Minnesota Agriculture in the Classroom

AgMag

Exploring Minnesota Agriculture with Today's Youth

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Can you have agriculture without natural resources?

There's just no way!

Photos Courtesy University of Minnesota Agricultural Experiment Station

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 prevent water pollution, we help keep water safe for cooking, swimming, drinking and **aquatic** life.
- 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.

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?

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.

Agriculture and Water

You already know that agriculture provides our food, fiber and so much more. All plant and animal agriculture depends on water. How do today's farmers protect our water? They…

a. Learn safest ways to use and handle crop protection chemicals.

b. Plant crops in strips, alternating row crops (such as corn) with hay or pasture crops.

c. Plan and time crop irrigation.

d. Keep livestock away from rivers, wetlands and lakes.

e. Keep manure and animal wastes contained.

f. Leave plant remnants (stalks, leaves) on fields after harvesting instead of plowing them under.

g. Keep grass or natural vegetation strips (**buffer strips**) along waterways, lakes and rivers.

Why do farmers do these things?

Some good reasons are listed below. Write the letter from the list on the left next to one or more reasons that match it.

____ Helps keep toxic materials and pollution out of water supplies.

____ Helps reduce loss of soil to wind or water erosion.

____ Conserves water.

____ Helps keep animal waste out of rivers, wetlands and lakes.

*Water covers about **70%** of the earth's surface.*

Thanks, Farmers!

The longest river in the U.S. is the Missouri River. At about 2,340 miles in length it is slightly longer than the Mississippi River (2,320 miles). The two combine to form the longest river system in North America. There are hundreds of farmers and agricultural activities along these rivers.
How are they important in keeping the rivers clean?

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? _____ _____ _____ _____

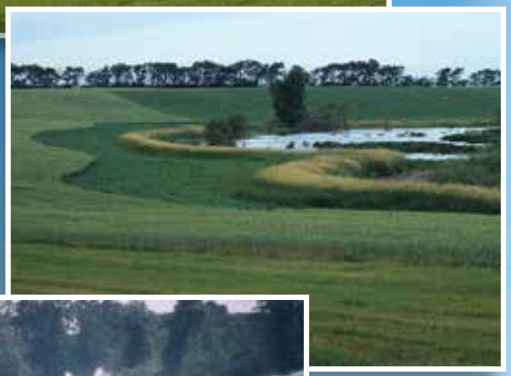
The soil beneath our feet is as important as the air we breathe and the water we drink. Farmland and forested land represent two-thirds of our state's landscape. Whose responsibility is it to care for the soil? Farmers and foresters have a big role to play. But each of us must also help. These soil-care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

1. Cover bare soil with new plants or mulch so soil 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?

How can you help protect the soil of football and soccer fields, parks and other public places?

For more on soils see: **http://soils.usda.gov/education**

Strip cropping



Buffer strips

Crop irrigation

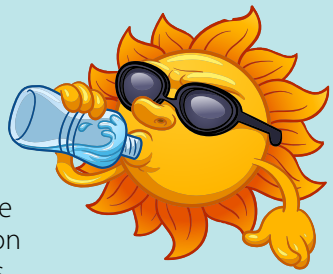
Photos Courtesy University of Minnesota Agricultural Experiment Station

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!

Think & Discuss

From Texas to California, southern and western states have continued drought in 2015. That means limited water for states with exploding populations. California, the top U.S. agricultural state, is in the third year of one of the state's worst droughts in the past century. Records show 2014 was California's driest year in 119 years.

This lingering drought has led to fierce wildfires and water shortages. Farm crops and livestock are deeply affected.

List at least 15 ways water is used.
What needs must be met first if there is not enough water for everything? Mark them with a star.

_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____

What happens if your starred needs are not met?

Pollinators: Partners with Growers

Did you know that bees are not only an important natural resource, but also important partners to farmers and food growers? Beekeepers regularly open their hives to see how their bees are doing. A healthy hive means healthy bees as well as enough pollen and honey to feed the bee colony.

