USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service
Salina, KS

June 2008

Soil Does More Than Get You Dirty!

Teachers' Guide to Soil Activities K-6

Dedicated to Dr. Orville W. Bidwell

This booklet is dedicated to Dr. Orville W. Bidwell, Professor Emeritus at Kansas State University, Manhattan, Kansas. His lifetime of hard work and dedication to teaching soils and soil science included a leading role in the establishment of Harney silt loam as the Kansas State Soil.

Dr. Bidwell received his Ph.D. from Ohio State University in 1949. In 1950 he began a career in soils that spanned over thirty years in the Department of Agronomy at Kansas State University, retiring in June 1984. During his career, he received numerous honors and awards that included Fellows from American Association for the Advancement of Science, Soil Conservation Society of America, American Society of Agronomy, and Soil Science Society of America.

Dr. Bidwell was dedicated to the education of Kansans and others about our soil resource. He wanted everyone—from students to homeowners to farmers to government planners and others—to be knowledgeable about their soil. To help accomplish this, he collected and mounted over 250 soil profile monoliths, was active in Soil Survey education-distribution meetings in 35 counties, originated the Natural Resource Management Club at Kansas State University in 1970, and created and published quarterly the Agronomy Department Newsletter for two thousand alumni.

Dr. Bidwell passed away on June 5, 2006.

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Preface

Each year the children of Kansas become further removed from the farm atmosphere due to a variety of circumstances, none of which they have any control. More and more families are located in an urban setting, both parents are working outside the home, and fewer families have a garden nor the time to work in one. This means that our children have had very little experience in the real world of tilling soil. When children from Kindergarten to Grade 6 were asked where do you find soil, the following responses were given.

"You buy it at the store, but don't forget, you have to pay for it (soil)!"
"If you dig down far enough, I think you will find it (soil)."
"If you go out in our backyard, lift up the old gate that has fallen down,
I think you will find it (soil)."
"Can you find it in a pot that has a plant in it?"
"I think there is some of it (soil) under our school."

These common misconceptions about where soil is found, as well as what we find in soil and how it is made will be addressed in the lesson plans that follow. These lessons have been trial tested and revised. Of course, you as the teacher will be the best judge of which activities will be most appropriate for your children.

The lessons have been divided into those lessons found to work really well with young children K-2 and lessons for more advanced children.

Our thanks to Twyla Sherman, assistant professor, College of Education, Department of Curriculum and Instruction, Wichita State University, Wichita, Kansas, for her dedication in the writing and editing of these materials. Each year, she uses these materials to acquaint teachers with the importance of our valuable resource soil.

Your comments and additions would be happily accepted. Please let us hear from you as you try these activities with your classes.

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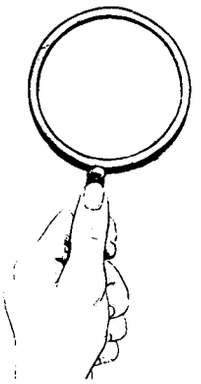
K-1
Activities

I Spy Soil
(Introduction for Soil Activities)



Lesson #1
Grade K-1

Guiding question ---
How can we identify/describe soil?

Time - 30 min.

Student Outcomes

When taken on an outside walk, student will observe/ identify soil in the schoolyard and give properties.

Materials

trowel
outdoor area where you can dig (near foundation or shrubbery)

Vocabulary

soil
properties
dirt

Focus ---
"Today we are going to go outside and take a walk around the schoolyard. We will all need to stay together. There is something I want each of you to find when we go outside. We will play 'I Spy' to find it; so listen carefully for me to say 'I Spy.' If you think you spy what I am looking for, raise your hand."

Procedure ---
1. Proceed outside after reviewing rules to be observed while outside. When everyone is out and is in a position to view some soil, say "I spy some soil." When a child correctly identifies some soil, use the trowel to scoop some up for closer observation (if in an appropriate place).
2. "What are some properties (describing words) of soil?" (rough, brown, tan, black, soft, crumbly, rocky, etc.) As time permits, have other students identify soil in other locations. When observing additional soil, ask the question, "How is this soil different from other soil we observed?" (Note: If the word "dirt" is used, tell the students that what we are observing is soil. Dirt is something you sweep off your kitchen floor.)

Closure ---
When the students are back in the classroom, ask the question "What was the item we spied outside?" (soil) Review properties of soil by having students name them; list them on the board. Emphasize that we observed "soil" (not dirt).

Notes:
Soil came from the Old French *suel* for earth. *Dirt* came from the Old Norse *drit* for excrement.

Give a Worm a Bath

Lesson #2
Grade K-1

Guiding question ---
What is in soil?

Time - 25-30 min.

Student Outcome

Given items from material list, student will be able to:
1. Observe the soil with hand lens.
2. Use the spoon to move soil around to observe properties of the soil.
3. Give properties of the soil on request.
4. Give the worm a "bath" with eye dropper and water.

Materials

soil sample for each student (include a worm, leaves, rocks, bark, roots, etc.)
paper plates
cups
hand lens
water
eye droppers
spoons
newspapers

Vocabulary

properties
observe
living
nonliving

Focus ---
Review the previous lesson. Ask the students what special item we located during the "I Spy" game? (soil)

Procedure ---
1. Designate the getters to come and get newspaper, paper plates, cups, spoon, magnifying lens, and eye droppers.
2. "I am passing out some soil to each of you. I want you to observe it carefully and identify things you find in soil. (Allow some time for students to observe soil and 'discover' their worm.)"
3. "What are some properties of your soil?" (soft, black, wet). "What are some things you have found in the soil?" (worm, rocks, leaves, bark, roots, etc.) As students give these words, list them on the board.
4. Soil is made up of living things and nonliving things. (label your lists on the board as such)
5. Pass out water and have the students give their worm a bath. "Worms live in soil. Soil is very important to worms; it is their home and it provides them with food."
6. "Can you name any other animals or insects which live in soil?" (snakes, ants, bugs, frogs, etc.)

Closure ---
After cleaning up, review what the students discovered. Ask them, "What are some things we found in soil?" (refer to the list on the board) Review the column of living things. "What

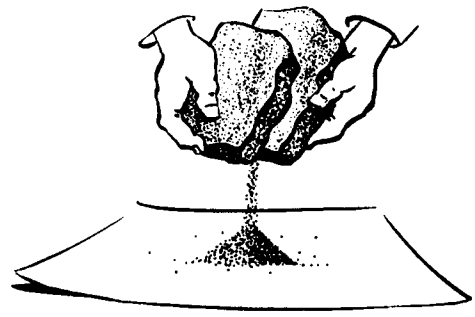
continues

Notes:

did we call these things in this column?" (living things) Review the column of nonliving things. "What did we call these things in this column?" (nonliving things) "We also discovered that soil is very important to living things such as worms, because the soil is their home and the soil provides them with food."

Notes:

Making Soil



Lesson #3
Grade K-1

Guiding question ---

How are two types of Kansas soil made?

Time - 30 min.

Student Outcome

Given items from material list, student will be able to:
1. Rub two pieces of rock together over paper plate.
2. Drop water from eye dropper on pile of rock accumulated on paper plate and describe observed changes.
3. Give properties of rock on request.

Material

*sandstone—at least 2 pieces each
*shale—at least 2 pieces each
paper plates
eyedroppers
spoons
paper towels
cups
water
newspapers

Vocabulary

shale
sandstone
properties

Focus ---
"Yesterday we observed soil. What did we discover was in the soil?" (list resources on board) Review the idea of living and nonliving things found in soil.

Procedure ---
1. Have the getters pass out plates, newspaper, spoons, eye droppers, and paper towels.
2. "I am passing out rocks to each of you. You may take the rocks out of the bag, hold them, and look at them carefully. What are some properties of your rock?" (response)
3. "I have two rocks here; do you think any of the rock will break away if I rub them together?" (response)
"Let's find out. I want each of you to rub the rocks together over your paper plate." (Model if necessary — monitor and make sure students are getting some rock dust. Pass out cups of water.)
4. "Now take your eye dropper and drop some water on your pile of rock dust. How did the pile of rock dust change?" (response) "Take your spoon and stir the mixture. What is your mixture like?" (response) "Can you make fingerprints on your plate with the mixture?" (have them try) "We call this rock, shale."
5. "Please put your rocks back in their bag. I am collecting them now and I am passing out some different rocks. You may take them out and look at them. What are some properties of these rocks?" (response) "What do you think will happen if we

continues

Notes:
*Upon request your local soil conservation district will provide pieces of sandstone and shale.

See Appendix for a Soil Recipe and Kansas State Harney Silt Loam fact sheet.

rub these rocks together?" (response) "Let's rub them together and find out. Rub them over a clean area of your plate. How are these rocks different from the shale?" (response)
6. "Now put a drop of water on this pile of rock dust. How is it different from the first one we did?" (response) "Stir your mixture. Would this make a good fingerprint?" (try and see) "We call this rock, sandstone."
7. Collect rocks; have getters return materials and clean up.

Closure ---
"One of the ways soil is made is when rocks break apart into very small pieces. Remember how hard it was to get the shale to break apart?" (yes)

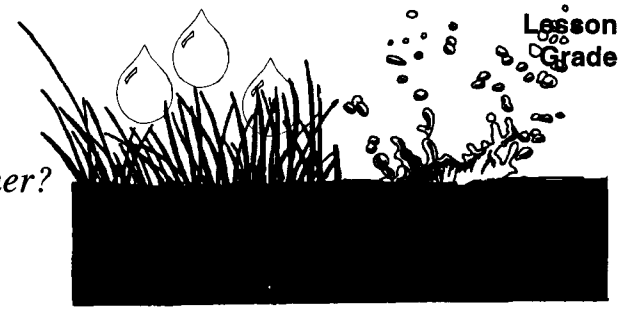
"It takes many, many years to make just a little bit of soil on the earth. It is very important for us to take care of the soil we have."

"How did the material you had on your paper plate look like the soil we found outside when we played 'I Spy.'"
"What properties did the sandstone have? What properties did the shale have?"

Notes:

Soil Erosion

Guiding question ---
How does soil move from one place to another?



Time - 20-25 min.

Student Outcome

Given items from material list, student will be able to:
1. Make a prediction on whether they think the soil will run out or splash out of the container or stay in .
2. Draw a happy face in the prediction section of their worksheet if they think the soil will stay in the container; or draw a sad face if they think the soil will run or splatter on the paper.
3. Observe and record the actual outcome in the result section of their worksheet .
4. Draw on the back of their worksheet other things they think help soil stay in place.

Material

For each group of students at a table:
container with soil
container with a section of grass sod
cup of water
large sheet of lightly colored paper
worksheet with sections for prediction and result

Vocabulary

sandstone shale properties soil prediction

Focus---
Review the activity with sandstone and shale by asking how long did it take to make just a small amount of ground up rock? "We made what we call **soil**. What would happen if it rained on bare soil? How does our homemade shale and sandstone soil compare with the soil that we found outside. How were the two soils alike? different? What happened when you put water on our soil we made?"

Procedure---
1. Have the getters come and get a large sheet of paper to cover their table. They will need to get a cup of water and worksheet for each student in their group, too. "I am passing out a container to each group. Please leave it in the center of your table. Some of you have soil and some of you have soil with grass growing in it. Where are some places we would find grass growing?" (yards, parks, school, church...) "Where are places we find soil without grass?" (fields, gardens, parks, dirt roads, beach...)
2. "I would like for each of you to predict whether the soil in your container will stay in or whether it will run and splatter out when we pour the cup of water from about this high. (model) Draw a happy face in the top portion of your paper if you think the soil will stay in; or draw a sad face if you think the soil will run out."

continues

Notes:

3. Have starter pour a cup of water over their container. The rest of the group may want to stand back from the table. "Look at your paper carefully. What do you observe?" (response) "Is this what you predicted would happen?" (response) "Record what actually happened in the bottom portion of your paper." (use the happy/sad face method again)
4. Collect all the containers and have getters throw away paper and return cups to the supply table.

Closure---
"For those who had grass growing in their soil, what happened when you poured the water on?" (response) "...and for those of you who just had soil?" (response) "Do you think the grass helped keep the soil in the pan." (response) "This experiment has shown us what happens to our soil when it rains. Grass is very important in keeping our soil from washing away."

Evaluation---
"If Mr. Jones bought a new house and every time it rained the soil from his yard ran down his driveway, what would he need to do?" (plant grass, trees, flowers, etc.) "I want you to draw a picture that would show what Mr. Jones might do to keep his soil from washing away."

