless supply of water we enjoy. Although three-quarters of the Earth is covered by water, the percentage of freshwater that is available for everyday human use is very small. Clean freshwater is even more scarce. While both salt water and freshwater are essential parts of the water cycle, the freshwater that most of us use in our daily lives makes up less than 1% of all the water on the planet. Because the "same" water is recycled year after year, contamination or overuse of this valuable resource can create both short- and long-term problems. Protection and conservation, on the other hand, may help maintain a supply suitable for plants, wildlife, and human uses. Understanding how water evaporates, collects, flows and circulates is the first step in this protection effort.

The Water Cycle

When precipitation in the form of rain, snow, sleet, or hail reaches the ground, it can take any number of pathways. Refer to the hydrologic cycle diagram to see some of the following terms illustrated. Water evaporates from the Earth's surface into the atmosphere. The Sun's energy creates both heat and wind, which cause evaporation. During evaporation, water vapor rises into the atmosphere on warm air currents. Once this water vapor hits the cool upper layers of the atmosphere, it condenses around tiny particles, such as dust and pollen, and forms clouds. As more moisture is added to the atmosphere, the droplets continue to grow until they are too heavy to circulate and they fall to the Earth as precipitation. Transpiration describes what happens when water that has been taken up by plants through their roots escapes as gaseous exchange through the surface of leaves. The escaping water enters the atmosphere as vapor and joins the water vapor produced by evaporation. Plants influence many other aspects of the hydrologic cycle. For example, they produce shade, which decreases the rate of evaporation.

