What's the Dirt on Soil?

Bicentennial Nature Center Network

Upper Elementary Curriculum; 2-3 hour program
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Recommended Grades: Upper Elementary (4th-5th grades); can be adapted to other grade levels

Indiana Standards Covered:

***4th Grade*:**
Science

- **4.2.1 -** Demonstrate and describe how smaller rocks come from the breakage and weathering of larger rocks in a process that occurs over a long period of time.
- **4.2.2 -** Describe how wind, water and glacial ice shape and reshape earth's land surface by eroding rock and soil in some areas and depositing them in other areas in a process that occurs over a long period of time.
- **4.2.6 -** Describe ways in which humans have changed the natural environment. Explain if these changes have been detrimental or beneficial.

Social Studies

- **4.3.6** - Describe Indiana's landforms (lithosphere*), water features (hydrosphere*), and plants and animals (biosphere*).
- **4.3.8** - Identify the challenges in the physical landscape of Indiana to early settlers and modern day economic development.

Health & Wellness

- **4.1.3** - Summarize ways in which a safe and healthy community environment can promote health.

Mathematics

- **4.M.1 -** Measure length to the nearest quarter-inch, eighth-inch, and millimeter.

English/Language Arts

- **4.SL.2.1 -** Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) on grade-appropriate topics and texts, building on others' ideas and expressing personal ideas clearly.
- **4.SL.2.5 -** Review the key ideas expressed and explain personal ideas in reference to the discussion.
- **4.SL.2.4 -** Pose and respond to specific questions to clarify or follow up on information, and make comments that contribute to the discussion and link to the remarks of others.
- **4.SL.4.1 -** Using appropriate language, report on a topic or text or provide a narrative in an organized manner, with effective introductions and conclusions, using appropriate structure and facts and relevant, descriptive details to support main ideas or themes; speak clearly and concisely at an understandable pace.

5th Grade:
Science

- **5.3.1 -** Observe and classify common Indiana organisms as producers, consumers, decomposers, predators and prey based on their relationships and interactions with other organisms in their ecosystem.
- **5.3.2** - Investigate the action of different decomposers and compare their role in an ecosystem with that of producers and consumers.

Health & Wellness

- **5.1.1 -** Describe the relationship between healthy behaviors and personal health.

Mathematics

- **5.M.1 -** Convert among different-sized standard measurement units within a given measurement system, and use these conversions in solving multi-step, real-world problems.

English/Language Arts

- **5.SL.2.1 -** Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) on grade-appropriate topics and texts, building on others' ideas and expressing personal ideas clearly.
- **5.SL.2.2 -** Reflect on and contribute to ideas under discussion by drawing on readings and other resources.
- **5.SL.2.3 -** Establish and follow agreed-upon rules for discussion.

- **5.SL.2.4 -** Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others.
- **5.SL.2.5 -** Review the key ideas expressed and draw conclusions in reference to information and knowledge gained from the discussions.

Purpose:

To introduce students to the importance of soil through: (1) learning the 3 main particle sizes of soil; (2) developing an understanding of why soils need to be studied; (3) connecting soil to land conservation while demonstrating the relationship between humans and soil; and (4) introducing the concept of the Children of Indiana Nature Park as a tool for learning.

Overview:

This program will: (1) demonstrate the difference between dirt and soil; (2) dig into the importance of soil by discussing what products humans use that originate from soil; (3) help students perform several experiments; and (4) lead students on a soil hike.

Outcomes:

Students will:
1. Better understand the science of soil (texture, color, etc.).
2. Be able to give examples which demonstrate the importance of soils.
3. Explain the relationship between soils and humans.
4. Help protect the soils that they affect, such as their yards or city parks.
5. Become better stewards of the land (and the environment in general).

Vocabulary Words:

- ***Dirt:*** misplaced soil or soil that has lost the characteristics that allow it to support life
- ***Soil:*** a naturally occurring mixture of organic materials (something that is or was alive), water, air and minerals that form on the surface of the land
- ***Sand:*** particles are around 0.05mm-2.00mm and feel gritty
- ***Silt:*** particles between 0.002-0.05, which can feel smooth or floury
- ***Clay:*** particles are usually less than 0.002mm and can feel sticky and/or gritty
- ***Loam:*** soil with a combination of sand, silt, and clay-sized particles
- ***Soil Compaction:*** occurs when soil particles are pressed together, reducing pore space between them; will change the ability of a soil to hold and conduct water, nutrients, and air necessary for plant root activity

- ***Soil Pollution:*** caused by human-made waste such as industrial activities of extracting minerals and not disposing properly of the by-products, using pesticides and fertilizers on crops, acid rain, oil spills/leaks and waste disposal such as sewage, landfills and industrial waste
- ***Soil Horizons:*** the distinct horizontal layers that make up soil. They range from organic-rich surface layers (humus and topsoil horizons) to underlying layers high in rock content (subsoil, regolith, and bedrock)
- ***Soil Profile:*** a vertical section of the soil from the ground surface downwards to where the soil meets the underlying rock
- ***Infiltration:*** movement of water into soil
- ***Permeability:*** downward movement of water into the soil
- ***Saturation:*** all soil pores are filled with water
- ***Field Capacity:*** soil water content after the soil has been saturated and allowed to drain freely for about 24 to 48 hours
- ***Gravitational Water:*** amount of water held by the soil between saturation and field capacity
- ***Permanent Wilting Point:*** soil water content when plants have extracted all the water they can—and do not recover
- ***Water Holding Capacity:*** amount of water held between field capacity and wilting point