Notes:

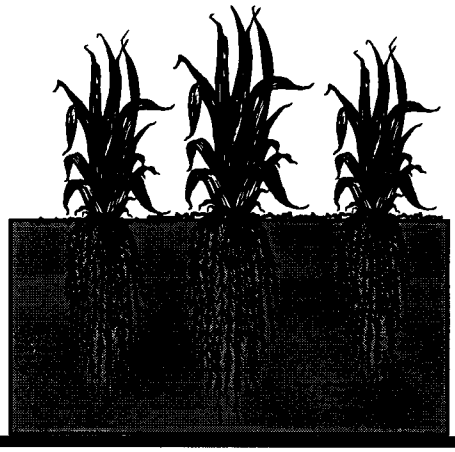
Worksheet - Soil Erosion Name_____

Soil Container_____

My Prediction?

Will not splatter?	Will splatter?
What really happened? Did not splatter.	Did splatter.

Soil Pictures
(Closing Activity)



Lesson #5
Grade K-1

Guiding question ---
How do plants keep soil from washing away?

Time - 20 min.

Student Outcome

Given materials, students will:
1. Draw a line across the middle of an open folder, as modeled.
2. Draw a plant of their choice above the line.
3. Draw roots below the line.
4. Apply glue around the roots and sprinkle soil over glue, then dump excess soil on newspaper.

Material

manila folders
glue
crayons/markers
soil
newspapers
paper towels

Focus ---
"In our last activity, what did we discover about grass and how it helps soil?" (The grass kept the soil from washing out of the container.) "We also decided there might be other plants which keep soil from washing away. What are some of those?"

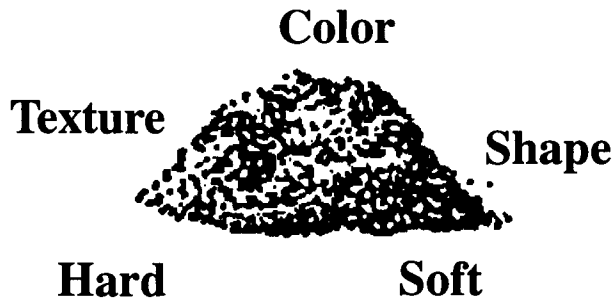
Procedure ---
1. "I am passing out some folders to each of you, along with some newspaper. I want you to cover your desk with newspaper. Open your folder and be sure your name is on it somewhere. Take a crayon and draw a line across the middle of your folder like this. This line represents the ground. Now I want you to draw your favorite plant above the line. It can be a tree, flowers, some grass, or whatever plant you like. Below the line I want you to draw some roots for your plant."
2. Have students apply glue around their roots and then sprinkle soil over the glue. (use soil from one of the other activities) Have them shake any extra soil onto their newspaper. (Have two getters carry the trash can around to collect all the newspapers.)

Closure ---
Have students share what plants they drew on their folders. List some of the different plants on the board. "All the plants we listed on the board help protect our soil. They keep it from washing away. How do the colors of the soils differ? Texture?"

Notes:
These soil pictures make a nice bulletin board display.

Grades 2-6
Activities

What is soil?



Lesson #1
Grades 2-6

Guiding question ---
Where do we find it?

Time - 45-50 min.

Student Outcome

The student, when asked to brainstorm around the topic of soil, will be able to write down ideas as to what soil is.

Material

what box that contains
soil
paper for the children

Vocabulary

brainstorm soil
properties objects

Focus ---
"Today, boys and girls, we will start a new unit. I'm going to have you reach into the **what** box and without saying anything to anyone you will think about what our new unit could be about. I'll ask you to give me properties of the objects in the box." (Note: The teacher needs to move quickly around the room just letting the child feel in the box briefly.)

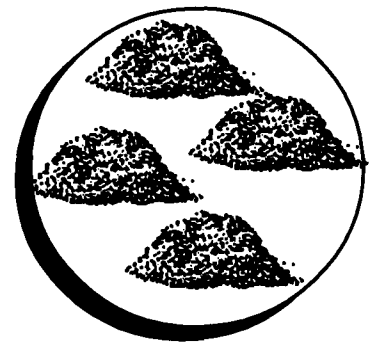
Procedure ---
1. "What are some properties of the objects in the **what** box?"
2. "What is the materials in the **what** box?" Open box and show contents.
3. "What do you know about the material in the box? We will call this material soil."
4. "Take out a sheet of paper. Now I want you to write down everything you know about soil on your sheet like this."

soil
- grow plants
- animals live in soil

5. After 5-6 minutes, ask each child to contribute to a class brainstorm.
6. "What are some questions you have about soil that perhaps we can answer in our unit?"
7. "What are some things you think you know about soil?"
8. "Where do we find soil? How is soil made?"
9. "When we meet next time, I would like for you to bring a cup of soil from around your house or apartment. Be sure you label your sample with: your name, date, where you found your soil."

Notes:

A Close-up Look at Soil



Lesson #2
Grade 2-6

Guiding question ---
What do we find in soil? Part 1

Time - 40-50 min.

Student Outcome

Students will be able to
1. State one way the soils on the plates are alike or different.
2. Make a list of objects they see in their soil sample.

Material

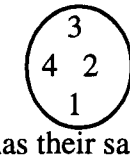
*soil each student brought from home
paper plates
eye droppers
hand lens
spoons
toothpicks
paper towels
small cups of water

Vocabulary

clay
humus
interaction
sand
soil

Focus ---
"When we brainstormed what we knew about soil, we had a lot of ideas. Let's look at the soil you brought from home."

Procedure ---
1. Have students form their collaborative groups. Wait until everyone is settled.
2. Designate one student in each group to be the getter.
3. Have the getter pick up a paper plate, spoon, eye dropper, toothpick, hand lens for each student and one cup of water for each group.
4. Each student will place one spoon full of their soil on their plate and share their soil with the other studentss in their group. Samples may be numbered if they wish.



5. When everyone has their samples, have the students observe their soil. After a few minutes ask — "How are the soil samples alike? different?" (Note: Add these ideas to your original brainstorm.)
6. "What do you see in your soil samples?" (Also, add these ideas to your brainstorm.)
7. "Drop a couple of drops of water on each sample. Observe what happens. What interaction did you observe? Now take your toothpick and stir each one — how are your samples alike/ different when they are wet? Take your finger and try to make

continues

Notes:
*Save soil for Part 2.

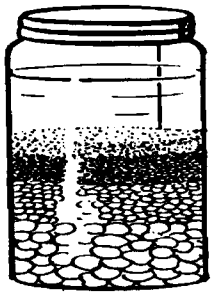
a fingerprint on your paper. Why does one type of soil and water interact with the paper plate better than others? How do the samples feel?" (Add these ideas to your brainstorm.)

Cleanup ---
Have getters pick up everything except the soil samples. When everyone has finished cleaning up area, proceed to closure of activity.

Closure ---
"How were the soils alike? different? What did you find in your soils? When we have science again, we will do some other experiments to find out more about soil."

Notes:

A Close-up Look at Soil



Lesson #3
Grade 2-6

Guiding question ---
What do we find in soil? Part 2

Time - 55 min.

Student Outcome

Given the materials, student will be able to:
1. Locate different particles in the soil.
2. Observe and record what particles they find.
3. Identify the properties of soil and recognize the phase of matter.
4. State the observation that a physical change has taken place when water and soil are mixed.
5. Classify substances within the soil.

Material

jars — enough for each group (preferably quart)
*soil
water
paper
hand lens (one for each student)
plastic spoons
paper towels
smaller jars or cups
chalk
chalkboard
handout "What is in the soil?" (See sample handout on the next page.)

Vocabulary

humus	clay	soil	phase of matter
silt	film	sand	physical change
decay	classify	substances	

Focus ---
Show the students some soil. Ask, "What is this?" After obtaining answers explain to the students that we will call it soil and it will be our focus for the next few weeks. Before going any further with the discussion - get started with the first activity - it will need 15 to 20 minutes in order to be ready for observation.

Procedure ---
1. Divide class into groups of 4 - Provide each group with a jar (large). Have each group fill its jar half full of soil - or have the jars with soil already in them, pour in water nearly to the top. Cap the jar. Shake it twenty times. Let it stand until the soil settles. (15-20 minutes) It will settle in layers, each one different.
2. While waiting for the soil to settle, start a class discussion. "What is soil?" Refer to brainstorm in Lesson #1. Keep a record of what is said. What do they know? What would they like to know? What is in soil? What is its purpose?
3. Get back into small groups. Handout "What is in the soil?" for observations, newspapers, paper towels, spoons and smaller cups for water.

continues

Notes:
*Recycle soil when lesson is completed.

See Appendix for a Soil Recipe and Kansas State Soil Harney Silt Loam fact sheet.

4. Have students observe what they find in their jars.
5. Record answers to the questions on handout. (sample below)
6. "How many layers are there?" (record on handout)
7. "Next skim off the floating bits with a spoon and spread them on a paper towel."
8. "Slowly pour water into a smaller jar or clear cup. Use the spoon to scoop up the grains in the top layer. Spread them out on another paper towel."
9. "Do the same with the grains in the next layer. If another layer, dump it on a paper towel."

Begin with the floaters. (record and discuss) "What do they feel like. Look at them with the hand lens. What do you see? (Explain that these bits of wood, leaves, and roots rot slowly, as they decay, they form black, gooey **humus**.) Write this on the board. "What are the other layers like?" (Explain that the fine grains are **silt**, the coarse grains are **sand**.) "What do you think made the water cloudy?" (Explain that those tiny particles in the film are **clay**.)

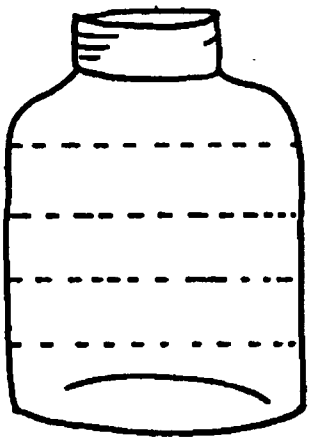
Closure ---
"What did we find in the soil?" (humus, silt, sand, pebbles, clay) "So we see that soil is made up of many different things. The humus usually floats. Sand & pebbles are heavier and they sink."

Notes:

What is in the soil?

Name _____ Date_____

Draw a picture of what you observe in the jar.



Label the different levels.

Level # 1: What I found in this layer:

_____

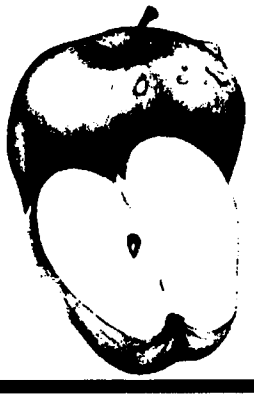
Level # 2: What I found in this layer:

_____

Level # 3: What I found in this layer:

_____

Available Soil



Lesson #4
Grade 2-6

Guiding question ---
Why learn about soil?

Time - 15 min.

Student Outcome

The student, when given an apple, plastic knife and plate, will be able to follow the directions given by the teacher.

Material

One for each student:
- globe
- large apple
- heavy plastic serrated knife

paper towels
paper plates

Vocabulary

serrated

Focus ---
"Does anyone have any idea why I thought this was an important subject to teach?" Explain that soil is one of our most important resources. "Why do you think this is?" Explain that all living things depend on soil as a source of food either directly or indirectly. We need the soil to produce food, but we have a problem, our population is growing while the soil that is useful for this is diminishing. "What can we do to save our soil?" We need to use our soil wisely and protect it to ensure the future. Your apple is going to represent the earth like this globe represents the earth.

Note: The following activity is to show just how much of the earth's surface is actually used for our food production as compared to the growing population. Do the next activity while modeling it for the students.

Ask students to give properties of the plastic knife. (made of plastic, serrated and breakable) "The knife will cut you if not used properly. If you break the knife, ask me for another. So that we don't cut ourselves, this is how we will work with our materials today."
1. "Place apple on the paper plate."
2. "Cut the apple on the paper plate according to the directions to be given. Do not hold apple in your hand."

continues

Notes:

Procedure ---

1. "Cut the apple into 4 equal parts. Three parts represent the oceans of the world. Lay aside 3 parts on paper plate. The 4th part represents what?" (land areas)
2. "Cut the land section in half lengthwise. Now we have two one-eighth (1/8) pieces. One section represents land such as deserts, swamps, antarctic, arctic and mountain regions. Lay aside one section on the paper plate."
3. "Slice this remaining one-eighth (1/8) section crosswise into 4 equal parts. Three of these sections represent areas of the world which are too rocky, too wet, too hot, or where soils are too poor for production, as well as areas developed by man. Lay aside 3 pieces of the apple on the paper plate."
4. "Very carefully peel the last section which is one-thirty second (1/32) of the apple. (lay aside apple flesh) This small bit of peeling represents the soil of our earth on which mankind depends for food production."

