AgMag
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The Magazine of Minnesota Agriculture in the Classroom

Celebrating Our 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 completely around the world. Our cropland would cover all of Rhode Island, Massachusetts, Connecticut and Vermont. Fresh air, rich soil, lots of water, 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 and fiber 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?

Minnesota's natural resources thanks to glaciers! **See more on page 4.**

Photo Courtesy University of Minnesota Agricultural Experiment Station

Happy Birthday AgMag - The AgMag is 20 years old! The first AgMag went to Minnesota kids in **1 9 8 6** . Look for the **birthday candles** hidden in your AgMag this year. These items were in the first AgMag 20 years ago!

Celebrating Our Resources—Handle with Care

Photo Courtesy University of Minnesota Agricultural Experiment Station

What natural resources are these kids enjoying? Besides humans, what or who else benefits from healthy soil, air and water?

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 earthworms and other living things helpful to plants

Without it, life on Earth 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. Whose responsibility is it to care for the soil? Farmers have a big role to play. But each of us must also help. Here are some soil care tips:

1. Plant grass or flowers in bare soil 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. Do your part to help protect the soil of football and soccer fields, parks and other public places.

For more on soils see: www.nrcs.usda.gov/feature/education

Our Actions Matter!

How do the things we buy affect the water, air and soil we depend on? Visit this website and find out how our interaction with these resources affects Earth now and for years to come.

www.pbs.org/pov/borders/2004/index_flash.html

Soil – A Worm's Eye View

You've probably noticed that not all soil looks, feels or even smells the same. Fine or coarse, wet or dry, black and rich, or brown and sandy: what might cause such differences? Ask your teacher for the activity page *What Type is Your Soil?* in the AgMag Teacher Guide. Discover more about the priceless natural resource in which most of our food is grown!

All soil types are made of three main ingredients: **silt, sand and clay,** in varying amounts. Soil is made from broken down rocks, organic matter (decayed animal and plant life), water and air.

Topsoil
Most of the plants grow here.

Subsoil
Begins several inches or a foot below the topsoil and may be many feet deep. Tree roots grow here.

Bedrock
Bottom layer, also called "parent material."

Soil is normally found in layers.

In a year, all the earthworms in an acre of soil can move at least **20 tons** of earth above and below the ground.

Holding Onto Soil

Farmers fight soil erosion in many ways. Draw lines to match each title with its description. Write each title number on the matching picture.

Titles

1. **Strip cropping**
2. Windbreak
3. No Tillage
4. Grassed Waterways

Free farm help

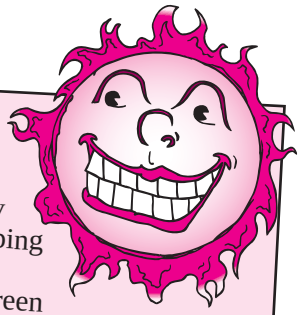
Earthworms help to "turn" the soil—bringing down organic matter from the top and mixing it with the soil below. If 500,000 worms live in an acre of soil, they could make 50 tons of castings. That's like 100,000 one pound coffee cans full.

Care for the air

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

Because air travels, polluted air can blow in from near and far. Lucky for us, many people are working 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 clean, cheap, renewable energy sources. They are using solar power, wind and field crops to run our cars, homes and factories. It all adds up to cleaner air!

Thanks, plants!



Green plants help to clean air by soaking up carbon dioxide, trapping fine dust, and releasing 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 and one-third from forests. Take a breath. . . and thank the plants!

Make up a rhyme that uses the words CARE and AIR.

Care for the water

Q 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 one *trillion* tons of water every day. Water weighs 8 lbs. a gallon. How many gallons are in just one ton?
- The federal Clean Water Act requires states to adopt water-quality standards. These rules protect the nation's waters. They say how much **pollution** can be in lakes, rivers, streams or groundwater while still allowing for drinking, fishing, swimming, irrigation or industry.

What do you know about water?

1. How many gallons of water (average) does it take to produce and process the food you eat in one day?
   a. 20 **b.** 200 **c.** 2,000
2. Everything we eat, drink and use depends on water in some way.
   a. True **b.** False
3. In a lifetime, you will drink enough water to fill over bottles.
   a. 36,000 liter bottles. **b.** 100 liter bottles. **c.** 500,000 liter

Check your answers - Page 8.

