OSU EXTENSION SERVICE

Klamath Basin Research & Extension

Grow It, Cook It, Like It

Farm to School and Nutrition Education Program

FoodCorps

Oregon State University

Hi, I'm Miss Anna!

Q: If you were a vegetable, what type of vegetable would you be?

If I were a vegetable, I would be a pea! Special bacteria can live on the roots of peas (and other legumes). These bacteria make a nutrient called Nitrogen for the soil. Nitrogen is one of the three key nutrients that plants need to grow.

I am like a pea because I build a welcoming and nourishing foundation that allows others to thrive and grow. Plus peas are delicious – I especially enjoy snap peas!

To the right is a picture of me at Henley Elementary asking students what they think of our local ground beef taste test. My Shasta Scorpions and Henley Hornets will recognize me from the cafeteria and maybe even your classroom!

Questions or comments about this lesson? Get in touch!

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Lesson #4: Superior Soil

Today, we're going to learn about healthy soil and conduct a science experiment to figure out what type of soil is good at holding water.

Q: What makes soil healthy?

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Review – Decomposers

Last experiment, we learned that soil with a lot of organic matter, and decomposers to break this organic matter down, is high in nutrients.

The waste that decomposers (like worms, bacteria and fungi) put into the soil is full of nutrients.

Nutrients are things that are required for growth and life.

Your body needs nutrients like protein, fat, carbohydrates and vitamins to grow and stay healthy. Plants are just the same – they also need their own nutrients to live!

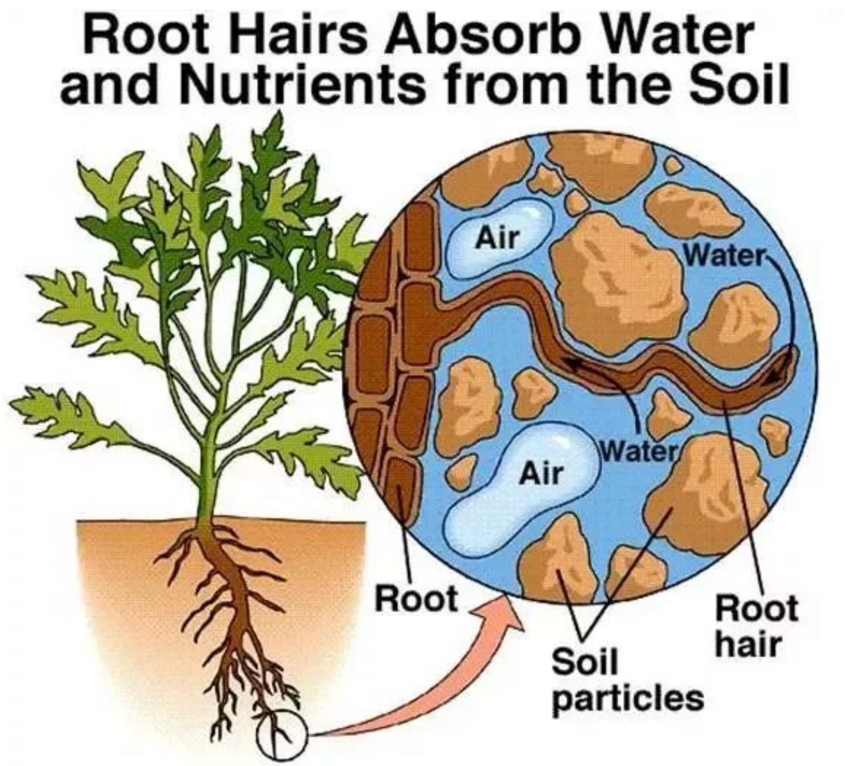
You get your nutrients from eating all five of the food groups from MyPlate!

What Makes Soil Healthy?

Plants suck up important nutrients from the soil through their roots.

Another very important thing that plants take up from soil through their roots is **WATER**!

So, soil that is **high in nutrients** and has **enough water** is called healthy soil because it helps plants grow and develop.



Not all soils are created equal

It turns out that some types of soil are much better at holding nutrients and water than others – and these types of soils are easier for plants to live in.

The basic types of soil are named based on which minerals they are mostly made of. Thinking back to our first lesson, "What is Soil?", the minerals in our layers were sand, silt and clay. The four basic types of soil are sand, silt, clay and loam.

Loam is actually a mixture of all three minerals – it is normally about 40% sand, 40% silt and 20% clay.

Each type of soil has different qualities, including how much water it holds.

Q: What type of soil is better at holding water?

Let's get ready for our next experiment!

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Time for our experiment!