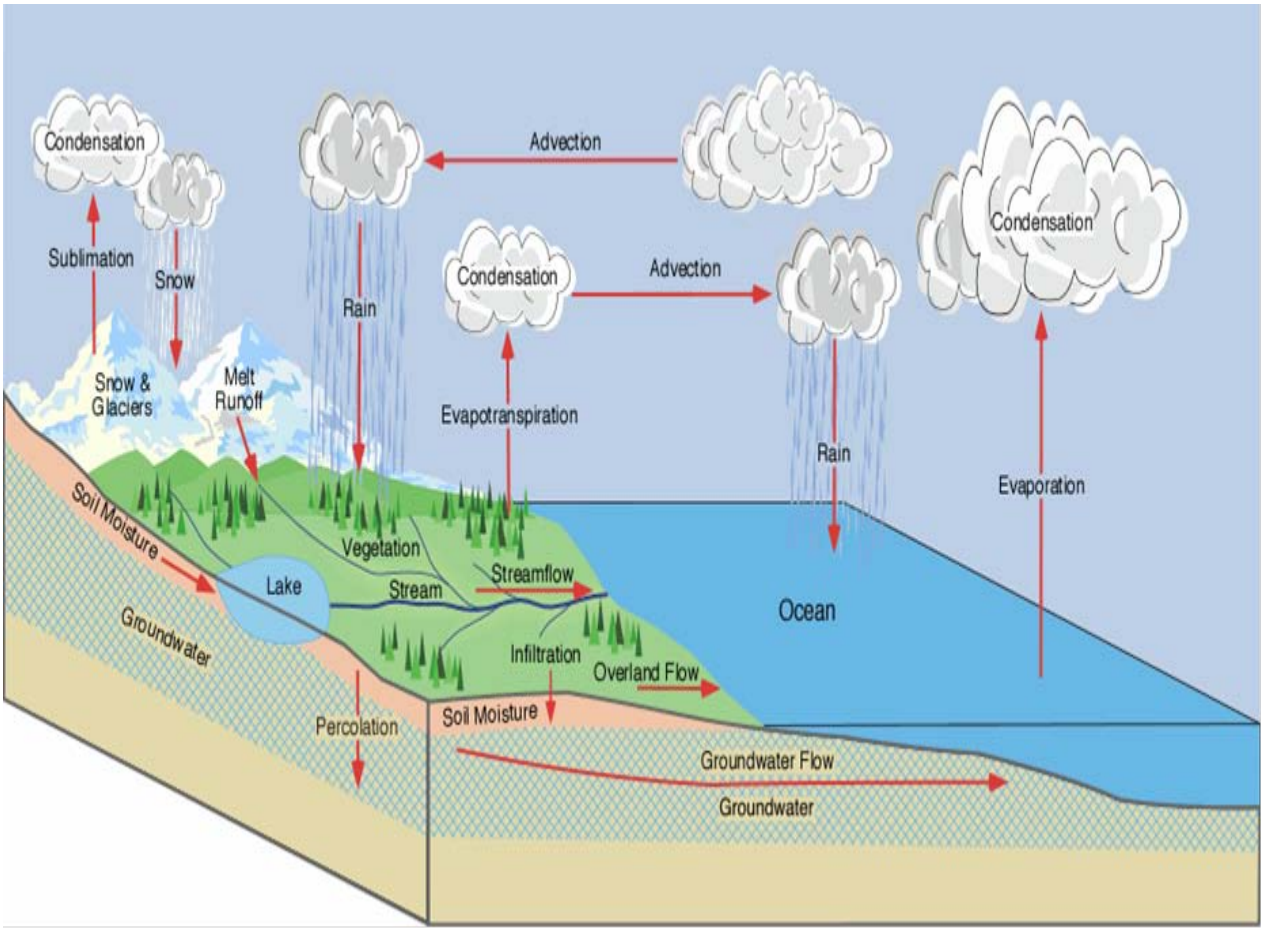

Figure 2- The Water Cycle

Depending on local conditions, some of the water which falls as precipitation will infiltrate soil and percolate into the ground to become groundwater. Groundwater is found in the tiny spaces between bits of sand and gravel or in fractures in the bedrock. The unsaturated zone (or the zone of aeration) is the upper zone where both air and water

fill the pores between soil particles. The zone below is the saturated zone. Here the spaces between soil particles contain only water. The water table is the uppermost edge of this saturated zone. Aquifers refer to places within the saturated zone where the water between soil particles or in fractures in bedrock is readily available and can be obtained by drilled wells. Some of the precipitation that falls becomes surface water. The geology and topography of the land determine how surface water flows. Compact soils and steep terrain diminish infiltration and accelerate surface water runoff. Sandy soils and flat terrain increase infiltration and decrease the rate of surface water runoff. Surface waters are familiar to us as streams, rivers, lakes, ponds, oceans, and wetlands.

Groundwater plays an important role in supporting plant and animal life. Roughly 22% of the Earth's freshwater is groundwater. However only about one-half of that is actively exchanged through the water cycle. Water table levels fluctuate depending on how much water enters the system at recharge areas and how much is withdrawn. Recharge areas are surface areas where precipitation or surface water infiltrates the soil to enter the groundwater system. Often they are upland areas. Discharge areas occur where the surface of the Earth dips below the water table, causing groundwater to become surface water. Groundwater can discharge as a spring or into other water bodies such as streams, wetlands, estuaries, or marshes.

In New England, recharge levels are usually highest during winter and spring because of snowmelt, rainfall, and low rates of evaporation and transpiration. Water table levels may rise during this time because there is less uptake of water by plants, withdrawals for public water supplies, and irrigation of agricultural crops and lawns. Water tables are affected year-round by withdrawals for commercial, industrial, and residential water use. In addition to topography and geology, confining layers will influence the location of groundwater. Confining layers are impermeable layers of bedrock or clay that prevent water from flowing into or out of a particular area. In practical terms, confining layers serve as barriers that limit the amount of water available to a well, separate one aquifer from another, or act as partial barriers to contamination in an aquifer. Groundwater sandwiched between two confining layers may be under pressure. Artesian wells are wells that tap into groundwater under these conditions. A perched water table occurs in very permeable material when infiltrating water is prevented from moving downward by a low permeability layer, such as clay or silt, and is thus held above and separated from the regional groundwater system. Perched water tables may result in wetland or pond formations.

In coastal areas, fresh groundwater or surface water flows into salt water. When this happens, the freshwater tends to "float" because it is less dense than salt water. However, there are many factors, such as the amount of suspended material and temperature differences, which influence the nature of fresh/salt water interactions.

Watersheds

Watershed refers to the land over and through which water flows to reach a common water body. It has two components - surface drainage and groundwater drainage. An

underground drainage area is sometimes called a ground watershed. Just as surface water flows over the surface of the land in response to gravity, groundwater flows through permeable soils and fractures in bedrock in response to gravity. Groundwater, however, flows much more slowly. A surface watershed divide is the set of points separating one watershed from another. Surface watershed divides are usually mountains and high points of land. Ground watershed divides separate ground watersheds from each other. Surface watershed divides may be in different places than ground watershed divides.

Figure 3- A watershed illustration

In every watershed, small streams flow into larger streams, which flow into rivers, lakes, and bays. The smallest streams at the outer limits of a watershed are called headwaters. In New England, headwaters are often located in the mountains. These headwater streams have no tributaries and are called first order streams. All other streams have tributaries. Second order streams form when first order streams meet. Third order streams form when second order streams meet, and so on. In regions like New England that have varied terrain we often describe water as flowing from the mountains to the sea or to a lake. The water follows gravity and the contours of the landscape. A watershed is identified by the name of the water body that serves as the collecting basin for that drainage are. All land is a part of some watershed! Not only do streams and rivers flow to a collecting basin, but

so too do the impacts that humans have upon those water bodies. Human activities that impact the quality of the river water flowing into a basin also impact the basin itself.

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