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DOES YOUR SOIL HAVE GOOD STRUCTURE? GIVE IT THE SLAKE TEST, PG 3

The Soil Daily Times

Conservation Writing & Jim Claypool Art Contest | Soil | 2014

PROTECT KENTUCKY'S SOIL

Soil is one of Kentucky's most important, but least appreciated, natural resources. Our marketable products – livestock, tobacco, grain, pasture, hay and timber – all come directly or indirectly from the soil. Even our state tree (Tulip Poplar) and state flower (Goldenrod) need soil to grow in.

Soil is also used as a foundation for houses and factories, for roads and dams, as a storage area and filter for groundwater, and as a disposal area for waste.

Crider soil was chosen as the best representative of Kentucky soil. It covers nearly a half-million acres, is widely distributed and is one of our most productive farming soils.

It's deep, well-drained and a moderately permeable type formed in a mantle of loess, a type of silt that forms fertile soils, in underlying limestone.

Crider soils are found in the Pennyroyal and Outer Bluegrass regions of Kentucky.

Although you might not live where Crider soils are found, it's easy to find out what kind of soil surrounds you. The Natural Resources Conservation Service has a web tool that allows you to search for your school or home location and find out what kinds of soil they are built on. Not only can you find out what kind of soil you have, you can also use the tool to find out how suitable that soil is for various land uses. Visit websoilsurvey.sc.egov.usda.gov/App/HomePage.htm.

What on Earth is Soil?

THE FOUR BASIC COMPONENTS:

45 percent

Minerals (these come from rocks that break down)

25 percent

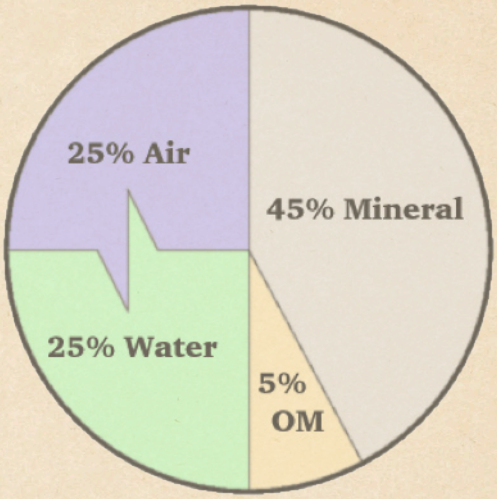
Air (gases take up space between soil particles)

25 percent

Water (needed by plants to grow, also keeps reactions going)

5 percent

Organic matter (dead tissue of plants, animals, and countless microscopic organisms)



Source: courses.soil.ncsu.edu/resources/physics/composition/compo3b.png

If we look closer at the mineral portion of soil, we might not see a difference, but we can FEEL it. Soil minerals are described by three particle sizes: sand, silt, and clay. All soils have some of each particle size, but not in the same proportion. Sand, silt, and clay are all very small, so it's hard to see them, but you can use your hands to really dig in! Here's how:

1. Place a small quantity of soil in the palm of one hand. Slightly moisten the soil with water. With the index finger of the opposite hand holding the soil, swirl the mixture in your palm. Feel the soil texture. Determine if the soil feels gritty (sand), smooth (silt), or sticky (clay).

2. Now, let's see how much clay is in your soil. Use a little more soil (about ¼ cup) and water to make a mud ball. Place the ball of soil between your thumb and index finger. Gently push the soil with your thumb, squeezing it upward into a ribbon. Try to make your ribbon a uniform thickness and width. The ribbon will naturally break at some point. Make at least three ribbons and measure them to see how long they are.

If your ribbon is less than 1 inch long, you've got little clay in your sample. If your ribbon is 1-2 inches long, you've got a moderate amount of clay in your sample.

If your ribbon is more than 2 inches long, you've got a lot of clay in your sample.

The Dirt on Soil

Scientists who study such things say you find dirt under your fingernails, while soil is the earth beneath your feet. It's the thin skin surrounding planet earth.

Soil makes up the upper layer of Earth that's capable of supporting plant life. Soil is made up of finely crushed rock, living and dead organic matter (leaves, twigs, dead bugs, live organisms, etc.), water and air. It's not just crushed up rock, but the living things in it, along with things they change and things they make.

WHY IS SOIL SO IMPORTANT?

As "Dr. Dirt," a soil scientist in Texas, notes on his web site, the "big deal" about soil depends on your point of view:

Those who farm are concerned with how well the soil can produce the bounty of crops they can grow to make money and provide for their families.

Those who are environmental engineers depend on how well the soil can purify itself when faced with contaminants.

Those who construct buildings, bridges and roads are concerned with how well soil can support weight. (The leaning Tower of Pisa was built on soil that could not support it.)

Those concerned about wildlife look at soil's ability to provide food and shelter for animals.

Those who garden depend on the soil to help them provide food for the dinner table.

THE SLAKE TEST

Can Your Soil Pass?

Does your soil have good structure? Give it the slake test! Ray Archuleta, an agronomist with the USDA Natural Resources Conservation Service with a passion for soil health, has done the test scores of times. Anyone can do it, he says, and he predicts it will open your eyes.

"What happens with poor soil structure is that the pores collapse in water and the soil breaks apart," Archuleta says. "Soil with good structure—the untilled soil—can still be intact for the most part even 24 hours later. The reason for the difference is soil structure. Biological cementing, the work of soil microbes, glues the aggregates of the untilled soils together."

In a similar test, an infiltration or rainfall simulation test, Archuleta puts the two soil samples in wire mesh inserted into empty jars, then simulates rainfall onto them.

"When you put a tilled soil and an untilled soil in yarn jars and simulate rainfall onto them, you quickly see the untilled soil allows the water to infiltrate the whole profile. On the other hand, water stays on top of the tilled soil much longer," Archuleta says.