Gather the following materials before you begin:

- ✔ **Two small paper or styrofoam cups** - pick something that you can punch a hole in the bottom of easily.
- ✔ **Two pieces of filter paper –** a cut coffee filter will work well
- ✔ **¼ cup sand –** make sure it is dried out. Do this by leaving it out in the sun, or baking in the oven with parent permission.
- ✔ **¼ cup soil –** same note as above for the sand.
- ✔ **Two larger cups/containers** - pick something wide enough that you can easily hold the small cup over it, and something that holds at least ½ cup of water
- ✔ **Measuring cups** - you will need to be able to measure ¼ cup and ½ cup

Step #1 – Set up your filters

1. Flip over the small cups and poke a few holes on the bottom using a pencil or pen. The holes should be about as wide as a hole punch.
2. Flip the cups right side up and put the coffee filters inside the bottom of each cup. Fold and tear them as needed so it sits on the bottom and completely covers it.
3. Pour ¼ cup of sand into the first small cup with the filter.
4. Pour ¼ cup of soil into the other small cup with the filter.

Don't worry if your holes don't punch through cleanly. I recommend you do more & bigger holes than I did.

Filling up my first cup with the filter in place!

Step #2 – Pour water through your filters

1. Measure out ½ cup of water. For this experiment, you should try to get this measurement really accurate.
2. Hold the small cup with the sand over your larger cup/container. Slowly pour the ½ cup of water into the small cup and let the water run out the holes on the bottom, collecting in the larger cup/container below. *Note - you will have to pour a little water at a time, so that the small cup with the sand doesn't overflow from the top.*
3. When the measuring cup is empty, and all your water has filtered through the sand into the larger cup/container, set it aside.

Soil and sand filters ready to be used for testing!

Step #2, continued – Pour water through your filters

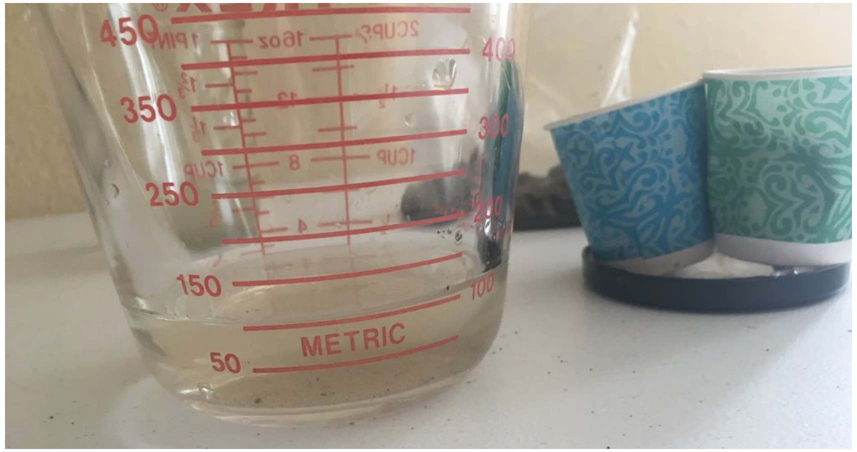
1. Measure out another ½ cup of water.
2. Hold the other small cup with the soil over your other larger cup/container in order to collect the water. Slowly pour the ½ cup of water into the small cup and let the water run out the holes on the bottom. You will have to pour a little water at a time, so that the small cup with the soil doesn't overflow from the top.
3. Keep pouring until the measuring cup is empty, and all your water has filtered through the soil into the larger cup/container.
4. Be sure to keep the two containers with the filtered water separate, so you can identify which came from the soil and which came from the sand (label them if needed).

https://www.youtube.com/watch?v=qnCzyLuPBjo

Need a brain break? Play this game with your family!