"So we see that it is a very small portion of land. What should we do to this small portion?" (protect and conserve it)

"One problem we need to correct is soil erosion. Does anyone know what soil erosion is? When we have science again, we will see if we can discover what causes erosion."

Notes:

Soil Erosion by Water

Guiding question ---
How does soil move from one place to another?

Time - 45 min.

Student Outcome

Students will observe the interaction of soil and water, and sod and water; the students will observe and describe the different splatter marks the contents of the two tins make on the white paper and discuss the interaction on the systems and how this is similar to our own environment.

Materials

pie tins with sod only for each group
pie tins with soil only for each group
plastic cups of water
newspapers
two sheets of plain white paper for each group

Vocabulary

evidence of interaction
interaction
system
environment

Focus ---
Ask students what they think soil erosion is and if they can give reasons why we have erosion in our environment.*

Procedure ---
1. Divide into groups of 4 and have getters come and get materials. "Eyes up here for directions. Put newspaper down on your table and then one piece of white paper over the newspaper. Now put your tin with soil only in the middle of the paper. What do you think will happen if we pour ½ of our cup of water into the tin, from a height of about 2 ft.?" (modeling height) "These two tins are our systems. One system is made up of soil only. The other system is made up of soil and grass or sod. Do you think pouring the water on the two different systems will make the water react differently? Let one student from your group hold the cup 2 feet above the tin with just the soil in it and pour ½ cup of water in it. What does your white paper look like?" (response) "These splatters were made from the water interacting with the soil. Draw a picture of what the pattern on your white paper looks like."

"Now, put a fresh sheet of white paper down and place your tin with the sod in the middle of the paper. If we pour ½ cup of water over the tin with sod, what do you think the splatters will look like? Will they be different? Draw on your paper what you think the spatters will look like."

continues

Notes:
*If you are aware of evidence of soil erosion around your school yard, take the children to the site as your focus.

Recycle the soil.

"Let's find out. Let another student of your group pour the rest of the water on, at least 2 ft. above the tin. Now look at this sheet of paper. What do these splatters look like? Are they different? How did the water interact differently in the two systems? Draw a picture of this pattern on your white paper. Why do you think the patterns were different on the 2 pieces of paper? How were they different? How do you define environment?" (where you live and around your home) "How do you think these pie tin demonstrations are similar to our environment? Where in our environment would you find bare soil? Where have you seen soil that has no protective covering? These are all places where we might find bare soil in our environment. Where would we find an area in our environment that is similar to the sod in this pan?" (hold up the pan with the sod) "This could also represent wooded areas or any area that has something that protects the soil from run-off water. What do you think the cup of water represents in our environment?" (rain) "This type of interaction of water hitting the soil is called **erosion**. Erosion means that the water, or rain, washes the soil away. What difference did you see in the pattern of the tin with only soil and the pattern of the sod? Which one had erosion occurred? How do you know? Why do you think erosion didn't occur in the other tin? So we know that grass helps catch the rain and keeps the soil from washing away, or eroding, but the dirt doesn't catch the rain, and therefore it gets washed away. So it is very important to stop erosion by planting grass and trees in our environment to keep our soil from being washed away. Let's clean up our tables by having our getters roll up the newspaper and white paper and throw them away. Someone else bring the pie tins up to the front of the room and put them in the large box and the getters can put the plastic cup over by the sink."

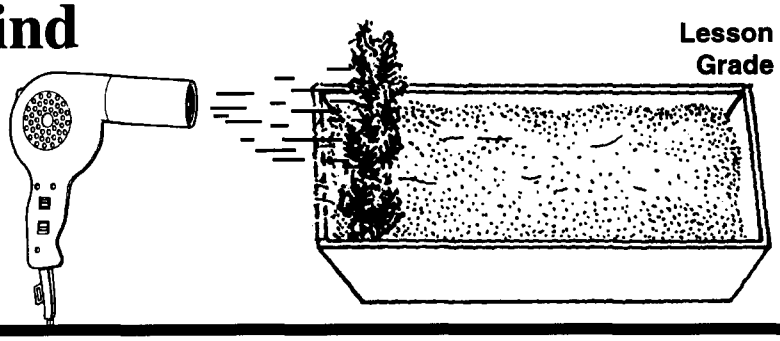
Questions for closure of the lesson ---

1. "What is it called when two or more things come together and something happens?" (interaction) "Can you give me an example from today?" (water and soil)
2. "What did our pie tins represent?" (sod system and a soil system)
3. "What was the term we used to describe our surroundings?" (environment)
4. "When the water interacted with our tin of soil, what did we say occurred?" (erosion)
5. "Did erosion occur with the tin of sod?" (no)
6. "Which tin had the least erosion?" (sod tin) "Why?" (Because the grass helped soak up the water; roots may have helped old soil; grass may have softened the force of the rain.)
7. "What other ways can we help prevent erosion?"

Notes:

These are a few questions to monitor their understanding of the lesson. This feedback would help you determine areas of comprehension and those which need to be covered more thoroughly. This questioning would be in lieu of a test because more is gained from experience and discussion.

Soil Erosion by Wind



Guiding question ---
How does soil move from one place to another?

Time - 25 min.

Student Outcome

None for this teacher demonstration.

Materials

pictures of wind erosion
aluminum - disposable baking pan (turkey size) or a cookie sheet
a variable-speed blow dryer
plastic drop cloth or sheet
sand to cover base of pan
small cedar or juniper branches
about 40 questions covering all activities

Focus ---
"Is water the only problem concerning soil erosion?"
"What else can cause soil erosion?" (wind, people, land slippage)
"Let's look at wind erosion."
"We will see that wind plays a role in soil erosion. Some soils are more prone to wind erosion than others. Most wind erosion occurs in areas of high prevailing wind speeds and low-annual rainfall. Soils have a smooth surface and are composed of particles that are easily moved by wind."
"What else would cause a lot of wind erosion?" (limited vegetation cover)
"Where do you think wind erosion would be of most concern?" (Somewhere where there is not a lot of vegetation: the plains, prairies. Texas has greatest land area subject to wind erosion.)

Procedure --- Teacher Demonstration
"Let's do an activity to see just how wind erosion occurs."
1. Place the drop cloth on the floor with dryer at one end. Locate the blow dryer 6 to 24 inches away (dependent upon the size of the dryer) so the direction of airflow is over the drop cloth.
2. Turn on dryer at varying speeds. "What can we do to help save this soil from the wind? What do I have out for you that we could add to our pan of soil that might keep the soil from moving?" (small cedar or juniper branches) Return sand to pan. Let students place the twigs and branches in various ways to see where they protect the soil the most. Again, turn the fan on.

continues

Notes:

"What happened this time when the wind blew over the soil. We see again that vegetation helps prevent soil erosion. We also see that a great way to control wind erosion is to plant a cover crop or windbreak that decreases the speed of the wind at the soil surface. What are windbreaks? They can be rows of evergreen trees planted perpendicular to the wind, narrow bands of tall grasses, or grasses planted in the fields instead of row crops."

4. "What other things can cause erosion? (land slippage and people)

"Land slippage refers to blocks of saturated soil moving down slopes in response to gravity similar to an avalanche usually seen as a cave-in of a cliff or bluff that overhangs a river or stream. It can also be seen as landslides or mud slides along steep road embankments (southern California)."

"People also cause erosion. How does this happen?" (people taking short cuts through lawns, shrubs, or down banks; people scuffling feet under playground equipment; people playing in one spot continuously; a baseball field, etc.) "Can you think of any others? Has anyone seen any of these? What can we do to prevent this people-caused erosion?"

Notes:

Conservation of Soil and Water Play

Background ---
In Kansas, the majority of our soils are used to grow crops. Sometimes our soils are not treated with enough care so they remain productive for crops in the future. In the past, land was considered to be a resource that would never end. When a piece of land became unproductive, the farmers simply moved and settled on another piece of land. Finally in the 1930s, these farming practices led to blowing of billions of tons of soil commonly known as the "Dust Bowl." When the clouds of dust reached Washington, D. C., the Congress acted to stop the erosion by starting conservation programs under the direction of the Soil Conservation Service. Today, part of the soil erosion problem has been corrected but much more still needs to be done. Conserving our soils will benefit all Americans by maintaining a resource which provides us food, as well as wildlife and a healthy environment in which to work and play.

Student Outcome ---
This activity is a great way to culminate the unit on soil at either the primary or intermediate level. As the students walk through this activity, they can have fan adding sound effects of rain and thunder.

Material ---

2 balls of yarn: one red, one green

Construct the following signs (use imagination to decorate): punch two holes in signs and attach a small length of yarn so that students can wear around neck

1 - Rain (12"x8") can be posted on chair or board. Students could also have the sign around their neck.

10 - Raindrops (circle)

2 - Plant (8"x4") for two students 1 - Conservation (8"x4")

10 - Soil (circles)

2 - Lake (8"x4") for two students

1 - Ocean (12"x8") can be posted on chair or board. Students could also have the sip around their neck.

Two pint jars of water can be used to help explain the process of conservation on the green side and without conservation on the red side. In one jar, have only water to represent the green yarn side. In the other jar, mix some soil with the water. Shake the jar to represent the water running to the lake on the red yarn side. When the jar is allowed to sit, the soil will settle out just like in the lake.

Procedures ---
The following drawings show classroom set up and movements of students. Students who are the 10 "raindrops" move along paths as shown by the yarn down to the "ocean."

It really works best if you have the red yarn side do their actions first Be sure you have your jar of soil/water ready to shake when the raindrops, that have been moving quickly, picking up the "soil" people and carefully (be sure to remind them!) take the soil students with them. The water drops can also uproot the plant (again, carefully). The raindrop students and the soil students then move on to the lake, where the teacher needs to have the group pause while you shake the soil/water jar. Questions

like, "How would you like to live in this environment?" (as you shake the jar) "What will happen to the lake when the soil and water stop moving?" (let the jar remain still for a few moments) Ask again, "How would you like to live in this? What will happen to the plants/fish/small organisms that live in the lake. What do you think will happen to the lake? Have you ever seen a place that used to be a lake and now it is all plants?"

Now it time for the **green** yarn side to go through their actions. Ask, "Do you think the same thing will happen when it rains on this (the conservation) side? Why?"

The group of five "raindrops" moves from the "rain" sign along the green yarn. They encounter a student wearing the "conservation" sign. They are let go one at a time, at intervals, to continue along the green yarn. "Why would conservation keep the water drops from moving fast? What kinds of things could keep the water from moving so fast and carrying soil with it?" (grass, trees, mulch) Because they are slowed down or held back by the "conservation," they are not able to pick up or take the "soil" signs from around the feet of the student who is wearing the "plant" sign. "How will this plant react differently to just a gentle rain drop compared to the rushing raindrops on the red side?" (plant could smile, hold up arms to indicate growth, any action that would indicate a happy plant) They continue along the green yarn to the "lake" student where they are again held back for a short time. This is when the teacher holds up the clear jar of water, shakes it and asks, "How does this water in this jar compare to the jar of water on the red side?" and "Which water would you rather live in if you were a fish, etc?" They then proceed to the "ocean" sign at the far end of the green yarn.

At the end of the play you might use these questions for discussion:

1. What held back the raindrops at the "Conservation" student?
2. What are some examples of conservation practices?
3. What is the loss of soil called? (erosion)
4. On the green yarn side, what would happen if you removed the plants?
5. If you put lots of plants on the red yarn side, what would happen if you removed the plants?
6. What happens to plants that lose part of their soil?
7. How would the students like to swim or boat in the dirty lake? What would they do with it? Can the soil in the lake be reclaimed?
8. Which lake will have better fishing? The one on the green yarn or the one on the red yarn and why?
9. How can we keep from having erosion around the schoolyard and at home?

