THE EFFECT OF RAIN ON THE SNOW COVER [1]

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There are several opinions concerning the disposal of rain water which falls on a snow cover. Does it go through the snow as through a porous medium? Does it melt some of the snow crystals as it goes through, or is it absorbed by the snow cover and held until the snow melts? An attempt to answer some of these questions was made by the Utah Agricultural Experiment Station in May, 1928. Experiments were carried out on the Wasatch Plateau at an elevation of 8,700 feet. By these experiments it was sought to determine some of the snow-melting characteristics.

Fluorescein was used as a coloring matter so the path of the water could be traced through the snow. Experiments were conducted on the snow cover during rain storms, after rain storms, and during freezing weather. Some few experiments were conducted using artificial rain in an effort to determine the melting effect of rain.

On May 10, 1928, during a medium downpour of rain fluorescein was placed on the snow cover in an open park. Within 5 minutes the color had reached the ground through 4 feet of snow. The color reached the ground first through tiny crooked paths, indicating there were continuous paths through which the rain water was reaching the ground. The entire mass of snow showed the color more slowly, indicating that a general downward movement of water through the snow was going on.

Fluorescein placed on a level snow surface during clear, warm weather showed some well defined water channels, but in general the downward movement of moisture was quite uniform throughout the entire mass. This indicated that the snow layer was melting from the top as well as from the bottom and that the water from the surface was going down through the porous snow to the ground.

Fluorescein was placed on a level snow surface just prior to freezing temperature. In fact, the thermometer registered quite close to zero centigrade when the color was placed. Twelve hours later the snow column was examined, and it was found that the color had progressed only approximately 3 inches into the snow, showing that with the fall in temperature the water in the snow, which carried the color, was congealed and held in place until higher temperatures melted it again.

Along with this experiment fluorescein was placed on a snow cover on a steep slope to determine if any degree of movement took place down the slope. In the first case the slope was one and one-half to one. The color moved down the slope only 1½ feet, while dropping vertically approximately 3 feet. This indicates that there is not much movement of moisture down the slope through the snow cover. In the second case the slope was flatter, being two to one, in which the color passed vertically downward and then moved along the ground in the snow layer next to the ground about 3 feet in 12 hours. There was no appreciable lateral movement through the snow. The third case was a repetition of the first, on a slope of one and one-half to one, and here the coloring matter moved down the slope about a foot in a vertical drop of 3 feet. These experiments indicate very little movement down the slope through the snow during the process of melting.

In addition to the above field experiments some laboratory experiments were conducted using snow cores 8 inches in diameter and up to 20 inches long. These core were allowed to melt under a constant temperature of 90° F. Fluorescein was placed on each core, and in every case narrow streaks of color preceded the uniform mass of color to the bottom. The coloring matter had entirely disappeared from the snow before the cores were entirely melted, showing that the water carrying the coloring matter had entirely passed out of the snow cores.

To determine the extent to which rain melts the snow cover on which it falls, two snow cores having a diameter of 6.37 inches and depth of 7.25 inches were set up. Colored artificial rain water was applied to these cores through a hand sprinkler. The temperature of water on first core was 78° F. and on the second core 54° F. Water to a depth of 7 inches was sprinkled on each core. Both cores had passed their point of maximum density and the snow was granular and porous. The artificial rain passed to the bottom of the column of snow immediately upon application. It was stored in the bottom of the column until the capillary rise amounted to about 1¼ inches. The water then passed through the snow at practically the same rate it was applied. After applying 7.25 inches depth of water to each core they were allowed to drain for 3 minutes. The snow above the capillary rise took on its original whiteness, indicating that the applied water had passed on through.

In case one, where the water had a temperature of 78° F., more than one-half the snow core was melted. In case two, with a water temperature of 54° F., the core lost only 18 per cent of its original water content.

These few experiments are not claimed to be conclusive, but they do indicate that rain alone plays a minor part in melting the snow cover.

[1] Contribution from Department of Irrigation and Drainage, Utah Agricultural Experiment Station. Publication authorized by Director, July 11, 1929.

THE FREQUENCY OF TROPICAL CYCLONES (WEST INDIAN HURRICANES) THAT CLOSELY APPROACH OR ENTER CONTINENTAL UNITED STATES

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Although there have been three major compilations of the purely statistical view of tropical cyclones of the Western Hemisphere during the last twenty and odd years [1] close agreement in the number and frequency of these storms is lacking. This is not surprising in view of the inherent difficulty that arises when attempt is made to use a scale of intensity. No two persons will closely agree upon the allocation of a large number of storms to any common scale. The beginning of the record in each of these publications is different; the storms of the early seventies being omitted, thus: Garriott begins with 1878 and ends with 1900, Fassig begins with 1876 and ends with 1911, and Mitchell begins with 1887 and ends with 1923. While it is true that the record of the early seventies is much less complete than that of subsequent years, nevertheless it is the purpose of the present writer to include it to the end that the record of tropical cyclones

[1] Garriott, E. B., West Indian Hurricanes, Weather Bureau Bulletin H, Washington, D. C., 1900. Fassig, O. L., Hurricanes of the West Indies, Weather Bureau Bulletin X, 19193. Mitchell, C. L., West Indian Hurricanes and Other Tropical Cyclones of the North Atlantic, Mo. Wea. Rev., Supplement No. 24, 1924.