Materials Needed:

Introduction:

- a brick
- blush or foundation
- a bottle of water
- a piece of clothing made from 100% cotton
- a flower or fruit of some kind

Scoop on Soils:

- Golf ball
- Softball
- Basketball
- 5 different types of soil and a contrast sample (i.e. coffee or brown sugar)
- 5 containers to hold the 5 soil samples
- 5 small containers to hold water
- 10 eye droppers
- instructions typed out & laminated

- 10 hand towels
- 5 clipboards
- 5 pencils
- 5 “Soil Classification Results” sheets

Hike Time:

- Soil sampler/probe
- 3 soil samples
- Containers to hold the 3 soil samples collected on the hike
- a piece of pottery
- Neosporin
- Calamine lotion
- Sponge
- Small to medium pan filled with water
- Small flower pot w/holes in the bottom filled with sand
- Small flower pot w/holes in the bottom filled with clay-type soil
- 3 bottles of water
- Food coloring

Soil Shake:

- 3 1-quart jars w/lids
- Several pitchers
- Alum
- Teaspoon
- Ruler
- Paper to record results
- Laminated “Texture Triangle” (found in appendix)
- 3 pre-made soil shakes for students to practice converting measurements into percentages and using texture triangle

The Program

Welcome/Introduction (10 minutes):

*****Interpretation Note: Many parts of this document are written as speech and will appear in a grey box. Please feel free to adapt and change as necessary. It may be helpful to write out exactly what you want to say (at least in the introduction), but this document is really an outline, not a script.**

Begin with the normal introduction for your facility (Thank everyone for visiting, welcome them to the facility, introduce leaders, location of restrooms, etc.).

Do you know why you are here today? Did you know that YOU have been chosen to receive a special gift? Let me ask you something. What do you think of when you hear the word "park"? Slides? Swings? Playgrounds? Well, we have a NEW way to think about a park. When you hear that word, we want you to think of trees, birds, insects, and presents. Wait, presents?! Yes, presents. The State of Indiana has decided to give you a gift, but it's not one that you unwrap, it's one that you protect, just like a special birthday gift. Indiana created The Children of Indiana Nature Park in Centerville, Indiana in honor of you. It doesn't have swings or slides; instead, it has trees, trails, tracks, and turtles. Indiana thinks you are so important, that each one of you can claim a "deed" for a piece of this land. What's a deed? It means that you are in charge of protecting something special. Your teacher is going to help you claim your deed, and you can learn about your piece of land and all of the ways it is growing and changing by visiting a special website listed on your deed. But how can we protect this land or the land that we live on without learning why it is important? Well, we are going to start today! Today's program is called "What's the Dirt on Soil?". Once you leave today, you will know why!

Dirt vs. Soil: How many of you have ever played in the "dirt" while looking for earthworms? How many of you have ever planted a seed or a plant or helped out in a garden? How many of you have played outside and then tracked dirt into your house?

Of those three questions, only one of them describes "dirt". The other two describe "soil". Dirt is what you tracked in to your house after playing outside. Soil is filled with nutrients and water and is where plants grow and earthworms live. How many of you knew that there is a difference between the two?

Dirt can be described as "misplaced soil" and is a negative term (just sounds dirty!). It can also be described as soil that has lost the characteristics that allow it to support life. Dirt can be "stuff" on the floor, the dust in your house, or the mud in your shoes.

You might ask, "Then what IS soil?" Let's talk about it! Soil is a naturally occurring mixture of

organic materials (something that <u>is</u> or <u>was</u> alive), water, air and minerals that form on the surface of the land.

Every soil originally formed from parent material: a deposit at Earth's surface. The material could have been bedrock that weathered in place or smaller materials carried by flooding rivers moving glaciers, or blowing winds. Over time, sun, water, wind, ice, and living creatures help transform, or change, the parent material into soil.

Now before we get started, I am going to hold up a variety of items. Once I am done showing them to all of you, I will have some questions for you. (Hold up a brick, a piece of pottery, Neosporin, Calamine lotion, blush or foundation, a bottle of water, a piece of clothing made from 100% cotton and either a flower or fruit of some kind.)

Do any of those items relate to soils in any way? (YES!) Why do you think I am holding these items up? (They are all derived from soils!) Briefly go over how each is derived from soils: bricks—clay, pottery—clay, Neosporin—neomycin found in the soil, Calamine lotion—clay, blush/foundation— kaolin and bentonite (clays), water—soil stores and cleans water, cotton clothing—cotton plant grows in the soil, flowers/fruits need the soil to survive and grow.

I want to make sure each and every one of you understands the importance of soils and why we need to protect and respect our soils and land. You will all be soil scientists after today! From here on out…there shall be NO MENTION of "dirt"!

<u>The Scoop on Soils (30 minutes):</u>

Soils can be categorized by studying the particles (and their size) found in the soil. There are three main particle sizes of soils: sand, silt and clay.

For example, a clay particle could be represented by this golf ball (in reality, these materials are usually less than 0.002mm and can feel sticky and/or gritty), silt could be represented by a softball (in reality it is usually between 0.002 and 0.05mm and can feel smooth or floury), and a sand particle could be represented by this basketball (in reality, these particles would be around 0.05-2.00mm). Therefore, soils can be classified as silty, sandy or clay soils.

Most soils are a mixture of sand, silt and clay and are said to be loams. If the sample of soil has more sand it is a "sandy loam", more silt is a "silty loam", and more clay is a "clay loam". They can be further classified such as "sandy clay loam", "silty clay loam", etc.

