

# AgMag

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THE MAGAZINE OF MINNESOTA AGRICULTURE IN THE CLASSROOM

## CARING FOR OUR NATURAL RESOURCES



### Minnesota, "The Land of 10,000 Lakes,"

is really the land of 20,000 lakes, ponds and marshes of five acres or more. Forests cover one-third of our state. Our rivers end-to-end could reach around the world. Our cropland would cover all of Rhode Island, Massachusetts, Connecticut and Vermont. Fresh air, rich soil, lots of rain most years, good climate, crops, livestock—our state has them all.

Minnesota's **natural resources** are our treasures to protect. Our agricultural industries depend on these natural resources. We, the people, depend on agriculture. That's why our farmers and others must act as stewards of the land, or Earth Keepers, protecting these important resources.

- When we protect our soil now, it can grow good food, fiber and fuel (energy) for the future.
- When we clean up our air, we make life healthier for people, plants and animals.
- When we prevent water pollution, we help keep water safe for cooking, swimming, drinking and **aquatic** life.

Nearly three-fourths of the land in Minnesota is owned by farmers and other private landowners. Why is it important that all landowners and users be good Earth Keepers?

What natural resources can you find in these pictures?

What connections to agriculture do you see?

Can you have an ag-less day?  
There's just no way!

The Minnesota DNR (Department of Natural Resources) stocks our lakes with over 260 million fish each year.





Photo Courtesy: danmarshall.com

# Celebrating our NATURAL RESOURCES

Turn on a faucet. Where does the water come from? Is it from your local public utilities company? Is it from your backyard well? Either way, it comes from Minnesota's surface water, groundwater, or both.

# CARE FOR THE WATER

How do you like taking a shower in the same water molecules the dinosaurs waded in?

It's true! The water we use today is the same water that has been recycled for millions of years since the earth was formed. We will never have any MORE water. That's why we need to keep our water clean.

If all the world's water could fit into a gallon jug, including salty oceans and frozen glaciers, only a single drop would be fresh and usable for human needs. The amount of fresh water isn't all we care about. We want the water we drink and use to taste good, smell good and look good. We want it to be safe for all human uses and for aquatic creatures, too.

### Did You Know?

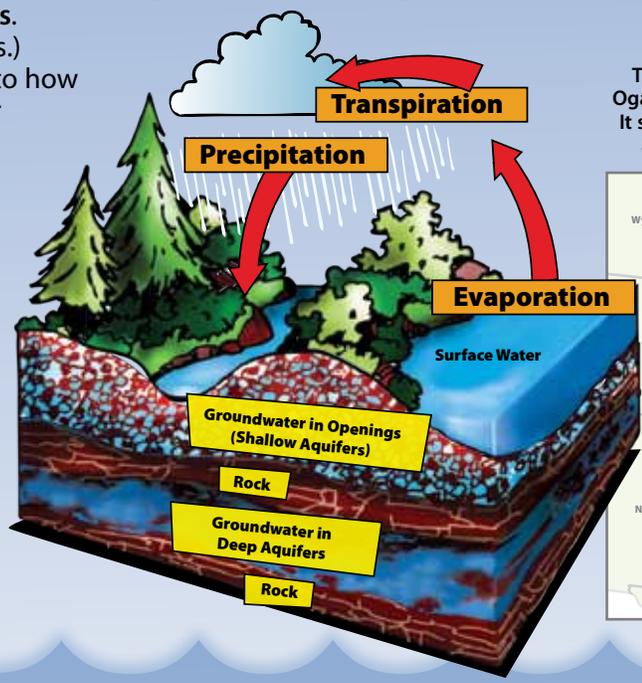
- The earth recycles the same water over and over. This process is the water cycle, or hydrologic cycle. Water changes forms—from solid to liquid to gas—over and over again.
- The earth recycles one trillion tons of water every day. A gallon of water weighs 8 pounds. How many gallons are in just one ton (2,000 lbs)?
- The federal Clean Water Act requires states to set water quality standards. These rules protect the nation's waters. They regulate how much pollution can be in lakes, rivers, streams or groundwater before the water becomes unsafe for drinking, fishing, swimming and more.

