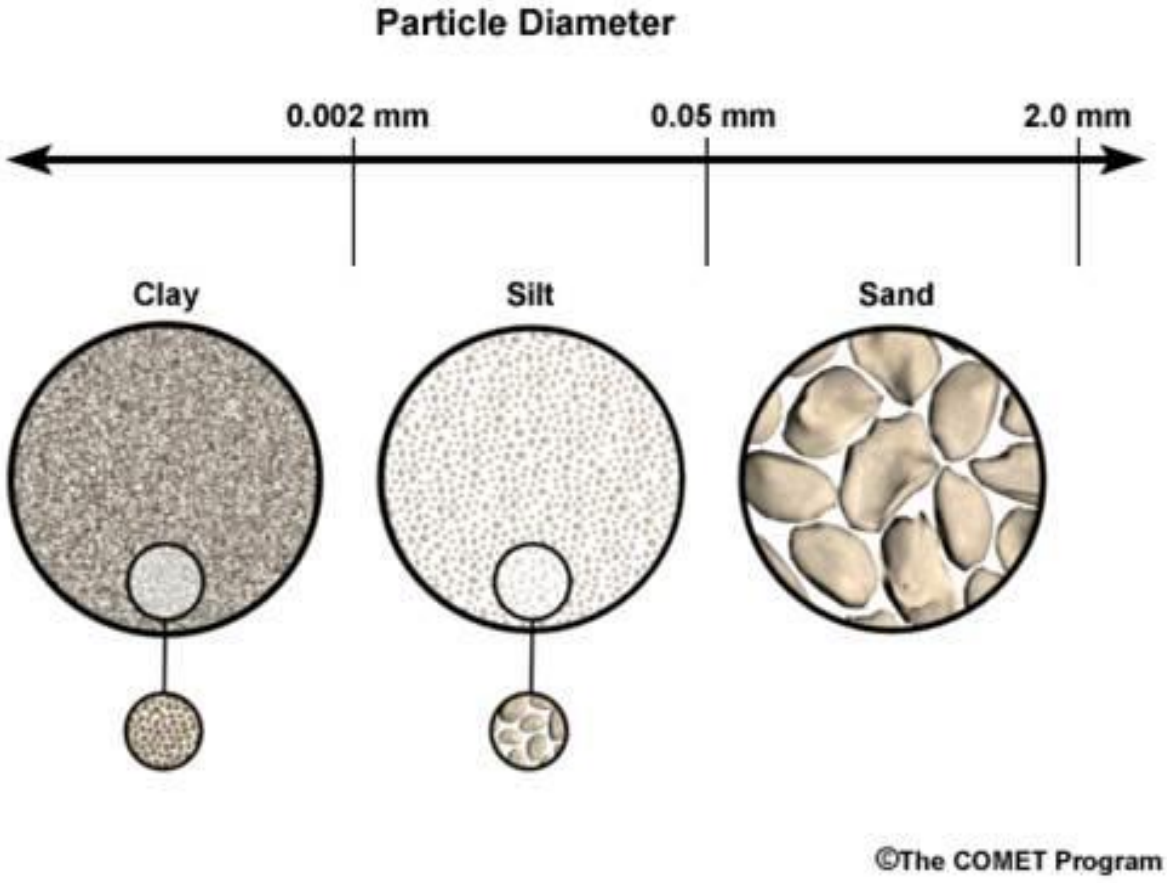
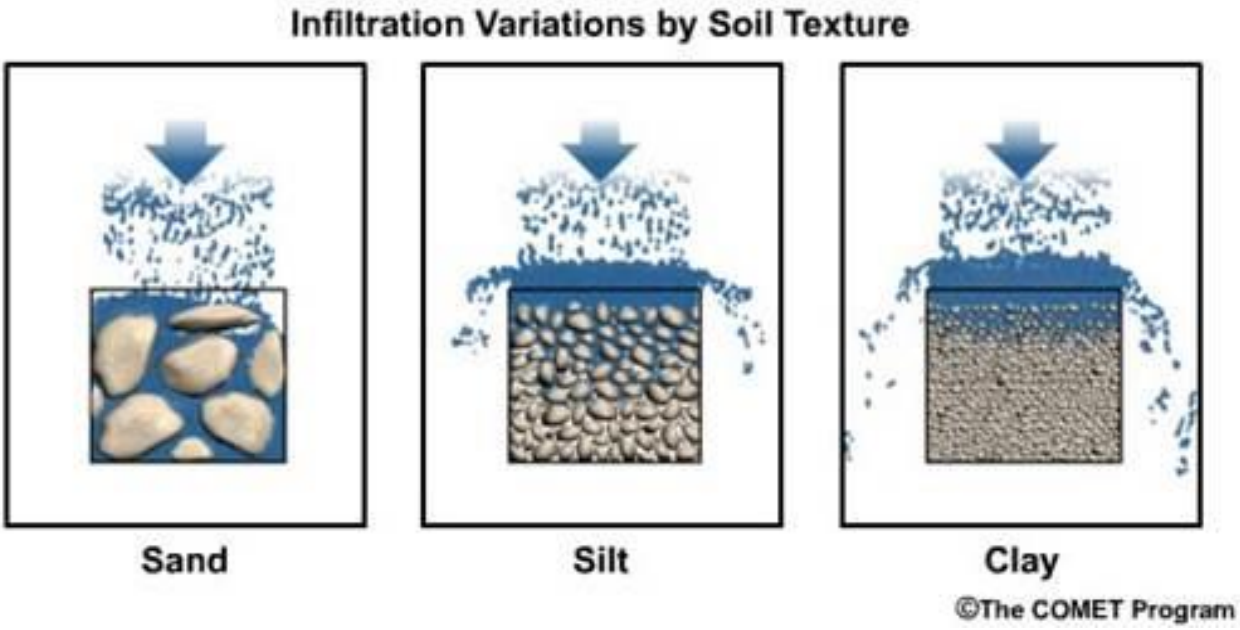
What influences how water moves?