"I think these tests are powerful visual tools to help explain and help people remember how soils function" Archuleta continues. "I used to think if I tilled the soil—fluffed it up—it would allow more water in. But that's just not true. Tilling soil closes pore space and keeps rainfall from infiltrating. You've got to have pore space in your soil from top to bottom."

"The tests tell me in our watersheds we have an infiltration problem, not a runoff problem," he concludes. "What I mean is, if we focus on building healthy soils that result in more infiltration, we'll do what we need to do to eliminate much of the runoff."

You can watch Archuleta perform both of these tests on YouTube:

- http://www.youtube.com/watch?v=9_ItEhCrLoQ&feature=youtu.be
- http://www.youtube.com/watch?v=Rpl09XP_f-w.

soil profile

Ever wonder what's going on in our soil? A soil horizon is a layer of soil. This soil profile has five horizons: O, A, B, C, and R. Only well-developed or healthy soil has all of these layers. Usually each horizon is obviously different – generally in color and texture. If soil isn't healthy, for instance soil that has had a lot of construction done on it, it may lack distinct horizons.

O – Usually about 2 inches deep, this organic layer consists of fallen leaves and decomposing plants and animals. This layer cushions falling raindrops, slows runoff and filters out pollutants. The humus (residue from these decomposing materials) is full of important nutrients. This layer is usually very dark.

A – This layer is about 10 inches deep. It is the topsoil layer that is plowed and planted for crops. This layer is also where most plant roots are located. Tree roots help hold soil in place and filter pollutants from water passing through. This layer is not quite as dark as the O layer above.

B – The subsoil layer is about 30 inches deep. This layer is where most of the minerals from the topsoil layer collect, but it has fewer organic materials. Burrowing animals, rodents, and insects create spaces for air and water and help mix the soil. When these creatures die, they get "recycled" into organic materials to enrich the soil. This layer is generally lighter in color than the above layers. When soil scientists describe this layer, they describe the kind and amount of minerals within it.

C – This layer is about 48 inches deep. It is a transition layer between soil and the partially disintegrated parent material that will eventually become soil. This layer is made up of slightly unbroken rock and very little organic material. Plant roots are not found in this layer.

R – The bedrock layer is about 60 inches deep. Over a long period of time, this rock becomes new soil.

soil on the move

Some soils form over parent material and stay there. And sometimes, wind, ice, water and gravity carry soil materials to other places.

On the sides and bottoms of many slopes, gravity pulls down rock, creating soil from rocks and particles from higher up.

what color is your soil?

Soil scientists use color charts to analyze the soil. The color of the soil can tell scientists what the original source material of the soil was, what nutrients are in the soil, and how much moisture has been in the soil. All of this information can help tell what plants will grow well in the soil or if the soil is appropriate for certain land uses.

The Smithsonian has an interactive online exhibit about color matching in soils. It can be found at http://forces.si.edu/soils/swf/colormatching.html.

make your own dirt shirt

1. Fill a bucket half full with water. Hot or boiling water works best.
2. Add enough dirt so the water is gritty and muddy looking.
3. Place a white cotton T-shirt in the bucket. If desired, tie knots in the shirt or tightly secure random sections with rubber bands for a tie-dye effect.
4. Use a long wooden stick to stir the shirt in the muddy water until the shirt has attained the desired color.
5. Hang the shirt in the sun to dry.
6. When the shirt is dry, rinse it in cold water to remove excess mud (using 1 cup of vinegar in the rinse can help set the color), then wash it in cold water in the washing machine and dry hot to set the color.

THE WORLD AS AN APPLE

Imagine the Earth as an apple cut into four quarters. Three quarters represent water. One quarter is land.

Cut one quarter in half again. One piece would represent land that is unsuitable for farming, such as desert or frigid regions. This leaves 1/8 representing land where we can live and grow food.

Cut that 1/8 into four more pieces. Three represent soil too poor to grow food or areas covered by cities.

That one tiny piece left, 1/32 of the apple, represents the amount of land available for farming. The peel represents the thin layer of topsoil used to produce food.

The American Farmland Trust, an organization devoted to preserving land for farming, notes that each year the United States loses more than 1 million acres of farmland. More than 75 percent of America's fruit, vegetables and dairy products are produced on farms near urban areas that can gobble them up as cities expand, it says.

KEEP IT COVERED

If you're trying to make your soil healthier, you shouldn't see it very often. In other words, soil should always be covered by growing plants, their residues, or a combination of the two.

Keeping the soil covered all the time makes perfect sense when you realize that healthy soils are full of life and that the microorganisms living in the soil have the same needs as other living creatures. They need food and cover to survive.

When you have a vegetative cover on the soil, especially a living cover, you offer those microbes both food and shelter. Some scientists say when you till the soil and remove crop residues, the effects are as devastating to soil microbes as a combination of an earthquake, hurricane, tornado, and forest fire would be to humans.

From the perspective of the living creatures within the soil, a tillage tool like a chisel shank has the effect of ripping the ground like an earthquake; removing residue is like a tornado ripping the roof off a house; uncovered soil can be drenched and whisked away by gushing water and wind like that of a hurricane—or scorched in the hot sun like an out-of-control fire.

To learn more about soil health, and to meet some of the farmers who are "Unlocking the Secrets in the Soil," visit nrcs.usda.gov.

VENUS & MARS

There is no soil on Venus or Mars, even though those planets have plenty of rocks. Massive windstorms on Mars grind boulders into fine dust. The acidic atmosphere on Venus cooks up new chemicals from rocks. Yet there are no living organisms there, so there's no soil. Living organisms make soil a material in which plants can grow. So thank an earthworm that you have dinner here on Earth. (Microscopic organisms don't tend to stop by to chat).