## Where Does Our Water Come From?

Guess what? Rain, snow, sleet, hail: All of the water we drink or use falls on the earth first. Some ends up in lakes, wetlands, rivers and streams as surface water. Some seeps, creeps, **percolates** and trickles down into the ground, becoming groundwater. It finds its way into openings in rock, sand and gravel that catch and hold it. These underground water storage spaces are called **aquifers**. (Water in wells is pumped from aquifers.) Water levels in aquifers are connected to how much rain we get and how much water we draw from the aquifers.

Aquifers can be small in size or stretch more than ten thousand square miles. Sometimes we find water only a few feet below the ground. Other times it may be hundreds of feet deep.

Imagine how hard it is to find and map aquifers when we can't see them. Drilling wells gives us some information. But aquifer experts are still learning!



The largest aquifer in the U.S. is the Ogallala Aquifer under the Great Plains. It spreads across 174,000 square miles and is under parts of eight states.



# CARE FOR THE SOIL

## What four-letter word does all these things?

- holds roots in the ground so plants don't fall over
- holds water so roots can absorb moisture
- holds minerals and nutrients that plants use for food
- is home to other living things helpful to plants

Without it, life on land would come to a dead stop!

What is it? \_\_\_\_\_

The soil beneath our feet is as important as the air we breathe and the water we drink. Farmland and forested land represent two-thirds of our state's landscape. Whose responsibility is it to care for the soil? Farmers and foresters have a big role to play. But each of us must also help. These soil care tips are things we all can do:

1. Grow plants on bare soil or cover it with mulch so it won't wash or blow away.
2. Stay on sidewalks and trails. What happens when people don't? Do you see any places where sidewalks should be built to protect the soil?
3. How can you help protect the soil of football and soccer fields, parks and other public places?



www.nrcs.usda.gov/feature/education

For more on soils see:

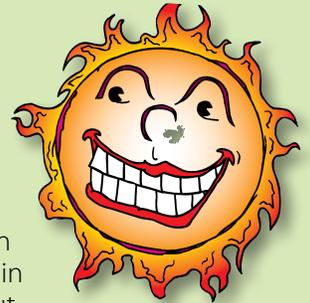
# CARE FOR THE AIR

## Take a deep breath. Can you tell the difference between fresh air and polluted air?

Air travels. That means polluted air can blow in from near and far. Lucky for us, many people work hard to clean up the air. Car makers build engines that pollute less. Laws regulate industrial waste disposal. Many people—including farmers—are making electricity from cleaner, renewable energy sources instead of coal or petroleum. They are using solar power, wind and field crops as energy sources for our cars, homes and factories. It all adds up to cleaner air!

### Thanks Plants!

Did you know that green plants help to clean air? They take in carbon dioxide, trap fine dust and release oxygen during **photosynthesis**. Those green plants include grasses on prairies, algae in oceans, crops in fields and trees in forests. About one-third of the oxygen released comes from grasses and other non-woody plants. One-third comes from ocean plants. Another third comes from forests. Take a breath... and thank the plants!



## Agriculture and Water

You already know that agriculture provides our food, fiber and so much more. All plant and animal agriculture depends on water.

In a year with normal rainfall, only a half million of Minnesota's 22 million acres (1 %) of cropland is irrigated. Compare that to rainfall-poor California, where 90% of cropland must be irrigated.

The agriculture industry knows it must take good care of water. Farmers are learning safer ways to use crop protection chemicals to keep them out of water supplies. They plant crops in ways that help prevent water from washing soil into streams, lakes and rivers. They plan and time irrigation to save water. They keep livestock away from riverbanks to prevent trampled soil and animal waste from ending up in the water. They manage animal wastes from feedlots. Some ag industries, such as ethanol plants, are exploring ways to use "reclaimed water." Reclaimed water (treated municipal wastewater) may be able to replace high quality (fresh) water and still meet the needs of some industries.

