Subjects/Target Grades

Science and Social Studies
Grades 7-12

Duration/ Location

30- 40 minutes
Classroom setting

Materials

Per class

- egg carton, ice cube tray, or small containers
- gravel
- sand
- silt
- clay
- water
- teaspoon

Per small group

- container, such as a small jar with a lid, test tube with stopper, or a plastic bottle with lid
- gravel, sand, silt, and clay, or a soil that is a mixture of sediment sizes
- water

Per student

- Size of Soil Particles student reading
- Permeability and Soil Groups student reading
- Lower Grand River Watershed Soils student reading

Lesson Two Explain: Managing Excess Sediment-

pages 9 &10 from lesson 2

Activity Overview

Students observe the characteristics of sediment materials, including gravel, sand, silt, and clay, and create a sediment jar to visualize their learning.

Lesson Procedure

1) Place two samples each of gravel, sand, silt, and clay in an egg carton or ice cube tray. Have students make observations of the dry gravel, sand, silt, and clay noting the size of the particles and other properties.

2) Have students predict what will happen if about one teaspoon (5 mL) of water was poured on each of the samples. Ask students which materials would be most permeable to rain (will most easily let water flow through) and least permeable to rain? [*In order from most to least permeable: gravel, sand, silt, clay*] Which would have the greatest to least runoff potential in the first storm after a drought? [*In order from greatest to least runoff potential: clay, silt, sand, gravel*]

3) Relate these observations to the types of soil that are in the Lower Grand River Watershed as shown in *Size of Soil Particles*, *Permeability and Soil Groups*, and *Lower Grand River Watershed Soils* student readings.

4) In small groups, have students construct a sediment jar by filling a container such as a plastic bottle or test tube with a stopper with a mixture of gravel, sand, silt, and clay or a mixture of soil types. Add water to the jar until it is about 80% full. Predict what will happen if the jar is shaken. Cap and shake for about 20 seconds and observe what happens over several minutes. Compare this outcome to the prediction. [*The sediments will sort out in layers based on the particle size and the smallest particles will stay suspended in water longer than larger sediments.*]

5) Ask students to explain their results. During the discussion, emphasize the idea that different sizes of particles move at different speeds. Smaller ones will sink more slowly and end up on top of the larger ones when they both reach the bottom. Even if two particles are made of the same material and are the same shape, the smaller one will sink more slowly and end up on top of the larger one when they both reach the bottom.