In our simple calculation we assumed that all the rain that fell on the house site would run off the house site. In reality, there are several factors that influence how much of that rain would stay on site and how much would run off.

The first factor is soil type. There are three major types of mineral soil – sand, silt, and clay – and each has unique properties. The size of the soil particles greatly influences how much water will run off, and how much will soak in, or infiltrate.



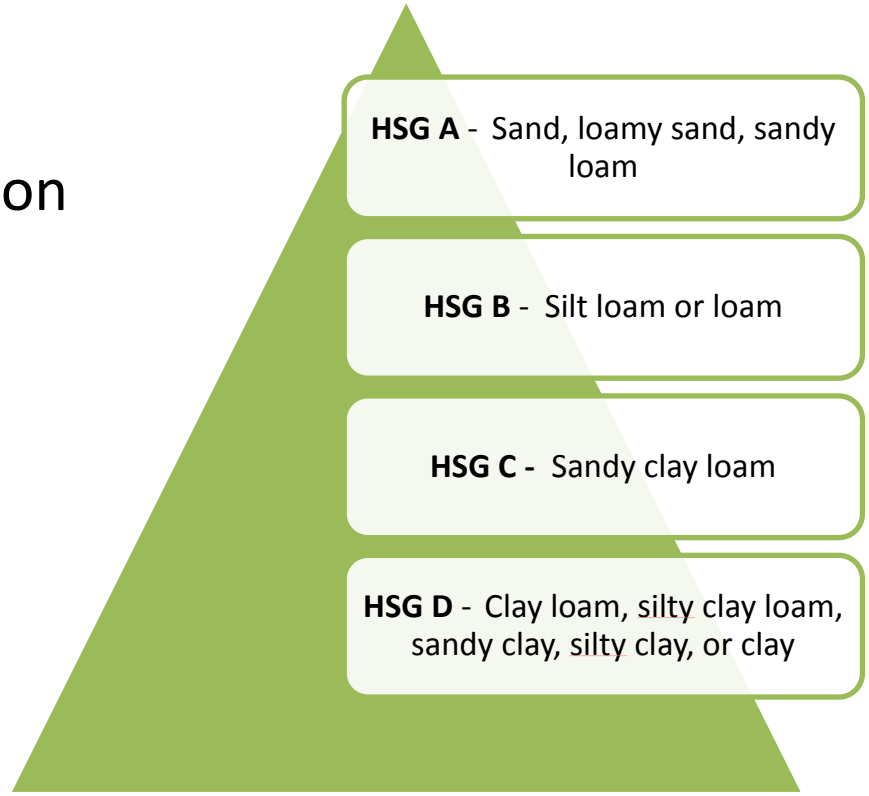
Sand particles are larger and irregular, leaving many gaps through which water can move. Clay particles are very small and tightly packed together, and water can't get through.