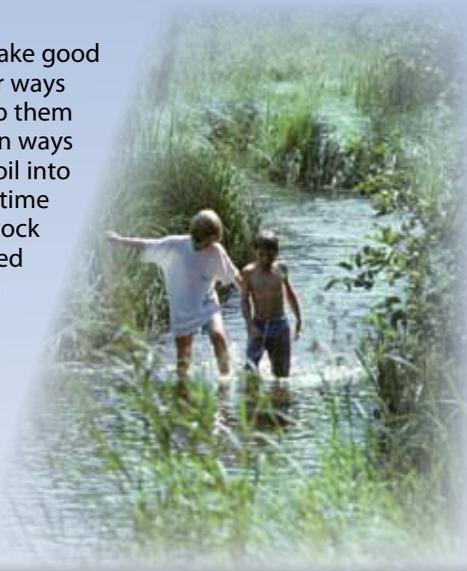


Photo Courtesy: University of Minnesota Agricultural Experiment Station

### Think & Discuss

#### Will 2012 Bring Drought?

The Minnesota Climatology Office recorded rainfall shortages in every Minnesota county in early 2012. The fall of 2011 was the driest in Minnesota's modern climate history. We are on track to have one of the top five least snowy winters this year.

- ? What impact could dry or drought conditions have on plants, animals and humans?
- ? What can you do to take care of the limited water available during low levels of rain and snow?

**Did You Know?** Minnesota has the most water resources of the 48 connected states. We have more shoreline than any state except Alaska!

**Try this!** Make an Aquifer in a Tank.

**Try this!** Awesome Aquifers

[www.beg.utexas.edu/education/aquitan/tank01.htm](http://www.beg.utexas.edu/education/aquitan/tank01.htm)

[www.groundwater.org/kc/activity8.html](http://www.groundwater.org/kc/activity8.html)



# Bloom and GROW!

## Adventures in Gardening

**All Kinds of Gardens!**  
 Maybe you'd like to grow just one type of thing in your garden. Check theme gardens that interest you.

- Just flowers
- Vegetables
- Native plants
- Salsa ingredients
- Berries
- Herbs
- Salad greens
- Plants to attract butterflies or hummingbirds
- A "Three Sisters" garden with corn, beans and squash—like the Native Americans taught the settlers
- An A to Z garden, with something for each letter of the alphabet
- A garden of just one color



Photo Courtesy dannarshall.com



Photo Courtesy U of M Extension Master Gardener Program

### PLAN AHEAD:

1. Do you have a space for a garden? Pick a spot. It can be a plot of soil, a window box, a big container or even a group of flower pots.
2. Growing plants need soil, moisture, heat and light. How can you provide each of these?
3. What will you want to plant? What grows in your space, soil and type of weather?
4. What do you need to buy? Tools? Seeds or seedlings? Plant food? Soil? What else?
5. When will you need to start your garden to allow enough time for plants to mature?
6. What daily or weekly tasks must gardeners do? Will you need help? Who can help you learn what you need to know?
7. Anything else?

### DIG IN:

1. Prepare the soil. What do you need to do? Do you need to add anything to make your soil healthier for growing plants?
2. Plant! Directions on your seed packages will guide you. How big will each plant get? How much space does each plant need? How can you make your garden colorful and attractive? How can you pair plants that do well together, or mature at different times? (Packages tell you how many growing days are needed.)
3. Label the rows so you remember what's planted where. As they grow, you'll learn to recognize each type of plant.
4. Water, weed and watch your garden. Observe and learn. Are plants thriving? Are some plants wilting? Is there any pest damage? Ask for help when you need it.



