

AgMag

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?



Conservation PLEDGE

I give my pledge as an American to save and faithfully to defend from waste the natural resources of my country—its soil and minerals, its forests, waters and wildlife.



Do you have corn in your furnace or beans in your bus? How are these renewable crops helping our air?

See page 6.



What forces created the land of 10,000 lakes? See page 4.



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?

- More than three-fourths of the **infectious** diseases in developing countries result from lack of clean water. Clean water for everyone is a main goal of science and health experts around the world.
- 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. Some of Minnesota's water resources are too polluted for certain uses. They are classified as "**impaired**." Is your favorite local water resource on the impaired waters list? Find out here:



Minnesota Pollution Control Agency website

www.pca.state.mn.us/water/tmdl.html

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
a. 36,000 liter bottles.
b. 100 liter bottles.
c. 500,000 liter bottles.

Check your answers - Page 8.

Care for the soil

Q 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. Properly dispose of motor oil, paint, cleaning chemicals or any other harsh liquids. This means don't dump it on soil. Check your community's rules for hazardous waste disposal and follow the guidelines.
3. 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?
4. Do your part to help protect the soil of football and soccer fields, parks and other public places.

For more on soils see:
<http://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

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



Read the three headlines above.
Use key words to identify the natural resource in each photo.



Name the Natural Resource

Photo Courtesy U of M Agricultural Experiment Station



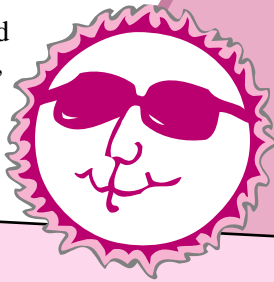
Name the Natural Resource

Photo Courtesy Minnesota Valley Nursery

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.

Name the Natural Resource



Photo Courtesy U of M Agricultural Experiment Station

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 below.

Titles	Description
1. Strip-cropping	A. Stubble from last year's crop is left on the field rather than plowing it under. This helps hold soil in place.
2. Windbreak	B. Grass is planted in main drainage areas in the field to slow running water and hold soil in place.
3. No Tillage	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.
4. Grassed Waterways	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 Board of Water and Soil Resources



Photo Courtesy U of M Agricultural Experiment Station



Photo Courtesy Minnesota Department of Agriculture



Photo Courtesy Board of Water and Soil Resources

Sustainable agriculture*

... is growing food, fiber and forestry products in ways that are:
 friendly to the environment today and for future generations of farmers and consumers.



profitable.
 acceptable to your community. (Others must believe in the products and the way they're produced. For example, it's not okay for agriculture to harm soil and water in growing its products.)

Why is it important that agriculture be sustainable?

* If you don't know the meaning of sustainable, look it up in a dictionary.