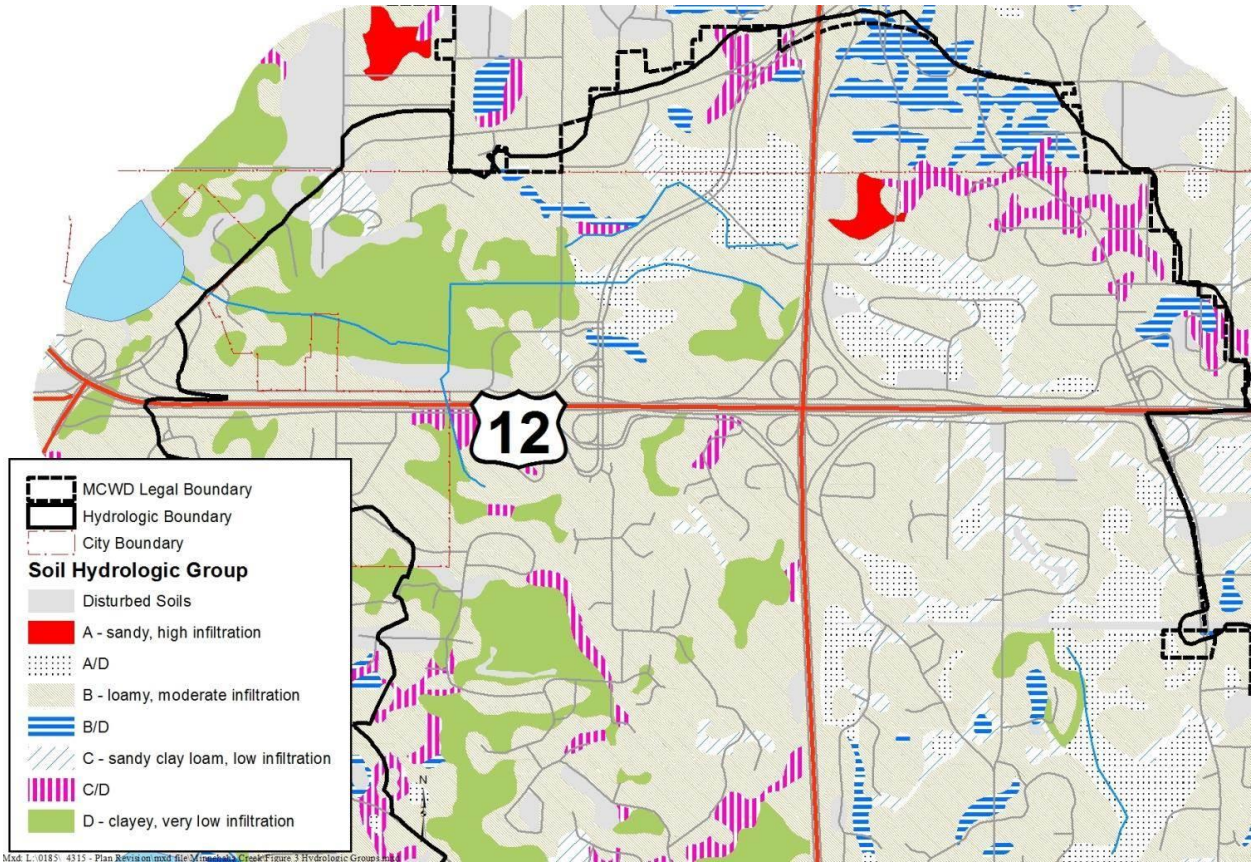
Most soils are a mix of these types.

The NRCS has established four hydrologic soil group (HSG) categories, A through D. Each soil on the county soil survey is assigned one of those categories. These are a general indication of how easily water can infiltrate through the soil. They are often referred to in shorthand. For example, it is easier to say "that site has B soils," than to say, "that site has loamy soils that are moderately conducive to infiltration."

Natural Resources Conservation Service (NRCS)



The Minnehaha Creek District Comprehensive Plan includes soil maps showing the hydrologic soil groups in the watershed. This is for general planning purposes. For sitework, it is necessary to evaluate the soils on site.