WOMEN IN MALI

Women in Mali in western Africa create stark black and white designs in Bogolanfini-translated as "mud cloth." Used in celebrations of life events such as births and marriages, the cloth is made in a complicated process involving white cloth, the "teas" of crushed plants and a black mud dye. The mud is collected from ponds and left to ferment in a covered pot for about a year. The women often spend weeks painting the elaborate designs.

START AN ENVIROTHON TEAM

If you really dig environmental issues, grab your like-minded friends and form an Envirothon team. The statewide competition allows high school students to team up on a series of hands-on outdoor contests to solve environmental problems and test their knowledge of natural resources.

The event is made up of a team of five high school students competing in five different areas: aquatics, forestry, soils, wildlife and a current issue. The 2015 current issue is "Urban Forestry." At each site, students will use their knowledge to participate in hands-on activities to complete a test.

The Kentucky Envirothon consists of two regional competitions. Top scoring teams from each of the regional competitions will move on to the state competition. The regional competitions are held in April of each year, and the state competition is held in May. Registration for next year's competition will begin in December.

Contact Information:

Your local conservation district (conservation.ky.gov/Pages/ConservationDistricts.aspx)

Division of Conservation (conservation.ky.gov/Pages/Envirothon.aspx)

Johnna McHugh - 502-564-2320 (johnna.mchugh@ky.gov)

Behold the Benefits of Organic Matter!

Organic matter matters. In fact, there may be no other component that's more important to a healthy soil than organic matter. The tiny fraction of soil composed of anything and everything that once lived—organic matter—is more than an indicator of healthy soils.

The carbon in organic matter is the main source of energy for the all-important soil microbes and is also the key for making nutrients available to plants. Here are just some of positive influences high levels of organic matter have on healthy soils:

1. Provides a carbon and energy source for soil microbes
2. Stabilizes and holds soil particles together
3. Supplies, stores and retains such nutrients as nitrogen, phosphorus and sulfur
4. Improves the soil's ability to store and move air and water
5. Contributes to lower soil bulk density and less compaction
6. Makes soil more friable (easily crumbled), less sticky and easier to work
7. Retains carbon from the atmosphere and other sources
8. Reduces the negative environmental effects of pesticides, heavy metals and other pollutants
9. Improves soil tilth (how suitable the physical condition of the soil is for growing plants) in surface horizons
10. Increases water infiltration rates
11. Reduces crusting
12. Reduces water runoff
13. Encourages plant root development and penetration
14. Reduces soil erosion

To learn more about soil health, and to meet some of the farmers who are "Unlocking the Secrets in the Soil," visit nrcs.usda.gov.

It's Alive!

Many people don't realize that soil, especially healthy soil, is full of life. Millions of species and billions of organisms make up a complex and diverse mix of microscopic and macroscopic life that represents the greatest concentration of biomass anywhere on the planet.

Bacteria, algae, microscopic insects, earthworms, beetles, ants, mites, and fungi are among them. All together, their value has been estimated at $1.5 trillion a year worldwide.

Like other living creatures, the organisms in the soil also need food and shelter. Some feed on dead organic matter, and some eat other microbes. As a group, they cycle nutrients, build the soil and give it structure.

The healthiest soils are those with a diversity and abundance of life. Farmers with the healthiest soils nurture that life by creating a diversity of plant life above the soil surface, with year-round ground cover, no tillage, and proper pesticide use.

Understanding that the soil is full of life is a game-changer for farmers who are farming with healthy soils in mind. For those producers, farming centers around feeding the organisms that build healthy soils.

To learn more about soil health, and to meet some of the farmers who are "Unlocking the Secrets in the Soil," visit www.nrcs.usda.gov.

CAN WORMS EAT YOUR GARBAGE?

You might know that the process of composting is a natural way to break down food scraps, grass clippings, and leaves. Usually this is done outside, maybe near the garden, and then the compost is added to the soil to help plants grow. But, did you know that with a little help from our worm friends that we can compost inside, too? The process of using worms to break down food scraps into nutrient-rich humus is called vermicomposting. Let earthworms turn your kitchen scraps into organic matter for your soil! Here's how:

You'll need:

- Shredded plain white paper for bedding
- A cup of garden soil
- Worms (red wigglers or small red worms; night crawlers won't work; bait shops or online are great places to get worms)
- Food waste (veggie/fruit peels, kitchen scraps; do not add animal products or citrus)
- Container with lid (plastic box or styrofoam)
- Tray

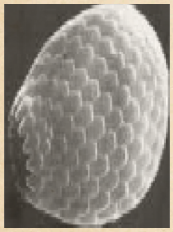
1. Drill/punch air holes in sides and bottom of container.
2. Shred paper and moisten with water. Squeeze out excess water.
3. Line container with layer of moist paper (cover bottom, about 2-3 inches deep).
4. Add a cup or so of garden soil (this provides grit worms need to "chew" the scraps).
5. Add a handful or two of worms (they will migrate to bottom).
6. Bury waste in bedding (rotate burial spots), making sure to cover completely with shredded paper.
7. Cover container firmly and place on tray to catch any liquid.
8. After 4-5 days, add more waste. As needed, add shredded paper to keep waste covered.
9. After about six months of burying waste, you'll be ready to harvest the worm castings (that's a fancy word for poop!).
10. To harvest, scoop contents of box into piles. Let worms migrate to bottom (they don't like light), harvest compost from top of pile, repeat until most compost is separated

WE LIVE HERE

The job of conserving and keeping the soil in top condition not only falls on the shoulders of people, but also on the microscopic and bigger creatures found in the soil below us.

NAKED AMOEBA SOIL PROTOZOA

Naked amoeba soil protozoa use their tiny tentacles to surround a food item and bring it into its body. A single amoeba can eat thousands of bacteria in a single day.