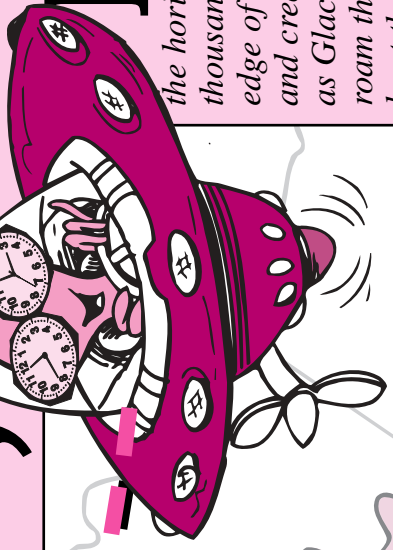
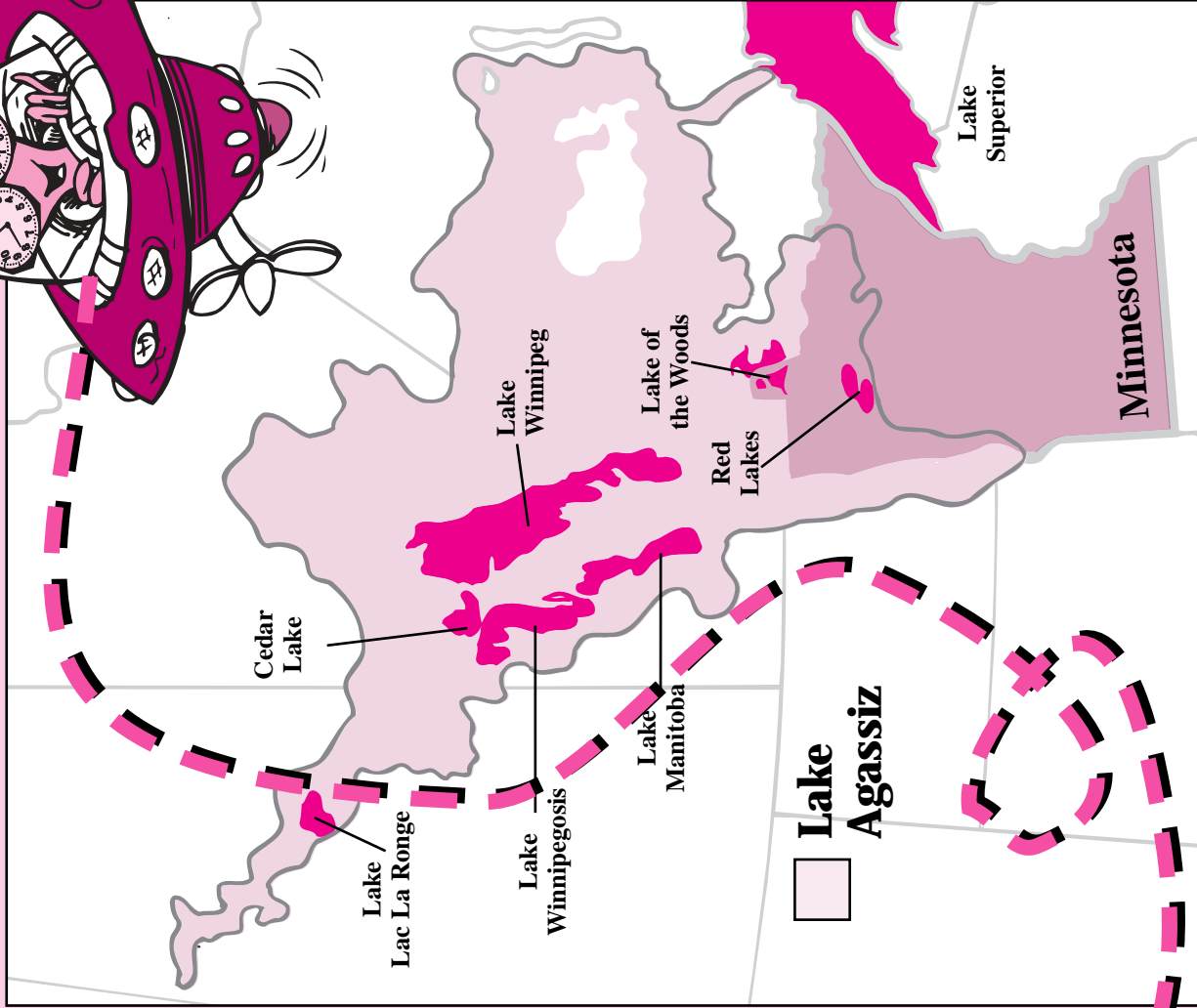
Making the scene:

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. Woolly 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 "fill."** 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.

Bountiful Biomes. Thanks, Glaciers!

The receding Lake Agassiz left flat land and rich black topsoil. Most of the land is farmed. Our famous **Red River Valley** is in this biome. This is Minnesota's driest biome. Winds blowing across the soil can carry it away. (Read more about those winds on p. 8.)