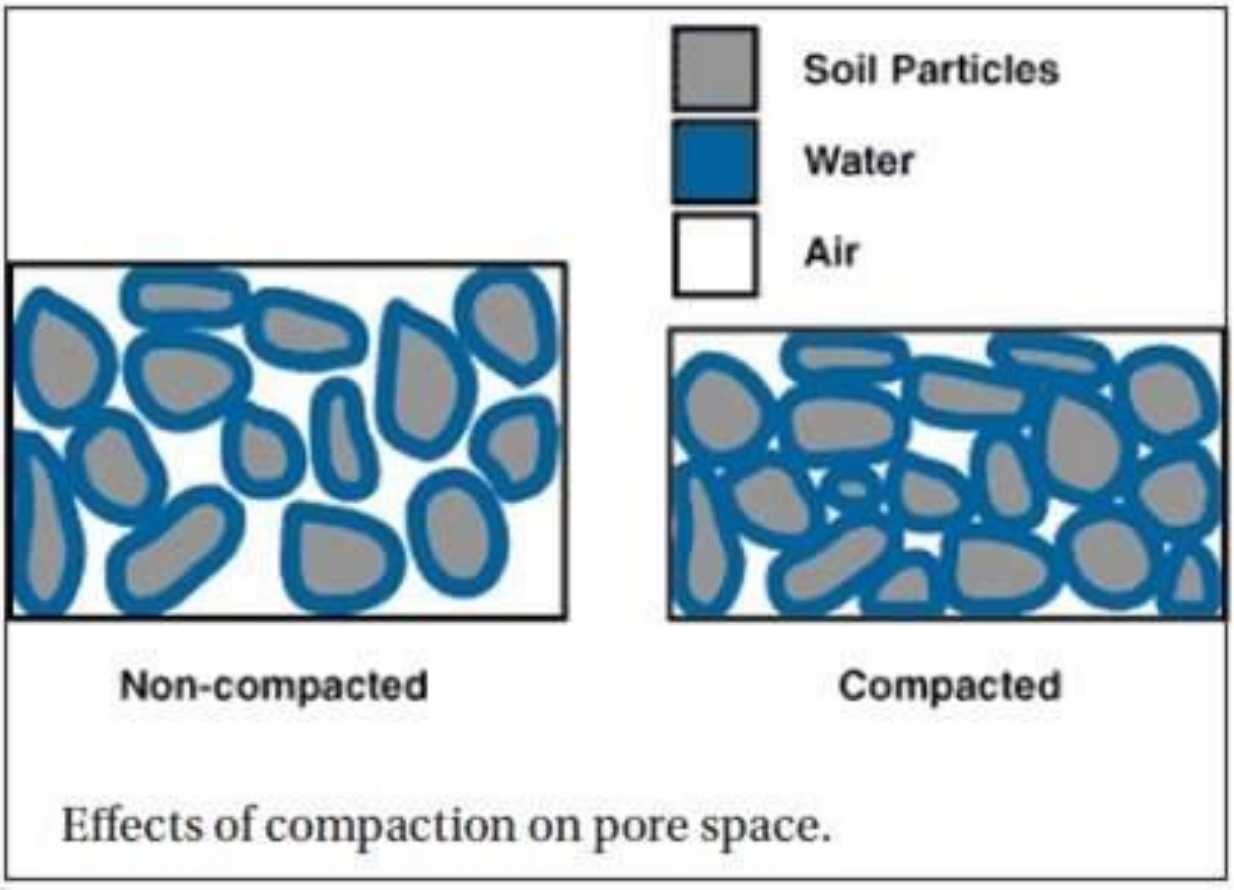
The Minnesota Stormwater Manual includes literature values for the infiltration capacity of different types of soils by HSG, which can be used for planning or modeling. **In practice, it is best to actually measure the infiltration rate of soils on your site.**

Table 12.INF.7 Design Infiltration Rates

Hydrologic Soil Group	Soil Textures*	Corresponding Unified Soil Classification**	Infiltration Rate [inches/hour]
A	Gravel, sand, sandy gravel, silty gravel, loamy sand, sandy loam	**GW** – Well-graded gravel or well-graded gravel with sand **GP** – Poorly graded gravel or poorly graded gravel with sand	1.63
		GM – Silty gravel or silty gravel with sand **SW** – Well-graded sand or well-graded sand with gravel **SP** – Poorly graded sand or poorly graded sand with gravel	0.8
B	Loam, silt loam	**SM** – Silty sand or silty sand with gravel	0.6
		ML – Silt **OL** – Organic silt or organic silt with sand or gravel or gravelly organic silt	0.3
C	Sandy clay loam	**GC** – Clayey gravel or clayey gravel with sand **SC** – Clayey sand or clayey sand with gravel	0.2
D	Clay, clay loam, silty clay loam, sandy clay, silty clay	**CL** – Lean clay or lean clay with sand or gravel or gravelly lean clay **CH** – Fat clay or fat clay with sand or gravel or gravelly fat clay **OH** – Organic clay or organic clay with sand or gravel or gravelly organic clay MH – Elastic silt or elastic silt with sand or gravel	< 0.2

