Watershed Wisdom –Transpiring, Recyclable, Energy Efficient, Stormwater System

Last week Dale Finseth and I both talked about what a watershed is and why we should care. The key point from my column is that water quality is directly dependant on land use within the watershed and the way the stormwater washes across it. This week we will discuss an amazing stormwater control system known as the Transpiring, Recyclable, Energy Efficient Stormwater System, or TREES for short. This key component of Mother Nature's basic watershed design is a wonder of efficiency, and coupled with vegetated wetland buffers, does an outstanding job of protecting the water quality of lakes and streams.

As anyone who has ever taken shelter under a tree during a rainstorm knows, trees do a great job of protecting the land under them. When the large raindrops hit the vegetation, they are broken up into many little droplets that continue to fall towards the ground, breaking up into ever smaller droplets as they hit more layers of vegetation, a process engineers would call "energy dissipation." The large surface area of the leaves and small branches becomes coated with water that never reaches the ground, a process hydrologists call "interception." The water that continues to fall to the ground ends up as a fine mist, or slow moving drops that drip off the lower parts of the tree. This moisture falls gently onto a thick spongy "duff layer" of decomposing leaves and pine needles that comprises the forest floor, soaking in slowly. As the runoff filters slowly through the forest floor, it continues to soak into the sediments below where it enters the groundwater table. A substantial portion is taken up through the roots of the plants and transpires directly back to atmosphere via evapotranspiration from the leaves. Except in very large rain events, very little stormwater actually runs off from a forest.

Contrast this with rain that falls on a plowed field, paved surface, or a dusty camp road. The raindrop hits the ground at high speed, with enough kinetic energy to erode the surface of the soil and splatter up muddy water. This water begins to puddle up and move down the hill, carrying dirt, manure, or other pollutants such as oil or grease along with it. If the surface topography is steep, the stormwater gains momentum and continues to erode, picking up an even higher pollutant load. Typically the stormwater from these developed areas is routed rapidly through ditches and pipes directly to the nearest stream, river, or lake. The turbulent motion generates kinetic energy that allows the flowing water to carry a large load of suspended sediments. When the polluted water eventually reaches a large pond or lake, the velocity will slow and the suspended sediment will settle out. The coarser sediments settle rapidly near the shore forming a delta near the inlet (check out the north end of Long Pond where Rt 27 drains into the lake at Tracy Cove) but the finer sediments (and attached pollutants) move out into the lake, creating turbidity, or cloudiness. These fine sediments settle very slowly, spreading pollutants to the deepest portions of the lake.

Under Mother Nature's system, thanks to the trees and surrounding vegetation, there is much less water flowing across the land surface towards the water. This water continues to be slowed and filtered by vegetation and rarely develops enough momentum cause erosion or carry a heavy sediment load. As the flowing water approaches a stream or lake, it typically flows into a heavily vegetated wetland buffer that acts as a large sponge to absorb the water and further slow the flows, allowing suspended sediments to settle. Some of the fine sediments adhere to the surface of the plant stems in the water

column, a process known as “adsorption.” The end result is that the water finally reaching the lake is clean and clear.

So, how do we protect our watershed and maintain high water quality? The answer is to mimic Mother Nature’s system as much as possible. More on that in future columns.