

STUDY TOPICS FOR HYDROLOGY FINAL

Snow, hydrologic importance of snow

Material characteristics of snow: depth, porosity, density, liquid water content, Snow Water Equivalent (SWE)

Measurement of snow & snowmelt, distribution of snow, snowmelt processes, snowmelt prediction

Soil water

Measurement/quantification of soil particles and structure

Porosity, effective porosity, permeability, Bulk density

Saturated vs. unsaturated soil, hygroscopic water

Volumetric water content

Infiltration rate

Gravitational forces vs. tensional forces

Surface tension due to adhesion and cohesion

Small pores fill first, larger pores empty force, this leads to hysteresis

Field capacity

Movement of soil water is due to soil water tension (not soil water content), so dry-to-wet movement can happen

Upward movement of soil water due to ET and suction by plants through roots

Concept of wilting point and plant available soil water

Factors that affect water movement in and through soils: Soil texture/structure/depth/layering, compaction, organic matter, soil fauna, hydrophobicity, antecedent soil moisture, frozen soil, vegetation & residue, macropores, surface detention, water viscosity & quality, urbanization, time

Soil water balance

Infiltration capacity

Hydraulic head and energy concepts related to groundwater flow

Equipotential lines, flow lines

Dependence of groundwater flow rate on hydraulic gradient, cross-sectional area, hydraulic conductivity; Darcy equation

The importance of the value of hydraulic conductivity, and the magnitude of the range of this variable

Unconfined vs. confined aquifers, water table, artesian wells

Effects of pumping (cone of depression), gaining vs. losing streams

Importance of runoff and subsurface drainage concepts to civilization

Runoff processes (Hortonian, Saturation overland), variable source area concept

Watershed factors that affect runoff

Examples of changes to hydrographs with differences in watershed factors

Hydrographs, hydrograph shape/parts, and hydrograph separation into baseflow/stormflow

Open channel flow, Flow velocity and Discharge (at a cross-section): $Q=AV$

Manning's equation and the meanings of its various terms:

hydraulic radius, slope, manning's n , wetted perimeter, cross-sectional area

Measuring Q at a cross-section

Stream gaging, rating curves

Floodplain modeling

Introduction to fluvial geomorphology: stream networks, origins of meandering and braiding, at-a-station and downstream hydraulic geometry

Dams and Dam Nation

Reasons dams are built, the various uses for dams

The history of dam building in the US, and the related history of effects on US rivers