You should know that there are many different colors that can be present in soil, and the colors depend on the minerals found in the parent material and on the chemical and biological reactions within the soil. Colors include (if you have samples of the different colored soils, please hold them up as you say the color): red, black, yellow, white, brown and gray. YOU CANNOT DETERMINE SOIL TEXTURE BY COLOR OR WHERE IT IS FOUND IN THE SOIL PROFILE.

We are going to classify some soils first! (Have 5 different types of soil—if possible, including 1 that is NOT soil such as coffee or brown sugar. The best way to do this is to have 5 different tables or areas with 5 different groups of students. Make sure tables/areas are labeled.) We are now going to divide into 5 groups.

Explain to the students that their groups are going to perform 3 different tests at each station. Materials at each station should include: a container with the soil sample, a small container of water with two eye-droppers, instructions typed out and laminated, and a few washable hand towels for students to clean their hands.

The first test should be the "Feel Test". Have one person in the group rub the soil (make sure it is a little moist) between their fingers. Once they do that, the recorder in the group should write down everything the student says about the texture of the soil. If it feels gritty, it is sand. Silt feels smooth, and clay feels sticky.

The second test should be the "Ball Squeeze Test" (or Soil Squeeze Test). Choose another person in the group to place some soil in the palm of their hand, and add water with the eye dropper. Then, they must knead the soil into a smooth and plastic consistency, like moist putty or playdough. Coarse texture soils (sand or loamy sands) break with slight pressure. Medium textured soils (sandy loams and silt loams) stay together but change shape easily. Fine textured soils (clay or clay loams) resist breaking. Make sure the recorder writes down the results.

The third test will be the "Ribbon Test". Provide the students with the chart/diagram in the appendix to help them better understand this part. Finally, the last person in the group will perform the test. They should squeeze a moistened ball of soil out between their thumb and fingers (another way is to just moisten a pinch of soil in their palm and rub it with their forefinger).

For ribbons less than 1 inch:

a.) Feels gritty = coarse texture (sandy) soil

b.) Not gritty feeling = medium texture soil, high in silt

For ribbons 1 to 2 inches:

a.) Feels gritty = medium texture soil

b.) Not gritty feeling = fine texture soil

For ribbons greater than 2 inches: fine texture (clay) soil

After all of the groups have been to each station, gather everyone together again and go over their findings. Do not tell the group that one of the stations was not actually soil. Find out what each group said about the non-soil, ask them questions like, *"Where do you think you would find soil like this?"* or *"Could anything grow in this soil?"* To get them thinking, ask them what they could MAKE with this soil. Hopefully one of the students will get the hint. If not, tell them that it is not soil and ask if anyone knows what it actually is!

NOTE: For more fun soil activities and resources, go to: http://utah.agclassroom.org/teachercenter/index.cfm?controller=main&action=lpsearch&lpID=5 06&searchGrade.gradeID=5&searchSub.subjectID=

Hike Time (60 minutes):

At this point, tell the students that we are going to go hiking to collect some soil samples from around the property. Stop at random points on the property, and ask students, "What is so special about the soil in this area?" For example, if you have a wetland, you can discuss how the soil helps to clean water as well as support the aquatic plants growing in and around the wetland. If you have any buildings on your property, stop near one and ask the same question (it supports the structure). If the building is made from wood, talk about the fact that the wood grew in healthy soil. If it is made of bricks, remind them that bricks are made from soil. Gardens are another great place to stop as soil sustains life for our garden plants.

Make sure to briefly discuss changes in soils such as soil compaction (occurs when soil particles are pressed together which reduces pore space between them changing the ability of the soil to hold and conduct water, nutrients, and air necessary for plant root activity), soil pollution (caused by human-made waste such as industrial activities of extracting minerals and not properly getting rid of the by-products, using pesticides and fertilizers on crops, acid rain, oils spills/leaks and waste disposal such as sewage, landfills and industrial waste), erosion (the wearing away of topsoil due to deforestation and tilling) and soil depletion/degradation (loss of minerals and nutrients).

Stop at 3 different types of areas to take a core sample of soil. For example, at Cope Environmental Center we will stop at a wetland, in the prairie, and in the forest. Use a soil sampler/probe at each location.

At the first stop, go over soil horizons (have a laminated print out of the diagram below or use a tablet if there is one available). Discuss the 3 major horizons (layers):

A: Also called "topsoil" and is made up of minerals and decomposed organic matter. It is usually very dark in color.

B: Also called "subsoil" and is located just below the A horizon. This horizon has clay and mineral deposits (such as iron and aluminum) and less organic material than the horizons above. It is usually lighter in color than the horizons above it.

C: Also called "parent material" and is located just below horizon B. It is made up of slightly unbroken rock. Just a little bit of organic material is found here. Plant roots are NOT found in this layer.

There may also be a horizon titled "O".

O: Organic materials that are not completely decomposed. This layer may be thick in some areas and thin in others or non-existent.

NOTE: There are many different diagrams of soil horizons on the Internet. The one included in the appendix is just an example. If you are using a tablet, just search for "Soil Horizons Diagram".

Have the students look at each sample that you take for the different areas. Ask the following questions while there:

Can you tell what horizon(s) you see in the sample. Do you notice any roots? Do you notice any organic materials? What colors do you see?

Make sure to keep the 3 core samples to take back and make a "Soil Shake".

