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AgMag

The Magazine of Minnesota Agriculture in the Classroom

Celebrating 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 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.



How does recycling help protect our natural 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?

Celebrating Our Natural Resources

HANDLE WITH CARE



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



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. Farmland and forested land represent two-thirds of our state's landscape. 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

Where's Your Basin?



You may not know it, but you live in a basin! A **drainage basin** is the area of land drained by a river or lake and its tributaries. Minnesota has 10 major drainage basins. Each basin is made up of smaller units called **watersheds**—areas of land from which rain and melted snow trickle down to the lowest point ... a stream, river or lake. Some water flows over the top of the land; other water flows underground.

- In which drainage basin do you live? _____
- In which rivers, lakes and ocean does the water from your basin end up?
- Explain: "We borrow water! We get it from someplace, we use it, then send it somewhere else."



For more on basins go to:
www.pca.state.mn.us/water/basins/index.html

2 We borrow water!

We get it from someplace,

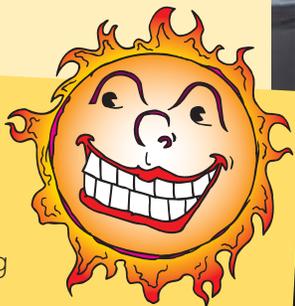
we use it, then send it

somewhere else.

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 cleaner, 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.



The Water Cycle

Show the Flow!

In how many directions does the water in Minnesota's drainage basins flow? Discover the answer with the "Minnesota Drainage Basins" handout in the Teacher Guide.

If you sprinkle your lawn, garden or field, where do the water droplets go?

Don't miss this COOL watercycle website
www.epa.gov/safewater/kids/flash/flash_watercycle.html

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. 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 say how much pollution can be in lakes, rivers, streams or groundwater while still being safe for drinking, fishing, swimming, irrigation or industry.

What do you know about water?

1. About two-thirds of the human body is water. People can live without any food for several weeks, but many would survive ___ without water.

a. 1 month	b. 2 weeks	c. less than a week
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2. More than 40 percent of the fresh water in the United States (and 10 percent of the world's) is in this lake.

a. Long Lake	b. Lake Superior	c. Lake Wobegon
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3. In a lifetime, you will drink enough water to fill more than ___ liter bottles.

a. 40,000	b. 100	c. 500,000
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Water Watch

Even in water-rich Minnesota, clean water is a great concern. Five million Minnesotans use and depend on our waters. Water and pollution experts manage our basins and waterways. They study where pollution is coming from and work to solve the problems. For example, they learned that when ocean-going freighters scoop up water for **ballast** in foreign ports and dump it in the Great Lakes, **alien invaders** come, too. New Zealand mudsnails, zebra mussels from the Caspian Sea and Eurasian ruffes all have taken up residence in Lake Superior. What has that meant for native species?

Keeping water clean and usable is a big job. Farmers, industries, homeowners and all of us must work together to keep pollutants out of our waters.

What good times have you enjoyed in our state's sun-sparkled waters? Write, draw, sing or tell about some.

Home Grown

Every day, Americans need energy (fuel) for heating homes and businesses, cooking food, running industry, powering cars, planes, trains and much more. Much of this energy comes from natural resources. It comes from the sun – the primary source of the earth’s energy. It comes from fossil fuels such as coal, natural gas and oil (petroleum). Fossil fuels start out as decayed plants and animals that turn to crude oil deep in the earth.

The sun is an everlasting source of energy, but what happens when supplies of coal, natural gas and oil are used up? Because it takes millions of years for them to form again, to us they are not renewable. They are gone for good. Many geologists predict the world will begin to run short of oil in this century. We need to find renewable ways to create energy. Agriculture and science are teaming up to do just that.

Energy From Plants

Corn Power

Wouldn't it be great if we had a fuel that causes less air pollution than gasoline, is easy to make here in Minnesota and is renewable? The good news is we do have such a fuel! Ten percent of the gasoline you pump into your car is ethanol, made from corn. When we need more ethanol, we can grow more corn. Ethanol production helps Minnesota farmers, businesses and communities. It can:

- Replace 10% of imported crude oil used to make gasoline. That saves both oil and money.
- Help cut air pollution. Ethanol burns cleaner than gasoline.
- Provide jobs at ethanol plants.
- Build new markets for the state's largest crop – corn. Corn growers earn money selling their corn to the ethanol processing plant. Many ethanol plants are owned by the growers themselves in businesses called **cooperatives** (co-ops). That means growers also share in the income when the ethanol is sold.



Photos Courtesy University of Minnesota Agricultural Experiment Station



Beans in your Bus!