Around 2006, beekeepers saw a troubling change. Hives contained honeycombs, beeswax and honey—but all too often no bees! Was the problem pesticides? Viruses or bacteria? Loss of habitat and pollen plants to feed upon? Bee-killing pests, such as mites?

We still don't have all the answers. We do know that vanishing bees mean huge problems for our food supply. Why? Bees are pollinators. About 1,000 plants grown for food, beverages, fibers, spices and medicines need pollinators in order to produce the products we need and want. Carrying pollen from plant to plant, bees and other pollinators are heroes of agriculture around the world. One of every three mouthfuls of food we eat depends on bees having pollinated the plants.

What do all these foods have in common? They all need

_____

Star the foods grown in Minnesota.

True or False?

T or F Bees are pests to be feared and eliminated.

T or F Early colonists brought honeybees to North America.

T or F Flowering plants can produce seeds without pollination.

T or F Pollination is essential to our food supply.

T or F Human actions can be harmful to pollinators.

T or F Chemicals can find their way into bees through the plants and pollen they depend on for making their honey.

Other Pollen Movers

Plants can't walk, but their pollen can hitchhike! How can each of the following be a pollen mover?

Hummingbird	**Butterfly**	**Water**
Bumblebee	**Beetle**	**Wild Native Bee**
Wasp	**Wind**	
Bat	**Human**	

Think & Discuss

www.ted.com/talks/marla_spivak_why_bees_are_disappearing.html

Did you know?

- Minnesota, Wisconsin, and Michigan together have more than 500 species of native bees. Native bees and other insects are important pollinators.
- A honey's color and flavor depends on the plants visited by the bees. Clover, buckwheat, orange blossom, alfalfa and basswood are a few honey varieties. **Taste Test:** *Get some different honeys and see if you can taste the differences.*

Making Connections:
What's the Farmer's Dilemma?

Farmers earn money through raising and selling crops. It's not simple. They must balance crop needs with environmental concerns, including pollinators. Honeybees, for example, can fly as far as eight miles in search of pollen and nectar. That's why it's a community effort to keep pollinators safe. Check choices that are friendly to pollinators and tell why.

- [ ] Know your local pollinators and provide what they need to survive.
- [ ] Grow a variety of plants that blossom at different times through the seasons.
- [ ] Provide sheltered, undisturbed places for overwintering pollinators.
- [ ] Create pesticide-free landscapes and habitat areas.
- [ ] Use crop protection chemicals only when needed. Apply them during times when bees are less active, such as after sunset.
- [ ] Help rebuild the bee populations by starting hives.

Beekeepers stay calm and wear special clothing to avoid being stung.

Helping Pollinators:
We Can Do It!

All pollinators need a seasonal succession of blooming plants to get through spring, summer and fall—and to prepare for winter. How can you use your school, community and backyard to help pollinators? How does each photo show something helpful for pollinators?

School gardens including native flowering plants. Bees especially like bright white, yellow or blue flowers with a pleasant fragrance.

Native wildflowers along fields, roadsides and walkways.

Milkweed and habitat for Monarch butterflys.

Photo Courtesy Champlin Brooklyn Park Academy

Photos Courtesy University of Minnesota Agricultural Experiment Station

BEE proactive!
It is easy to do your part to help me!

Bees in surprising places

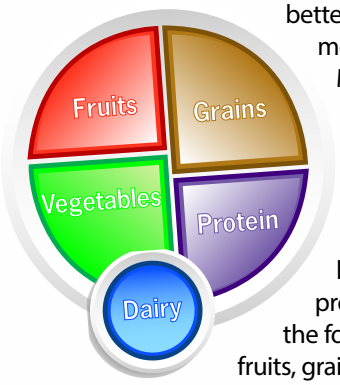
Beekeeping is a hobby that's growing in surprising places! People want to do their part to help bees, and they want to grow more food locally.