TESTATE AMOEBA SOIL PROTOZOA

Testate amoeba soil protozoa make a protective shell of silica, soil particles or calcium. They roam on the surface of soil in its water coating, feeding on bacteria found there.

FLAGELLATE SOIL PROTOZOA

Flagellate soil protozoa have one or two flagella (arm-like) that they use to pull themselves through the soil, releasing nitrogen for immediate plant use.

CILIATE SOIL PROTOZOA

Ciliate soil protozoa are the largest of the protozoa and the fewest in number. They eat tens of thousands of bacteria daily, which regulates the population. They use tiny fine cilia (hair-like) along their bodies like oars to rapidly move in soil.

NITRIFYING BACTERIA

Nitrifying bacteria (cross section view shown) act as decomposers that recycle the energy stored in dead organic matter back into plant food.

Ants live in large colonies underground. As they create their passageways, they make the soil looser.

Earthworms burrow through the soil, making it easier for plant roots to receive water and nutrients. Their waste adds nutrients to the soil.

Moles burrow through the soil, making the soil looser. These, and other burrowing animals, are often considered pests because they can undermine plant roots, and their "mole hills" can cause injury to people and animals who step in them.

You can see what kinds of bugs and worms live in the soil around your home by doing a simple experiment. Find a spot in the yard with your mom or dad that is okay to dig in. Dig a hole big enough for an approximately 4-cup bucket or container to fit in. Place the bucket into the hole and move the dirt just to the rim, so that the top of the rim is at the same height as the top of the dirt. After your bucket is in place, wait a day and come back and see if you have caught anything. You can keep looking every day for a week to find out what is living in your soil! Use a magnifying glass to look at your catches up close!

DEAR DR. DIRT —

What is the biggest animal that lives in dirt?
Signed, Hope

There are many animals that make homes or dens in the soil, starting with many too small to see with your eye. Many worms and insects spend part or all of their lives in the soil. Many rodents (mice, rats, gophers, prairie dogs, groundhogs, rabbits and hares) live in the soil, as do many reptiles (snakes, lizards, toads and tortoises). Several predators dig dens in the soil (foxes, badgers ...) and some live under rocks or in caves (bobcats, coyotes, cougars, wolverines, and even bears, to name a few). Worms are probably the largest animal that spends their entire life in the soil - there are some earthworms in Australia that are 2m long! Most of the larger animals sleep in a den in the soil, but spend much of their time roaming around looking for food.

You can e-mail your own questions to Dr. Dirt at:
crobinson@mail.wtamu.edu

Protecting Kentucky's Natural Resources

State agencies within the Commonwealth of Kentucky work with landowners across Kentucky to protect agricultural and natural lands. These state agencies work within the state's and country's laws to provide a way for landowners to make sure that the land's current uses are maintained over time.

Since 1994, the Purchase of Agricultural Conservation Easement Corporation has given the state power to buy conservation easements to ensure that farmlands are not changed to other uses. A conservation easement is a legal agreement that a property owner makes to limit development that can take place on the land. Landowners are also encouraged to dedicate their land to farming by donating easements. Donors may receive federal and state income tax and estate tax benefits.

The corporation works through the Department of Agriculture to select lands to be purchased through this program. Since the program started, easements on 88 farms for a total of 20,927 have been purchased and easements on 34 additional farms have been donated. Through this program, 25,565 acres have been protected from future development.

The Kentucky Heritage Land Conservation Fund also started in 1994. This fund also helps protect the state's soil by purchasing and preserving the state's natural lands for enjoyment by this and future generations. Natural areas that have rare or endangered species, areas important to migrating birds, areas that perform natural functions and areas that are to be preserved in their natural state for educational uses are eligible for conservation under this program.

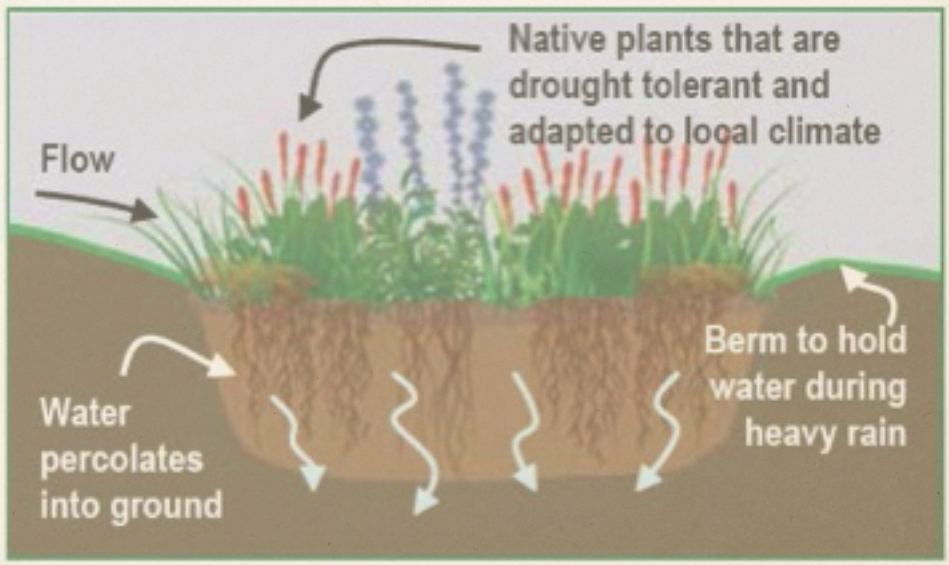
Kentucky's Agricultural

see NATURAL RESOURCES next pg ▸

MAKING STORM RUNOFF AN ASSET

When rain and melting snow run off across hard surfaces like pavement and rooftops, it picks up whatever is in its way – oil, salt, fertilizer, animal waste, vehicle fluids, dirt, litter, etc. – and eventually carries it into a storm drain. A storm drain is the opening into a system of pipes and ditches designed to quickly move stormwater created by rain and melting snow away from streets, homes, parking lots, etc.