Explanations ---

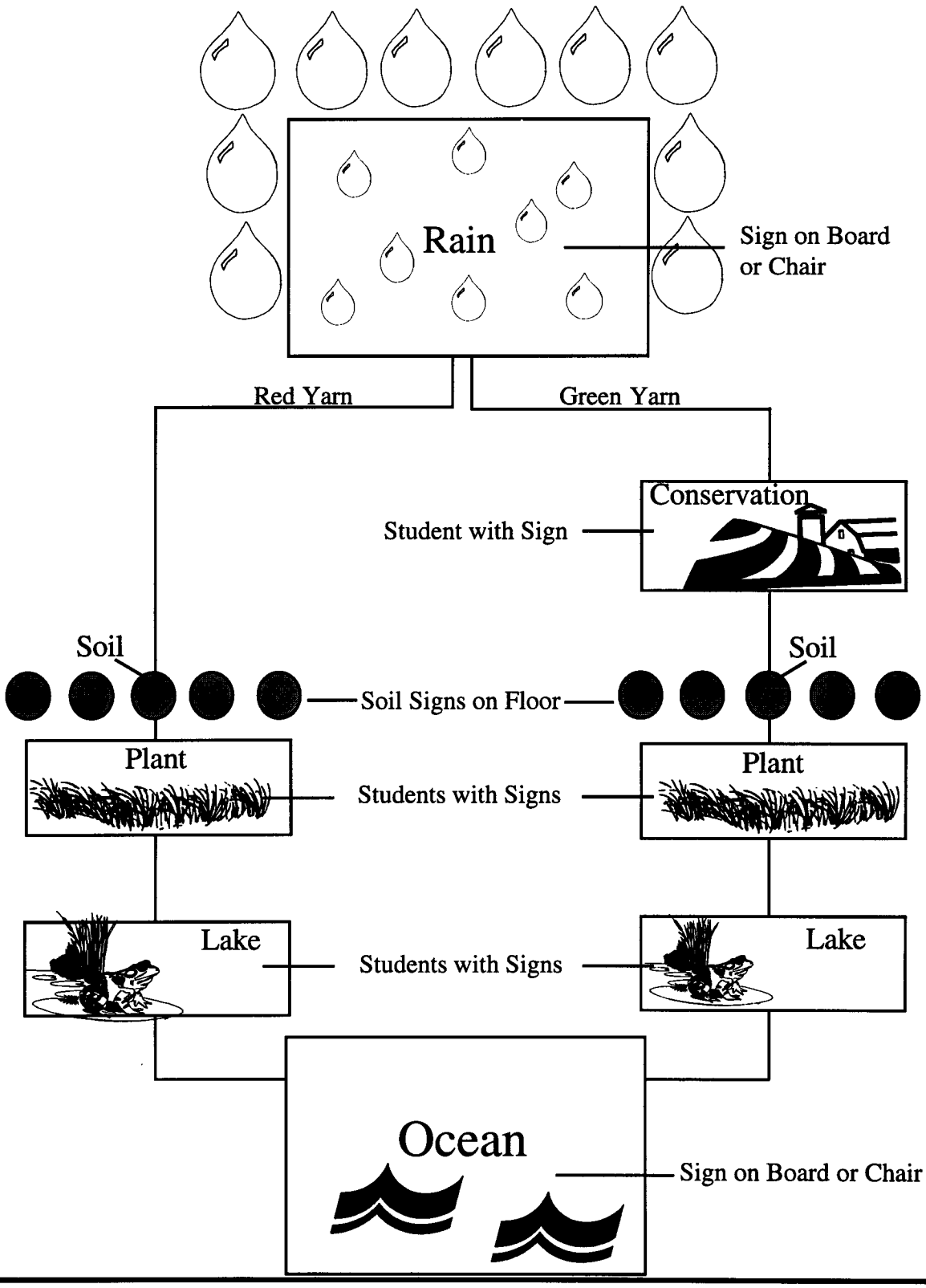
Conservation. The protection or improvement of soil, air, and water. Common conservation practices which protect soil from erosion include grass, dead plants (residue), terraces, and minimum tillage. See the local Natural Resources Conservation Service office for pictures of these practices. Conservation practices which retard water for a short period of time can be illustrated by placing a sponge in a cup of water or in a trough of trickling water.

Erosion. The wearing away of soil by wind or water. See Lesson 2, Activities 1 and 2. A way to help explain erosion could be to cut a small Styrofoam ball into eight to 10 irregular shapes. Then take these pieces and put them back together with toothpicks. To explain erosion or wearing away, pull pieces off one at a time as they are acted on by wind and water.

Terraces. An embankment or combination of an embankment and channel constructed across a slope to control erosion by diverting and temporarily storing surface runoff instead of permitting it to flow down the slope.

Minimum tillage. A practice which leaves the residue or dead plant of the previous crop on the surface at planting time.

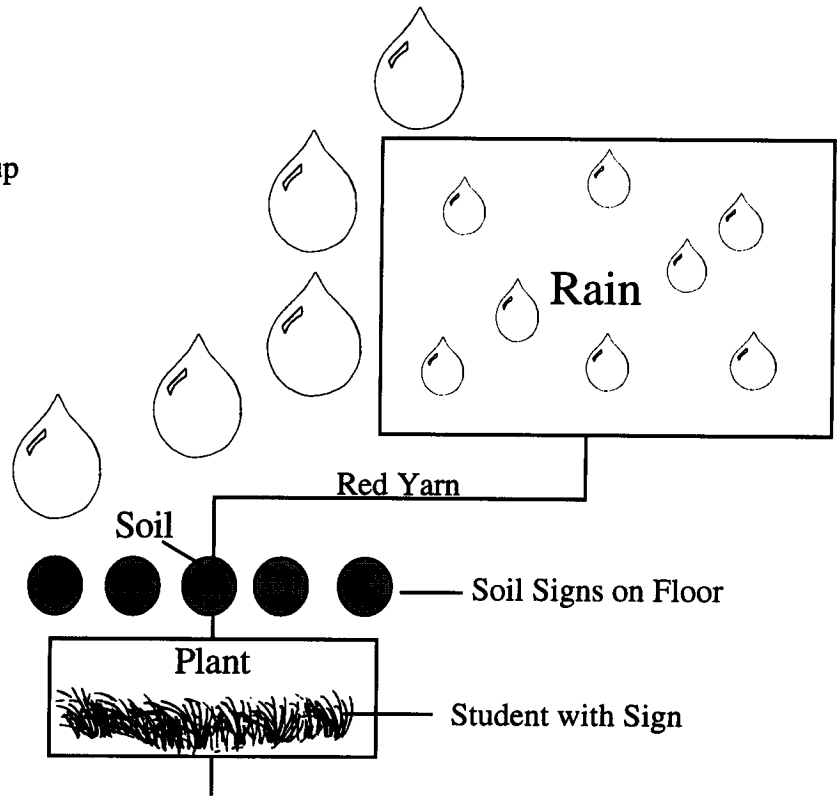
This is how the classroom and students will be positioned at the start of the activity. It works best if the **red** yarn group do their actions first, then have the **green** yarn group (conservation) do their actions.



Conservation of Soil and Water Play

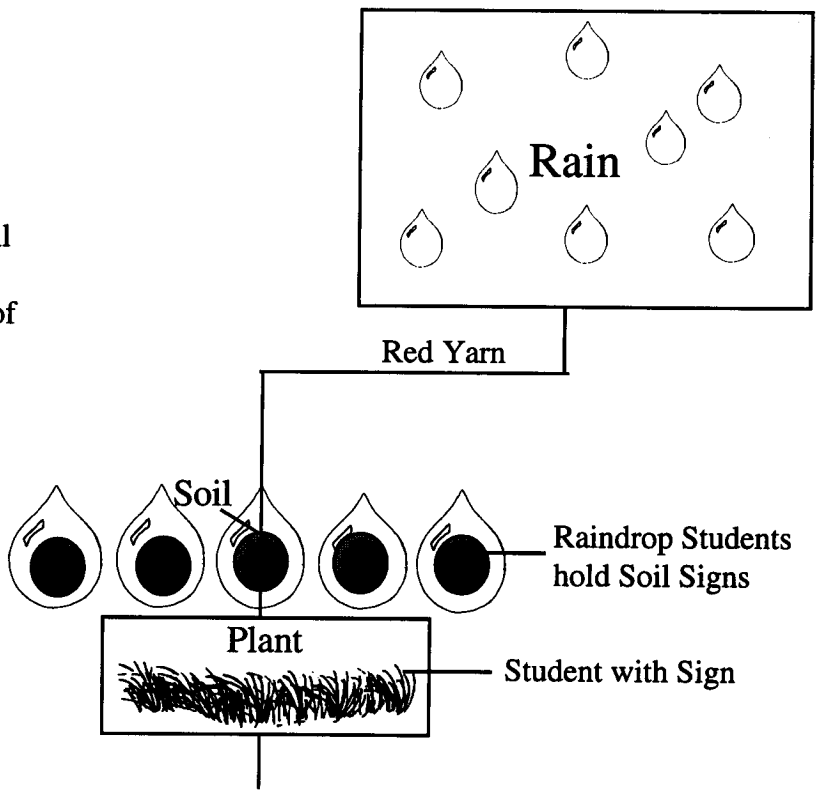
Step 1
(red yarn group)

Raindrop students as a group start along red yarn.



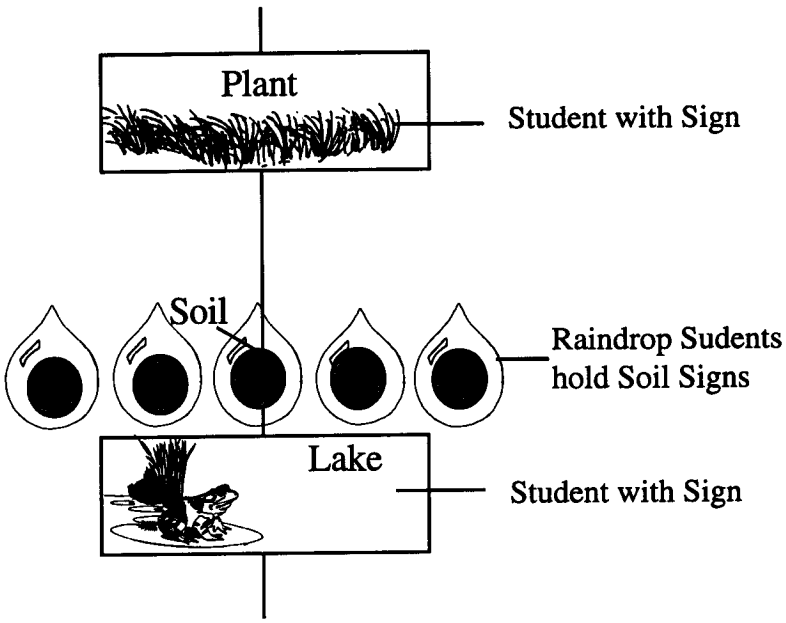
Step 2

Raindrop students pick up Soil signs from plant who cannot defend against the onslaught of Raindrop students.



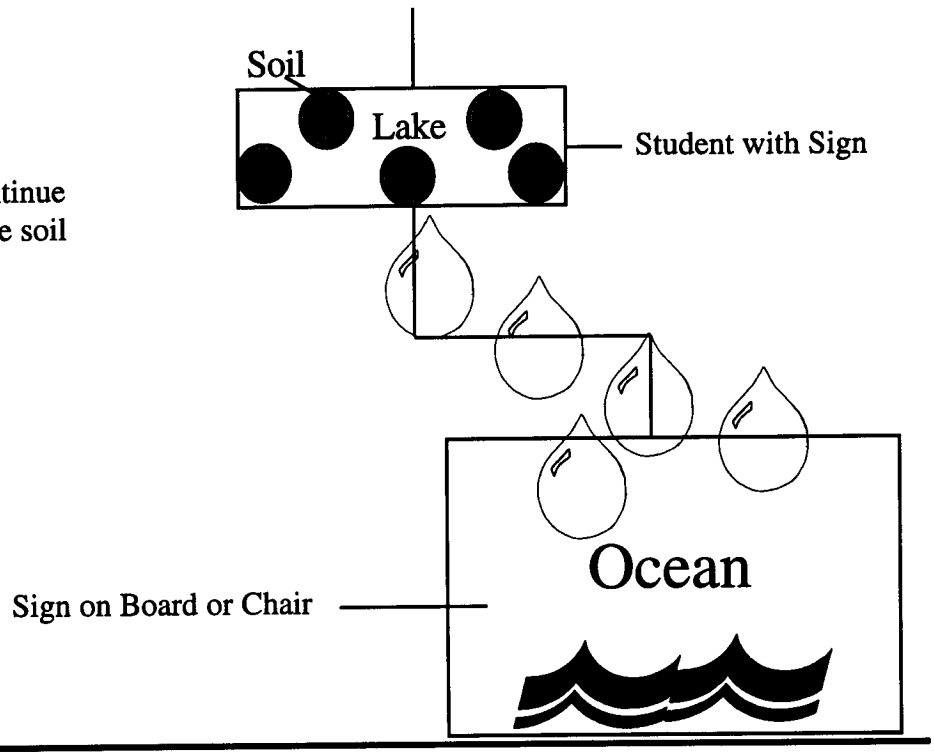
Step 3

Raindrop students with soil signs are held back at lake and must drop their soil as raindrop students must continue.



