Minnesota Agriculture in the Classroom

AgMag

Exploring Minnesota Agriculture with Today's Youth

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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 dannarshall.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.

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 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?

http://soils.usda.gov/education

For more on soils see:

Strip cropping

No-till or conservation farming

Crop irrigation

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

Some southern and western states have drought, limited water and exploding populations. California, the top U.S. agricultural producing state, has had less rainfall in 2013 than in any year since statehood (1850)! Finding enough water to meet growing demands for agriculture and everything else is a challenge.

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?

Photos Courtesy University of Minnesota Agricultural Experiment Station

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.

Why are bees disappearing?

Think & Discuss

www.ted.com/talks/marla_spivak_why_bees_are_disappearing.html

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**	

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

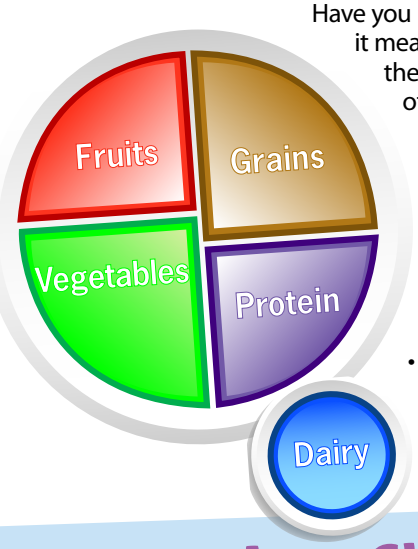
Beekeeping is a hobby that's growing in surprising places! People want to do their part to help bees, and they want to grow more food locally.

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?

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

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

Proteins and Whole Grains

What counts as proteins and whole grains? Meat offers protein, but so do beans and **legumes**. Whole grains like whole wheat and whole oats may be familiar, but there are many other whole grains, too. Millet, quinoa (say "KEEN wah) and teff are popular grains in many African and South American countries. Beans and legumes are important sources of protein in most countries around the world.

MyPlate... for Everybody

The variety and quality of food in the U.S. is unmatched anywhere. All the ethnic groups that make up our population bring a rich diversity of foods and menus.

MyPlate is based on a culturally specific way of eating. It assumes that everyone has their own plate. Not all people serve food that way, though. Not all people serve foods in separate groups, as seen on MyPlate. Many ethnic groups are known for wonderful, complex "mixed" foods. Vegetables, grains, proteins and dairy foods are all in one dish.

Q. *If you live in a family that eats a lot of mixed foods, how can you follow the MyPlate guidelines for healthier eating?*

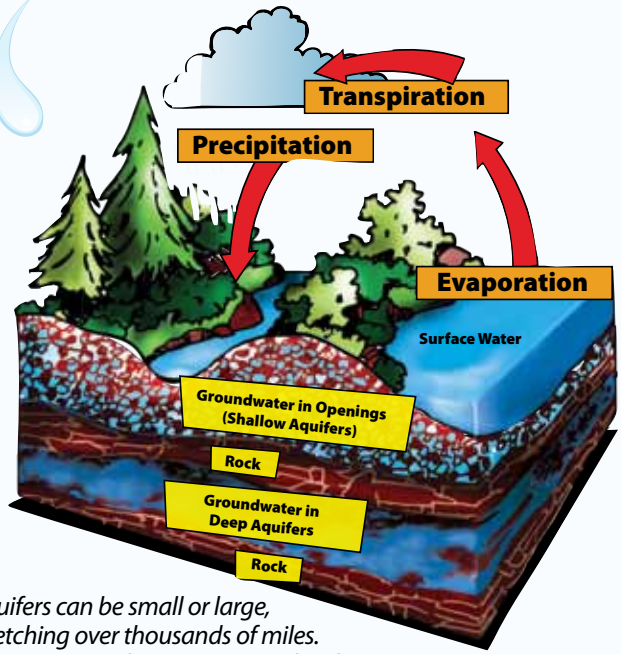
Water Watchers

We are a state of 10,000 lakes. It doesn't seem like there'd be any water shortages here. However, population is increasing. The need for water goes up as more people, businesses and activities are added. Demands for water are growing as never before.