Step #3 – Results

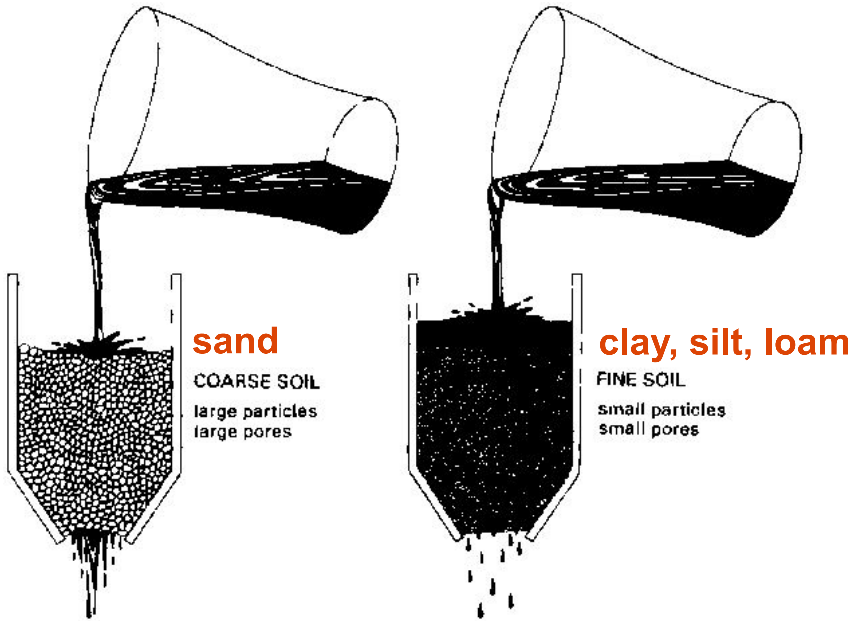
1. Take your container that collected the water filtered through the sand and pour it into something to measure it. If you have one, use a measuring cup that has a few different markings so you won't have to round or estimate the exact amount of water. However, if you don't have this, pour the filtered water back into your ½ cup measurer and mark the water line with a dry erase marker, pencil, or piece of tape. Record this amount.
2. Now, dump out this water and repeat this process for the water that filtered through the soil.
3. Compare the two amounts. Which filter let less water through? Why do you think that might be?



Measuring cup I used to figure out how much water came through the soil and sand filters.

Sand v. Soil

- You should have seen that we collected less water from the soil filter than the sand filter, and both should have less water coming out than we poured in.
- As it turns out, sand is not very good soil for holding water. The large grains of sand have a lot of space in between them, so water flows out easily and doesn't get stuck in all the tiny spaces.
- However, soil types like clay, silt and loam are made up of smaller particles that don't have as much space in between them. This means that water gets trapped in the soil, where the plant roots can pick it up, therefore supporting plant growth.
- So now we know – sandy soil is *not* superior soil!



Experimental Error

- If you didn't get those results – don't worry! Sometimes this happens when you're doing experiments.
- This is why good scientists repeat experiments multiple times before drawing any real conclusions. If something doesn't come out as they guessed it would, it could be a result of **experimental error**. Error is something that creates a difference between the real result and the result you got.
- For example, in this experiment if you measured out more water for the soil cup than the sand cup because one of the measuring cups you used was actually slightly larger than the other, your results would have been off.
- What are some other possible sources of error in this experiment?

Why should we care about soil + water?

Q: What does the weather feel like in Klamath County in August & September?
It's sunny, hot and very dry without much rain at all. Sometimes it is even smoky from forest fires because it's so dry & hot.

Plants need water from the soil to live. But, in the late summer there are still plants living outside, right? Why is that? Sometimes, it's because we water them (like crops), and other times it's because the soil is actually holding enough water to keep the plant alive.

If we have healthy soil that holds water well, we don't have to worry about watering plants as much, or even at all, to keep them alive.

Knowledge Check!

- ✔ Send an email to anna.barlowe@foodcorps.org with your experiment results! How much water did you collect from the soil filter and how much water did you collect from the sand filter? Bonus points if you include a picture of your experiment set-up!
- ✔ I will respond and let you know if you can check off the "Superior Soil" lesson/activity on your Bingo Board.
- ✔ Congratulations - you are one step closing to earning prizes and have some new knowledge about soil types and water!

Thanks for joining me!

Want more fun farm to school and wellness activities? Want to earn awesome prizes? Visit our website to learn more!

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Learning Objectives & Science Standards

Overall Program Learning Objectives:

1. Label the life cycle of plants/animals and describe the role humans have
2. Safely prepare a recipe with ingredients from food grown in Oregon
3. Describe what a plant needs to grow and how humans can assist
4. Identify where and how food is grown in Klamath/Oregon
5. Identify an Oregon grown food and taste it.

NGSS Standards Used in Garden Education 3rd Grade:

3-LS1-1 From molecules to Organisms: Structures and Processes

Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.

3-LS3-1 Heredity: Inheritance and Variation of Traits

Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.

3-LS4-3 Biological Evolution: Unity and Diversity

Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

3-LS4-4 Biological Evolution: Unity and Diversity

Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.

3-ESS2-1 Earth's Systems

Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.

Engineering Design 3-5

3-5-ETS1-1 Engineering Design

Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

3-5-ETS1-2 Engineering Design

Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

3-5-ETS1-3 Engineering Design

Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.