Stormwater pipes don't flow to sewage plants for treatment. They empty directly into bodies of water, such as streams, rivers and lakes, without being cleaned. Increased untreated stormwater can pollute drinking water sources, pollute water recreation areas and cause illness, harm animals and plants that live in bodies of water and destroy stream banks and property with erosion.



As communities struggle to prevent the problems caused by increased stormwater runoff, they are faced with increased needs and decreased budgets. Many are realizing new approaches are needed for effective and more affordable stormwa-

see RUNOFF next pg ▸

...NATURAL RESOURCES

District Law passed in 1982, allows a landowner or a group of landowners who are farming 250 acres that share a boundary to apply to become an agricultural district. These agricultural districts protect our best agricultural land for food and fiber production and prevent its conversion to nonagricultural usage. There are currently 547 certified agricultural districts consisting of over 450,000 acres in 81 of Kentucky's 120 counties.

In order to create an agricultural district, the local conservation district board makes a recommendation to include land as an agricultural district, and then forwards information to the Kentucky Soil and Water Conservation Commission for approval.

It provides a way to protect farmland from being taken over for other uses (such as being added on to a nearby city). This law is one example of the ways Kentucky has been a national leader in protecting and promoting its farmland.

For more information on the Purchase of Agricultural Conservation Easements program, contact the Kentucky Department of Agriculture, Office of Ag Marketing and Product Promotion at 502-564-4983 or kyagr.com/marketing/PACE.html. For more information about the Kentucky Heritage Land Conservation Fund, call 502-564-2320 or visit heritageland.ky.gov. For more information about the Agricultural District program, contact the Division of Conservation at 502-564-2320 or visit your local conservation district.

...RUNOFF

ter management. One option is an approach that protects, restores, or imitates the natural water cycle and is called green infrastructure.

Green infrastructure means planting trees and restoring wetlands, rather than building a costly new water treatment plant. It means using existing water supplies more wisely instead of building a new water supply dam. It means restoring natural floodplains instead of building taller levees to keep floodwater out. It includes both the natural environment and human-designed systems to provide clean water, conserve natural systems, and provide a wide range of benefits to people and wildlife.

Green infrastructure solutions can be applied on different levels, from the house or building level, to the broader landscape level. On the house or building level, green infrastructure practices include rain gardens, permeable pavements, green roofs, infiltration planters, trees and tree boxes, and rainwater collection systems.

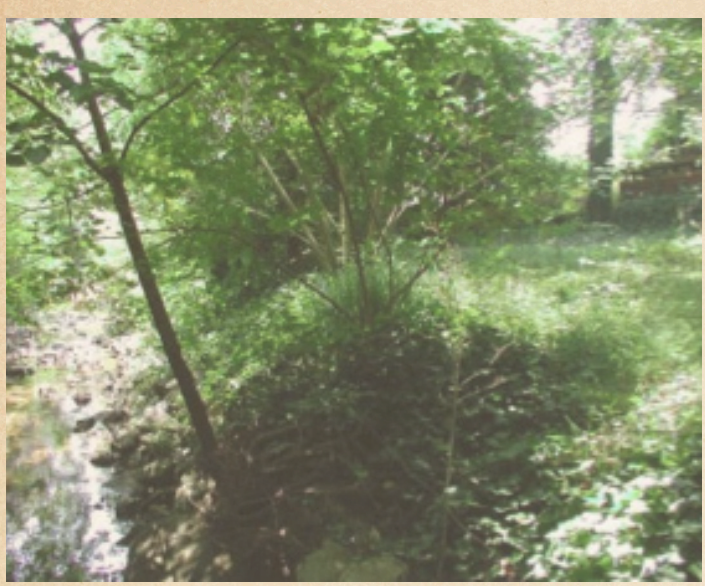
Rain gardens are becoming increasingly popular as a natural way to use stormwater as a resource rather than a waste. A rain garden is a shallow depression planted with native plants and designed to capture and soak up runoff from the hard surfaces in the area. It serves as a temporary pond that allows pollution to settle and filter out as the water slowly soaks into the ground.

Studies have shown that up to 70 percent of the pollution in our streams, rivers and lakes is carried there by stormwater runoff. Rain gardens can cut down on the amount of pollution reaching bodies of water by up to 30 percent.

Rain gardens provide other benefits as well. They help reduce the amount of stormwater entering bodies of water by holding back some of the runoff. This means less flooding and erosion. Rain gardens replenish groundwater by allowing the stormwater to soak in instead of letting it run off. They also provide valuable habitat for birds, butterflies and many helpful insects while adding to the beauty of the landscape.

Native plants are the best choice for a rain garden since they are adapted to the local climate, soil and rainfall amounts. This means they generally require less care and attention than other types of plants. Native plants have deeper root systems that improve the movement of water into the soil. Also, plants take in water through their roots and give off oxygen and water vapor into the air.

People are often concerned about increased numbers of mosquitoes from a rain garden. However, an effective rain garden is built so that water soaks into the soil within 1 – 2 days after the rain stops. Mosquitoes need 7 – 12 days to complete their breeding cycle, so the rain garden doesn't give them time to develop.



BACKYARD STREAMS

If you are lucky enough to have a stream in your backyard, help it stay healthy with plants. In many housing areas, trees and shrubs are cut down along streams and the stream banks are mowed to the edge of the water. This results in streams that are unshaded and causes bare, undercut, eroding banks that destroy property and produce muddy water. They often flood and contain heavy algae growth that choke out stream life by using up the oxygen.