Is there a long line of buses waiting to take students home when your school gets out? If so, you may notice the smell of diesel exhaust in the air. Many big, powerful engines burn diesel fuel. Breathing diesel smoke is not good for our lungs and hearts, or for our environment. Agriculture is helping clean the air by producing **biodiesel** fuel for engines in buses, trucks, tractors and some cars.

Biodiesel is an environmentally friendly fuel, burning much cleaner than fuels made from oil. In Minnesota, most biodiesel fuel is made from soybeans, which are high in oil. Like ethanol, it is renewable because it comes from crops that can be grown every year.



Photos Courtesy University of Minnesota Agricultural Experiment Station

About 18% of Minnesota's corn crop is used for ethanol. If ethanol causes high demand for corn, what happens to the price of corn? Cattle, hog and poultry farmers and makers of many different foods also need corn. What do higher corn prices mean for them and for us?

Did YOU know?

Ethanol can be made from other high-starch crops besides corn. Soybeans, sugar cane, sugar beets, potatoes and even cheese whey are some of the others. In Brazil, many cars run on a mix of nearly 100% ethanol made from sugar cane.

Think about all the things you do that depend on energy. What would you do without it?

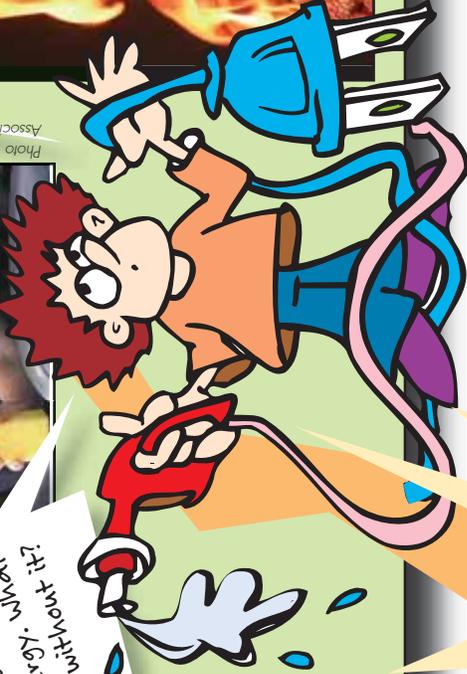
Watch for E85 at more gas stations. It's an 85% ethanol fuel from corn.



Photo Courtesy American Lung Association of Minnesota

Biomass

World demand for both food and fuel is expected to double in the next 50 years. We need to take the burden off corn as our main source of ethanol. Soon we may be using fuel from the fiber of sticks and trees, prairie grass, wheat straw, cornstalks, sugar cane, paper pulp, rice hulls and even garbage!



Harvesting the Wind

If you live in southern Minnesota or have visited there, it's a sure bet you've noticed the wind. It seems to blow all the time! Scientists and farmers took notice, and some farmers across southern Minnesota added to what they produce. Many fields with crops now also hold towering wind turbines, gently turning in the wind. The wind power is used to generate electricity. Minnesota's wind turbines now produce enough electricity for over 270,000 average households. How does wind-generated energy save water? How does it reduce air pollution?

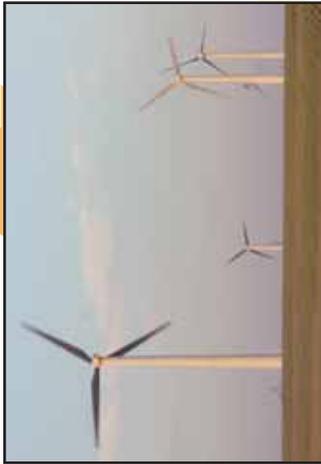


Photo Courtesy Agricultural Utilization Research Institute

POOP Power

Habenschield Farms near Princeton was the first Minnesota farm to use cow manure (poop) to produce electricity. Over 800 cows on the farm produce about 20,000 gallons of manure every day. The manure is scraped from the barn, together with recycled newspapers that are used for bedding for the cows. It's mixed until smooth, and then pumped into a huge covered digestion tank, where it heats up and gives off **methane** gas. The gas is burned by an engine that drives a generator that creates electricity. The manure, now a lot less smelly, empties into a storage lagoon. Later, it is spread on cropland as **fertilizer**. Why do farmers use fertilizer?



Digestion tank

The farm's poop power makes enough electricity to run the whole farm with plenty left to sell to others.

Photos Courtesy University of Minnesota Agricultural Experiment Station



Storage lagoon

**PROTECTING
NATURAL
RESOURCES**

Wherever You Live

You've been learning a lot about how agriculture is protecting our natural resources. You don't need to be a farmer or live in the country to do your part. Plenty of people in cities and towns across America are working hard to conserve natural resources and energy. Here are some things we all can do. Read on...