Soil Water[1]: (30 Minutes):

(A sponge and a pan filled with water should be placed on the trail before the program begins. You will also need a small flower pot with holes on the bottom filled with sand, a small flower pot will holes on the bottom filled with clayey type soil, and a bottle of water.)

[1] http://news.nationalgeographic.com/news/2005/05/0525_050525_deadzone.html(11/13/1 0))

Once you have reached your next stop, ask the students if there is any relationship between water and soil. Let a few students answer.

There is DEFINITELY a relationship between soil and water. Soil acts like a sponge. It absorbs and retains the water. Movement of water into soil is called infiltration, and the downward movement into the soil is called percolation or permeability. Pore space in the soil is what allows water to infiltrate and percolate. It also serves as a storage compartment. (This is the time to use the sponge, water and pan for a demonstration.)

A sponge is just like the soil because it is a solid and it has pore spaces. (Use a sponge about 6 x 3 x .5 inches in size. Place it under water in a pan and allow it to soak up as much water as possible.) At this point, the sponge is at saturation (all soil pores are filled with water). Now, carefully support the sponge with both hands and lift it out of the water. When the sponge stops draining, it is at field capacity (soil water content after the soil has been saturated and allowed to drain freely for about 24 to 48 hours). The water that has freely drained out is gravitational water (the amount of water held by the soil between saturation and field capacity). Now, squeeze the sponge until no more water comes out. The sponge is now at permanent wilting point (soil water content when plants have extracted all the water they can and do not recover). The amount of water that was squeezed out of the sponge is the water holding capacity (the amount of water held between field capacity and wilting point).

About half of this water can be considered plant-available water. You may notice that you can still feel water in the sponge. This is the unavailable water. Let's think of the 3 main particle sizes of soils that we studied earlier. What are they? (Clay, silt, and sand.) Which one do you think will have the quickest rate of percolation? (Sand) Which will take the longest? (Clay)

Let's try it out!

At this point, have the samples of clay and sand available. Then, choose 2 students to come up to the front. One will pour water into the sand-filled flower pot, and the other will pour the rest of the water into the clay-type soil filled flower pot. Make sure to time it for no more than 3 minutes.

What happened? Which one had water dripping out of the bottom first? Did the flower pot filled with clay soil have water pouring out of the bottom before the 3 minutes was up? Why not? (It is not as porous.)

Why is it important to study this? Think about farmers who have crops such as corn. Does corn need water to survive? YES! So, do you think a sandy soil would be good for corn? (NO! It won't

be able to hold as much water and is very susceptible to wind erosion.) What about clayey soils? (It can be good as it can hold a lot of moisture as long as there is not a lot of rainfall. Lots of rainfall would mean that farmers would need to have extensive drainage to ensure their fields didn't flood.) Knowing the characteristics of the different soil types is very beneficial to farmers (and builders) and can help them determine best practices.

Now, we are going to try one more thing. Let's divide into 3 groups. Each group is going to get a bottle of water that has been colored by food coloring (this represents rain and agricultural chemicals). Each group will then find their own soil plot (make sure they are spread out). Next, have one person in each group pour out the colored water. Everyone in the group should then observe what happens to the water. Where does it go? Does it filter into the ground? Does it run down to another location?

Once all of the groups have finished, have them meet back together and go over their observations. If any of the colored waters filtered into the ground, ask the students what could be affected by the water absorbing into the soil. (It could go down into the water aquifers, could affect worms and other critters that live in the soils, could be absorbed through the roots of plants/trees, etc.)

If the colored water didn't filter into the ground, where did it go? Why is this dangerous? This runoff can carry fertilizers and chemicals into waterways. Runoff from both synthetic fertilizers, animal waste, or even car fluids can poison drinking water and aquatic ecosystems wreaking havoc on human health and wildlife. Knowing what soils we have and how they work can help farmers, developers, and conservationists work together to avoid dangerous runoff.

Do you think the Children of Indiana Nature Park might be affected by runoff? How (by nearby farms, industry, parking lots, etc.)? What could we do to protect this land (intensive plantings surrounding the Park, reduce the number of chemicals used on nearby farms, etc.)?

Another little tidbit: Factory farm runoff also causes algal blooms that kill fish by depleting water of its oxygen, contributing to the formation of hundreds of "dead zones" worldwide where sea creatures cannot survive. The largest of these can be found in the Gulf of Mexico and is nearly the size of the state of New Jersey! Now, let's hike back to where we began!

Soil Shake (20 minutes):

We are now going to make 3 "soil shakes" that you will get to take back to your classroom! (Have three jars that have been sitting for a week (or more) so that they can practice converting the measurements into percentages and using the chart.) Let's divide into 3 groups for the 3 different test samples that we took on the hike.

NOTE: You may also want to pre-make a jar that has all of the different soils. That way the students can see how the soils layer as they settle.

STEPS (it is best to print these out and laminate them for the students):

1. Place 1-inch of soil into a 1 quart jar (or a plastic water/drink bottle). Add water until the jar is 2/3 - 3/4 full.
2. Add one teaspoon of alum (optional water softener; found in the spice aisle of most grocery stores. Alum helps the soil settle faster, but it is not necessary.). Be sure the lid of the jar is tight. You may use 3 or 4 inches of soil if you would like to see "larger" layers. Be sure to record the starting depth so you can accurately estimate percentages.
3. Shake the jar vigorously until all the particles have been sufficiently wet and separated by the water, about 2 minutes. If you have access to music, play something while they shake! (Taylor Swift's "Shake it Off", KC & the Sunshine Band's "Shake Your Booty", or Buddy Holly's "Shake, Rattle & Roll" are all great choices!)
4. Set the jar down and allow the soil to settle.
5. After 1 minute, measure the amount of soil on the bottom of the jar. Record this information. This would be a good time to remind them that soil pieces are comprised of different size particles. Also, explain to students that they will be taking these samples back to school to finish this activity.