Natural, undisturbed streams are lined with native plants that shade and stabilize the stream banks. You can help protect your backyard waterway by adding plants to your stream bank.

Healthy and effective stream "buffers" consist of a balanced mix of shrubs, trees, tall grass and wildflowers.

Vegetated streamside buffers protect your waterways in several ways:

- Natural vegetation slows runoff and allows it to soak into the ground, which recharges wells and reduces flooding
- The deeper roots of native plants, shrubs and trees help hold soil and control bank erosion
- Woody plants and tall grass filter soil, bacteria, fertilizers, pesticides and other pollution from storm runoff before it enters the stream
- Trees shade the water to keep it cool for fish, frogs and other stream creatures
- Shaded cool water holds more oxygen and prevents fish kills
- Native plants don't need fertilizers or extra water
- Stream buffer plants provide beautiful seasonal blooms and autumn color while attracting butterflies and birds

So instead of cutting grass to the water's edge, do your stream a favor and let it go natural with flowers, bushes and trees to enhance the health, beauty and value of your yard.

SO LET'S MAKE SOME SOIL

(Bring a good book to read while you wait. This could take several hundred years.)

First we need some mineral particles. Let's start with some bedrock – limestone is a common one here in Kentucky, but any bedrock will do. This will be the parent material. We'll grind it down through physical weathering – windstorms, streams running through or maybe just run a glacier over it. Add freezing and thawing, and eventually the rock will become fine particles.

This produces two bigger types of particles: sand and silt. You can easily see a single particle of sand. The light-colored sand feels gritty and doesn't hold water well because it has large spaces between particles. The darker silt is a tinier particle than you find at the beach. It feels smooth and can hold water better. The tiniest particles, though, are clay. You'd need a microscope to see them. Darker still, clay feels sticky and holds lots of water. Clay minerals come from chemical weathering. Basically water running over rock or the rock's exposure to air actually changes the minerals into a different substance.

Then in will move some lichens, often the first to settle in such an attractive new neighborhood. Next come microscopic decomposers including bacteria, fungi, and protozoa. They use the parent material and turn decomposed organic matter into humus to make nutrients for plants.

With plants, we'll also soon have earthworms, gophers and moles. Their burrowing helps stir the mixture, which helps us gain a balance of water and air. Soil with too much air and too little water will blow away and be inhospitable to plants. Too much water and too little air will drown plants, and we'll see all our worms gasping at the surface.

But we've just made a soil that is just right, with a rich blend of pulverized rocks, organic material, water and air.

Source: sedonaeye.com/dust-storm-crashes-close-i-10-west

THE DUST BOWL AND SOIL CONSERVATION

The term "The Dust Bowl" refers to a period of time that occurred primarily in the 1930's in the central area of the United States commonly referred to as the Great Plains. This time was characterized by large dust storms that significantly impacted over 100 million acres in the both the central United States and Canada, displaced thousands of farming families and negatively affected the economy of the entire nation for years afterward.

The Dust Bowl was caused by several factors, including a very severe, naturally occurring drought that struck the nation at this time. However, the other primary factor was one due to man: poor farming and soil erosion practices for years prior to this drought. At that time, people did not have a good understanding of conservation and their effects on the land. Farming technology was rapidly progressing at the same time. The bigger and better machines allowed people to clear more land faster, to plow deeper, and to farm areas that they may not have farmed before. With the removal of natural vegetation that had deep root systems that retained moisture in the ground, the drought was worsened. As the drought worsened, it became drier, and more vegetation was lost, and more soil was exposed. It was a difficult cycle that once started, only continued to worsen.

As the drought conditions worsened, the exposed soil was dry. With no plants to retain moisture and roots to hold the soil in place, it would simply dry completely out, turn into dust, and blow away when strong, dry winds would occur. These dust storms were referred to as "black blizzards", and would completely remove soil from some areas, while depositing feet of dust in areas downwind. These storms were so strong, and the dust so fine, that some of it was carried all the way to east coast, over 1,000 miles away.

So, how did we break this cycle? Obviously, nature had to help some when the rain slowly started to return. But the human response was much more important. Soon after this disaster, people realized that they had to learn from this, and local counties in these affected areas began to form local conservation districts. These districts were developed to discuss, research, educate, and help local landowners to farm in a responsible manner to avoid making the same mistakes, and to help restore the natural balance that was lost during this event. Conservation districts then began to spread to all areas in our nation that had a farming community.

By the mid 1950's, each Kentucky county had its own local conservation district. These districts were charged with helping their communities grow while protecting and conserving their natural resources. From the lessons learned from the Dust Bowl many years ago, today our conservation districts help landowners in various ways. The erosion that happens in Kentucky is typically

see **DUST BOWL** next pg ▸

...DUST BOWL

from too much water, instead of too little like during the Dust Bowl. So, many of the Best Management Practices (BMPs) that are offered by the state and federal governments through our conservation districts are to prevent the erosion of soil into our waterways. Some examples of these are: no-till planting, strip cropping, rotational grazing, planting vegetative buffers along streams, etc. Other objectives of these practices are to prevent pollution from livestock waste and from pesticides, to protect waterways by planting vegetation along them, to provide ground cover to both prevent soil erosion and guard the integrity (moisture and nutrients) of the soil. The conservation districts offer help to farmers in planning these practices, offering the use of equipment at a low cost to accomplish these practices, offering environment education programs in their counties.