Rooftops from Minneapolis City Hall to downtown hotels now host beehives! Minneapolis and St. Paul were among the first cities to allow beekeeping in urban areas. Are any beekeepers or apiaries in your community?

Hives On the Move

U.S. bee pollination needs are heaviest in our southern and western states. Many beekeepers move their bees from state to state to pollinate flowering crops. The hives travel the highways on trucks that are parked near the fields when the bees go to work.

Eat Well, Be Well!



Have you noticed all the buzz about better food choices? What does it mean to eat more healthfully? MyPlate is a great reminder. It's the newest healthy eating guide from the U.S. Department of Agriculture (USDA). MyPlate shows how to divide your plate for a healthful meal. It shows the proportions and also details the food groups of vegetables, fruits, grains, proteins and dairy.

A look at MyPlate reminds us to:

- eat less by avoiding oversized portions;
- eat more vegetables, fruits and whole grains;
- choose from a big variety of proteins; and
- include calcium-rich foods.

Q: The USDA hopes that MyPlate becomes your plate! Why?

Wiser Choices

MyPlate helps us remember to avoid foods that are high in sodium or empty calories. Empty calories have the same energy as other calories but none of the vitamins, minerals or other nutrients you need. Examples are sugary drinks; sweets like cookies, ice cream and candy; white bread and white rice.

Check your menu! Which of these is a better choice, and why?

Today's Menu

Beverage: ☐ soda pop ☐ water or milk

Sandwiches:
☐ bacon cheeseburger with fries
☐ turkey wrap with serving of raw veggies

Dessert:
☐ Cookie ☐ Apple ☐ Hot Fudge Sundae

Taste Test

Talk about food with classmates or neighbors. In your group, try to come up with the names of three foods that you have never tried. Find out more about these foods and their nutritional value.

List your discoveries below and make plans to taste them.

Do a word search on Food-A-Pedia for quick facts about more than 8,000 foods.

www.supertracker.usda.gov/foodapedia.aspx

MinnesotaAgriculture: 1970 – Today

Always Something New!

In your last AgMag, you learned about farming during the early 1900s. Imagine a farm family from that time stepping onto a modern farm today. They'd be shocked and amazed to see all the changes.

Science and Technology Take the Lead

Computers manage farm businesses, keep crop and animal records and so much more. Computers are built into many farm machines. Electronics are everywhere. Using modern equipment, one family can farm thousands of acres of cropland, raise thousands of pigs or milk hundreds of dairy cows. Corn that was knee high by the fourth of July in 1900 is often shoulder high by that date now. A robot may be milking a cow. A drone may be flying over fields surveying land or finding insects. Barns are temperature-controlled to keep animals comfortable.

A drone surveys fields and a robot pushes feed so cows can reach it.

Photos Courtesy University of Minnesota Agricultural Experiment Station

Two other big developments that have changed farming are:

Plant and Animal Breeding

Scientists have been improving plants and animals through careful breeding for many years. That's how we get lean meat animals, high milk-producing dairy cows, hybrid crops, drought-resistant wheat and more.

Plant researchers studying pollination.

Precision Farming

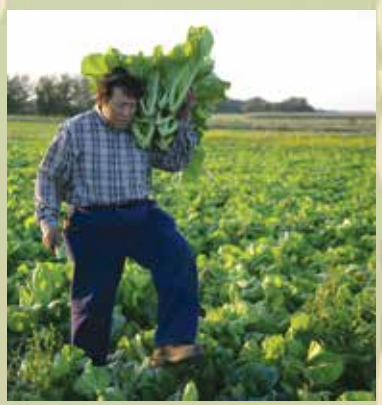
Farming today is done in inches, not just acres. Digital software, drones and GPS systems linked to satellites help farmers. Electronic devices can map every inch of a field and show just how to manage it for best production. They can control the number of seeds planted, provide the exact amount of fertilizer needed in each area, tell exactly where to kill weeds and more. It's all done from laptop computers, cell phones, tablets and tractor cabs.