Send the following instructions with the teachers so that they know what to do with the samples:

6. Allow the sample to settle for 3 to 4 hours, then measure again and record the level of the silt. This is your second layer. If your field trip is in the morning, measure before the students go home in the afternoon. If your field trip is in the afternoon, measure first thing the next morning.
7. The rest of the soil (or clay particles) may take the next couple of days (or even a week) to settle depending on the amount of clay in the sample. Because you know that each sample started with 1 inch, you can determine the amount of clay, because you know the amount of organic matter that is floating on top (this may be difficult to measure), sand, and silt.
8. Convert the measurements into percentages. Students may need help with this. If you used 1 inch of soil, and the first layer measured 1/2 an inch, that would be equal to 50% sand. A 1/4 inch measured in the second layer would be 25% silt. The remainder would be 25% clay. If the sample has 5% organic matter, you may only have 20% clay. If you started with 4 inches of soil and 2 inches settled out as sand, 50% of that sample would be sand. 1 inch of silt would be 25%, and 1 inch of clay would be evaluated as 25% clay.

9. Determine the soil type by using the Texture Triangle.

Closing (5 minutes):

Let's think about all of the things that we talked about today. What is the difference between "dirt" and "soil"? (Dirt is misplaced soil—the stuff you find in your house, on the floor, in your shoes; soil is naturally occurring materials including organic materials, air, and water.) What are the 3 main types of soil particle sizes (silt, sand and clay)? What are the different horizons of soil profiles? (O, A, B, & C). Why is soil and our land important to us and why should we treat it with respect and protect it? (We couldn't survive without healthy soils. Our food grows in it. Our houses and buildings are built on it. It's used for medicines, makeup, building materials, and it even cleans and stores water!

Remember the special piece of land we talked about earlier? The one that has been gifted to YOU? Now you know A LOT about why the soil there is MUCH more than just DIRT. You ALSO know how important it is to protect that piece of land. Start by protecting your own back yard! When you go home tonight, dig into some soil near your home. What kind is it? Can you see the different layers? What is living there? What plants or animals are making that soil their home? Remember that it is the reason we can eat and live every day! Be a conservation hero! Think about things you can do to protect that soil!

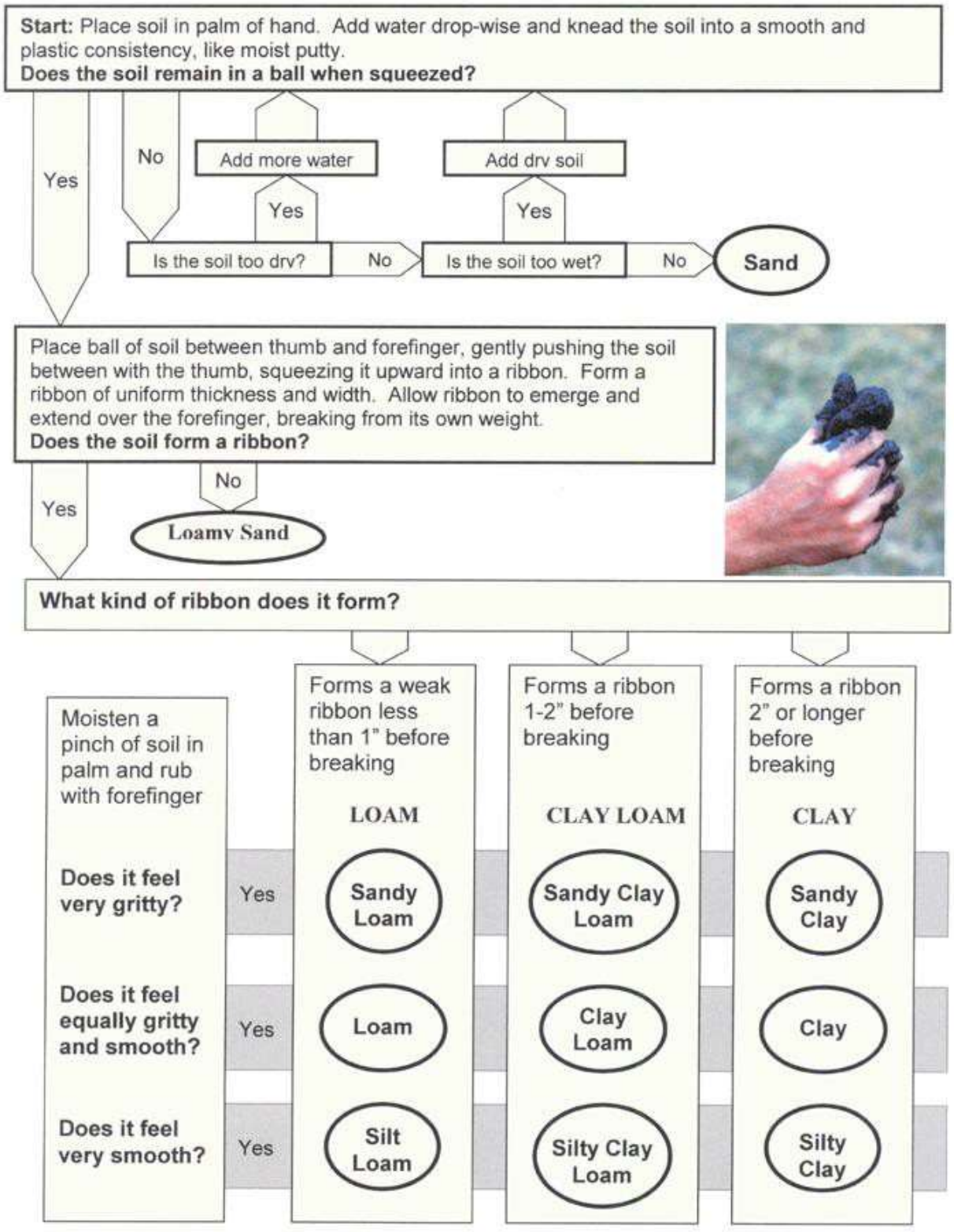
Thanks for coming to visit us!