Step 4

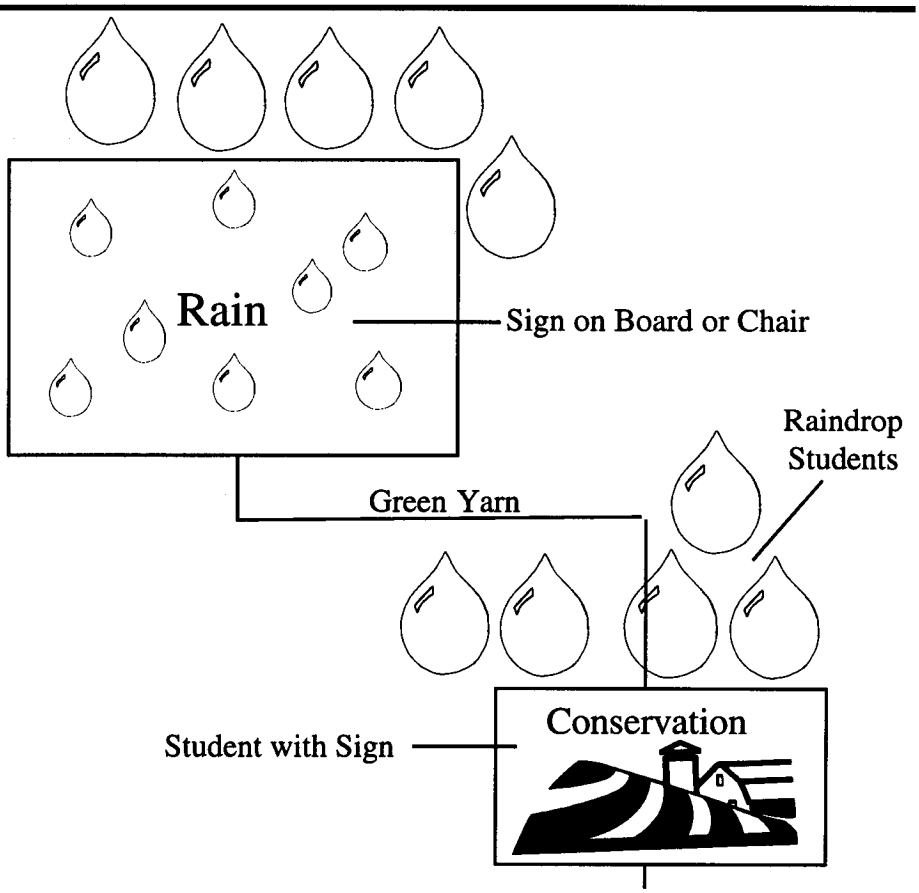
Raindrop students continue on to the ocean and the soil remains in the lake.



Step 5

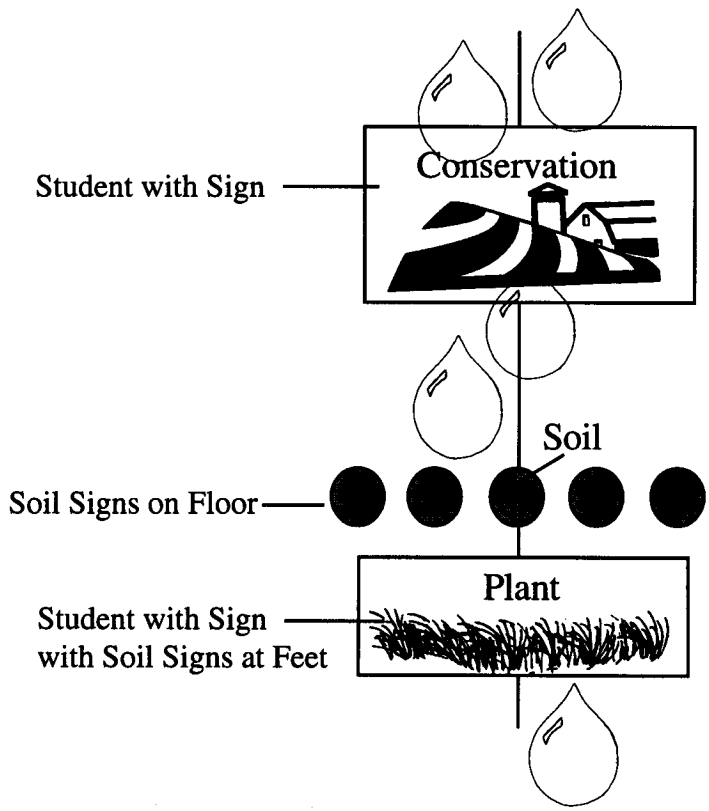
(green yarn group)

Raindrop students move down the green yarn and stop at Conservation student.



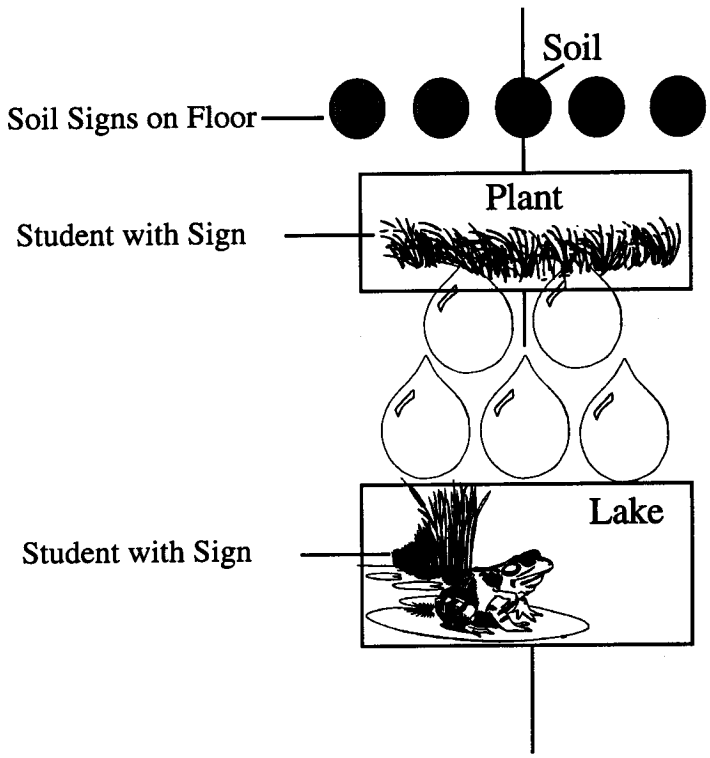
Step 6

Conservation student lets Raindrop students proceed along the green yarn - **one at a time**. They continue past the plant student but cannot pick up any Soil signs.

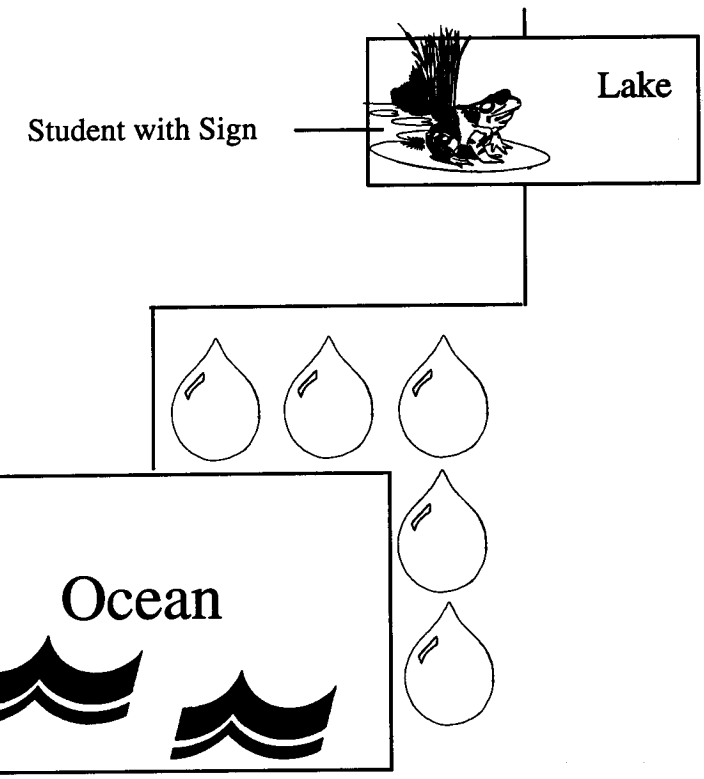


Step 7

Raindrop students are held back for a short time by the Lake student.



Step 8



Raindrop students continue to the Ocean sign.

Learning Center 1

What's in soil?

Materials ---
4 plastic bowls each filled with a different soil particle size group:
clay - (dry - from art department)
humus - (leaves, grass)
silt - (local Natural Resources Conservation Service office)
sand - (lumber yard, sand pile)
pencils
paper
newspapers or sheet of plastic covering (to keep area clean)

Preparation ---
Mark bowls with different colored circles. For example: a red circle on one bowl that holds clay, a green circle on another, etc.

Make cards for each student that correspond by color with the circle on the bowl. Each student will need a set four of 4 different colored cards (made of construction paper). On each card give similar instructions and questions listed below on the sample card. The students will correspond the color of the card with the color on the bowl and answer questions about the sample in that bowl.

Sample Red Card

Name_____

Instructions: Locate the bowl with (the color) circle on it. Look carefully at what is in the bowl. Answer the following about this soil particle size group:

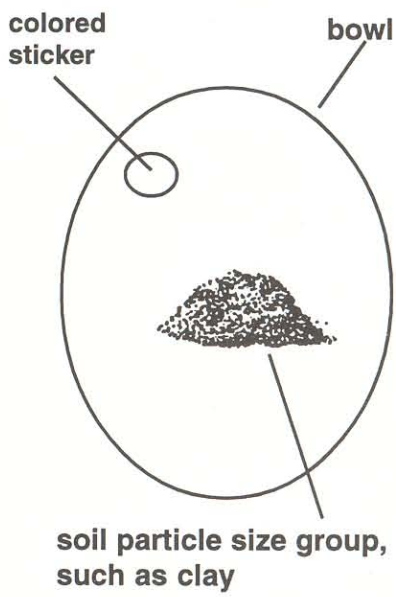
1. What is this?

2. Where would you find this?

3. Describe how it looks?

4. Describe how it feels?

5. Explain what you know about it.



Learning Center 2

Soil Trivia

Materials ---
set of cards with a question on each card (about 40), with answers
three game pieces
one dice
a generic game board

Instructions --- Read before starting game
1. Each student rolls the dice. The student with the highest number will be the reader of the questions, but does not play
2. The others in the group pick a marker, place it on start and roll to see who goes first. High number goes first.
3. Each question must be answered correctly to move the number of spaces rolled.
4. Each student answers only one question on their turn.
5. When finished, leave everything as you found it.

