The Importance of Forested Watersheds

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Most drinking water comes from the forested watersheds of Pennsylvania. These watersheds have long produced the high-quality water necessary for drinking. In addition, forested watersheds offer a measure of protection against rapid runoff of precipitation, thus reducing flood hazards. Erosion and accompanying sedimentation of streams and reservoirs are greatly reduced by the presence of forests.

These forest influences have long been recognized by man. In 1215 Louis VI of France instituted an ordinance titled "The decree of waters and forests," which was intended to protect forested watersheds from being stripped of trees. In 1606 a letter was written to the government of Venice enumerating the effects of deforestation in the Alps on sedimentation in the lagoon at Venice and the flooding of the Po River.

Unfortunately, these European experiences were soon forgotten by the early settlers of America. They looked upon the vast forests covering eastern North America as inexhaustible and set out to clear the land with uncontrolled zeal. Such was the magnitude of these forest-clearing efforts that in 1867 a report was published on the disastrous effects of deforestation in Wisconsin. This report and other happenings in those times led to the passage of legislation by Congress to protect the watersheds of navigable streams. The U. S. Forest Service was created to administer lands acquired by the federal government under this legislation.

A great controversy arose at this time over the importance of forests in flood protection. One result of this controversy was the establishment of the first experimental watershed in the United States at Wagon Wheel Gap, Colorado. Since that time many more experimental watersheds have been established throughout the country. Much of what we know about the relationships of forests and water is a result of work done at these research facilities.

There is no question that forests are important in influencing the flow characteristics of streams and rivers, but they do not have much influence on the general climate of an area. A popular misconception is that more rain falls on forested areas than on nonforested areas because the forests contribute more water vapor to the air. We know that such a notion is false because virtually all of the rain falling on continental land masses is originally evaporated from the oceans and transported over the land mass by prevailing winds.

The simple observation that it is cooler in the shade tells you that forests are important to the climate near the ground. One very important aspect of the forest's shading of the ground is its influence on the melting of snow. During winter, when all the leaves are off of deciduous trees, there is still a noticeable shading effect. Slower-melting snow means a less rapid rise of stream water levels and a reduced flood hazard.

Another popular belief is that streams and springs will dry up when forests surrounding them are cut. This is not true. Research shows that more water is added to streams and springs when forests are cut. This shouldn't seem surprising when you consider the tremendous amounts of water used and evaporated by trees. A single tree is capable of evaporating as much as 10,000 gallons of water a day. If such figures are multiplied by the number of trees in a forest, the tremendous water-using potential of forests is obvious. When forests are cut, the water that they would have used is available for streamflow. Thus, streamflows increase dramatically for the first few years following forest cutting. Shortly, young trees, growing in place of the ones cut down, will use as much water as the original trees did.

Many old root channels in forest soils serve as conduits for water to enter the soil and underlying rock formations. The mat of leaves underneath a forest prevents the forest soil from becoming compacted by heavy rain droplets. This improves infiltration of water into the soil. All of these things help to lessen the amount of water runoff, prevent rapid rises of stream water levels, and reduce flood hazards. As a result the ground upon which they grow serves as an important water storage area.

The value of forests in controlling floods is limited by a number of factors. The most important of these factors is the amount of rain falling in a given period of time. Amounts of rain associated with most catastrophic floods are so great that the presence or absence of forests matters little. Such was the case with Hurricane Agnes flooding in 1972. However, for lesser amounts of rainfall the influence of forests can be very great.

Forests also influence water quality. Forest soils are held firmly in place by the extensive root systems of each tree. A blanket of dead leaves and humus shields the soil from the impact of raindrops, which have already had their fall broken by the tree crowns. Soil thus protected is seldom dislodged and carried into streams to degrade water quality, choke reservoirs, or cover recreation areas with silt.

Forests may affect water quality in many more subtle ways. Some researchers report that the quality of precipitation falling through forest canopies differs with forest cover. For instance, precipitation reaching the ground under conifers is likely to be of different quality from that falling through an opening in the forest. Similarly, some forest species such as alder are able to fix nitrogen in much the same way as alfalfa does. Streams with alder borders tend to have a higher nitrate content. These small increases in nitrate mean more food for fish.

Shading by forest trees lowers water temperature. Shallow headwater streams are especially influenced by forest shading. Large increases in stream temperature accompany the removal of streamside forest vegetation. These temperature increases greatly affect aquatic organisms living in the stream and are detrimental to organisms requiring cool waters in which to live. Fortunately, good forest management practices prevent this from happening.

Finally, many aquatic organisms, particularly certain kinds of aquatic insect larvae, require tree leaves, bits of bark, tree seeds, and other parts of trees to eat. These stream-bottom dwellers depend upon the accidental falling of a leaf into the water for their existence. In turn trout depend upon these insect larvae for food. Consequently, a forest can be a vital part of the aquatic food chain.

Tree leaves can act to lower water quality in some situations. During low-water flows, many streams are nothing more than an intermittent series of pools with very little inflow and outflow of water. Under such conditions a heavy leaf fall may cause a depletion of dissolved oxygen, an increase in water color, and an increase in the acidity of the stream. These changes are usually of minor consequence, but they do occur.

Relationships of forests to water may be complex. Despite some limitations, forests exert strong and continuing influences on both quantity and quality of water in streams of Pennsylvania. This influence is felt by way of a very intricate set of interactions involving climate, geology, topography, soils, and finally the trees themselves. In some ways forests act to lower water quality and in others they act to enhance it. The net effect of these complex interactions between forests and water quality indicates an overwhelming enhancement of water quality by forests. Forest watershed research has contributed a great deal to our understanding of forests and water, but many things are as yet not fully understood.

The next time you walk along your favorite stream, remember that to a great extent that stream is a mirror of its surroundings. Trees often are a part of those surroundings.

National Award to Lancaster Goodwill

The Public Relations department of Goodwill Industries of Lancaster County has received a national first place award for a detailed report on "Outstanding Community and Financial Support" for 1973. The Lancaster Goodwill received the top award while in competition with 154 other Goodwills throughout the U.S.

The award is the result of community and financial support to Goodwill last year; primarily that of the Goodwill Radiothon held at the Foodergong Lodge in October which was spearheaded by radio stations WGSA-WIOV and supported by numerous local radio and television stations. Over $80,000 was eventually received as a result of the Goodwill Radiothon, thanks to hundereds of hours of volunteer work.

Mr. Norman L. Schell, president of the Lancaster Goodwill, accepted the award in New York City this week at the National Delegate Assembly of Goodwill Industries. This marks the first year the Lancaster Goodwill has taken a first place in national competition.