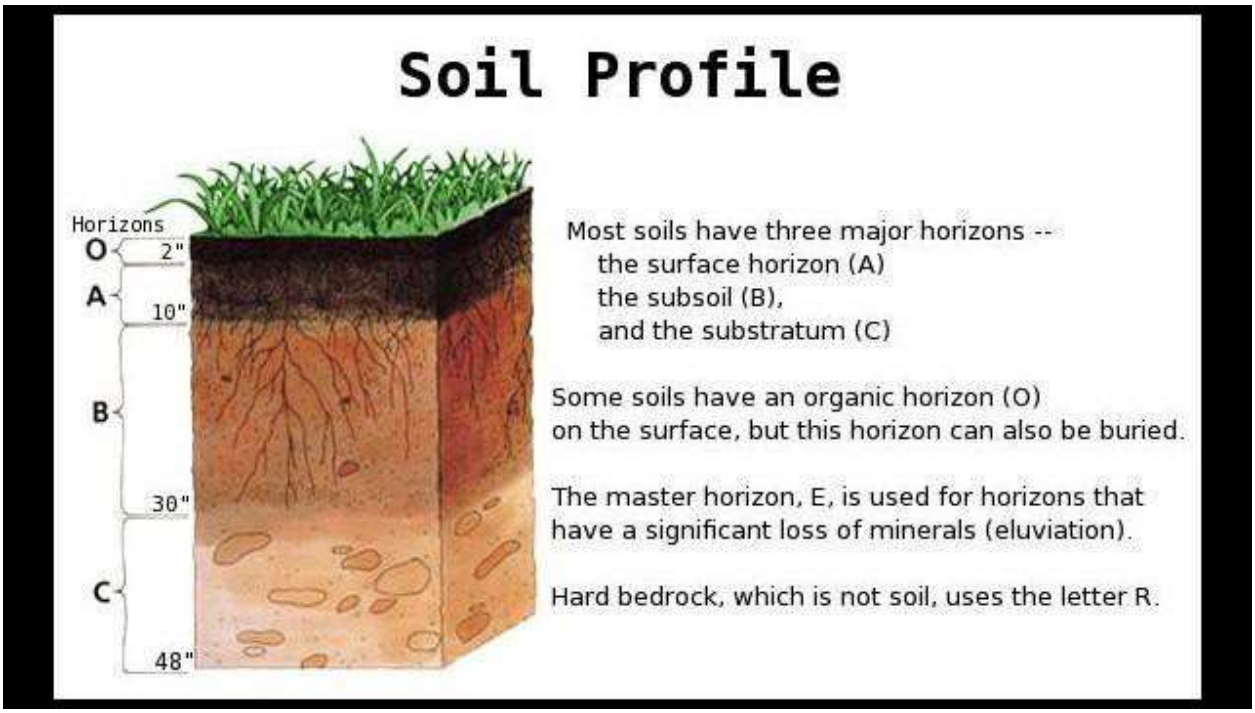
OTHER TOPICS YOU MAY WANT TO MENTION:

1. Expand on soil's relationship to farming: what things can grow in each type of soil; composting; till vs. no till farming; root structures vs. no root structures; etc.
2. Discuss "splash erosion" (This is the direct movement of soil by splashing. Soil particles can be thrown as far as 3 feet by raindrop splash.) **Short activity:** Start by giving each child a piece of paper. Place a small lid (from a 2-liter or a bottle of water) containing soil on the paper. Use an eye dropper to suck up water, and then hold it over the lid filled with soil. Let the water droplets fall! A nice splatter of soil should go on the paper which demonstrates splash erosion.
3. Soil formation: There are 5 main factors: 1) parent material, 2) relief or topography, 3) organisms (including humans), 4) climate, and 5) time. Depending on the above factors, it will take AT LEAST 100 years to form soil.
   Taken from:
   http://www.nrcs.usda.gov/wps/portal/nrcs/detail/wa/soils/?cid=nrcs144p2_036333