Description

A. Stubble from last year's crop is left on the field rather than plowing it under. This helps hold soil in place.

B. Grass is planted in main drainage areas in the field to slow running water and hold soil in place.

C. Rows of trees or bushes are planted where they will block **prevailing winds**. This reduces wind **erosion** and protects crops—and gives the bonus of wildlife habitat.

D. Crops are planted in strips, alternating row crops (such as corn) with hay or **perennial** pasture crops. Hay and pasture crops provide ground cover, which helps reduce wind and water erosion.

Photo Courtesy University of Minnesota Agricultural Experiment Station

Photo Courtesy University of Minnesota Agricultural Experiment Station

Photo Courtesy Board of Water and Soil Resources

Photo Courtesy University of Minnesota Agricultural Experiment Station

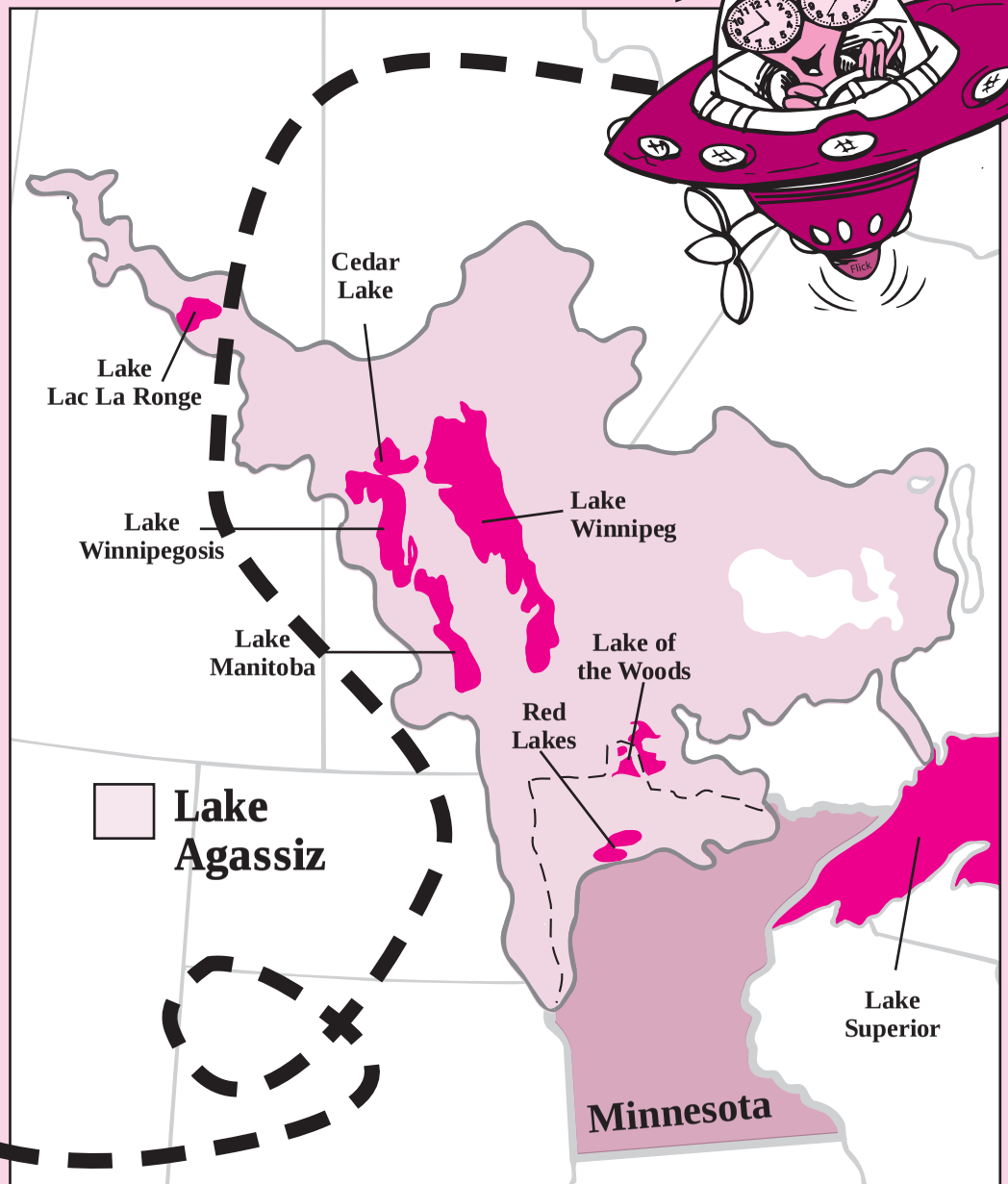
Making the scene:

Land of 10,000 Lakes

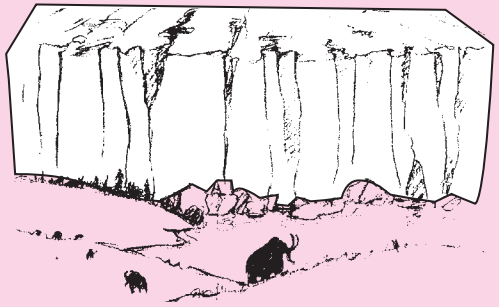
Minnesota, A Great Agricultural State

Back in AgMag Issue 1, you learned that Minnesota's amazing agriculture starts with great soil types and terrain plus the right climate. But how did these soils and terrain come to be here in the middle of North America? To answer that, let's jump into a time machine and travel back about 14,000 years. Ready?

Let's Go!



Imagine a frozen landscape as far as your eye can see. A dazzling, endless white glacier stretches to the horizon where Earth meets sky. Two thousand years pass. Some of the southern edge of the glacier melts. It floods the land and creates a huge lake. The lake is known as Glacial Lake Agassiz. Wooly mammoths roam the shores. Nomadic bands of humans hunt the mammoths and other game.



As glaciers move along they change the land. They scrape off soil and leave bare rocks. They move soil and boulders and gouge the earth. They create hills, valleys and ridges. The rocks and soil carried along or frozen into the glacier are left behind as **glacial "till."** Ridges, mounds and irregular boulders dumped by a glacier are called **moraines.**

Glaciers crept across Minnesota several times. They left behind many different landscapes and soil types. Today we see three main landscape **biomes**—regions of similar soils and plant materials. Minnesota's three biomes are pinelands, hardwoods and prairies. Each biome has its own terrain, plants and soil types.

Diverse Soils. Thanks, Glaciers!

Which Region?

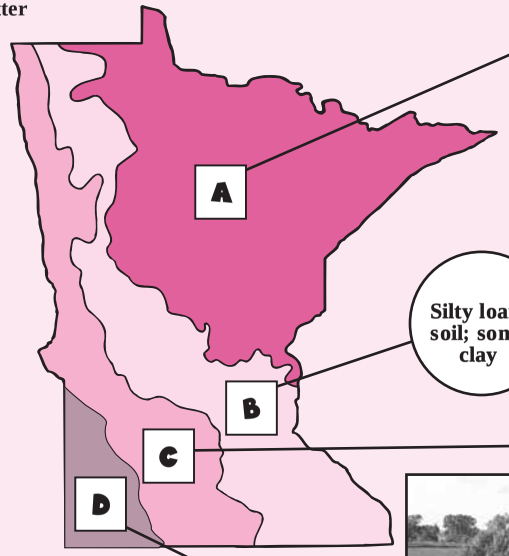
Write the letter

The old Lake Agassiz lake bed left rich, deep soil on flat land. Most of the land is farmed. Our famous Red River Valley is here. Winds blowing across the prairies can carry soil away.

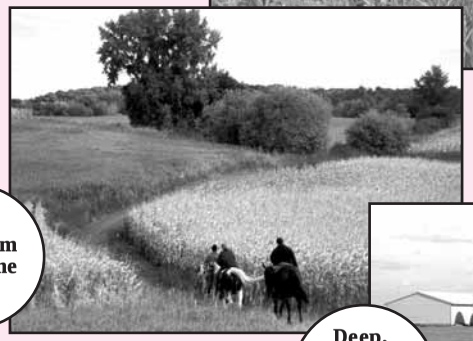
This small area is unique because the last glaciers did NOT go over it. Wind-blown silty soils from the prairie make good cropland.