Size of Soil Particles

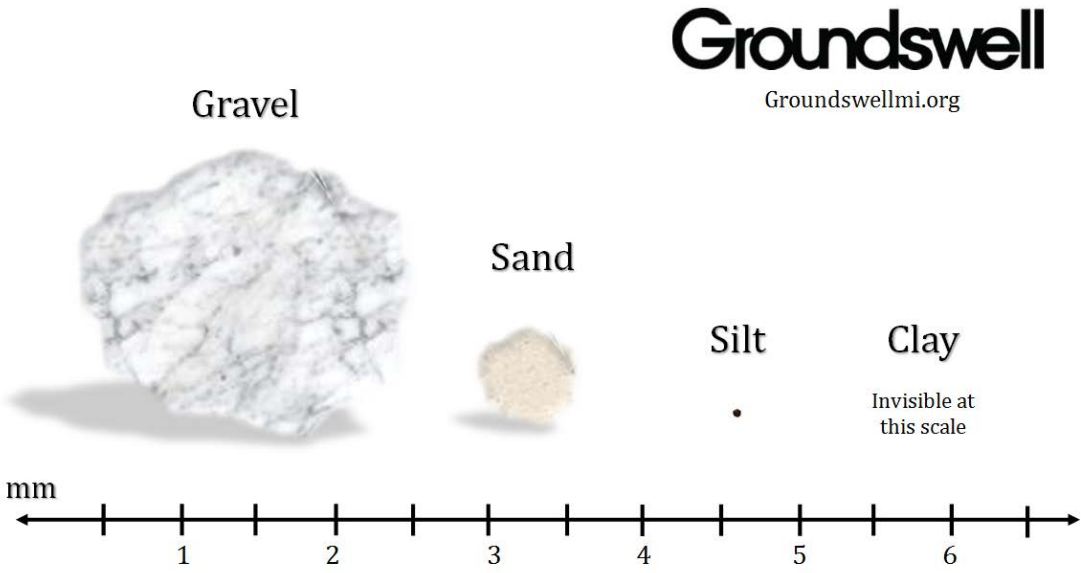
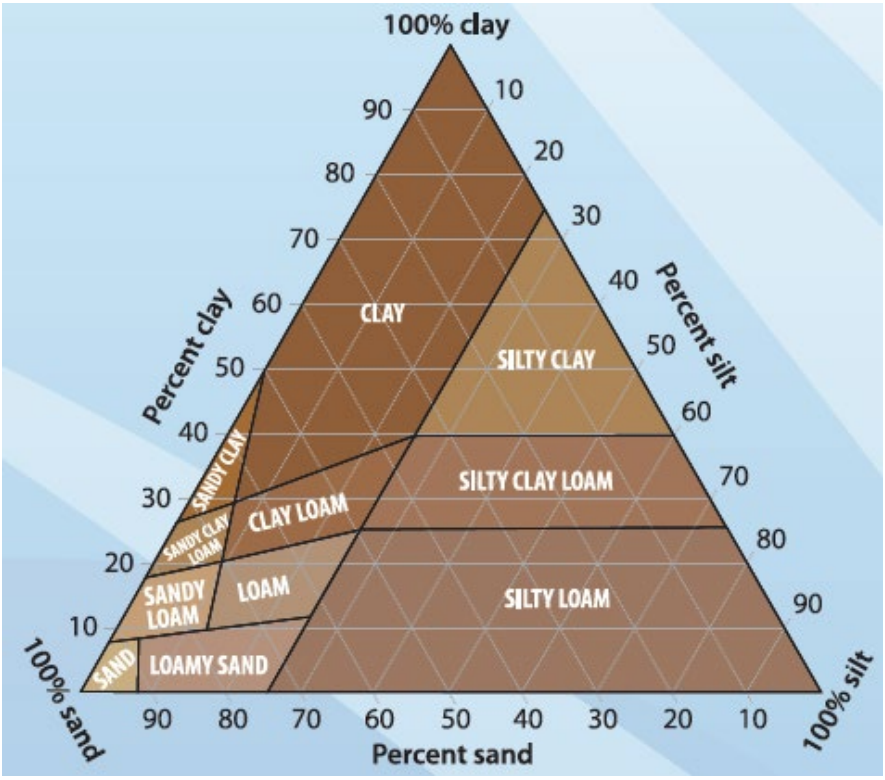
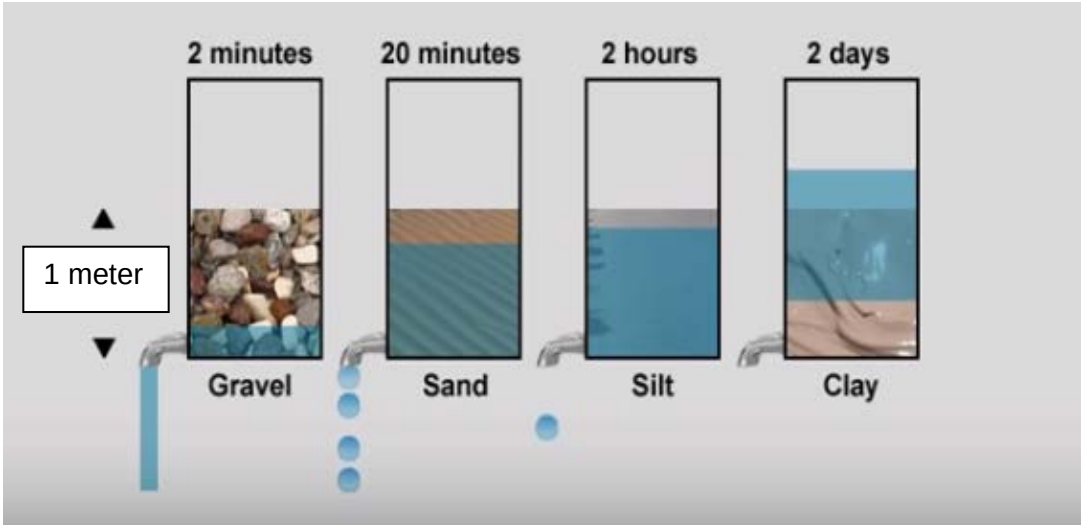


Image by Groundswell



Texture Triangle
https://www.soilquality.org.au/factsheets/soil-texture-measuring-in-the-lab