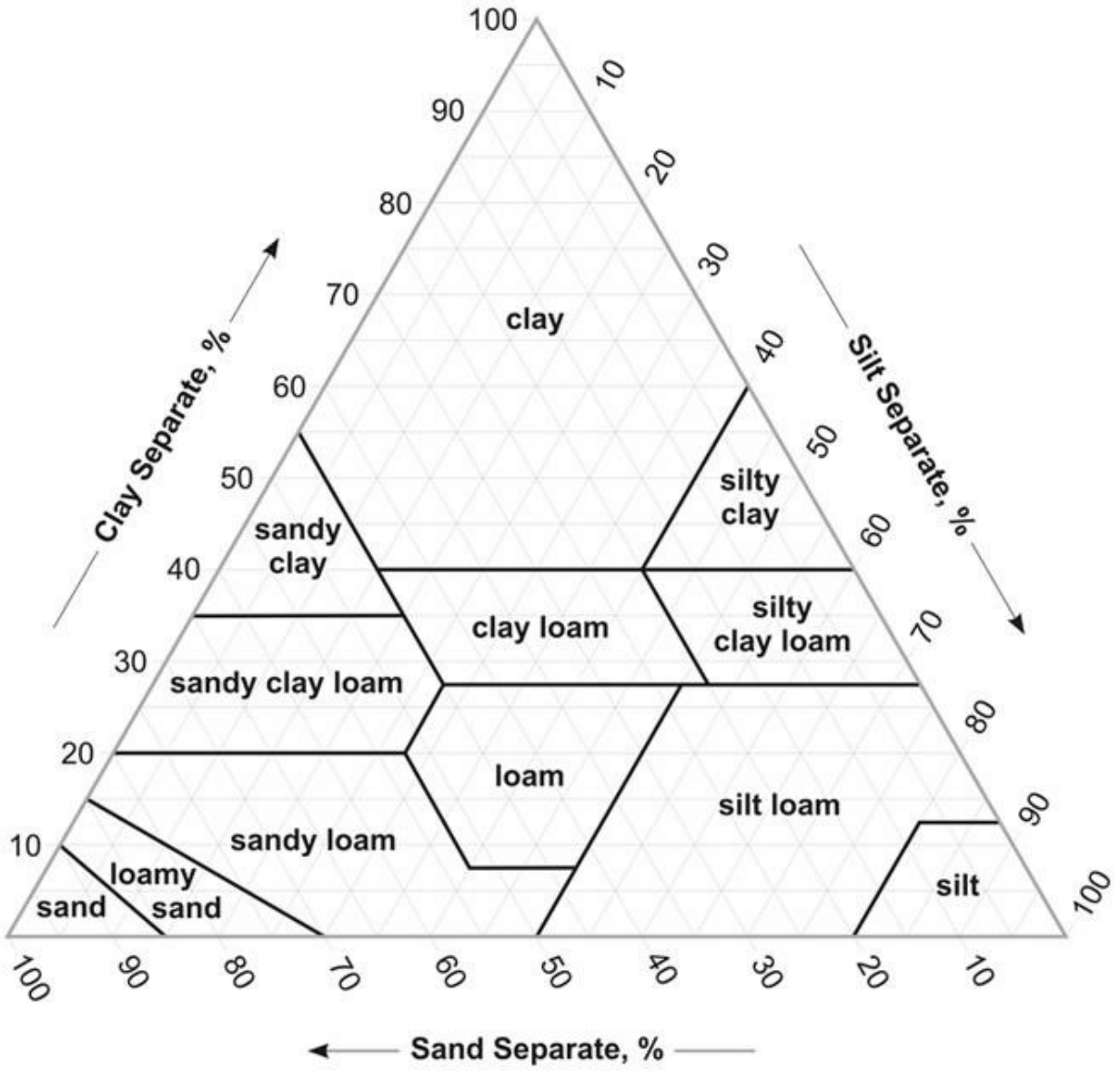
Taken from: http://www.ext.colostate.edu/mg/gardennotes/214.html

Soil Texture by Feel





The following diagram was taken from:
http://www.wkyc.com/images/640/360/2/assetpool/photogallery/258720/photo1Soil_profile_horizons.JPG


100
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Clay Separate, %
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Sand Separate, %
clay
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sandy clay
clay loam
silty clay loam
sandy clay loam
loam
silt loam
sandy loam
loamy sand
sand
silt

SOIL CLASSIFICATION RESULTS

STATION ONE:

Feel *(Circle which word best describes how the soil feels; you may write in other words, too!)***:**

Gritty
Smooth
Sticky
Other:

Ball Squeeze or Soil Squeeze *(Check which one best describes what happened to your ball of soil)***:**

__Broke with slight pressure

__Stayed together, but changed shape easily

__Resisted breaking

Ribbon Test *(Check which length bests describes your ribbon, and then circle which one best describes the texture)***:**

__For ribbons less than 1 inch:
a. Feels gritty = coarse texture (sandy) soil
b. Not gritty feeling = medium texture soil high in silt

__For ribbons 1 to 2 inches:
a. Feels gritty = medium texture soil
b. Not gritty feeling = fine texture soil

__For ribbons greater than 2 inches – fine texture (clayey) soil

STATION TWO:

Feel *(Circle which word best describes how the soil feels; you may write in other words, too!)***:**

Gritty
Smooth
Sticky
Other:

Ball Squeeze or Soil Squeeze *(Check which one best describes what happened to your ball of soil)***:**

__Broke with slight pressure

__Stayed together, but changed shape easily

__Resisted breaking

Ribbon Test *(Check which length bests describes your ribbon, and then circle which one best describes the texture)***:**

__For ribbons less than 1 inch:

c. Feels gritty = coarse texture (sandy) soil
d. Not gritty feeling = medium texture soil high in silt

__For ribbons 1 to 2 inches:

c. Feels gritty = medium texture soil
d. Not gritty feeling = fine texture soil

__For ribbons greater than 2 inches – fine texture (clayey) soil

STATION THREE:

Feel *(Circle which word best describes how the soil feels; you may write in other words, too!)***:**