Name this Biome:

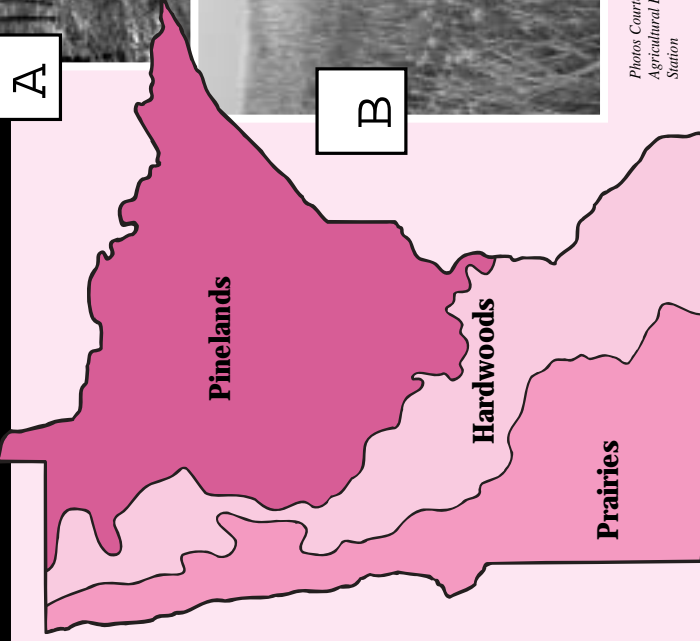
The glaciers created ridges of rocky, sandy moraines and hundreds of lakes and swamps. This biome has many evergreen trees that like a short summer growing season. **Peatlands** occur on the flat bottoms of former glacial lakes.

Name this Biome:

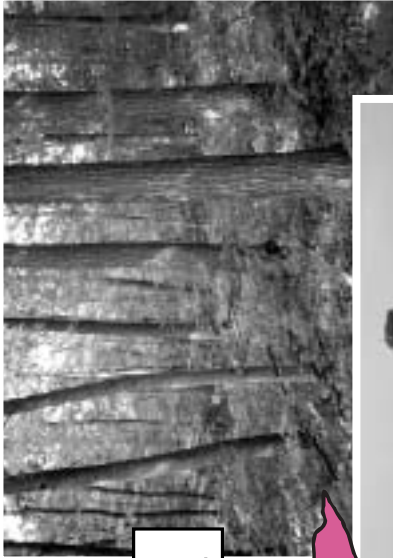
This biome is warmer and drier than the pinelands. It is cooler and moister than the prairies. Much of the land has been cleared for farms and towns. The natural vegetation is mostly broadleaf trees, with some pines. Many lakes formed where blocks of glacial ice melted. You can also see large boulders that were dropped by glaciers.

Name this Biome:

Match the photo.



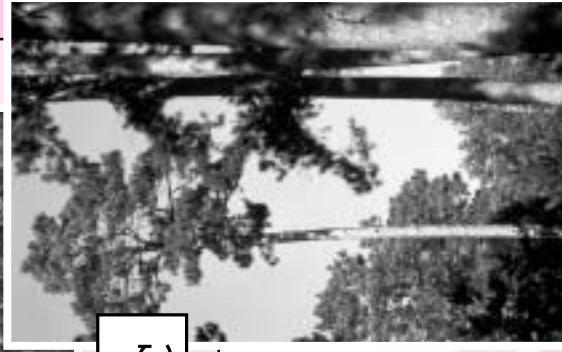
A



B



C



Photos Courtesy U of M Agricultural Experiment Station

Think & Discuss

- In which biome do you live?
- What clues, if any, did the glaciers leave in your area to show that they were once here?
- How is each biome area important to Minnesota agriculture? (HINT: Recall the definition of agriculture: the growing and harvesting of food, fiber, forest and landscape materials.)
- Name three things people can do in each biome to protect its natural resources. Why are people's actions important?

By studying soils, scientists learn about the soil types and their characteristics. They learn how to use and protect each soil type. Knowing about soil helps farmers and gardeners plant the right crops in the right places for good yields. It helps builders know the best spots for roads, sewage treatment plants and sturdy buildings that last for years. (Think about the California mudslides. What's the connection?)