Questions Used for the Game ---
What is a compost? *an area where we put grass clippings create soil fertilizer*
True or False: Sand is the fine soft grain particles in soil. *False*
True or False: Water and wind can carry away our soil. *True*
Give an example of people-caused erosion. *under swings, on playground, bike paths, path caused by animals, accept anything similar to these answers*
What happens to the earthworm when it rains? *it comes up for air*
Is soil the same everywhere? *no*
True or False: Gully erosion is the most dramatic form of soil erosion. *True*
Can all the soil on the earth be used for food production? *no*
What type of erosion can get in the way of using farm equipment? *gully erosion*
True or False: All soil is brown. *False*
True or False: Sheet erosion is very noticeable. *False*
True or False: Gully erosion occurs on a steep slope. *True*
How can we tell if clay is in the soil? *it packs together well and stays together*
True or False: We can see the effects of sheet erosion better than the effects of rill erosion. *False*
True or False: Gully erosion is a severe problem on flat land. *False*
What do we need to do to the soil? *protect and conserve, or plant on, accept either of these or anything similar*
What did we say could be compared to a bomb? *a raindrop*
What is missing from "clean" sand? *humus*
True or False: The result of sheet erosion is small channels. *False*
Where is wind erosion of greatest concern? *prairies, areas with little or no vegetation, Texas, accept any of these*
What are the three types of soil erosion caused by water? *sheet, rill, gully*

continues

What kind of soil is most likely to be taken first during the soil erosion process? *the top soil, the most fertile soil, the good soil, accept any of these*
What is soil erosion? *a force that takes away or disrupts the soil, accept anything similar to this*
True or False: Silt is fine; it feels soft. *True*
What goes in when the sun shines, but goes out when there's rain? Look for it on a clear day and you look in vain. *the earthworm*
Name two particles that you can find in humus. *leaves, twigs, roots, wood chips, dead bugs, accept any of these*
Do earthworms breathe air? *yes*
Where can we find soil? *everywhere*
Where do you find "clean" sand? *the beach*
How can we prevent wind erosion? *plant grass, windbreaks, accept anything similar to these*
Name three things that you might find in soil. *sand, silt, humus, clay, pebbles, accept any of these*
Soil erosion can do what to the price of food. *increase it*
True or False: Wind causes more erosion in dry areas. T*rue*
What particle in soil does not stick together well and has large grains? *sand*
Soil erosion can be reduced by doing what? *planting grass, planting trees, windbreaks, vegetation. accept any of these*
True or False: Wind erosion occurs in areas of high prevailing wind speeds and low annual rainfall. *True*
Is wind erosion worse in forests or prairies? *prairies*
What is land slippage? *soaked soil that moves down slopes because of gravity; mud slides, land slides, similar to an avalanche*

Learning Center 3

Earthworm Observations

Materials ---
4 plastic bowls each with soil with one earthworm in each
foil to cover each bowl when not in use
pencils
paper
newspapers or sheet of plastic cloth (to keep area clean)
wet cloth for wiping hands and cleaning
4 sets of 8 questions about earthworms
folder

Instructions for students ---
1. Each get a piece of paper, a bowl, and one stack of cards.
2. Carefully take off the foil off the bowl.
3. Look carefully at what is in your bowl.
4. Explore the soil with your hands.
5. Keep the contents in the bowl.
6. Answer all of the questions on the cards. Remember to write the number of the card in front of your answer.
7. When finished with the card turn your paper over and write a short story about your earthworm. Make up an adventure for your earthworm - "The Day in the Life of a Worm."
8. Before leaving, put the foil back on the bowl. Use the wet cloths to wipe your hand and clean work area. Put your paper in the folder.
9. Leave everything as you found it. Did you put your name on your paper?

Questions used --- (could be a worksheet)
What do you see?
How do earthworms breathe?
Watch the earthworm move. How does it do this?
What does the earthworm look like? Look closely.
What does the earthworm do when you touch it gently with your finger.
Is your earthworm active?
Is it moving around a lot?
Where can you find earthworms?
Do earthworms come out every time it rains?
What is one thing an earthworm might eat?

Learning Center 4

Soil Electronics

Materials ---
worksheet (to record student's answers)
3 electronic game folders
3 battery-bulb systems
pencils
folder - to collect worksheets

Instructions for students ---
1. Each one take a folder, electric system (instructions for making on the back), a worksheet and a pencil.
2. Put your name on the worksheet.
3. Choose a question, touch one wire to the hole on the left and the second wire to the hole on the right that correctly answers the question. (The bulb lights up if your answer is correct.)
4. Write answers on worksheet.
5. If there is time, trade folders with someone else who is finished.
6. When you leave, put your papers in the folder.

Questions used on folders ---
Yellow folder:
In the 1930's what did wind-erosion cause? *the Dust Bowl*
What goes in when the sun shines but goes out when there's rain? Look for it on a clear day and you look in vain. *the earthworm*
Besides water what is the one other thing that can cause soil erosion? *the wind*
What is a sign of people-caused erosion? *mud puddles under the swings*
Wind erosion occurs in areas of high prevailing winds and low-annual rainfall. How can we prevent wind erosion? *windbreaks*
Soil erosion can do what to the price of food? *increase it*
Land slippage is similar to what? *an avalanche*
What can we make by using our grass cuttings after mowing the yard? *a compost*
What in soil does not pack well and has large grains? *sand*

Blue Folder:
What soil particle group is soft and velvety? *silt*
What soil particle group is rough? *sand*
What soil particle group allows for good packing? clay
What soil particle group consist of twigs, leaves, and wood chips? *humus*
What in soil do plants and trees depend on for growth? *nutrients*
What can we compare a bomb to? *a raindrop*
What do we need to do to the soil? *protect it*
What is one problem we face with soil erosion? *low-food production*

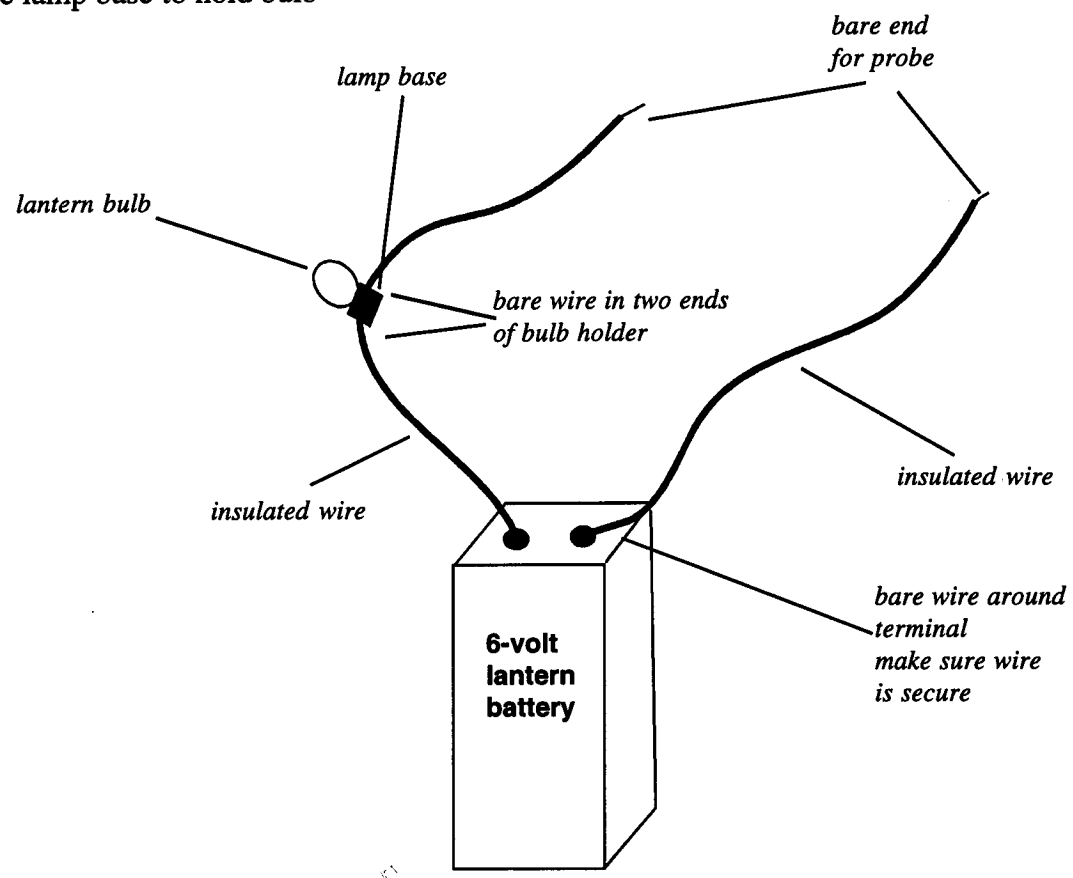
continues

What type of soil is most likely to be taken first during soil erosion? *the top soil*
What is erosion? *a force that takes away or disrupts the soil*
What happens to an earthworm when it rains? *comes to the top*

Green folder:
What type of soil erosion occurs on a steep slope? *gully*
What was the film that we found in the water after separating the soil particles? *clay*
What particle is in the type of soil that tends to make things dirty? *humus*
Where is wind erosion of greatest concern? *prairies*
Besides food production what other problem can soil erosion cause? *washing out of roads*
What should we do to our soil? *conserve it*
Where is soil? *everywhere*
Where does the wind cause alot of soil erosion? *dry areas*
Where can you find "clean" sand? *beaches*
Soil erosion can be reduced by doing what? *planting*

Directions for making battery, bulb, wire system

Materials ---
6-volt lantern battery
3 insulated wires with 1" stripped from each end
1 screw-in lantern bulb that can handle 6 volts (Radio Shack, Walmart, K-Mart, etc.)
1 screw-in type lamp base to hold bulb
tape

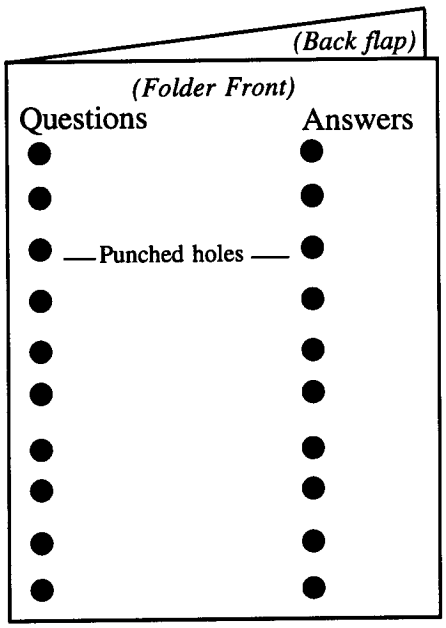


Directions for making electronic game folders

Materials ---

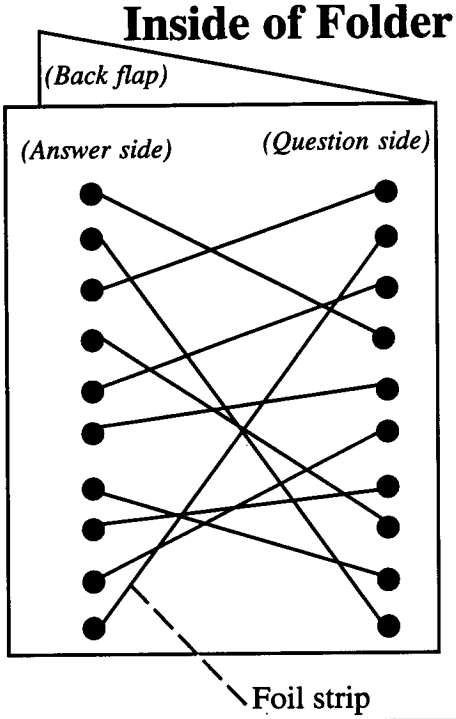
3 folders - yellow, blue, and green
aluminum foil
tape (cellophane, masking or mailing)
hole punch

Outside of Folder



Front folder flap

Inside of Folder



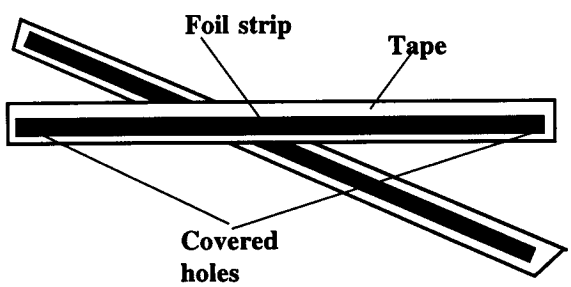
Backside of front folder flap

Mark and punch holes for 10 questions and 10 answers. Leave enough space between holes to write questions and answers beside each punched hole (see illustration at left).

Write questions and answers on the outside of the folder, mixing them so answers are not directly across from the corresponding question.

Turn folder over and on the backside of the folder front place aluminum foil strips from the question to the correct answer. Tape foil in place. Make sure foil completely covers holes. Individually, completely cover the entire foil strip with tape or circuit will not complete (see illustration below). As you add foil strips, turn folder over and test each strip with battery device, making sure answer and question match correctly. If light burns, ciruit completes.

When all circuits work correctly and all questions and answers match as you intend, tape the folder flaps together so connections are not disturbed.



Name_____

Soil Electronics Worksheet

Write your answer in blank of corresponding number.

Folder --- Yellow

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

Folder --- Blue

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

Folder --- Green

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

Learning Center 5

Writing Center on Wind and Water Erosion

Materials ---
6-8 pictures (mounted on cardboard) of different types of wind and water erosion, such as gully, rill, sheet, etc.
paper
pencils
folder

Instructions for students ---
1. Each student chooses one picture and takes a pencil and a piece of paper.
2. Write your name on your paper.
3. Look carefully at your picture. Write as much as you can that describes **what** is happening to the soil and why. Then explain why this is happening to the soil. Then explain what could be changed to protect the soil.
4. If you have time, you may turn your paper over and draw a picture with the new changes you suggested OR you may choose a new picture and repeat the instructions in #3.
5. When you leave, stack the pictures for the next students and place your papers in the folder.