While we have come a long way in this effort, there is still work to be done. We have not resolved all issues with conserving our important natural resources, and we continue to learn more effective techniques to try to work with nature. Even with all the lessons learned from the Dust Bowl, we have seen dust storms on the increase in the Great Plains in recent years. Studies have even shown that this increase in dust storms could be affecting things like glaciers melting at a fast rate in the Rocky Mountains (the dust is dark in color, and when it is deposited on top of the ice, it absorbs sunlight, thus increasing temperature and making the ice melt faster). Dust from these storms also decreases visibility. On October 29, 2013, there was a traffic pile-up on an interstate in Arizona in which 19 vehicles were involved due to a dust storm and decreased visibility. Examples such as this show that, even though we have made great progress, we still have work to do with our conservation districts helping landowners resolve these natural resource issues.

FARMERS FIGHT EROSION

Photo courtesy of Jay Nelson, DOC.

There is a creek in the wood line to the right. This is a perfect example of a riparian forest buffer in Adair County on Russell Creek. This farmer farmed the optimum land and protected the rest.

Many of the best management practices (BMPs) that our conservation districts and state and federal agencies encourage farmers to install involve the prevention of soil erosion. Soil is one of our most important natural resources. Soil and water are two essential components of our environment. Without protection and conservation, these cornerstones of our natural systems would be broken. This is also true to the livelihood of farmers. Farmers depend on these two natural resources for their very existence. As with any natural system, there are intricate relationships when these two essential resources interact. Each needs the other to be effective, but too much of one with the other can throw off the natural balance with bad results. Too much rain (water) on the land will cause the soil to erode away. And, if too much of this soil enters the water (streams and groundwater), it is considered a pollutant and is bad for water quality and natural aquatic habitats. So farmers have a huge responsibility when working with the land and water in unison.

see **FARMERS** next pg ▸

...FARMERS

In nature, there is balance. Vegetation typically covers the soil, allowing for moisture content to remain in the proper amounts and protecting the soil by supporting it with root systems and breaking the fall of raindrops with its foliage. If the plant life keeps erosion at bay, then nutrient and solids (soil) levels in the water remain in normal ranges. That is why it is very important for farmers to respect that balance that is needed to keep their natural resources in check.

Even the simplest things that farmers do can make big differences. Selecting the proper fields for planting crops can make a huge difference in how the water interacts with the soil. The more slope there is to the land (hillsides), the more probable that soil may be lost. Selecting how to plant those crops is also important. Traditionally, land was tilled and broken up, exposing soil to weathering and removing old vegetation. We now know that this is not good for the land. Farmers now plant crops using no-till methods, which prevents that ground from being broken and leaves remnant vegetation for soil protection. It is also good practice to rotate crops among different fields in different years. Overusing fields year after year depletes nutrients that are essential for good soil health. When planting on slightly sloped ground, the farmer should plant in rows horizontal with the hillside in order to prevent runoff from going straight downhill, thus gaining erosive force. There is also a practice to plant a cover vegetation in low areas or drainage ditches to prevent soil erosion. These are commonly referred to as grassed waterways.

Livestock operations can also affect soil erosion. By rotating cattle among different fields, it insures that they will not overgraze the vegetation, thus keeping some vegetative cover to prevent erosion. New fencing might be installed to achieve this purpose and to prevent the livestock from directly entering streams and rivers. When cattle do have to cross streams; fencing and stabilization materials such as fabric and rock are used to prevent soil from eroding into the water body. Cattle feeding areas make sure that the heavily used areas are contained in a way that the heavy trampling of the ground does not lead to erosion.

These are just some of the many practices that can be utilized by farmers to remain at the forefront of conserving Kentucky's soil and water resources.

Photo courtesy of Barren County NRCS staff.

This is a livestock stream crossing practice in Barren County, KY. Notice that the cattle are fenced to only be able to access and cross the stream where there is protection (rock and fabric) to prevent erosion.

Photo courtesy of Taylor County NRCS staff.

This is a livestock heavy use area/watering system in Taylor County, KY. The rock is placed to prevent the trampling of soil and erosion potential. The water tank is also part of the practice as the livestock were fenced out of an adjacent stream in order to plant a buffer.

Even the simplest things that farmers do can make big differences.

Trees: Nature's Best Erosion Controller

Trees are the best natural cover for minimizing surface runoff of water and soil erosion. Soil erosion on forestland is lower than for other land uses, including cropland or pasture. Erosion rates from undisturbed or carefully managed forests are less than one-half ton of soil loss per acre per year; far less than the acceptable level of five tons of loss for agricultural land. With the use of best management practices (BMPs) in any forest activity, soil erosion potential can be kept to a minimum.

How trees stop erosion?

When bare ground is exposed, water falling as raindrops can run freely over the unprotected soil. Each raindrop has the impact of a tiny bomb, causing soil particles to splatter and allowing them to be carried away with the surface water to nearby creeks, streams and rivers. In one season, an inch or more of exposed soil can be lost by raindrop impact, but this doesn't happen where there are trees!

Trees offer a line of defense?

Trees offer many lines of defense against soil erosion. The first is the leaves in the crowns of the trees that intercept and slow the falling rain, causing it to reduce its speed of descent. Secondly, once the slowed raindrop reaches the forest floor, leaves, twigs, limbs, and decaying matter absorb the remaining force of the raindrop. Thirdly, the forest floor acts as a sponge, underlying soil layers made porous by organic matter (material from once-living plants and animals) and animal activity (such as burrowing of earthworms, insects and rodents) soak up the water and prevent the surface runoff and transportation of soil particles.

Finally, forest tree and shrub roots form a dense mat in the soil. Besides transporting water to the tree, roots bind the soil. They also pry the soil apart so water can move through easier, which is very important in soils that are compacted from foot travel and construction equipment. When trees die, their roots will begin to decay underground, causing the roots to shrink in size. These openings left from the decaying roots create a filtering system that delivers clear, unpolluted water to streams, rivers, lakes and reservoirs.

FARMING FOR THE MICROBES

Estimates vary, but if you could weigh all the organisms in the top six inches of soil on an acre of land, you'd find they would weigh between 2,500 pounds to more than 5,000 pounds, depending on how healthy the soil is. That is a LOT of life.