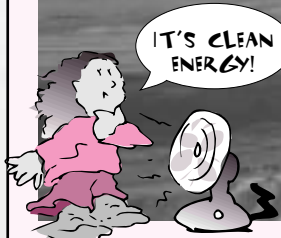
Fun to Know

- 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.
- Lake Winnipeg, Lake Manitoba, the Red Lakes, and Lake of the Woods are remnant lakes from Agassiz's waters. Which of these lakes are in Minnesota?
- What is **peat**? What are some valuable uses of peat?



RENEWABLE ENERGY

Harvesting the Wind



IT'S CLEAN ENERGY!

You can see them for miles: high towers topped with slowly rotating blades. These wind turbines are humming in a windy region in southwestern Minnesota. The wind seems to blow here all the time. Scientists and farmers took notice, and some farmers in southern Minnesota are harvesting the wind. Corn and soybean fields may now also hold 200-foot towering wind turbines. The wind power generates electricity. Minnesota's 650 wind turbines produce enough electricity for over 200,000 average households. Minnesota is home to the first farmer-owned wind farm in the U.S. Watch for more wind turbines in our future!

Photo Courtesy Dan Juhl, Woodstock, MN.

Q. Wind, sun and plants are *renewable* energy sources. They keep coming back day after day and won't run out. Why are renewable resources important when we plan energy for the future?

Q. Who owns the rights to the wind?



www.windustry.org

AgBrag

Already known for its strong **ethanol** industry, Minnesota can now boast its first **biodiesel** refinery. The plant (FUMPA Biofuels Plant) is located at North Redwood Falls, MN. Open since November 2004, it will produce 2.8 million gallons of fuel yearly. Soybean oil is the fuel's main ingredient now. Later, waste grease (french fries) and animal fat will be used to make fuel, too.

Did YOU know?

In October 2004, the Minnesota Prairie Line Railroad became the first in the country to power its locomotives with biodiesel fuel.



Photo Courtesy Agricultural Utilization Research Institute

TRY THIS! Pretend you are at a gas station. Someone asks you what ethanol is. What would you tell that driver about ethanol as a good choice?

Beans in Your Bus!

When your school ends each day, is there a long line of buses waiting to take students home? If so, you've probably noticed the smell of diesel exhaust hanging in the air. Breathing **diesel** smoke is not good for our lungs and hearts. Agriculture is helping clean the air by producing **biodiesel** fuel for diesel engines in buses, trucks, tractors and even ambulances.



Biodiesel is environmentally friendly. It's made from agricultural products and **by-products** such as vegetable oils, waste grease or animal fats. In Minnesota, most biodiesel is made from soybean oil.

Did YOU know?

Biodiesel fuel burns much cleaner than old style fuels that are made from petroleum. Adding biodiesel to the fuel tank reduces air pollution. Biodiesel is also renewable. It takes Mother Nature 250 million years to replace petroleum reserves. It takes Minnesota farmers just six months to bring in a new crop of soybeans.



Biomass

ENERGY FROM PLANTS

Shelled field corn isn't just animal food anymore. Some 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.

Adjusting the flow of corn into the firebox and bringing in oxygen makes good heat.



Fast growing poplar trees are another kind of **biomass**. These trees can be burned to create heat and electricity.



Photos Courtesy Agricultural Utilization Research Institute

Changing Faces of the Land

As soon as the glaciers melted, people arrived in what later became Minnesota. Early people were very aware of land, water and wildlife. They lived in tune with the natural world and its seasons. They believed the land belonged to everyone. In these times, human actions changed the land very little.

The 1800s saw thousands of settlers from Europe flooding into the area. Most came to farm, but some came to start other businesses. By the middle of the century, much of the land had been surveyed and divided into sections or plots. Now individuals, the government or companies could own the land. Landowners could decide how they wanted to use their own property.

New inventions were appearing everywhere. By the end of the 1800s, steam power, railroads, steel plows, repeating rifles, new flour milling technologies and many other tools had brought rapid changes to the way people used the land and its resources.