### Gardens are Good for You!

You will:

- get exercise and fresh air
- improve nutrition through really fresh food
- learn about ecosystems, plants and growing things
- \_\_\_\_\_
- \_\_\_\_\_



Gardening is a business for some growers. Visit a farmers' market and you'll meet them.  
Photo Courtesy/Minnesota Grown Program

### HARVEST AND ENJOY!

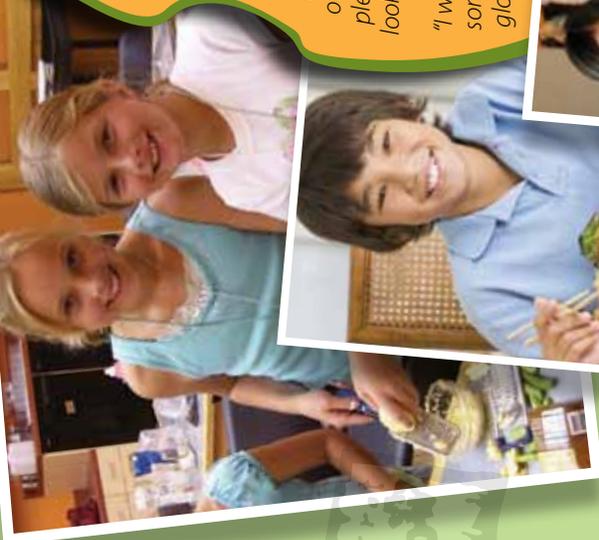
How will you clean, prepare, cook and serve your food? Do you have extra produce to share?

### AFTER THE HARVEST

Imagine it's the end of the gardening season. Think about this: Were your expectations met? What were some surprises? What might you do differently next time you have a garden?

Lots of great help is just a mouse click or a phone call away. Check out the library, or check out the Web.

[www.kidsgardening.com](http://www.kidsgardening.com)



### Why grow a garden?

"I would grow a garden to experience the thrill and excitement of feeding the plants and eating your own food. Seeing your plant sprouts growing toward the light is inspiring and unique! Also, I love the thought of eating your own food, and gardens are very pleasing to the eye! It makes our front and backyard look and feel so welcome."

"I would like to have a squash, like a pumpkin or some brightly colored one, daisies, peapods, morning glories, strawberries, and carrots."

Anna K, Minneapolis



## FARMS & SCHOOLS: NEW PARTNERSHIPS

Did you know that many schools and farms are teaming up to make food better for kids? They are getting food grown by local farmers onto school lunch trays. Kids in many school districts see winter squash, corn on the cob, melons, potatoes and apples from local farmers on their lunch trays. Less salt, more fruits and vegetables and whole grains are all part of the goal of healthier eating. Best of all, locally-grown food tastes great and is miles fresher.

Over 800 Minnesota schools, representing some 525,000 students, participate in Farm to School programs. That number is growing each school year. Many of these same schools also plant vegetable gardens to provide home-grown produce for school lunches. Urban, suburban and rural, food served in schools is constantly changing due to local Farm to School nutrition programs.

Farm-to-school programs make everybody winners. Linking schools with local farms means healthier meals in school cafeterias. It means improved student nutrition. It means learning lifelong health habits. It helps fight child obesity and it supports local farmers. Do you know where YOUR school lunch comes from?

### Even Closer Than the Farm

Some schools are growers, too. Alexandria's Food and Nutrition staff planted apple trees at two schools to provide Honeycrisp and Sweet 16 apples for school meals and snacks. Students at Solway Elementary in Bemidji planted a school garden and the fresh produce was used in their summer food service program. Benson Public Schools initiated a "Greenhouse Connections" program. The schools teamed up with a local florist, using extra greenhouse space to grow mustard greens and arugula.

Photos: Courtesy North Trail, Sibley East, Pequot Lakes and Dover-Eyota schools



# A Family Farm, A Family Business

Shannon and Nathan Kuball are dairy farmers in Waterville, Minnesota. Kuball Dairy was started by Nathan's great great grandfather, Albert, in 1902. Nathan is the fifth-generation Kuball family farmer on this land. Children Kelsey (10), Emma (7) and Keegan (4) are the sixth generation to live on the farm.