A tractor cab is the control center for field work.

With the help of technology, what have been agriculture's biggest achievements in the last 100 years?

Find AgMag Volume 26 to see Agriculture's Biggest Leaps, amazing inventions and new ways of farming.

www.bit.ly/AgBigLeaps



New People in Minnesota Agriculture

By 2011, over 7% of Minnesota's population was born in another country. Most **immigrants** moved to one of our large cities. Some moved to small towns and rural areas to work in agriculture. For exasmple, jobs at farms, processing plants and meatpacking businesses attracted seasonal workers and new immigrants to Worthington, Willmar and other southern and western Minnesota cities. Immigrants make huge contributions to Minnesota agriculture every day.

Each group of newcomers brings their own tasty foods, flavors and traditions. That means more choices for all of us! Today's supermarkets are packed with hundreds of foods for us to choose from, including locally grown. Some stores have whole sections of food from countries around the world. Farmers markets, food cooperatives and restaurants also offer a great variety of foods brought by immigrants.

What do you enjoy most about the growing diversity of Minnesota's people?

Meet a Modern Farm Family

Patsche Photos Courtesy xxx

Wanda Patsche

Chuck and Wanda Patsche own and operate a modern farm with pigs, corn and soybeans in southern Minnesota. Their farm has grown from 150 acres 37 years ago to nearly 1000 acres today. Chuck's parents and grandparents once farmed part of this land.

"Our farm has changed in big ways over the last 35 years," Wanda explains. "The biggest change is the technology that lets us be more efficient and do a better job farming. When we started farming, our herd was 96 sows. All were housed outdoors where it was hard to keep them safe and content. Today, we raise about 2200 pigs indoors. We get them from a nearby sow farm when they are three weeks old. It takes them around six months to grow from 13 pounds when we get them to market weight of 280 pounds.

"Our goal is to raise the healthiest animals possible. The baby pigs live in clean barns when they come to our farm. Technology allows us to automatically control feed, ventilation and temperatures. During the hot summer weather, water sprinklers in the barns help keep the pigs cool. We work closely with a veterinarian on a vaccination plan to help prevent diseases. As they grow, we feed our pigs nine different rations to meet their nutritional needs.

Three generations of the family enjoy the baby pigs. Chuck, daughter Kristeena and grandchildren Edwin and Jadyn are in a pig barn. Farming is often a family activity.

Wanda and Chuck and one of their large machines: a combine for harvesting crops.

"Our crop machinery is much larger today. More work gets done in less time. Our crops get planted more accurately and faster."

Wanda, Chuck and their one employee need extra help at harvest time. Their grown daughters and other family members come to help during these busy fall days when workdays can be 16 hours long.

Good Stewards

Chuck and Wanda work hard to protect the environment. *"We have buffer strips of grasses between our crops and waterways to help protect our waters. We practice **crop rotation** and **minimum tillage** to help with soil erosion. We fertilize with pig manure to replace soil nutrients used by the crops. We use the least pesticide possible."*

Visit Wanda's Blog **www.mnfarmliving.com**

Looking Ahead

The average Minnesota farmer today is 55 years old. Why is it important for young people to be involved in agriculture and farming?

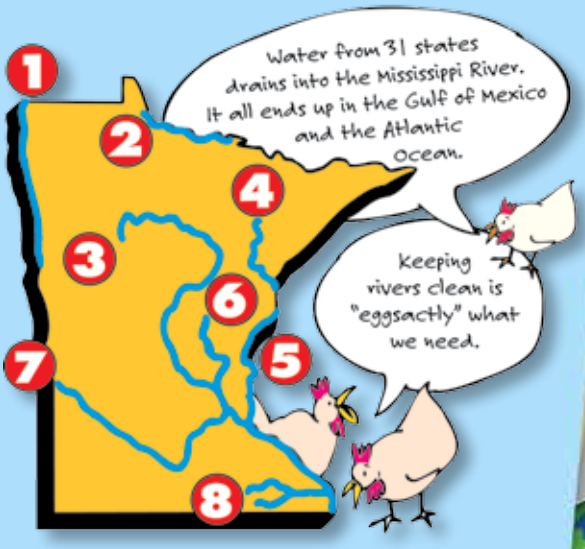
Fast N Fun

Celebrate Minnesota Water

Minnesota's waters flow outward in three directions: North to Hudson Bay in Canada, east to the Atlantic Ocean, and south to the Gulf of Mexico.