Learning Center 6

Exploring Soil - Testing for Clay

Materials ---
small paper plates
eye droppers
dish of soil with lid
water
plactic spoons
paper
wet cloths for wiping hands and cleaning
large bowl for collecting soil - please recycle soil

Instructions for students ---
1. Get one paper plate and one piece of paper. Write your name on the paper.
2. Remove the lid from the dish of soil and put one spoonful of soil on your paper plate. Replace lid.
3. Look carefully at your soil. Write a few sentences about what you see.
4. Take an eye dropper and get some water.
5. Drop one drop on your soil. Write a few sentences on what happened and why you think this happened.
6. Use your eye dropper again. Add enough water to make a ball out of you soil. Be sure not to add to much water!!
7. Does your soil pack nicely? Write a few sentences on how your soil packed and why.
8. Dump your wet soil into the big bowl when you are finished. Use the wet cloths to wipe your hand and clean work area.
9. Leave everything as you found it.

Integration Ideas

PHYSICAL EDUCATION

Guiding Question: What is erosion? What will prevent erosion?
Objective: Develop locomotor skills (walking, running, skipping, leaping, sliding, and hopping); and explore nonlocomotor movements (bend/stretch, swing/sway, twist/turn, shake/bounce, push/pull/lift).
Materials: None
Source: Project L.I.F.E., 1981, Washington State Conservation Commission, p. 28.

The activity can be adapted to erosion concepts. Children could pretend to be soil in blowing wind; or to be soil washing away during a rain. Some students could be designated as plants. Any soil close to them (other students) would not move around like soil without plants. (Use your imagination on this and let the kids have fun!)

LANGUAGE ARTS

Guiding Question: What is soil?
Objective: Engage in writing and develop process writing skills, and develop/broaden vocabulary.
Materials: Balloons, paper, pencils
Source: Debbie West classroom teacher, Kellogg Science Magnet, Wichita, Kansas

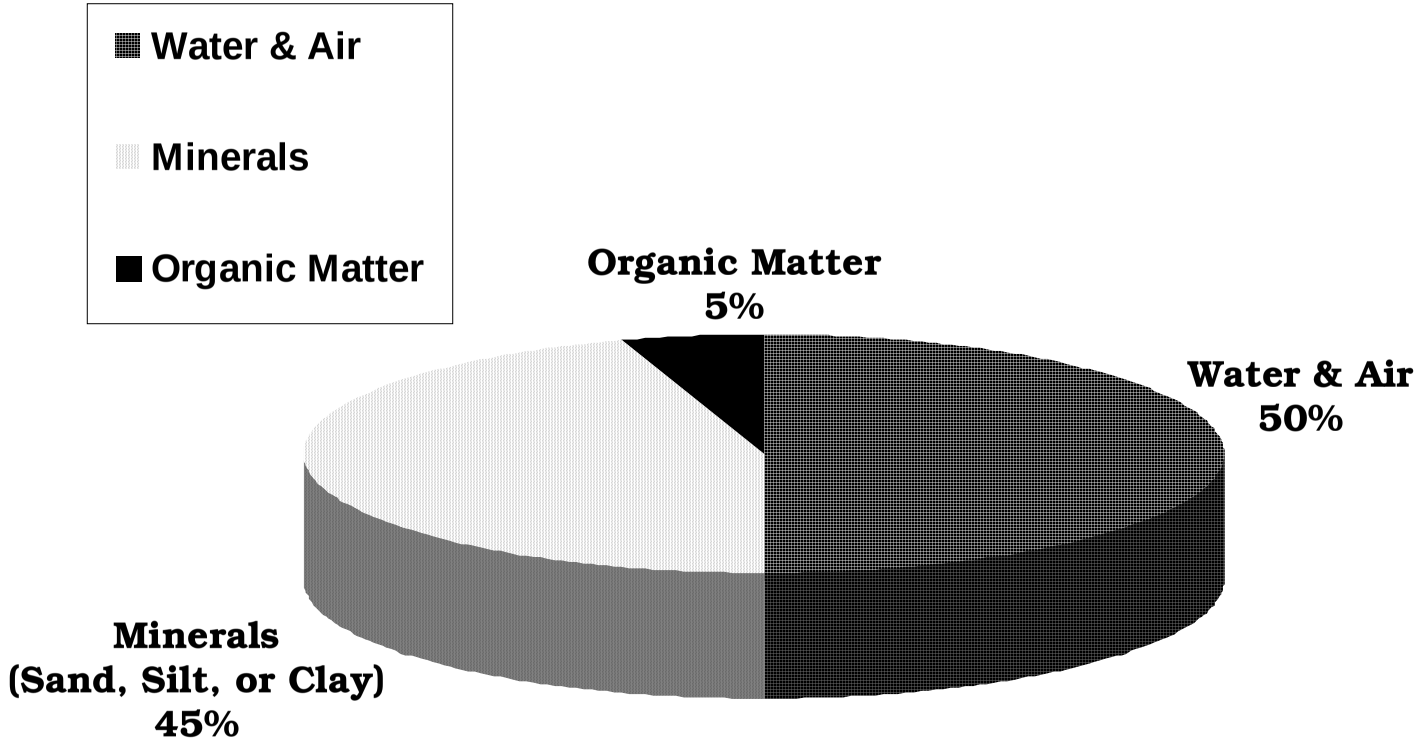
Select various words from the science lessons to be used as spelling/vocabulary words, such as worm, rock, soil, etc. Print the word on a balloon and hang in various parts of the room. Incorporate those words into sentences for writing practice. ("I saw a worm in the soil." "Rocks are in soil.")

APPENDIX

USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

Helping People Help the Land

A Soil Recipe



Visit your local NRCS office to learn more about natural resources conservation. The office is located at your local USDA Service Center (listed in the telephone book under United States Government). More information is also available on the Kansas Web site at www.ks.nrcs.usda.gov.

May 2006

USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

Helping People Help the Land

Kansas State Soil
Harney Silt Loam

What's So Important About Soil?

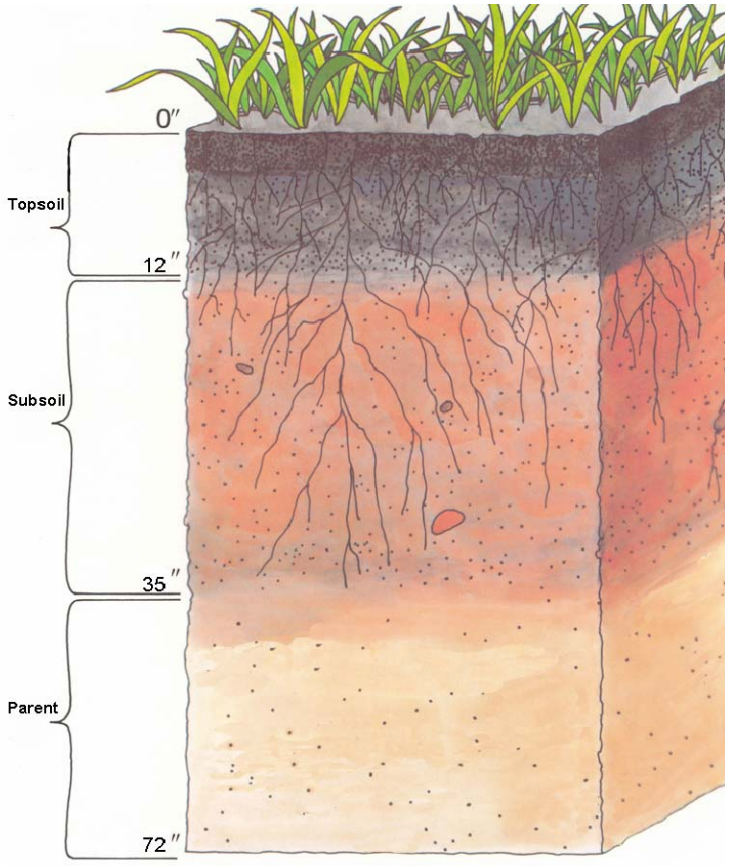
Soil is Kansas' most valuable resource. Combined with the state's climate and water supply, soil supports our No. 1 industry – agriculture. Agriculture contributes nearly $8.7 billion each year to the Kansas economy.

How Did Our Soils Become So Good?

The Kansas state soil evolved under prairie grasslands and over time developed the rich, deep topsoil used by farmers and ranchers today. The vast grassland sea gave way to the plow as pioneers sought to raise grain crops for themselves and their livestock. It has the right soil quality, growing season, and moisture supply to produce sustained high crop yields when modern agricultural methods are used. Kansas soils are known around the world for their exceptional qualities.

Why A State Soil?

Due to the state's unique soil legacy and the completion of the state's most comprehensive soil inventory by the USDA Natural Resources Conservation Service, it was proposed that a typical prairie soil be selected to serve as an acknowledgment to the great agricultural heritage in Kansas. It also serves as a standard against which other soils can be compared.



Harney Silt Loam Profile

Why Harney Silt Loam?

Harney silt loam depicts all the desirable qualities of an ideal prairie soil, and it is the most extensive soil in the state covering 3,976,000 acres in westcentral Kansas. A variety of cash crops, irrigated and dryland, are raised on Harney silt loam. Livestock gets its food directly from this soil.

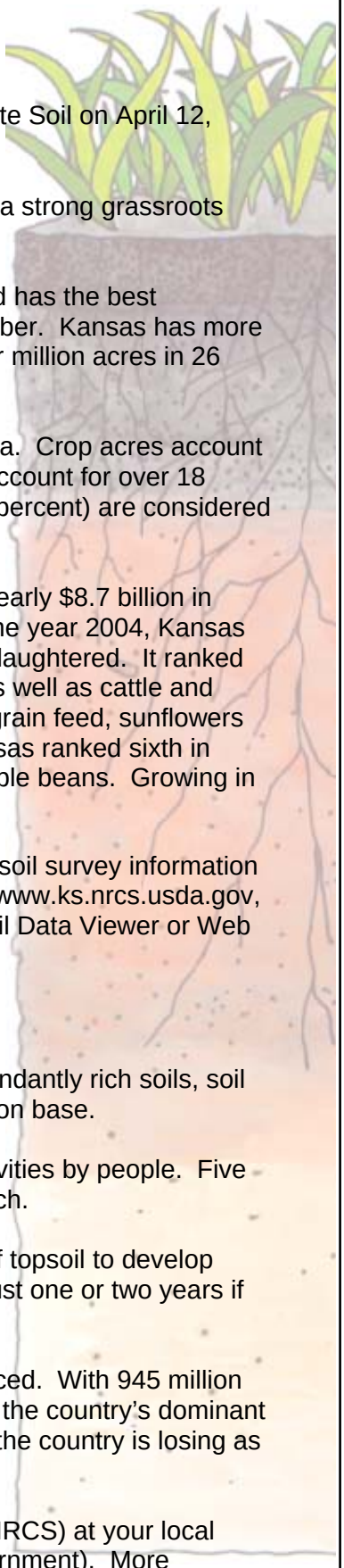
What is Harney Silt Loam?

Harney is a very deep, nearly level to moderately sloping, well-drained soil on flat ridgetops and sideslopes. Harney soils formed in wind-blown silts called "loess."

This soil typically has a dark grayish-brown silt loam topsoil layer about 12 inches deep. Below this lies the subsoil layer that is about 23 inches thick. The upper part of the subsoil layer is grayish-brown silty clay loam, and the lower part is brown, calcareous silty clay loam. The parent layer is 35 to 72 inches deep and is a yellowish-brown, calcareous silt loam with a few chalky sediments (see profile above).

Salina, Kansas
May 2006

The Roots of a Great State – Our Soil



Did You Know?

Harney silt loam, state mapunit symbol 2612, was adopted as the Kansas State Soil on April 12, 1990, when Governor Mike Hayden signed Senate Bill 96.

Kansas was the seventh state to name a state soil. It took five years through a strong grassroots effort to get Harney named as the state soil.

Harney silt loam possesses the ideal qualities of a prairie soil. Prime farmland has the best combination of physical and chemical characteristics for producing food and fiber. Kansas has more acres of prairie soils than any other state. Harney silt loam covers almost four million acres in 26 westcentral Kansas counties.