All Photos Courtesy Kuball Family

## Changing Times, Changing Farms

Years ago, all the adults and children in a farm family were needed to do the many farm jobs. Technology has changed that. Computers, milking machines and modern machinery do much of the work today. (You've learned about much of the technology that changed farming in your two earlier

AgMags.) Technology has made it possible to do more farm work with fewer people. Some farm men and women now

have time to work other jobs off the farm. Nathan Kuball works full time in the family's farming business. Shannon works part time at the local elementary school as well as on the farm. On some farms, the children are very involved in daily work. The Kuball children help with calf feeding.



Kelsey feeds a Holstein calf. Black-and-white Holsteins are the main dairy breed in the U.S.

## Caring for the Land and the Animals

What's most important to the Kuballs? That's easy: care of their land and animals. Keeping soil healthy and preventing loss to erosion is a year-round effort and not just for Earth Day. Good nutrition and medical care top the list for animal care. Animal nutritionists develop special feed mixes (called rations) to meet each cow's needs. Veterinarians work with the Kuballs

to keep their herd in top health. Farmers know the value of keeping cows comfortable and contented. The Kuball cows sleep on recycled rubber-filled mattresses covered with dry bedding. The cows keep cool in the summer thanks to fans, sprinklers and good ventilation. Roll-down curtains and their own body heat keep them warm in winter.



## The Kuball Family Farm

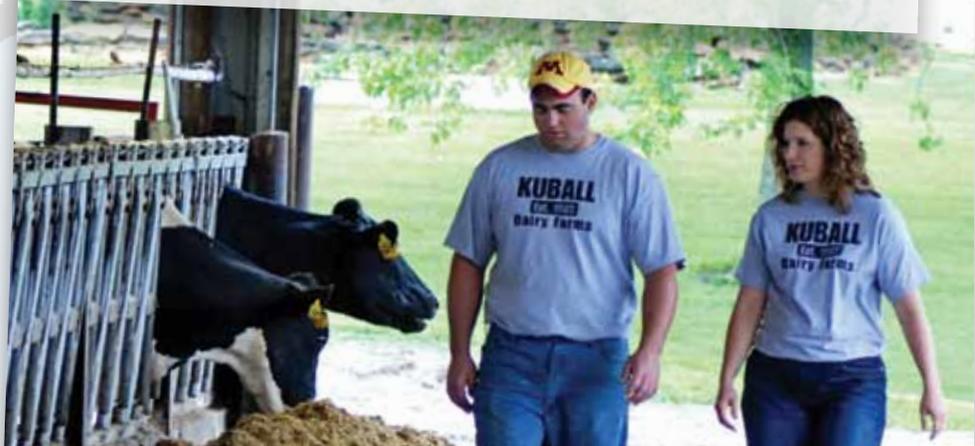
For the first 62 years, you could see chickens, hogs, horses and cows on the farm. In 1964, the family decided to specialize only in dairy production. They had 50 cows in a tie-stall barn. The cows ate, slept and were milked in their stalls. Today the farm has 180 milk cows. The cows are in a free-stall barn where they can roam around the barn. They eat fresh food, drink fresh water and sleep when they want to. They are milked twice a day in a separate building called a milking parlor.

In 1964 the Kuball farm was 120 acres. Today it is 700 acres. How do you think this compares with the national trend in farm size?

Kids! Discover more about farming "Then and Now." Ask your teacher for a copy of page 5 in the AgMag Teacher Guide.

## Q. What's the best thing about being a farmer?

A. Farmers get to see the results of their work. We work not only for our own family, but for people everywhere who want wholesome products for their families. We have an awesome responsibility to be good stewards of the land and the animals in our care. When we do that, the animals and the land give us the things we all need. A farmer's work feeds thousands of people around the world! As a family, we work together. We are a team, helping each other and our farm business succeed.



# Agriculture's Biggest Leaps (Part III)

Agriculture has changed in amazing ways in the years since Native Americans first farmed the land. What have been the biggest achievements in the past 100 years? Some top agricultural engineers asked themselves that question. They came up with a list that we've explored in your three AgMags this year. Here's Part Three!