Gritty
Smooth
Sticky
Other:

Ball Squeeze or Soil Squeeze *(Check which one best describes what happened to your ball of soil)***:**

__Broke with slight pressure

__Stayed together, but changed shape easily

__Resisted breaking

Ribbon Test *(Check which length bests describes your ribbon, and then circle which one best describes the texture)***:**

__For ribbons less than 1 inch:

e. Feels gritty = coarse texture (sandy) soil
f. Not gritty feeling = medium texture soil high in silt

__For ribbons 1 to 2 inches:

e. Feels gritty = medium texture soil

f. Not gritty feeling = fine texture soil

__For ribbons greater than 2 inches – fine texture (clayey) soil

STATION FOUR:

Feel *(Circle which word best describes how the soil feels; you may write in other words, too!)***:**

Gritty
Smooth
Sticky
Other:

Ball Squeeze or Soil Squeeze *(Check which one best describes what happened to your ball of soil)***:**

__Broke with slight pressure

__Stayed together, but changed shape easily

__Resisted breaking

Ribbon Test *(Check which length bests describes your ribbon, and then circle which one best describes the texture)***:**

__For ribbons less than 1 inch:

g. Feels gritty = coarse texture (sandy) soil
h. Not gritty feeling = medium texture soil high in silt

__For ribbons 1 to 2 inches:

g. Feels gritty = medium texture soil
h. Not gritty feeling = fine texture soil

__For ribbons greater than 2 inches – fine texture (clayey) soil

STATION FIVE:

Feel *(Circle which word best describes how the soil feels; you may write in other words, too!)***:**

Gritty
Smooth
Sticky
Other:

Ball Squeeze or Soil Squeeze *(Check which one best describes what happened to your ball of soil)***:**

__Broke with slight pressure

__Stayed together, but changed shape easily

__Resisted breaking

Ribbon Test *(Check which length bests describes your ribbon, and then circle which one best describes the texture)***:**

__For ribbons less than 1 inch:

i. Feels gritty = coarse texture (sandy) soil
j. Not gritty feeling = medium texture soil high in silt

__For ribbons 1 to 2 inches:

i. Feels gritty = medium texture soil
j. Not gritty feeling = fine texture soil

__For ribbons greater than 2 inches – fine texture (clayey) soil

Instructions for Feel Test:

1. Choose one person in the group to be the "feeler".

2. The "feeler" should grab some soil, and add a few drops of water to it while it's in their hand.

3. Next, the "feeler" needs to rub the soil between their fingers.

4. Choose another person to be the recorder in the group.

5. As a group, decide what type of soil you are feeling by its texture. If it feels gritty, it is sand. Silt feels smooth, and clay feels sticky.

6. The recorder will then need to circle which word best describes the texture of the soil and write what type of soil the group thinks they are working with at this station.

Instructions for Ball Squeeze (or Soil Squeeze) Test:

1. Choose a different "feeler".

2. The "feeler" needs to place some soil in the palm of their hand, and then add water with an eye dropper.

3. Next, the feeler must knead the soil into a smooth and plastic consistency, like moist putty.

4. The recorder should now place a check mark next to the phrase that best describes what happened to the ball.

5. Finally, the recorder needs to write what type of soil they think they are working with at this station.

INFORMATION: Coarse textured soils (sand or loamy sands) break with slight pressure. Medium textured soils (sandy loams and silt loams) stay together but change shape easily. Fine textured soils (clay or clay loams) resist breaking.

Instructions for Ribbon Test:

1. Choose your last "feeler".

2. The "feeler" should squeeze a moistened ball of soil out between their thumb and fingers (another way is to just moisten a pinch of soil in their palm and rub with their forefinger).

3. The recorder should now place a check mark next to the description of length that best describes their ribbon. NOTE: Use the provided chart for help!

4. Finally, the recorder needs to write what type of soil they think they are working with at this station.

Resources for Teachers and Naturalists:

Rocks & Soil; by: Janet A. Hale and illustrated by: Sue Fullam and Cheryl Buhler; Teacher Created Materials, Inc.
Project Learning Tree: Environmental Education Activity Guide Pre K-8; American Forest Foundation
Dig In!: Hands-On Soil Investigations; NSTApress
Your local Purdue Extension (https://extension.purdue.edu/Pages/default.aspx)

http://www.soil-net.com
http://www.nasdnet.org/education/soils
http://www.soil4kids.org
http://isee.purdue.edu
http://www.nrcs.usda.gov
http://www.websoilsurvey.nrcs.usda.gov/app/HomePage.html
http://www.passel.unl.edu
http://www.kidsgeo.com/geology-for-kids
http://www.Utah.agclassroom.org
http://www.nysipm.cornell.edu/teaching_ipm/sole/
http://www.soils4teachers.org/lessons-and-activities
http://www.slcschools.org/departments/curriculum/science/Model-Lesson-Plans/documents/SoilLesson_Plan.pdf
http://www.agclassroom.org/ny/resources/pdf/activities/k/soil.pdf
http://www.earthday.org/sites/default/files/Soil%20Basics_Lesson%20Plan.pdf
http://school.discoveryeducation.com/schooladventures/soil/
http://edibleschoolyard.org/node/9023
http://www.nysipm.cornell.edu/teaching_ipm/sole/land/what_is_soil.pdf
http://soilweb.landfood.ubc.ca/youth/resources/activities
http://www.scilinks.org/Harcourt_Hsp/HspStudentRetrieve.aspx?Code=HSP102