Soil Scavenger Hunt & Activities

Activity 1:

It's easy to overlook soil, because we usually only see its surface. Let's dig belowground and take a closer look!

What to do: Grab a shovel or trowel and find a safe spot you're allowed to dig. Dig a small hole, so you can see how the soil changes as it gets deeper. Soil scientists call this a "soil profile". Now you get to be a soil scientist! Make observations about how the soil changes with depth - draw or paint a picture, feel how the texture of the soil is different at the different depths of the soil profile, see if the colors change, and look to see if there are plant roots or other soil organisms throughout the depth. Are there any points at which you see an abrupt change, or are the changes more gradual? The deeper you dig, the more differences you may find! (Remember to wash your hands afterward.)

What you might find: Soils are complex and dynamic! You will often observe that the top layers of a soil, which soil scientists call "horizons", are darker than the lower layers. Can you guess why that might be? What is different about the surface of a soil than the soil deep, deep belowground? You might have guessed that one important difference is that plants grow at the surface of the soil. When these plants die, they decompose in the soil, leaving behind rich, dark "organic matter" near the surface of the soil. This gives topsoils their characteristic darker colors.

Why is soil organic matter important?: Soil organic matter has many important roles! It holds nutrients, such as nitrogen or phosphorus. As it decomposes, these nutrients become available to living plants so they can grow. It also soaks up water better than mineral particles like sand, so it can help soils hold on to water. Additionally, there is lots of carbon in soil organic matter, so soils play an important role in the global carbon cycle and in helping prevent climate change. In fact, soils store more carbon than the atmosphere and living organisms combined!

Learn more:

- What is soil? The Soil Science Society of America has a great poster that gives an overview: https://www.soils4teachers.org/files/s4t/dig-it-poster-side-one.pdf
- What do other soil profiles look like? The Soil Science Society of America has a great poster that shows the types of soils found around the world http://www.soils.org/files/s4t/soil-taxonomy-web-poster.pdf
- Got more questions? Ask a soil scientist! https://www.soils4teachers.org/ask

Share: Post a photo of what you found or your soil drawing on social media using the hashtags #UWSoilSafari and #ScienceExpeditions.

Activity 2:

We tend to admire the trees standing tall with colorful leaves, but the trees that have fallen are full of life too. Let's see what we can find!

What to do: Go to a place that you are allowed to go to that has lots of trees. This could be a forest, park, or maybe your yard. Find a log, stump, or large branch that is no longer connected to a standing tree. Take a close look to see what small organisms may be living there. Be cautious around larger, unfamiliar animals and remember to wash your hands afterward. See what to do as Miranda Sikora explores the first signs of life on a log after winter.

What you might find: You might find mushrooms, which is a visible part of fungi. Fungi are really good at breaking down wood and using it as a source of energy. There may be termites and other organisms that eat and live in the wood. If they are around, you might see the organisms that eat them!

Why are these organisms important?: The organisms on dead or rotting wood are breaking down the wood into smaller pieces. These smaller pieces join the soil and become an important part of it. They contribute nutrients to the soil that trees and other plants use to grow. These trees eventually fall and return to the soil. They cycle repeats, helping maintain the trees and soils over long periods of time.

Learn more: Video of Prof. Ray Weil finding white rot fungi and termites on a fallen tree (zoom view at 1:58 to end).

Share: Post a photo of what was on your log on social media using the hashtags #UWSoilSafari and #ScienceExpeditions.

Activity #3:

Soil is full of microbes, which are really important for keeping plants healthy. But how can we know that soil microbes are there if they are too small for us to see?

What to do: This one is easy! Go outside to smell the air after it rains.

What you might notice: There is usually an earthy smell after a good rain. That earthy smell is called “petrichor”. This smell is partially made by the molecule geosmin, which is released into the air when rain falls on soil. Geosmin is produced by a type of soil bacteria, called Streptomyces or Actinomycetes.

Why is this important?: Soil bacteria are invisible to us, but we know they are there because we can smell the geosmin molecules that they release. Petrichor is a cool word in itself--in Greek, petra means rock, and ichor is the blood of the gods in Greek mythology.
What else comes out of the soil after it rains?
Learn more: Smithisonian’s “What makes rain smell so good?”

Share: Post a photo of things that come out of the soil after it rains on social media using #petrichor, #UWSoilSafari and #ScienceExpeditions.

Activity #4:

Building a Winogradsky column

There are many more species of microorganisms than there are species of animals on the planet, but because microbes are so small, they often go unnoticed. Different groups of microbes feed on different nutrient sources just like all the species of animals have different diets. One way to identify different groups of microbes within the soil or sediment is to look at the colors that they produce. A Winogradsky column is a tool that scientists use to grow microorganisms. By adding different sources of nutrients to a Winogradsky column, we can cause different groups of microbes to grow. We can identify the different groups of microbes by the different colors that they produce within the soil or in lake sediment.

