

# Soil Science Curriculum

Content and lab derived from the USDA-NRCS Guides for Educators. Go to [bit.ly/SoilLessonPlan](http://bit.ly/SoilLessonPlan) and [sdsoilhealthcoalition.org/soil-health-buckets/](http://sdsoilhealthcoalition.org/soil-health-buckets/) for the Guides and additional pictures and diagrams.

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## “Edible Infiltration” Healthy Soil Activity

### Objectives

Like a sponge, healthy soil holds more water in the soil profile than unhealthy soil. Because the soil profile has good structure and macro pores, precipitation soaks into the healthy soil profile while water will sit on top of or “run off” of tilled soil because the macro pores have been destroyed.

Healthy soils:

- Are more productive soils.
- Improve nutrient use efficiency.
- Allow water to infiltrate into the ground, reduce runoff pollution, and provide water to plants when they need it.
- Add nutrients to the food we eat.
- Break down or capture pesticides and other contaminants.
- Resist wind and water erosion to improve the quality of our air and water.

Each student gets either a cup of tilled or no-till soil (chocolate “crispies” cereal). They watch as it rains (milk is poured on top of the soil/cereal). Rain (milk) soaks into no-till soil (infiltrates) because it has macro pores. Rain (milk) does not soak into the tilled soil and sits on top becoming run-off which causes water erosion on soil.

### Materials

- Clear/transparent cups (5 oz. or 3 oz. depending amount of cereal for the number of students.)
- Spoons
- Serving scoops (one ounce)
- Milk – In the photos on page 2, the red and yellow dispensers were used to pour the ounce of milk in the little scoop without so much splatter.
- Chocolate “crispies” cereal
- Plastic sanitary gloves for handling food

### Process

Edible Infiltration Preparation: The No-till soil is used “as is” from the bag/box. The tilled soil is crushed prior to the lesson. A rolling pin can be used with cereal in a heavy-duty re-sealable baggie.



“Healthy soil” in a cup



“Plowed soil” in a cup

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Farming systems: the No-till soil is in the bowl; tilled soil is in the bag.



Staff explains the lesson and experiment.



Add Rain (milk) to the cup.



Add a little milk.



Watch what happens.

# “Edible Infiltration” Healthy Soil Activity



Infiltration



No Infiltration or run-off



See the Difference!



Answer questions and eat the snack!

## Students Demonstrate Knowledge

### Sample Questions

1. Compare the two cups.

a. **What do you notice about how the “rain” infiltrates, or goes through the “soil”?**

b. **What do you think is the reason the “rain” infiltrates, or goes through the “no-till” sample and not the other?**

(In healthy soil, roots and soil animals create pathways, or pores, for water to go down and through the soil. When these pathways, or pores, are destroyed the water is unable to infiltrate the soil.)

2. a. **What do you think happens to the water when it cannot infiltrate the soil?**

(Stays on top, evaporates, etc.)

b. **If the ground has a slope, like a hill, and the rain/water can not infiltrate the soil, what does it do?** (It runs downhill - this is water erosion. It takes the soil away).

3. **What did you learn about soil?**

(Healthy soil holds more water in the soil profile than unhealthy soil.)

Like all living things, healthy soil needs air and water. Soil organisms need air to breathe, and they also depend on water to deliver nutrients and support the food web. Without pores through the soil, air and water would be unable to reach those living organisms.

Soils are made up of air, water decayed plant residue, organic matter from living and dead organisms, and mineral matter like sand, silt, and clay. Earthworms and dying roots create pores.

One acre of healthy soil can store more than 160,000 gallons of water in its upper foot. Soil microbes (bacteria and fungi) produce sticky substances that hold soil particles together.

Disturbances, like tillage, destroy pore structure and kill earthworms and fungi. Tillage breaks up soil structure and destroys the pores in soil that allow water to infiltrate the soil profile. Certain cropping systems, such as no-till, are better for soil—make better soil structure.

4. **What are some management activities that anyone can do to keep their soil healthy.**

- o Dig a little – then look, touch, and smell your soil. Get help if your soil doesn't appear healthy.
- o Keep it under Cover – keep the soil covered: whether in a garden, field or pasture, cover crops and mulch or residue left from plants provides soil with a protective cover that reduces erosion. It's also a source for carbon, the essential energy source for the soil food web.
- o Do not disturb – when soil is plowed or tilled, it can cause compaction or “plow pan” which restricts water infiltration and increases runoff.

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## Additional Learning Resources

USDA NRCS Soil Health Information Center has soil health videos and fact sheets to help people understand infiltration: <http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/soils/health/>. The website has some of America’s top soil health experts and innovative soil health farmers. From video demonstrations on soil health to videos featuring the men and women who are farming with Soil Health Management Systems, people can see why there’s a growing movement to “Unlock the Secrets in the Soil.”



Can your soil pass the “infiltration test?”



Is your soil healthy and functioning?



Have you discovered the cover?



How should healthy soils look?



How should your soil smell?



How to boost your soil’s energy.

Go to the South Dakota NRCS conservation videos for more healthy soils stories at <https://www.youtube.com/user/NRCSSouthDakota/featured>

Conservation professionals are available to help people learn about taking care of natural resources. Visit your local USDA Service Centers to find the Natural Resources Conservation Service or conservation district staff.