The glaciers created ridges of rocky outcroppings and hundreds of lakes and swamps. Glaciers scraped off the topsoil, so farming is limited. Evergreens grow well. **Peat lands** occur on the flat bottoms of former glacial lakes.

Many lakes formed where blocks of glacial ice melted. The glaciers left till deposits, and winds added to them. Broadleaf trees grow well here. Much of the land has been cleared for farms and towns.



Sandy, rocky, shallow soil and peat



Silty loam soil; some clay

Deep, clay soils; thick, dark topsoil

Heavier silty soil; some clay

Photos Courtesy University of Minnesota Agricultural Experiment Station

Think & Discuss

- What clues, if any, did the glaciers leave in your area to show that they were once here?

Show What You Learned

Use what you learned on these pages to write a paragraph: **What makes Minnesota such an important agricultural state?**

_____

_____

Find out about agriculture in a desert state, a New England state and a Rocky Mountain state. **How is agriculture in those states like and different from ours? Why?**

_____

_____

Why do we care about soil types?

By studying soils, scientists learn how to use and protect each soil type. Knowing about soil helps farmers and gardeners manage the soil for good yields. It helps land use planners decide how to use the land wisely. It helps builders know the best spots for roads, sewage treatment plants and sturdy buildings that last for years. We all benefit when human uses are wisely matched to soil types.

(Think about the California mudslides. What's the connection?)

Did you know?

- Glacial Lake Agassiz was named after Louis Agassiz in 1879. He was the first to realize it was formed by glacial action.
- Only Iowa and Illinois have a greater percentage of land that is plowed, tilled and planted than Minnesota does.
- In Southwest Minnesota, the water supply cannot meet the thirst of new industry. Why? The region lacks the essential deep-down rock that's porous enough so water can pool and collect. The last glaciers didn't reach here, so the region has fewer lakes and smaller sand and gravel deposits. Underground sand and gravel deposits become water storage basins, or aquifers, that hold our groundwater. Recent lower-than-average rainfall and higher temperatures mean even less water in this part of Minnesota.

Gardening with Water in Mind

Cardinal Flower High Bush Hydrangea Giant Hyssop New England Aster

Native Plant Gardens

Everyone agrees that it is important to protect earth's precious water supply. Do you know **native plants** can be one of our biggest helpers in saving and protecting water?

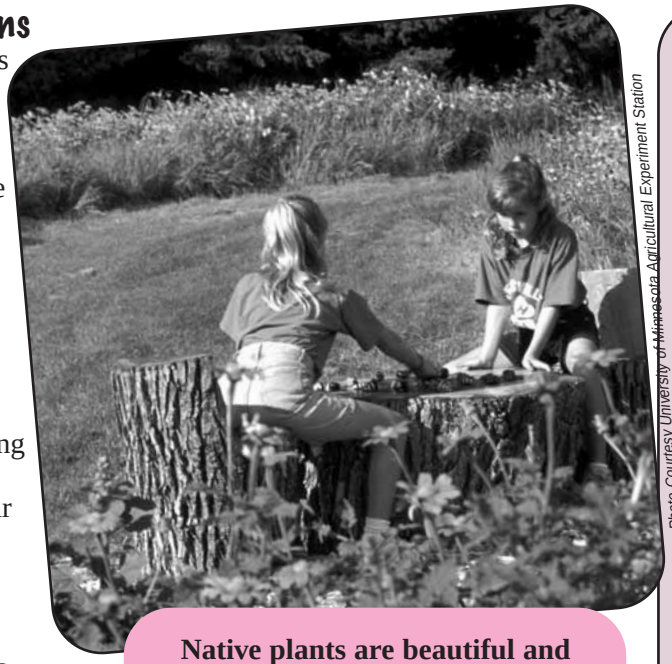


Photo Courtesy University of Minnesota Agricultural Experiment Station

Native plants are beautiful and they save water and work.