What do to: Build your own Winogradsky column using the instructions in this video or follow the steps below.

1. Collect mud and lake/pond water.
2. Find a jar or clear plastic bottle to use for your column.
3. Fill the bottle ⅓ full with a mixture of mud, shredded newspaper, and 1 egg yolk.
4. Fill the next ⅓ of the bottle with mud.
5. Fill the rest of the bottle with lake or pond water.
6. Cover the top of the bottle with a piece of plastic wrap and use a rubber band to secure it in place. DON'T put the lid on because pressure may build up causing the bottle to break and leak.
7. Place the bottle in a sunny spot - inside or outside - and wait!

What you might find: Over the next couple weeks and months, you'll see colors start to appear in different parts of the bottle. Why do you think this is? Think about how we put the newspaper and egg yolk at the bottom of the jar. Are the colors different in the bottom ⅓ of the jar?

Learn more: Microbes aren't limited to eating newspaper and egg yolk. Try out other nutrient sources such as egg shells, sugar, or flour, or try modifying the environment by adding more or less water or adding salt. Do the different additions lead to different results?

Share: Post a photo of your Winogradsky column before and after photos on social media using #UWSoilSafari and #ScienceExpeditions.

Activity #5:

Have you ever wondered how old trees are? Or an earthworm? What about soil? Does it even have an age?

What to do: Your goal today is to identify the youngest and oldest things you can find out in nature.

Like every good scientist, grab your trusty notepad and pencil and head out into the field. Ideally a place where you can find lots of little creatures, plants, and other things that live or grow in the soil. Make sure you only go where you're allowed to be. A big part of doing fieldwork is making observations, so let's do that!

We're going to be writing down all the things you think can have an age, your best guess for the age of that thing, and whatever notes you think might be helpful in helping you figure out it's age. We'll also leave a column blank so you can write down what the actual age might have been for when you go home and do some research into what you saw.

You don't have to restrict yourself to just notes either. Pictures are always great, and you can even carry little ziploc bags to actually take some

samples home to get a closer look later (just make sure you don't harm anything, plant or animal, in the process).

Here's an example table to help you get started. Make a similar table in your notebook to write down your observations. Here, we've filled in one of the rows as an example for the kind of thing you might write down.

What is it?	Notes	Your guess of its age	Its actual age
An earthworm	Seemed reddish in color, about 5 inches long	2-3 weeks	Looks like it might have been a red worm. They usually live between 2 to 5 years!

Don't worry too much about your guesses being wrong. It's actually almost more fun to be completely wrong and learn something totally new.

What you might find: You'd be surprised by how many things actually have an age. It doesn't just have to be living things. Soil has an age too. Soils of different types and in different climates can have surprisingly different ages. Even just an inch of some kinds of topsoil can even take a thousand years to form sometimes.

Learn More: If you find something that particularly surprises you, it can be interesting to learn more about it's entire life cycle. If a red worm lives for 2 to 5 years, does that mean it's a baby for the first 2 months? 6 months? When do they have kids anyway? There's no limit to the incredible variety you will find in nature.

Share: Post on social media the youngest and oldest things you find in the field, your guesses of their age, and their actual ages with #UWSoilSafari and #ScienceExpeditions. Bonus points if you have a picture too. We're excited to see what you can find, and we're sure you'll teach us a thing or two!

Activity #6:

Searching for Invertebrates

Insects, spiders, and other invertebrates (animals without backbones) make up an important part of the ecosystem by eating plant materials like leaves and wood or by controlling the pest insects. Many of these animals hide under decomposing logs and rocks during the daytime, and can be easily found in the garden.

What to do: Carefully turn over a log or medium-sized rock in a yard or park and observe the life underneath. To see how, watch Dr. Tim Berry as he finds organisms that live in these places.

Be careful not to handle wild animals and always wash your hands after handling decomposing logs and soil.

What you might find: Ants, centipedes, crickets, earthworms, millipedes, slugs, snails, spiders, and more!

Why are invertebrates important? Despite being very small, these animals have BIG impacts on the health of plants and soils all over the world. Invertebrates that eat decaying plant and animal matter are important because they return nutrients to the soil, which new plants need to grow. Predatory invertebrates like spiders and centipedes can help control the size of communities of nasty pest insects that damage helpful plants.

Share: Post a photo of the invertebrates you found on social media using the hashtags #UWSoilSafari and #ScienceExpeditions.