

K-12 IYS Activity



Summary

Highly compacted soils and high traffic areas are often less permeable, resulting in less water infiltration. Soil compaction can have both desirable and undesirable effects on plant growth and may also affect organisms that live in the soil, such as earthworms, insects and others. This project demonstrates the effects of human traffic on soil compaction and the effects of compaction on water infiltration.

Learning Objective

To examine the influence of soil compaction on plant and animal habitats and on water infiltration.

Materials Needed

- Ice pick
- Tin can with both ends cut out
- Water
- Paper
- Pencils
- Ruler or tape measure
- Stopwatch

On the Trail Again: Soil Compaction and Its Effects

Ages

Middle School, High School

Recommended Group Size

Less than 20

Where could you offer this?

University, local school, but need a site with both a trail (compacted) and a non-trail (uncompacted) area are needed

What type of room do you need?

Outdoor site

Type of Lesson

Hands-on (participants touch the stuff)

Outdoor

Experiment (follow procedure, get results, interpret results)

Small group exercise/discussion critical thinking

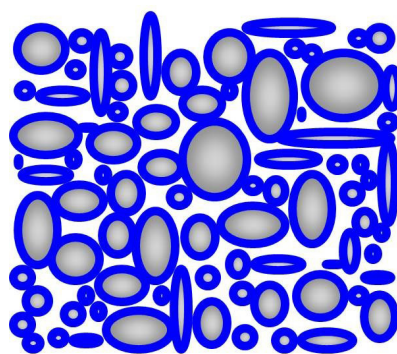
Time Needed

Scientist prep time + clean up, approximately 1 - 1.5 hours

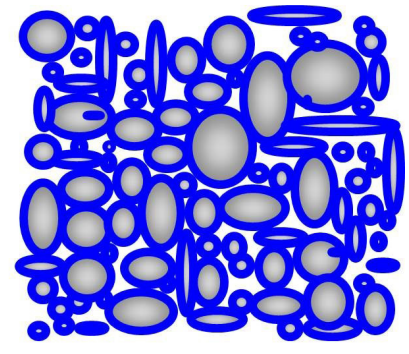
Participant/class time, 2 hours

People love to be outdoors, and soil is an important contributor to a good outing, whether you are hiking, mountain biking, painting, or just enjoying nature. But humans can have significant impacts on the soil. Although the type of soil is the most important factor in determining its water infiltration rate, another important factor is compaction. Soil compaction occurs when soil particles are pressed together, reducing the space between them:

Heavily compacted soils contain few large pores and have a reduced rate of both water infiltration and drainage from the compacted layer. This occurs because large pores are the most effective in moving water through the soil when it is saturated.



uncompacted



compacted

Celebrating the



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Method

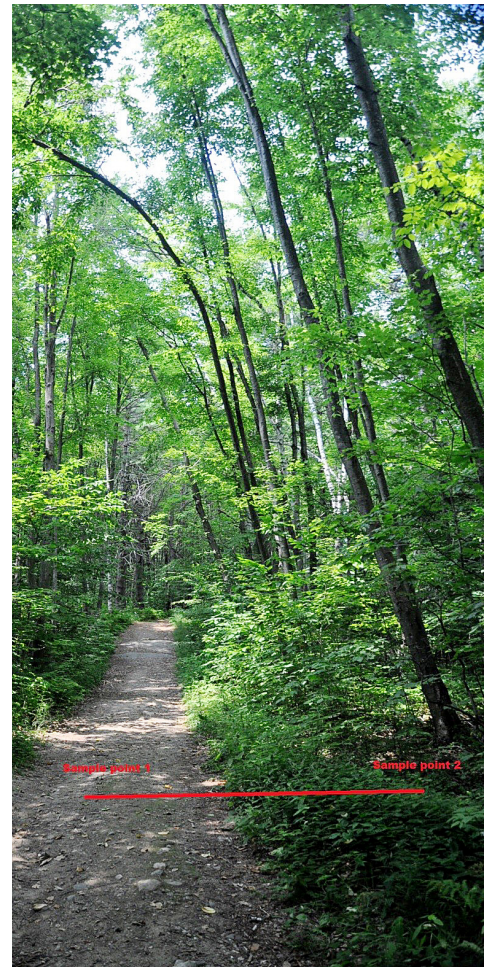
1. Find a site along a trail. Ideally, there will be a gradient from uncompacted (outside of the trail boundary) through very compacted (middle of the trail), but you need at least two sampling points (see photo) . A high-traffic site where people often congregate will work. The other site could be a site where there is little or no foot traffic.
2. Work in small groups to observe and classify the natural cover and litter (living and dead plants, insects, etc.) of each site. Sketch your findings.
3. Measure the soil's compaction at each site by recording the average depth to which an ice pick penetrates the soil when dropped four or five times from a height of three to four feet. Record the depths and calculate the average depth.
4. Measure the water infiltration rate of each site. This can be done by placing a tin can, with both ends cut out, into the soil, filling it with a known quantity of water (the water amounts must be exactly the same for each site), and recording the length of time necessary for all of the water to penetrate into the soil.
5. Compare the data obtained from the two (or more) sites and discuss the effects and relationships of soil compaction and living organisms.
6. Write a paragraph or discuss the following question: "Do you feel that soil compaction has an effect on the water infiltration rate and plant and animal life?"

Discussion Questions

1. Which site had more plant growth?
2. Where did water infiltrate the fastest—on the trail or not on the trail?
3. What do you think caused soil compaction?
4. How many human foot steps are necessary to cause soil compaction?
5. What might make a soil less likely to compact?

References

This material is borrowed from, and modified from, materials developed by the National Park Service for Carlsbad Caverns, and is one of two soil-related activities on this site: Middle School Ecology Curriculum - Carlsbad Caverns National Park (U.S. National Park Service).
http://www.nps.gov/cave/forteachers/middle_school_ecology.htm



Additional Resources

www.soils4teachers.org



Soil Science Society of America
www.soils.org