Many city dwellers are gardening with water in mind. How? They are removing sod and planting native gardens. That is, they replace parts of their grass lawns with wild flowers and other native plants that thrived in our ecosystem long before people (and grass carpets, chemical fertilizers and pesticides) came along. Unlike sod turf, native plants can withstand a range of weather and soil conditions. For example, choosing native plants that do well in sandy, well-drained soil means they'll be fine in dry weather with no help from us: no mowing, watering, fertilizing or fuss.

Would your family like to help? Ask for native plants and seeds at plant nurseries and garden stores. Whether you have wet soils, dry soils, sunny or shady areas, you can plant native species that will be right at home in your yard.

Dogwood River Bulrush Big Blue Stem

Rain Gardens

Before urban areas with all their roofs, streets, alleys, parking lots, driveways and sidewalks appeared, rain and melted snow seeped slowly back into the earth. But water flows fast across hard human-built surfaces, picking up urban pesticides, fertilizers and gas and oil residue. This polluted runoff dumps into storm sewers, then moves through the sewer system and into local lakes, streams and wetlands. Some people are bringing rain gardens to the rescue!

Photo Courtesy Minnesota Department of Agriculture

Where do you see rain gardens in your community?

What's a rain garden? It's a garden designed with a dip at the center to collect rain and snow melt. When located next to hard surfaces such as sidewalks or parking lots, rain gardens collect runoff water. They allow rain and melted snow to seep naturally into the ground. The slow-seeping water is filtered as it moves underground. Returning cleaner water into the ground prevents polluted runoff from getting into storm sewers and then to our lakes and streams.

Cranberry Joe-Pye Weed Switch Grass Bluebells Pussy Willow Prairie Phlox Switch Grass

Think & Discuss

1. In many urban areas neighbors, community leaders, businesses and government agencies work together to re-create natural areas and improve water quality. What are some good ways to encourage people to plant native species, create gardens on their boulevards instead of grass and plant rain gardens in their yards? How will this benefit everyone, including you?

2. To make sure we never lose the seeds of agricultural and other plants from years gone past, our country has a huge seed bank in Fort Collins, Colorado. Over a billion seeds are carefully stored in vaults that protect against earthquakes, tornados, floods, explosions and more. Why is a seed bank important? How could it help in times of crop failures or other interruptions to our food supply?

Honeysuckle Prairie Coneflower

Changing Faces of Minnesota Agriculture

Minnesota agriculture began with American Indians. Next came settlers, primarily from Europe, during the 1800s and early 1900s. By the late 1900s, **immigrants** were arriving from all over the world. Our agriculture keeps changing along with the population.

Today's Newcomers

Minnesota is home to many new immigrants. They include people from Southeast Asia, India, Latin America, Somalia, the former Soviet Union and many other nations. Like earlier newcomers, these immigrants left their countries for specific reasons. Many left to escape violence, joblessness or poverty. They came for new opportunities. Many came to join family or friends already in Minnesota.

Photo Courtesy University of Minnesota Agricultural Experiment Station

Changing Cities and Towns

Most immigrants moved to the Twin Cities, Duluth or Rochester. Other communities such as St. Cloud, Moorhead, Willmar, Worthington, Marshall, Worthington, Owatonna and Albert Lea also became home to thousands of immigrants between 1990-2000. Many moved to small towns and rural areas to work in agriculture. For example, jobs at farms, processing plants and meatpacking businesses made Worthington a magnet for seasonal workers and new immigrants. By 2000, Worthington was Minnesota's third most racially diverse city. (Minneapolis and St. Paul are first and second.)

From fields to processing plants and grocery stores to restaurants, immigrants make huge contributions to Minnesota agriculture every day.

New Menus, New Celebrations

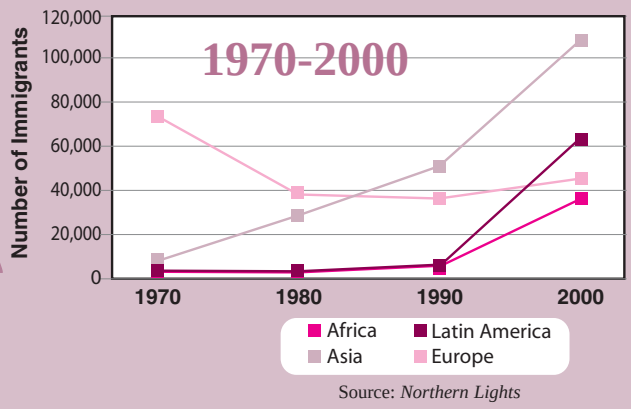
Native Americans found plenty of edible plants and animals in the natural world, but early colonists often kept to their European food traditions. Every wave of newcomers brought their own tasty foods, flavors and traditions.

