

SNOWMELT INFILTRATION INTO SEASONALLY FROZEN SOILS

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ABSTRACT

The infiltration rate of snowmelt water into seasonally frozen soils is controlled in part by the amount of ice in the soil pores. The objective of this study was to measure the redistribution of moisture that occurs over the winter season for Fairbanks silt loam and to evaluate how the infiltration rate is related to the moisture content (water and ice).

For wet soils, an increase of the moisture content near the surface was observed over the winter season. In the core where the soil was originally dry at the onset of freezing, there was actually a decrease in the moisture content in the soil profile. Apparently for the wetter soils, large quantities of ice in the soil pores sufficiently reduced the water transmission properties so an ice-rich zone developed near the ground surface. In predicting snowmelt runoff, it is of critical importance whether or not this ice-rich zone near the surface exists. Field tests revealed the sensitivity of the infiltration rate into seasonally frozen soils for a range of moisture contents. The higher the moisture content, the greater the amount of ice present in the frozen soil; thus the infiltration rate and the saturated hydraulic conductivity were reduced.