Make Rain Gardens

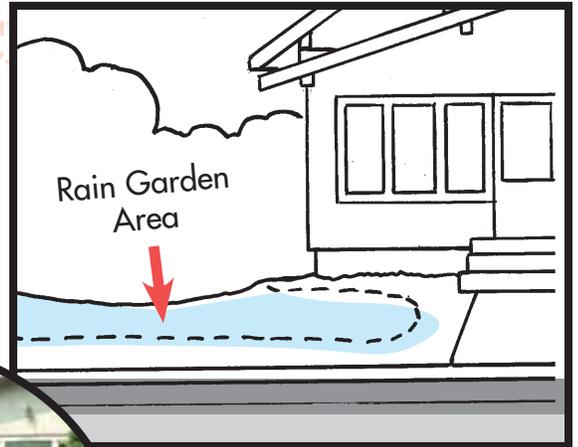
Before all the roofs, streets, alleys, parking lots, driveways and sidewalks of urban areas appeared, rain and melted snow seeped slowly back into the earth. But water flows quickly across hard human-built surfaces, picking up urban pesticides, lawn fertilizers, and gas and oil residue. This polluted run-off dumps into storm sewers. It moves through the sewer system into local lakes, streams and wetlands. Some city folks are helping slow pollution with rain



Photo Courtesy University of Minnesota
Agricultural Experiment Station

Use Native Plants in Landscaping

Would your family like to save time, energy and natural resources in your own back yard? Ask for **native plants** and seeds at plant nurseries and garden stores. Native plants are those that thrived in our ecosystem long before people came along. Because the setting is natural for them, they are hardy through a range of weather and soil conditions with little help from us. That means less tilling, mowing, watering, fertilizing or fuss. No matter where you live, you can have native species that will be right at home in your yard.



Rain gardens are gardens designed with a dip in the center to collect rain and snow melt. When planted next to hard surfaces such as sidewalks and parking lots, rain gardens collect runoff water. This water is filtered as it seeps slowly into the ground. Rain gardens help keep runoff out of storm sewers, or from running directly into our lakes and streams.

Two Native Plants



Photos Courtesy Peter Dziuk

BUY LOCALLY

Strawberries, squash, dairy products, meat, cereal, building materials. Our families use them all, but where do these items come from? Are they grown near you? Do they come from another state or country? How does that make a difference in the time, energy and resources used?

Think & Discuss

Check the Greener Choice!

Buy strawberries from

- a local farmers' market.
- a store that got them "fresh from California."

Buy grocery store milk that came from a

- nearby dairy.
- another state.

Drink water from

- recyclable bottles.
- the tap (faucet).



During the winter months, we depend on imports from other states and countries to bring us fresh food, flowers and more. But even in winter, we have some choices. Next time you're in the grocery store, check the food labels. See where some of your favorite foods come from. Are your frozen peas from Le Sueur, MN or from California? Is your turkey from Willmar or from North Carolina?

Stores work hard to bring us variety because we want and expect it. Still, how is food that travels shorter distances the greener choice?

Locavore? Search for this NEW word on the Internet. What does it mean?

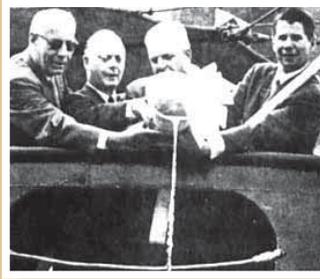
Sesquicentennial
 1858-1908
 1908-1958
 1958-2008

MINNESOTA AGRICULTURE THROUGH 150 YEARS OF STATEHOOD

On May 11, 2008, Minnesota will reach its 150th anniversary as the 32nd state in the United States of America. This milestone is called a **Sesquicentennial**, and it will be a year-long, statewide celebration! This AgMag spotlights a few events of Minnesota's great agricultural heritage in the last 50 years of statehood.

We began the last 50 years of our statehood by celebrating our Centennial in 1958. You read about 100 years of progress and change in the first two AgMags, and it didn't stop there. Modern railways, highways, air routes and two main water routes—the Mississippi River and the Great Lakes—carried millions of tons of Minnesota ag products to consumers around the world. Immigrants still arrived from all over the globe. Many left to escape violence, joblessness or poverty. They came for new opportunities. Some came to join family or friends already in Minnesota. Many moved to small towns and rural areas to work in agriculture. Agriculture changed along with the population, and now we enjoy greater food diversity than ever.

Technology and research are sweeping agriculture into an exciting new future. You read about many of them earlier in this AgMag. Agriculture will continue to be much more than farming. In your future you will surely have some exciting career choices in ag!



In 1959 Duluth became a world port with the opening of the St. Lawrence Seaway. The Great Lakes and the St. Lawrence River now linked our landlocked state to the Atlantic Ocean nearly 2,700 miles away. Today grain, iron ore and coal make up more than 90 percent of total Duluth Seaway Port commerce. The governor used water from the seven seas to christen the opening of the Seaway. Name the seven seas!



