

GLOBE Soil Moisture Campaign – Curriculum Connections

Why scientists are interested in soil moisture

Scientists are very interested in learning more about the global water cycle and the role soil moisture plays in interactions between the Earth's surface, the atmosphere and the environment. New computer models and satellites are currently being built to study and explore these important relationships.

You can participate in this effort by helping to collect data that will provide a regional snapshot of the real distribution of soil moisture. We can then compare your data with new computer or satellite data sets. We hope that you and your students are as excited as we are to apply their observations to addressing real world scientific questions.

Soil moisture's role in ecosystems

Soils supply plants with a place to take root, with water, and with nutrients. As water moves through the soil, it picks up nutrients from minerals and decaying organic matter. Water can also carry away harmful salts and elements by 'rinsing' the soil. The process by which materials are removed from the soil by water is known as *leaching*. Leached materials may be held in lower layers of the soil or may stay in the water and flow into rivers, lakes, and groundwater.

Water also helps to form the soil. In cold climates, water freezing in cracks causes rocks to break apart and moves soil particles around within the soil profile. This *freeze-thaw* action is a primary soil builder in cold climates. In tropical climates, soil properties change as water dissolves minerals in the soil. Water promotes the decay of dead plant and animal matter that becomes part of the soil. Soils found in places with little water, like deserts, support only certain types of vegetation and animal life. Places where the soil is so waterlogged that there is virtually no oxygen present, such as bogs, can preserve plant and animal remains for centuries because of the slow rate of decomposition. What role does soil moisture play in your ecosystem?

Soil moisture's role in watersheds

Soil acts like an enormous sponge spread across the land surface. Soil absorbs rain and snowmelt, slows runoff and helps to control flooding. Absorbent soils, like those found in wetlands, can soak up floodwaters and release them slowly, rather than allowing large runoffs that may cause damage downstream. If soils are already *saturated* with water, there is no space available for additional water to enter them, so new rainfall must flow across the surface to low lying areas. Water that is absorbed into the soil is held on

particle surfaces and in the open spaces between soil particles. Most of the water held in soil is available for use by plants during times of little precipitation. Some of the water absorbed by the soil will evaporate back into the air, or drain through the soil into groundwater. Measuring the amount of water stored in the soil helps us track the ability of soils to moderate other components of the water cycle. Soil moisture measurements also help us to estimate the soil water balance, which is the pattern of how much water is stored in the soil over a year. How many months each year are your soils saturated or dusty?

Soil moisture's role in the water cycle

Some of the water stored in the soil evaporates back into the atmosphere. This cools the soil and increases the relative humidity of the air. Changes in relative humidity from evaporation of soil moisture can affect the weather. The amount of water in the soil also affects soil temperature because liquid water heats up more slowly than either air or soil. Thus, changes in soil moisture affect local weather and climate, and hence soil moisture data can be used to improve numerical models of weather prediction. How do you think soil moisture affects your local weather and water cycle?

What is GLOBE?

The GLOBE program (www.globe.gov) is an international collaboration of schools, scientists and educators, involving students worldwide in hands-on field data collection and analysis. GLOBE data, collected by students, are archived in a public database on the Internet, making it accessible for environmental research projects by students, teachers and scientists. While we recommend that teachers become GLOBE qualified by participating in a GLOBE sponsored training workshop, it is still possible to participate in the Soil Moisture Data Campaign by contacting the GLOBE soil moisture campaign coordinators (below). GLOBE is sponsored by NASA and this work is funded by the National Science Foundation (NSF).

Who to contact

For more information, please visit our web site: www.hwr.arizona.edu/globe/sci/SM/SMC/,
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