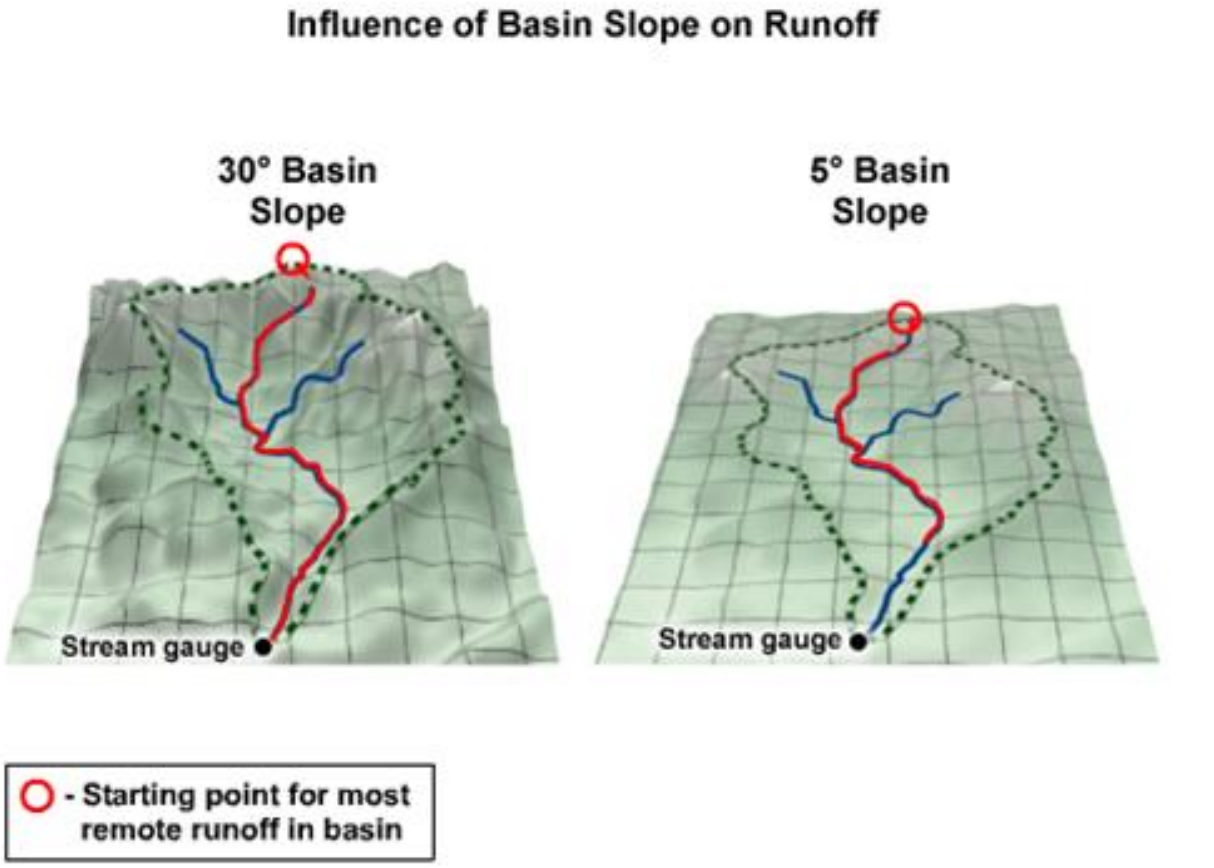
Compaction

Another factor influencing how much water will infiltrate versus run off is how compacted the soils are. Often during construction, large equipment will drive over what will later be sodded as turf. It is becoming more common now for cities and watersheds to require site developers to decompact the soils on site just before planting with seed or sod to restore infiltration capacity.



Effects of compaction on pore space.

Other factors influencing runoff are slope and roughness. Water will runoff a steeper slope more quickly than a flatter slope. Rougher terrain means there are more depressions where rainfall will get stored and which then will infiltrate rather than runoff.



In urban areas, Directly Connected Impervious Area greatly influences how much rain gets converted into runoff that gets conveyed into waterbodies. A large roof that runs off onto a parking lot and into a storm sewer is different from a large roof that runs off onto backyard turf grass, where it can infiltrate.

Learning Activity

In the Discussion Forums, write a definition that makes sense to you for each of these concepts-

- Soil Type and Porosity
- Soil Compaction
- Slope
- Directly Connected Impervious Surface