What these low-lying creatures lack in size, they make up for in numbers. Consider bacteria, the soil microbes with the highest numbers, for example. You can fit 40 million of them on the end of one pin. In fact, there are more soil microorganisms (microbes for short) in a teaspoonful of soil than there are people on the earth.

For those producers who understand the benefits of healthy, living soil, farming centers around feeding the organisms that build healthy soils.

These farmers understand that tillage, the turning of the soil that has been the standard for growing crops for years and years, is disruptive to soil microbes and destructive to the soil system.

Instead, they disturb the soil as little as possible. And, they grow a diversity of living plants in the soil as much of the time as practical, covering the soil and offering food to soil microbes through living roots. Those soil organisms, in turn, cycle nutrients back to the plant, allowing it to grow and flourish.

It's a natural, symbiotic system that leads to healthy soils and more sustainable and profitable agriculture.

To learn more about soil health, and to meet some of the farmers who are "Unlocking the Secrets in the Soil," visit nrcs.usda.gov.

Conservation Writing & Jim Claypool Art Contest | Rules | 2014

THE 2014 CONSERVATION WRITING CONTEST IS DESIGNED FOR KENTUCKY STUDENTS GRADES 6-12, AND THE JIM CLAYPOOL CONSERVATION ART CONTEST IS FOR STUDENTS GRADES 1-5.

STATE WINNERS:
First - $250 check; Second - $150 check; Third - $50 check

REGIONAL WINNERS
$50 check

COUNTY LEVEL WINNERS
$25 check

** State and Regional winners will receive a personalized plaque and certificate. County winners that win regional or state awards will only receive one check for the top prize.*

RULES

1. Kentucky students grades 6-12 are eligible to compete in the writing contest. Only students through grade 5 may compete in the art contest.

2. A student may not enter both the Jim Claypool Conservation Art Contest and the Conservation Writing Contest during the same contest.

3. An entry must be created by one and only one student. Any entry submitted by more than one student will be disqualified.

4. All entries become the property of the contest sponsors. The decisions of the judges at all levels of competition are final.

5. WRITING: entry may not exceed 1,000 words and must be written in ink or typed on one side of paper only. Typed entries must be written in 12pt font, Times New Roman or Calibri. No photographs or artwork may be included with the written work. It is suggested that the written entry take the form of informational writing (from the perspective of an informed writer to a less informed reader) and may be in the form of a letter, blog entry, editorial or speech. It should persuade the reader to take action toward good soil conservation practices or propose a solution to one or more soil conservation issues. The work should be from the student author and avoid plagiarism from this source or other sources. Sources should be cited.

6. ARTWORK: shall be 8 ½"x11". Any thickness or color of art board may be used. Art paper may be used, but must be pasted onto art board or cardboard before submitting for competition. NO plywood will be accepted. Artwork may be rendered in any medium: pencil, ink, charcoal, crayon, oil, etc., but it must be flat art. 3-D art is unacceptable; however, collages, photographs or other art pasted onto your board will be accepted as long as it is flat art pasted securely to the poster board. An art entry may take the form of a poster, newspaper advertisement or editorial cartoon, making sure that whatever form is used the artwork conveys a message at a glance that persuades its viewers to take action toward good soil conservation practices.

7. Top three writing entries and/or artworks from your school must be submitted to your local county conservation district by Dec. 1, 2014.

8. The official entry form must be completed and secured to the back of your entry.

POINT SYSTEM FOR ARTWORK

- 50 points - Purpose / Audience. (Appropriate communication style to reach audience, establishes and maintains a purpose; and holds to subject in community. Theme clearly conveyed at a glance.)
- 30 points - Composition / creativity / craftsmanship. (Layout, originality, and quality of work, such as neatness.)
- 20 points - Language / correctness. (Word choice, usage, spelling, punctuation, capitalization.)

POINT SYSTEM FOR WRITING

- 30 points - Purpose/Audience (establishes and maintains a purpose, communicates with audience, employs a suitable voice and/or tone)
- 20 points - Organization (logical order, coherence, transition organizational signals)
- 20 points - Idea Development/Support and Evidence of Research (student's original work the shows sources of research)
- 30 points - Correctness (spelling, punctuation, capitalization), Language (word choice, usage), Sentences (varied in structure and length, constructed effectively, complete and correct)

HELPFUL HINTS

- Keep entry simple and sincere.
- Be creative and original. Avoid plagiarism by using original words and ideas. Plagiarism is defined as the act of stealing and passing off the words of another as your own without crediting the source.
- Consider an area of soil that is important to you, your family and your community.
- Draw from your personal interests or experiences.
- Writing entry should take the form of informational.
- Think about soil issues in your community, farm, subdivision or city.
- DO NOT use the "The Soil Daily Times" as your only source.
- Interview people in your community about changes in soil issues.
- Find ways to improve soil in your community. TAKE ACTION!

The Division of Conservation acknowledges and thanks the following organizations and agencies for their support: Kentucky Farm Bureau Federation; Kentucky Association of Conservation Districts; Division of Water; Energy and Environment Cabinet; Department of Fish and Wildlife Resources; Division of Forestry; Department of Education; USDA Natural Resources Conservation Service, UK Cooperative Extension Service

Name (Miss, Mr) _____

Parent's Name _____

Home Address _____

City _____ Zip _____

Home Phone ( ) _____

Age_____ Grade _____ Teacher_____

County _____

School_____

School Address_____

City _____ Zip _____

School Phone ( ) _____

☐ I hereby certify that I have read the rules and helpful hints and this entry is the original work of:

_____
Student Signature

_____
Parent/Guardian Signature (required)

_____
Teacher or Principal's Signature (required)