Today we still enjoy bountiful American native ingredients such as wild rice, corn, squash and cranberries. We also enjoy great food diversity. What new foods and flavors have you tasted in Mexican, Thai and Indian restaurants? Asian grocery stores and community farmer's markets?

Along with foods, immigrants bring their music, dance, clothing and art to their celebrations and festivals. What examples can you name?

Think 3 Discuss

Immigration Trends into Minnesota



Source: *Northern Lights*

- Why do you think so many Asian immigrants chose Minnesota as their new home?
- Which group of immigrants has decreased? What might be some reasons?

New Connections Through the Years

1. What do you think the toughest part of immigrating has been for our newest immigrants?
2. Do you know anyone who has moved to Minnesota from another country? Why did they come to Minnesota? How did they feel about leaving their homeland?
3. How would you feel if your family decided to move to a different country? What important things would you need to learn?
4. What foods do you enjoy that came to us through immigrants?

Some information for this page is excerpted from *Northern Lights: The Stories of Minnesota's Past*, Minnesota Historical Society Press • 2003

Did You Know? *Minnesota was home to 260,000 foreign-born residents in 2000. Over 6% of Minnesota's population was born in another country. What do you enjoy most about the growing diversity?*

The number of immigrants living in the United States nearly tripled between 1970 and 1998.

(Source: The Center for Immigration Studies)

GRAB BAG

ANSWERS: What do you know about water? p. 2
1. b 2. a 3. a

From Field to Fuel

Shelled field corn isn't just animal food anymore. Many folks are buying it by the bushel for their stoves. New technology is being used to build stoves and furnaces that use dry corn kernels as fuel. But that's not all! Using corn as fuel is renewable energy. As fuel costs rise, people save money because corn is cheaper than other fuels. And farmers have a growing market for their corn!

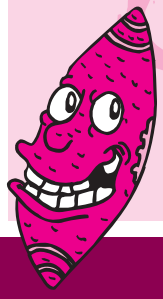
Country Corn

Q. What food is hot and cold?
A. Chili!

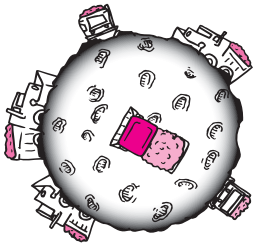
Q. If a rooster laid an egg on a slanted roof, which way would it roll?
A. No way. Roosters don't lay eggs.

Q. Which is correct? Yolks of eggs *are* white or yolks of eggs *is* white?
A. Neither. Yolks of eggs are yellow. (That's a yolk.)

More CORN



4,000 tons of popcorn was wolfed down on Super Bowl Sunday along with 14,500 tons of chips!



In 1986, the soil eroded from U.S. land each year would fill 320 million average-size dump trucks if each truck carried 20 tons of soil. If these trucks were 25 feet long and parked end to end, they would reach to the moon and three-quarters of the way back. Today, erosion by water on U.S. croplands has been reduced by 32 percent.

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?

Photo Courtesy Dan Juhl, Woodstock, MN

Buffalo Ridge, a geological formation in southwestern Minnesota, has 636 wind turbines. They supply "green" (clean, renewable) electricity. These turbines provide enough electricity to run 210,000 homes for a year. Every Minnesota utility offers its customers the opportunity to buy green power.

Surf the Net www

See how far $2 million lasts when you play the interactive game "Bet the Farm" at **www.cosi.org/onlineExhibits/farm/farmFrame.htm**

Players pretend to be Ohio farmers. Each player makes decisions about what products to raise, how to manage them, and how to market the bounty. The goal? To keep your farm profitable in spite of all the things that affect farming. The game takes skill, strategy, persistence and some luck.

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