## Electronic Innovations

From computers and monitors to GPS and greenhouse controls, electronics are everywhere in modern agriculture. Computer chips in animal ear tags are one example. Farmers use ear tags to identify and keep information on individual animals. Ear tags come in many different styles and colors, and can be set up to record different kinds of information. The large number on this identification tag is the cow's unique number in the herd; it functions like a name. This number is only used when the animal is on the farm. The 15-digit smaller number and the matching number on the button tag at the top follows the animal even when the animal leaves the farm or country. The first three numbers "840" tell us that the animal is from the United States. The other numbers help further identify where the animal is from.



Farmers can swipe ear tags to track animal blood lines, health, age, vaccinations, milk production, weight and more. When the animal leaves the farm, it can be traced all the way through processing.

Photos Courtesy Minnesota Board of Animal Health



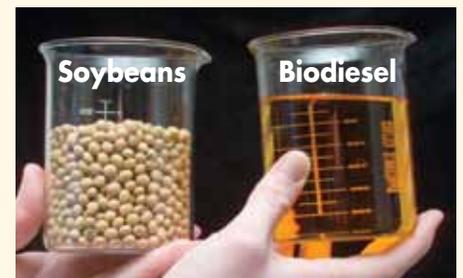
## Self-Propelled Combines

Mowers and threshers were good machines, but farmers made several trips across the field to harvest their crops. **Self-propelled combines** came into use in the mid 1900s. They both cut crops and harvest (separate the grains from the stalks) in the same trip across the field. Many combines have changeable heads so they can be used for several different kinds of crops. Wheat, oats, rye, barley, corn and soybeans are all harvested by combines. Combines save time and fuel energy. They help farmers harvest many more acres each day.



## Irrigation

Improving water use could be one of ag's biggest challenges in this century. **Irrigation** (watering the soil) allows crops to grow in places with limited rainfall. Key inventions are center-pivot irrigation and trickle or drip irrigation systems. Center-pivot irrigation systems (shown above) spray water across large areas of fields without using much water pressure or fuel/energy. In trickle or drip irrigation, tubes or hoses slowly and steadily deliver water close to the roots of plants. Water is saved because it is applied only where it's needed. Less evaporation also saves water.



## Biofuels

Boosting the amount of fuel we get from renewable resources is a big achievement in agriculture. Fuels made from crops such as corn, sugar cane and soybeans, or from trees and grasses, are called **biofuels**. Biofuels cut air pollution, provide jobs and build new markets for farm crops. Because they come from renewable resources, they help conserve the earth's supply of non-renewable fuel resources like natural gas and oil.

## The Top Six

You've learned about most of the engineers' choices for biggest agriculture achievements in the past 100 years. Can you guess which they thought were most important? Rearrange the letters and discover what topped their list.

1. **ctartro** \_\_\_\_\_
2. **rrlau tniocafilircdeet** \_\_\_\_\_
3. **mbnieoc** \_\_\_\_\_
4. **gnilkim ienhcma** \_\_\_\_\_
5. **octtno ipkcre** \_\_\_\_\_
6. **avtonirescno lialteg** \_\_\_\_\_

Circle the one that is not part of Minnesota agriculture? Why?

## What Do You Think?

What do you think was the biggest need or reason behind each new invention?

It's your turn soon. What would YOU invent to help feed the world or to make farming more efficient?

### Did you know?

Ten percent of the gasoline used in Minnesota contains ethanol made from corn. Ethanol is an early biofuel but others are following. Biofuel comes from other forms of **biomass** as well: the fiber of sticks and trees, prairie grass, wheat straw, sugar cane, paper pulp, rice hulls and more.

Photos Courtesy University of Minnesota Agricultural Experiment Station

### Baseball-Ag Connection

Every time a Minnesota Twins pitcher breaks the bat of an opposing player, **100 trees will be planted** in a Minnesota State park to help beautify, restore and enhance Twins Territory.