Match each number on the map to the river it names.

- ☐ Minnesota
- ☐ Mississippi
- ☐ St. Croix
- ☐ Red
- ☐ Rainy
- ☐ Rum
- ☐ St. Louis
- ☐ Root

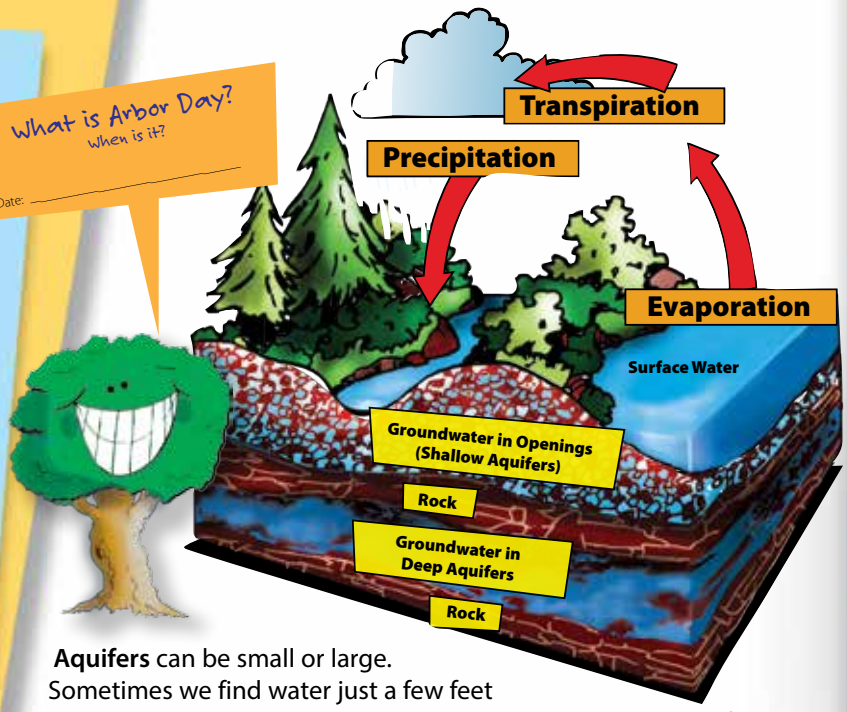


How can ***you*** help protect our rivers?

What is Arbor Day?
When is it?
Date: _____

Where Does Our Water Come From?

Water comes to us through precipitation in the form of rain or snow. The water moves through our landscape in rivers, lakes, wetlands and groundwater.



Aquifers can be small or large. Sometimes we find water just a few feet below the ground. Other times the water may be hundreds of feet deep. No one knows for sure how much water is in our aquifers. It's affected by how much rain we get and how much water we pump from wells. Today 75% of Minnesota's drinking water and nearly 90% of the water used in crop irrigation is pumped from groundwater aquifers.

97.2% of Earth's water is salt water. Just 2.8 % is fresh water and available for human and animal needs. Why can't we use salt water in the same ways as fresh water?

For Seven Generations...

When making an important decision, an ages-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?

Do you think that you will eat insects in your lifetime? Check out some bug recipes and discover more about insects, plants, soil, fungi and more. Visit **Just For Kids!**

www.ars.usda.gov/Main/docs.htm?docid=13680

Learn about and order our free educational materials at **www.mda.state.mn.us/maitc**

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