Agriculture and Urban Areas Change the Land

Our growing population meant more food, clothing, fuel and shelter were needed here in Minnesota. Better ways of transporting products to markets (railroads, roads, ships and barges) meant Minnesota's products could be sold to people far away. It all meant more demand for Minnesota products. Minnesota's huge forests were cut for lumber. Settlers plowed up prairie sod and cleared away forests to make farms and towns.

When areas were too wet to farm, many found ways to drain away extra water. This drainage improved cropland for better yields or added more acres of tillable soil.

Minnesota is one of the most highly drained states in the nation. About forty percent of our total croplands have been affected by drainage. Ditches, tiled waterways and pipelines all help farmers drain their fields. Draining is important to agriculture in some areas of our state.

As towns and cities grew larger, they pushed out into farm and forest areas.

Wetlands, often thought to be "useless," were drained to make housing developments, shopping malls, roads and parking lots.

People have needs, but there is a cost to the environment and ecosystems when wetlands are drained, forests are cut down and prairie grasses are plowed under. Forests, prairies and wetlands serve many important purposes just as they stand. Today, farmers and urban folks alike understand much more about protecting Minnesota's natural resources. As we meet human needs, we know we cannot ignore the needs of the natural world. Keeping balance is the only way our world can survive.



Tiling was hard work in the early 1900s. Clay or concrete tile was laid less than 3/8' apart on a slight slope. The opening between tiles allowed for water to slowly move out of the soil and into the tile. The slope sent it off the field and into a drainage ditch. Farmers could then plant crops such as corn, wheat and oats.

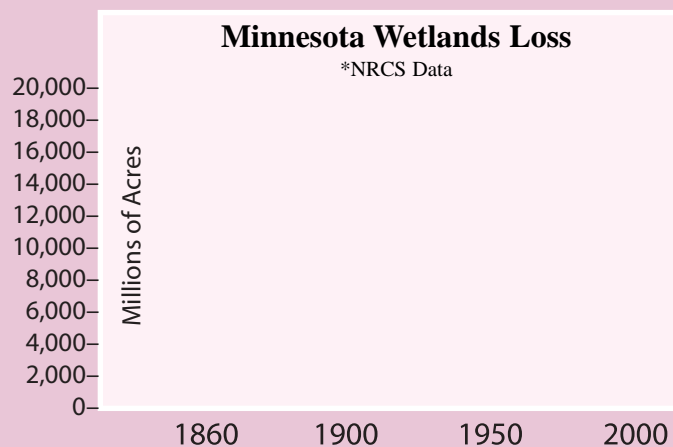
Photo Courtesy Minnesota Department of Agriculture

Wetlands: Going, going... Coming Back?

In the 1860s Minnesota had almost 19 million* acres of wetlands. Then settlers from Europe started coming in large numbers. By 1900 we had lost almost one million acres of wetlands, mostly to create farm fields. By 1950, we had lost another 5 million acres. By 2000, another 3 million acres were gone, totaling over 9 million acres or about 50% of the original acres of wetlands. (How many acres were left?) Most drained wetlands (73%**) were converted to agricultural uses. Urban growth, industry and transportation took the other 27 percent. Use the data to make a graph in the space below. What questions do you have after making your graph? What trend do you see?

* Figures rounded off to nearest whole number.

** Wetlands have many descriptions from permanent lakes to seasonally wet areas. Most of the 73% was seasonally wet land (too wet to plow).



What's happening across the U.S.? You know that wetlands are the earth's sponges, storing excess water and slowly releasing it. That's how they help protect against flooding.

Wetlands are important habitat for wildlife and birds. They are water purification systems. They are beautiful to look at. Look at the wetlands data for the United States. What trend do you see? How might you explain this trend?

United States Wetlands Loss

1900: 6 million acres drained
1950: 70 million acres drained
2000: 85 million acres drained

Today: We currently add about 250,000 acres per year back into wetlands. It's mostly through farmer conservation programs.