Norman Borlaug, a graduate of the University of Minnesota, won the Nobel Peace Prize in 1970 for being a leader in the fight against world hunger. Borlaug developed a high-yield, disease-resistant strain of wheat. He is called the father of the "Green Revolution," which describes a huge increase in food production that helped prevent famine in Asia and developing countries beginning in the 1960s. Why do you think he chose Africa for his focus in the past 20 years?



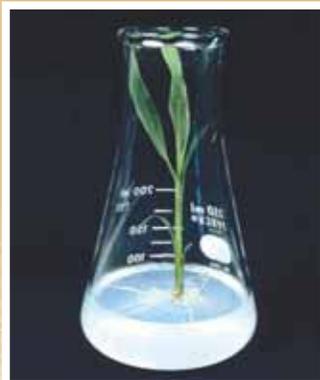
The mid 1980s brought tough times for farm families when many didn't make enough money to pay their bills and keep their farms. A crowd of 1,200 people held a rally in Worthington to call attention to the growing rate of farm foreclosures and bankruptcies. Store owners, bankers and educators joined farmers at the rally. In what ways is a threat to our farms a threat to all of us?

Above Photos Courtesy Minnesota Historical Society



By 2000 over six percent of Minnesota's population was born in another country. Worthington became Minnesota's third most racially diverse city. (Minneapolis is first; St. Paul is second.) What do you enjoy most about the growing diversity? What new foods and flavors have you tasted in Mexican and Thai and Indian restaurants? What new products have you seen at farmers markets? In 1970, U.S. grocery stores sold about 70 types of fruits and vegetables. In 1987 that number rose to 296 types. How do you think the number has changed today? Why?

Photo Courtesy Minnesota Department of Agriculture



For well over a century, the University of Minnesota has conducted research to develop new plants that provide food for life. For example, in 1975 U of M geneticists were the first to regenerate corn from tissue culture. Today, much work is being done in the area of renewable energy. Why is energy research important to our daily lives?

Photo Courtesy U of M Agricultural Experiment Station

GRAB BAG



On Tap

Americans spend **\$7.7 BILLION DOLLARS** a year on bottled water. The energy we waste using water that's bottled and shipped would be enough to power 190,000 homes. But refilling your water bottle from the tap requires no extra energy and no waste of resources.

River Reach

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?

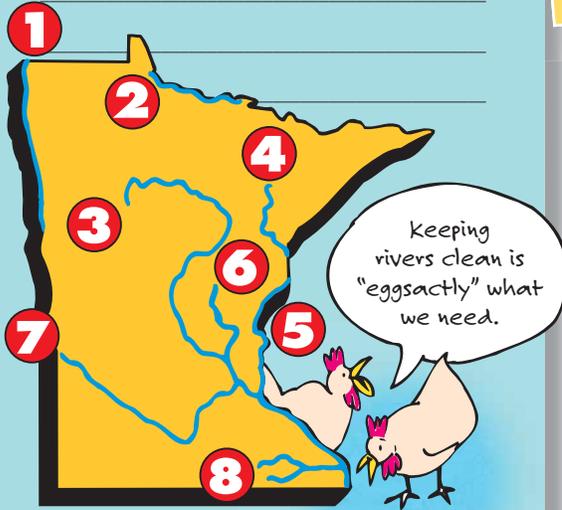


What's your ecological footprint? How does it compare to that of kids in other countries? Find out with this online quiz. Will you change some of your habits?

www.earthday.net/footprint/index.asp

Would you like to see an oxcart trek along the Red River trail? Or join a week-long wagon train from Cannon Falls to Red Wing, Hastings, Inver Grove Heights, Fort Snelling and the State Capitol? See these and many more Sesquicentennial events listed here:

www.mn150years.org/



Capitals for a Day

In honor of Minnesota's 150th anniversary these five cities get to be state capitals for a day. Each city represents one of Minnesota's unique biomes.

- **Bemidji**—represents the state's coniferous forests
- **Detroit Lakes**—represents the deciduous forest zone
- **New Ulm**—represents the state's prairie grasslands
- **Thief River Falls**—represents the tallgrass aspen parklands
- **Winona**—represents the driftless region—the only part of the state never covered by glaciers

Locate each city on a state map. Then place each with a star on the map above!



Make a list of all the ways your family uses water in a week. Then guess how much water it is. 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. Is it gallons, **cubic meters** or **cubic feet**?) Read the meter again after one week and see how your prediction checked out.

Country Corn Q. If a rooster laid an egg on a slanted roof, which way would it roll?

A. No way. Roosters don't lay eggs.

Name this April Day

Day

Date

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? _____

