Reprinted from:
Permafrost: Fourth International Conference, Proceedings
ISBN 0-309-03435-3
National Academy Press
Washington, D.C. 1983

FIELD EVIDENCE OF GROUNDWATER RECHARGE IN INTERIOR ALASKA

Douglas L. Kane and Jean Stein

Institute of Water Resources, University of Alaska,
Fairbanks, Alaska 99701 USA

Increased utilization of groundwater resources in discontinuous permafrost regions requires that we develop a better understanding of the system and its processes. This paper discusses the mechanics of one of the processes, groundwater recharge. Two distinctly different soil conditions exist; generally permafrost inhibits drainage and these areas are poorly drained, whereas nonpermafrost areas are better drained for the same soil type. Field studies near Fairbanks, Alaska, show that the infiltration and hydraulic conductivity properties for frozen and unfrozen soils vary substantially. Freezing of a soil reduces the infiltration rate because of the existence of ice in soil pores. Further, frozen soils with high ice contents have lower infiltration properties than frozen soils with low ice contents. Frozen but relatively dry soils behave in a manner similar to unfrozen soils. Therefore, substantial infiltration can occur in seasonally frozen soils from snowmelt. Our field studies have shown that most of the groundwater recharge occurs during the snowmelt period in nonpermafrost areas. This is partly because of the soil condition and partly because of the large quantity of water available. Recharge during the summer is limited by the pattern of summer precipitation coupled with the ongoing process of evapotranspiration.