Watershed Management Means Soil Conservation

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Watershed is not a very spectacular term—in fact it is a word with which many people are unfamiliar and of which many others fail to understand the significance. Only those whose livelihood is dependent upon products of a watershed understand its use; only those concerned with managing and utilizing a watershed know its value; and only those who have witnessed the almost unbelievable destructive force of a debris-laden mud flow and have been driven from their homes by swirling flood waters know its importance. In simple terms, a watershed is a natural basin upon which precipitation falls; in a more complete sense, it is an integrated system of climate, weather, vegetation, elevation, soil, micro-organisms, animals and man. To understand what a watershed means we must understand what it can do for us, in fact what we must make it do for us.

Although any land area may be designated as a watershed, the term is more commonly used to refer to mountainous areas of relatively high elevation. It is these areas which supply the life-giving substance—water—to cities and towns some of which are far removed from this natural impounding area. Without this water, civilization as we know it in this country would be altogether different. It is these areas which furnish summer forage for game animals and livestock; habitat for wild game birds, animals and fish; recreation; timber; and aesthetic values which are often overlooked but which have tremendous value in the security and grandeur they provide. Ironically enough, the life-giving water from a watershed may cause damage or complete destruction to the very civilization and social development it has fostered. Unmanaged these areas are responsible for devastating floods, fail to produce forage and timber, are soon depleted of wildlife, rendered useless for recreation, and remain a grim monument that attests to man's ravages of the land and wanton disregard for the future. These are not just words. These are proved facts. Man has yet to prove his ability to effectively manage land. He must learn if he is to survive. A watershed is a sustainer or destroyer of life; good watershed management practices will not only prevent destruction but will provide a sustained yield of vital products. Good watershed practice in essence is based upon one factor—soil, the precious material that is the most vital resource we have.

The Davis County, Utah Floods

Shortly after the turn of the century it became evident to some individuals that the occurrence of localized and yet highly destructive floods especially in western United States were the result of poor land practices. In northern Utah the period from 1878 to 1930 gave rise in one area to floods of progressively increasing severity (Marston, 1953). This particular watershed encompasses approximately 28,000 acres of steeply-sloping forest, brush and grass-covered mountainous terrain representing the western slope of the Wasatch Range in Davis County from Farmington south to Centerville. The adjacent foothill areas were settled approximately 100 years ago, and the settlers cut trees and dragged logs from the mountains to build homes, barns and fences. They also grazed these mountains with sheep, cattle and goats, totally unaware of the damage being done to the watersheds.

Minor floods occurred in 1878, 1901 and 1906, but soon after that they increased in frequency and intensity until, in 1912, a huge mud-rock flow issued from Bairs Creek (Marston, 1953). This was followed in September of 1918 by a flow in which the state road was covered by rocks and debris. During 1923 to 1930 floods of greater violence took a toll of six lives and caused more than a million dollars damage. In some instances farms and homes were completely destroyed.

It was at this point that the local people organized a Flood Control Committee and obtained a governor-appointed Flood Control Commission composed of foresters, geologists, engineers, bankers and livestockmen, to ascertain the cause of these floods (Marston, 1953). It was concluded, after thorough investigation, that the mud-rock flows were of unprecedented magnitude and violence in recent geologic time and were caused by depletion of plant cover on the headwater lands high above the foothill communities. Shortly afterward the Wasatch National Forest Boundary was extended to include these watershed lands and rehabilitation of

the watersheds under supervision of the U. S. Forest Service was begun.

Early thoughts were that these floods were due to normal causes—that they were the result of normal geologic erosion. It may be said that the streams wrote history in the terrain. Huge channels gouged out of previously undisturbed sands and gravels laid down in ancient Lake Bonneville were proof enough that the erosion and flooding was accelerated and not normal geologic erosion.

In order to prevent these floods it was necessary to have a full knowledge and understanding of their occurrence. A combination of factors contribute to uncontrolled runoff. Lack of sufficient vegetation, especially the fibrous-rooted grasses, together with their accompanying litter; high rainfall rate even for very short periods; and soil having a low infiltration capacity due to its moisture, structure and textural conditions are probably the most important of these factors.

Effects of Improper Watershed Management

How these interacting factors produce uncontrolled runoff on a watershed might be pictured as follows: Assume that in mid-August a normal summer storm of fairly high intensity occurs over a watershed. The vegetation, especially on the steep headwater lands adjacent to the highest ridges or boundaries of the watershed, has been depleted by overgrazing, misuse and/or fire leaving but a sparse cover of vegetation.

As precipitation falls, the soil, even though dry, is rendered impermeable by the sediment-laden splash of raindrops. Without adequate vegetation to hinder surface flow and enhance infiltration the water quickly collects into small rivulets. The water moves for some distance and then temporarily stops as natural depressions and voids are filled. Then the water continues, picking up soil particles which in turn abrade the surface of the slope and loosen still more soil. As the rivulets increase in size the water becomes a thick, muddy fluid, and upon reaching the main channel the velocity of the water is such that huge amounts of soil, rock and debris are gouged from the sides and floor of the channel. The result, as the runoff leaves the mouth of the canyon, is a heavy sediment-loaded fluid thickened to a lava-like consistence.

Because of its high density and velocity this fluid is able to buoy up huge rocks and transport them considerable distance. Boulders weighing approximately 300 tons have been moved in this manner (Cannon, 1931). By its very nature this heavy fluid is able to form its own path and may leave the stream channel. As it spreads out it loses its water content and velocity on the lesser slopes and gradually slows giving up the heavier rock and debris until there is little more left than muddy water.

The fertile soil of the valley previously deposited as a result of slow geologic erosion is inundated, orchards are buried, houses are torn from their foundations and demolished, roads are washed out and even more tragically lives are lost. The valuable soil on the headwater slopes—soil which it may take nature thousands of years to form and which is indispensable for the maximum growth of vegetation to prevent future catastrophes—is lost. Much vegetation necessary as seed stock is uprooted and washed away. The stage is set for an even bigger disaster.

Watershed management necessitates a control of overland water movement. This is possible within certain limits inasmuch as vegetation can be manipulated and hydrologic structures erected. However, these two factors have an intimate relationship with weather conditions. For instance, measures to restore vegetation should at the same time prevent further loss of soil if establishment of vegetation is to be expedited. At a certain level of precipitation plants may become well established, yet, at this level, denuded slopes may be stripped of soil at a rate which prevents vegetation establishment and fills dams and reservoirs with silt and sediment until they are rendered useless for water storage. Consequently, native and/or introduced grasses which are characterized by a highly desirable, soil-holding, fibrous root system and are relatively fast growing may be seeded in conjunction with the construction of contour trenches. Trenches break up the developing gully system, compound excess rain and create more favorable soil-moisture conditions for vegetation re-establishment.

Continual research on experimental watershed areas throughout the United States on runoff, stream flows, sedimentation and revegetation is providing basic information necessary for better methods of protection and management. These areas stand as examples of what can be done to rehabilitate and manage our watersheds.

Conclusion

Continuous, careful watershed management is a fruitful enterprise which can only result in more meat, timber, game, water, recreation and scenic grandeur. The key to the sustained yield of these products is adequate vegetation. Plants are the most vital living things on earth. Plants which make up the vegetational cover of a watershed probably reach the ultimate in usefulness to man. This vegetation must have water to exist. Only soil can complete nature's eternal triangle by functioning as a natural reservoir for water, thereby providing a medium for growth of grass and other vegetation for food, for protection and for prosperity. Water is a product of the land. . . .

LITERATURE CITED

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