We are starting to protect remaining wetlands, but can we bring some of them back? Stay tuned for events in your own community, in your own future.

Imagine you have to help decide.

If you are called upon to vote to drain a wetland for another shopping mall or preserve it as a wildlife refuge, how will you decide?

GRAB BAG

Name the Day

Most people have a favorite tree. Where is yours?

Thousands of people all over the country mark this day with planting ceremonies. In Minnesota and many other states, it is the last Friday in April each year. It's a day to celebrate trees!

What is it? _____

What is its date for 2005? _____

What will you do to celebrate trees?



Photo Courtesy U of M Agricultural Experiment Station

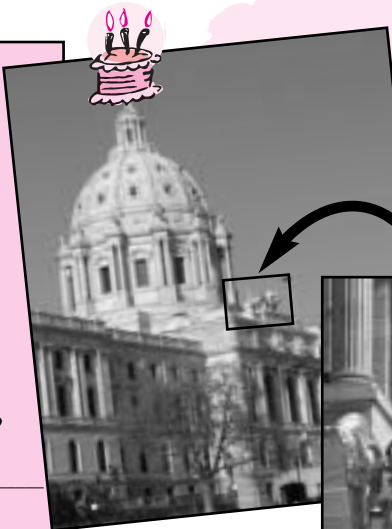
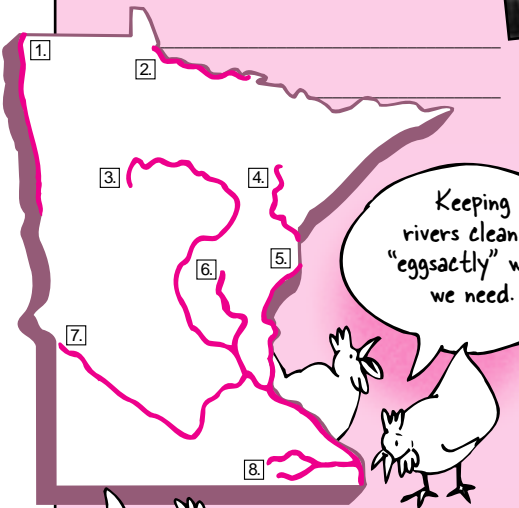
ANSWERS: What do you know about water?, p. 2.
1. b 2. a 3. a

Water Watch

Label these 8 rivers

- | | |
|--------------------------------------|------------------------------------|
| <input type="checkbox"/> Minnesota | <input type="checkbox"/> Rainy |
| <input type="checkbox"/> Mississippi | <input type="checkbox"/> R u m |
| <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?



Photos Courtesy David J. Oakes, Senate Media Services.

A CAPITOL QUESTION



The Minnesota state capitol is 100 years old in 2005! What are the figures on the golden statue at the base of the dome? What do they represent? The statue's name is "The Progress of the State," but it's usually known as the Quadriga. (The word quadriga refers to a chariot drawn by four horses.)



The Minnesota Historical Society can help you answer these questions. Go to Minnesota State Capitol, and click on Quadriga:

<http://www.mnhs.org/places/sites/msc/>

Surf the Net!

What things are investigators from the Food and Drug Administration (FDA) on the lookout for? Take the Food Safety Quiz for Kids to learn about food poison prevention. When you find out "What To Do About Flu," you will remember to wash your hands before eating! Find answers when you visit the U.S. Food and Drug Administration at:

<http://www.fda.gov/oc/opacom/kids/default.htm>

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?

HOW MANY MINNESOTANS?

You are among five million Minnesotans. Did you know that it took about 20 years for us to climb from 4 million to 5 million? How long do you think it will take to reach 6 million? (It took about 40 years for us to climb from 2 million to 3 million. It took 30 years to get from 3 million to 4 million.)



- Q. When is a potato like a bad idea?
A. When it's half-baked.
- Q. What kind of flour is used to make dog biscuits?
A. Collie-flour!