### Celebrate Minnesota Water

Label these 8 rivers

- |                                      |                                    |
|--------------------------------------|------------------------------------|
| <input type="checkbox"/> Minnesota   | <input type="checkbox"/> Rainy     |
| <input type="checkbox"/> Mississippi | <input type="checkbox"/> Rum       |
| <input type="checkbox"/> St. Croix   | <input type="checkbox"/> St. Louis |
| <input type="checkbox"/> Red         | <input type="checkbox"/> Root      |

How can *you* help protect our rivers?

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Make a list of all the ways your family uses water in a week. Then guess how much water it is in gallons.

Next, find your family's water meter. Take a notepad and jot down the date, time and the numbers on the meter.

(A parent can help you read the dials. The water is measured in cubic feet. One sweep-hand revolution is one cubic foot of water.) Read the meter again after one week and see how your prediction checked out.

*One cubic foot of water is about 7.5 gallons.*

Date \_\_\_\_\_ Time \_\_\_\_\_ No. \_\_\_\_\_

Date \_\_\_\_\_ Time \_\_\_\_\_ No. \_\_\_\_\_

### Don't treat our soil like dirt!

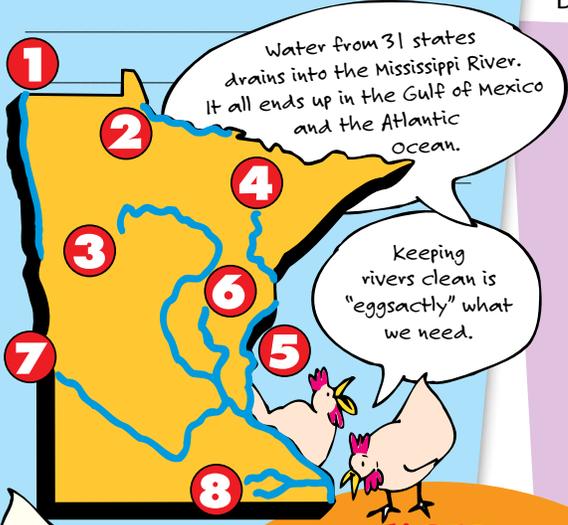
Dirt is what we wash off our clothes, vacuum out of our carpet and clean from under our fingernails. Soil is the dirt-like material that contains nutrients and supports the growth of plants that animals and humans depend on. Soil is a complex mix of ingredients: minerals, air, water and organic matter—countless organisms and the decaying remains of once-living things.

#### Soil Facts

- Soil is alive! One tablespoon of soil has more organisms in it than people on Earth.
- When you're sick and get medicine from a doctor, the antibiotics that help you feel better probably came from soil.
- It takes 500 years to form an inch of fertile topsoil.

Find more soil facts, interactive games and virtual tours of soils around the world at:

[www.forces.si.edu/soils](http://www.forces.si.edu/soils)



#### Did you know?

There are nearly **7 billion** people in the world today. Which countries do you think rank first, second and third in population?

Answers: 1. China; 2. India; 3. United States

What is Arbor Day?  
When is it?

Date \_\_\_\_\_

Why is it even more important to protect natural resources as population rises?

Think Green

#### Green Squad

Is your school a safe, healthy place that doesn't hurt you or the environment? The kids on the Green Squad know how to find out! They have a mission for you.

[www.nrdc.org/greensquad/intro/intro\\_1.asp](http://www.nrdc.org/greensquad/intro/intro_1.asp)



### FOR SEVEN GENERATIONS...

WHEN MAKING AN IMPORTANT DECISION, AN OLD NATIVE AMERICAN QUESTION WAS:

**HOW WILL THIS AFFECT THE PEOPLE SEVEN GENERATIONS FROM NOW?**

WHAT DO YOU THINK THIS MEANT? \_\_\_\_\_

HOW WOULD THINKING LIKE THIS MAKE A DIFFERENCE IN WHAT WE DO TO THE ENVIRONMENT TODAY? \_\_\_\_\_