Kansas has over 300 different soil types across its 52 million-acre surface area. Crop acres account for just over 26.6 million acres or 50 percent, while range and pasture lands account for over 18 million acres or 34 percent. Nearly 25 million of the 52 million total acres (48 percent) are considered prime farmlands. *****

Kansas soils directly impact the economic well-being of its people providing nearly $8.7 billion in annual income. Kansas is one of the nation's leading agricultural states. In the year 2004, Kansas was number one in all wheat produced, sorghum grain produced, and cattle slaughtered. It ranked second in sorghum silage produced, acres of cropland and prime farmland, as well as cattle and calves on farms. It ranked third in red meat production, cattle and calves on grain feed, sunflowers produced, commercial grain storage capacity, and acres of land in farm. Kansas ranked sixth in agricultural exports. Other Kansas crops include soybeans, corn, and dry edible beans. Growing in importance to Kansas agriculture is cotton. ******

Soils in every Kansas county have been identified and mapped. Since 2005, soil survey information is available for all counties on the Kansas NRCS Web site. To access, go to www.ks.nrcs.usda.gov, under "Information About," click on "Soils." Under this section, look for the Soil Data Viewer or Web Soil Survey.

Why Do You Need To Care About Kansas Soil?

Even though Kansas has a great agricultural heritage and is blessed with abundantly rich soils, soil erosion by wind and water continue to eat away at our food and fiber production base.

About 190 million tons of Kansas topsoil are degraded each year through activities by people. Five tons of topsoil spread over an acre is about the thickness of a dime or 3/32 inch.

Soils are not easily renewed in Nature. It takes about 500 years for an inch of topsoil to develop under prairie grasses. Unprotected crop fields can lose an inch of topsoil in just one or two years if exposed to wind erosion and heavy rains.

Farmland is threatened in every state, and once lost, it cannot be easily replaced. With 945 million acres--300 million of them prime land--in production nationwide, agriculture is the country's dominant land use. Sources that monitor the status of farming in America indicate that the country is losing as many as 1 million acres per year of prime farmland. *******

For more information, contact the Natural Resources Conservation Service (NRCS) at your local USDA Service Center (listed in the telephone book under United States Government). More information is also available on the Kansas Web site at www.ks.nrcs.usda.gov.

***** *National Resources Inventory, USDA Natural Resources Conservation Service*
****** *Kansas Department of Agriculture*
******* *Iowa State University, University Extension*

How Much Longer Can We Afford to TREAT OUR SOILS LIKE DIRT?

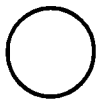
I. Definitions

A. Dirt - Filth, grime, gossip, SOIL

B. Soil - Surface layer of the earth that consists of SAND, SILT, and CLAY that support plant life.

1. Sand - Coarse, gritty particles. Identifiable minerals.
   Examples: Hourglass sand, beach sand, sandpaper.
2. Silt - Intermediate-size particles; not gritty. Silt clods soft, easily breakable when dry; silt, not shiny or sticky when pressed between thumb and forefinger, moist.
3. Clay - Fine particles. Clay clods hard and unbreakable when dry; produce a smooth, shiny ribbon moist when rubbed between thumb and fingers.

Blackboard Examples:

SAND	SILT	CLAY
		
Diameter - 40 in.	1 in.	.04 in.

II. Soils

Soils, like adult human beings, are the product of **Heredity, Environment,** and **Time**.

	Humankind	**Soils**
Heredity	Parent's Genes and Chromosomes	Parent Material, Geologic materials of weathered bedrock or deposits of wind, water, or ice.
Environment	Acquired knowledge and experience at home, play, and school.	Land Slope affects water intake, runoff, and erosion.
	Climate (temperature and moisture)	Climate influences weather, loss of fertility, and type of vegetation.
		Vegetation - Forest, prairie grassland, or desert shrubs
Time		Time

A short, short course for elementary school teachers developed by Orville Bidwell, Dept. of Agronomy, Kansas State University, Manhattan, Kansas 66506. January 1990

III. Some influences of the five soil-forming factors

A. Parent Materials: Sandstone weathers to sandy soils.
Shale and limestone weather to clayey soils.
Deposits of wind produce silty soils.
Deposits of water produce gravelly, sandy, silty, and clayey soils.
Deposits of ice produce cobbly, gritty, and gravelly soils.

B. Land Slope: Steep slopes produce rapid runoff and erosion.
Moderate slopes produce moderate runoff and erosion.
Level slopes produce little runoff and erosion and maximum penetration of moisture.

C. Climate: High temperature and moisture produce rapid weathering and chemical fertility loss known as leaching.
Low temperature and moisture produce slow weathering and leaching.
High moisture produces forest vegetation.
Intermediate moisture produces grassland prairie vegetation.
Low and inadequate moisture produces desert shrub vegetation.

D. Vegetation: Influences- Soil Color Organic Matter Chemical Fertility

Forest	Light	Low	Low and Acid
Prairie	Dark	High	High and Neutral
Desert	Light	Low	High and Alkaline

E. Time: Time is required for the above processes to take place. In general, the longer the time element, the more apt is the soil to develop a clayey subsoil.

IV. Using soil properties to classify soils
Soil scientists use soil properties such as slope, particle size, depth, color and degree of development to name and classify soils.

In October 1987, the Soil Conservation Service, now the Natural Resources Conservation Service (NRCS), completed mapping the state after 50 years of strenuous effort. Now each county has it own published soils booklet. (Copies may obtained either from the local office of the County Extension Service (CES) or the NRCS.)

V. School teachers are encouraged to consult the offices of CES or NRCS for assistance in preparing lesson plans using the county soil survey report.

VI. Selection of Harney Silt Loam as the official state soil for educational programs. The Harney silt loam was selected as the state soil because:

A. It has ideal properties of a prairie soil, of which Kansas has more acres than any other state;
B. Its nearly 4 million acres in 26 westcentral counties is the most of any of the state's more than 300 different soils;
C. Its uneroded profile is an ideal model to which other soils may be compared;
D. Its high crop-yield record has contributed to the state's economic wealth; and
E. Its excellent properties make it an ideal soil to commemorate the completion in October 1987 of the State's soil inventory by more than 75 soil scientists of the SCS and the Kansas Agricultural Experiment Station.

Conservation Glossary

Acre — A unit of measurement of land. It is equal to the area of land inside a square that is about 208 feet on each side (43,560 square feet).

Algae — Microscopic green plants that live in water and on land. They serve as food for other organisms.

Alum — A potassium or ammonium aluminum sulfate used especially as an astringent and styptic.

Bacteria — Microscopic organisms that live on water and on land. They help break down organic materials into simpler nutrients in a process called decay. Bacteria release nutrients to the soil.

Bedrock — A more or less solid layer of rock found on the surface of the land or below the soil.

Biochemical — Of or relating to biochemistry; characterized by, produced by, or involving chemical reactions in living organisms.

Carbon Dioxide — A colorless, odorless, nonpoisonous gas that forms carbonic acid when dissolved in water, produced during combustion and microbial decomposition.

Composting — Mixing decaying organic matter (food scraps, grass clippings, leaves) to form a rich soil conditioner.

Conservation — Saving by wise use; planned management of a material resource to prevent exploitation, destruction, or neglect.

Decomposing — Separating into constituent parts of elements or into simpler compounds, undergoing chemical breakdown.

Erosion — The wearing away of land surface by wind or water. Erosion occurs naturally from weather or runoff but is often intensified by peoples practices.

Flood plain — Nearly level land situated on either or both sides of a channel that is subject to overflow flooding. Lowland and relatively flat alluvial areas adjoining inland waters.

Fungi — Small simple plants that lack chlorophyll. The individual cells have a nucleus surrounded by a membrane, and they may be linked together in long filaments called hyphae, which may grow together to form a visible body. Simple fungi are useful in stabilizing solid waste and sewage.

Habitat — An area of land in which plants and animals live, grow, and reproduce.

Humus — Highly decomposed plant and animal material that is a part of soil.

Hydrologist Cycle — The cycle of water movement from the atmosphere to the earth and back again through these steps; evaporation, transpiration, condensation, precipitation, percolation, runoff, and storage.

Immunity — A condition of being able to resist a particular disease, through preventing development of a pathogenic microorganism or by counteracting the effects of its products.

Inert - Lacking the power to move; lacking a usual or anticipated chemical or biological action; very slow to move or act.

Inorganic — All chemical compounds in nature, except the compounds of carbon, but including the carbonates.

Interaction — When two or more things do something to one another, they interact.

Land — One of the major factors of production that is supplied by nature and includes all natures resources in their original state such as mineral deposits, wildlife, timber, fish, water and the fertility of the soil.

Lime — From the strictly chemical standpoint, refers to only one compound, calcium oxide (CaO): however, the term is commonly used in agriculture to include a great variety of materials that are usually composed of the oxide, hydroxide, or carbonate of calcium or of calcium and magnesium; used to furnish calcium and magnesium as essential elements for the growth of plants and to neutralize soil acid ty. The most commonly used forms of agricultural lime are ground limestone (carbonates), hydrated lime (hy droxides), burnt lime (oxides), marl, an oyster shells.

Limestone — A sedimentary rock composed of calcium carbonate, CaCO3. There are many impure varieties.

Microbial — Pertaining to a group of microorganisms (germs).

Microorganisms — Those minute organisms invisible or only barely visible to the unaided eye.

Millipedes — A small crawling animal; any numerous myriopads (class Diplopoda) having usually a cylindrical segmented body, two pairs of legs on most apparent segments and no poison fangs.

Mineralization — The conversion of an element from an organic form to an inorganic state as a result of microbial decomposition.

Minimum Tillage — Raising crops with small amounts of soil disturbance. Most of the residue from the previous crop is left on the surface.

Mineral — A natural inorganic substance that possesses a definite chemical composition and definite physical and chemical properties.

Mineral Nutrients — Elements, or compounds, essential as raw materials for organism growth and development, such as carbon, oxygen, nitrogen, phosphorus, etc. The dissolved solids and gases of the water of an area.

Mold — A superficial often wooly growth produced on damp or decaying organic matter or on living organisms.

Nutrient — A substance that supplies nourishment for an organism to live. It can be food or chemicals depending upon the organism.

Organic Matter — Plant and animal material in various stages of decomposition that may be part of the soil.

Parent Material — The earthy materials — bone mineral and organic — from which soil is formed.

Percolation — The downward movement of water in soil.

Permeability — The quality of soil that allows air or water to move through it.

Pore Spaces — The area of the soil through which water and air move. The space between soil particles.

Residue — Material that remains after gases, liquids, or solids have been removed.

Sandstone — A sedimentary rock consisting usually of quartz sand united by some cement (as

silica or calcium carbonate).

Serrated — A jagged edge.

Soil — A naturally occurring mixture of minerals, organic matter, water, and air which has a definite structure and composition and forms on the surface of the land. A kind of soil is the collection of soils that are alike in specified combinations of characteristics. Kinds of soils are given names in the system of soil classification. The terms "the soil" and "soil" are collective terms used for all soils, equivalent to the word "vegetation" for all plants.

Soil Horizon — A layer of soil that is nearly parallel to the land surface and is different from layers above and below.

Soil Mantle — The soil that covers the earth's surface, such as a carpet would cover a floor. This is the top layer that covers the surface.

Soil Survey — A general term for the examination of soils in the field and in laboratories; their description and classification; the mapping of kinds of soil the interpretation of soils according to their adaptability for various crops, grasses, and trees; their behavior under use or treatment for plant production or for other purposes; and their productivity under different management systems.

Soluble — Susceptible of being dissolved in or as if in a fluid. Capable of being loosened or dissolved.

System — A group of related objects that form a whole.

Terrace — A soil conservation practice in which ridges or steps are built on slopes to slow down runoff and increase soil moisture.

Texture — The relative proportions of the various soil separates in a soil as described by the class of soil texture.

Waterway — A grassed linear strip used to convey water from crop fields so that a runoff does not cause erosion.

Weathering — The disintegration and decomposition of rocks and other earth materials through exposure to the atmosphere; one of the major factors in soil formation.

Windbreaks — A living barrier of trees or combination of trees and shrubs located adjacent to a farmstead, field, feedlot, or other area to protect soil resources; reduce wind erosion; conserve energy or moisture; control snow deposition; provide shelter for livestock or wildlife; or increase the natural beauty of an area; also called field windbreak, feedlot windbreak, or farmstead windbreak, depending upon the intended use.

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For additional resource material on land use, contact your local Natural Resources Conservation Service (NRCS) field office listed in your telephone directory under United States Department of Agriculture, Natural Resources Conservation Service.