Permeability and Soil Groups



Source: https://www.youtube.com/watch?v=QcgTZxi1ajk

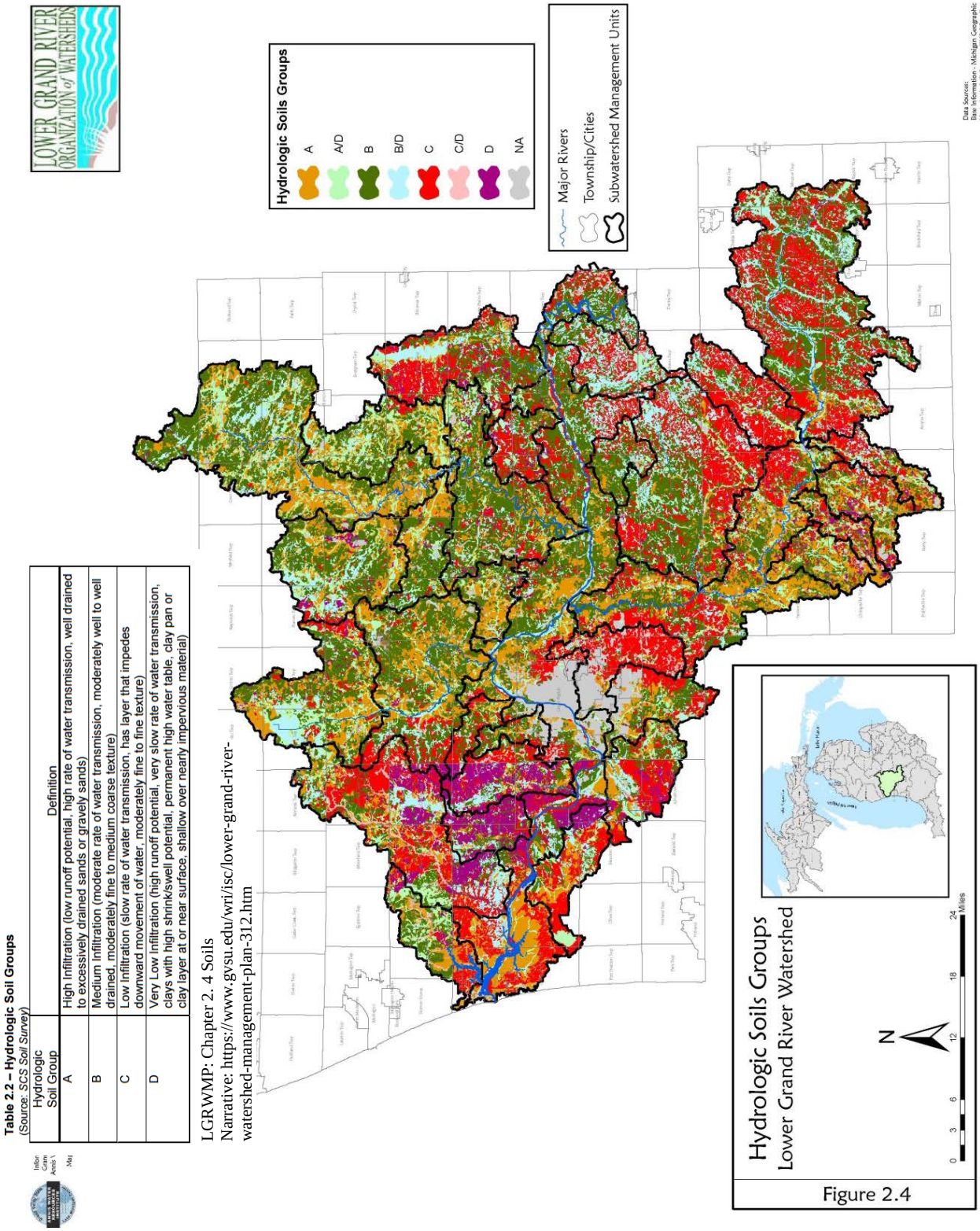
Table 1. Definitions of Hydrologic Soil Groups (USDA, 2010).

Group	Meaning	Saturated Hydraulic Conductivity (in/hr)
A	Low runoff potential. Soils having high infiltration rates even when thoroughly wetted and consisting chiefly of deep, well to excessively drained sands or gravels.	≥ 0.45
B	Soils having moderate infiltration rates when thoroughly wetted and consisting chiefly of moderately deep to deep, moderately well to well-drained soils with moderately fine to moderately coarse textures. E.g., shallow loess, sandy loam.	0.30 - 0.15
C	Soils having slow infiltration rates when thoroughly wetted and consisting chiefly of soils with a layer that impedes downward movement of water, or soils with moderately fine to fine textures. E.g., clay loams, shallow sandy loam.	0.15 - 0.05
D	High runoff potential. Soils having very slow infiltration rates when thoroughly wetted and consisting chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a clay-pan or clay layer at or near the surface, and shallow soils over nearly impervious material.	0.05 - 0.00

Saturated hydraulic conductivity is how fast standing water drains into the soil.

Loam is a combination of sand, silt, and clay.

Lower Grand River Watershed Soils



Lower Grand River Watershed Management Plan. Image from the Figures Volume: https://www.gvsu.edu/wri/isc/lower-grand-river-watershed-management-plan-312.htm