Some parts of Minnesota are already seeing the effects of water shortages. During last summer's drought, folks in Fairmont were told not to wash cars or water lawns and ball fields. The city of Marshall had to go 23 miles out of town for water from the Sandnes Aquifer. Businesses were told to cut water use. The water levels in White Bear Lake—and other lakes—kept steadily dropping. Swimming beaches were closed. Docks that were once out in the water stood on dry weed beds, far from the water.

Where Does Our Water Come From?

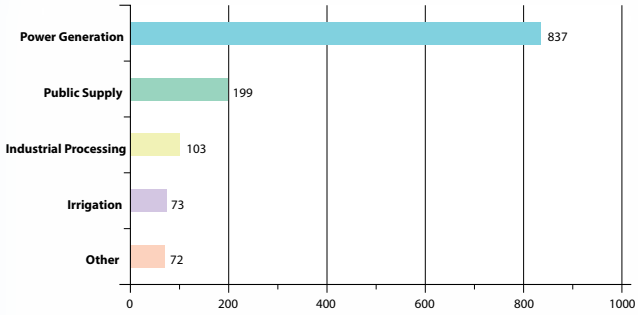
All the water we drink or use falls first on the ground as precipitation. Some ends up in lakes, wetlands, rivers and streams as surface water. Some seeps, percolates and trickles down into the ground, becoming groundwater. The water finds its way into openings in rock and gravel that catch and hold it. These underground water storage spaces are called **aquifers**. Water pumped from wells comes from aquifers.



Aquifers can be small or large, stretching over thousands of miles. Sometimes we find water just a few feet below the ground. Other times the water may be hundreds of feet deep. How much water is in our aquifers? No one knows for sure, yet we keep using more and more groundwater each year. The amount of water in aquifers is 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 agricultural irrigation comes from groundwater.

How long will the groundwater keep flowing at our level of use? How much surface water do we really have? Experts are working hard to figure it out. Mapping our water resources has become a big project. We can no longer assume there will always be enough water. Large water users (over 10,000 gallons a day or a million gallons a year) must get permits from the Minnesota Department of Natural Resources (DNR). They report how they are using water:

Minnesota Water Use 2011



MN DNR Ecological and Water Resources

Minnesotans use billions of gallons of water each year that are not reported. We only have records for those with DNR permits. Power generation doesn't really use up water. It takes in water from lakes and rivers, uses it to cool equipment, then returns most of it again.

Power Generation — Water used to cool power generating plant equipment.

Public Supply — Water distributed by communities for domestic, commercial, industrial and public users.

Industrial Processing — Water used in mining activities, paper mill operations, food processing, etc.

Irrigation — Water used for crop and plant watering.

Agriculture and Water

We cannot survive without the food, clothing and shelter we get from agriculture. Without water, agriculture cannot happen. Water is needed to grow plants and animals, and to process raw materials into the products we use. Crop irrigation is a big part of agriculture. Thanks to Minnesota's good rainfall and soil, only a half million of our 22 million acres of cropland (2%) need irrigation. Compare that to rainfall-poor California, where 90% of cropland must be irrigated.

Agriculture's need for water must be balanced with all the other ways water is needed. Science and technology can help us use our water more efficiently and protect water from contamination. Experts can develop better ways to clean water so it can be reused. But it takes everyone everywhere working together to make sure we have enough clean, fresh water to meet our growing needs.

How do you ...

- ☒ use water wisely?
- ☒ use less water?
- ☒ keep water fresh and clean?

Of all the water on Earth, only a small amount is usable for human needs. 97.2% of Earth's water supply is salt water. Only 2.8% is fresh water!

Why can't we use salt water in the same ways as fresh water ?

Learn more playing fun games!

www.groundwater.org/kids/games.html

Fast n Fun

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

Celebrate Minnesota Water

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?

_____

_____

_____

_____

_____

_____

_____

Glug-Glug

How much drinkable water do people use each day?

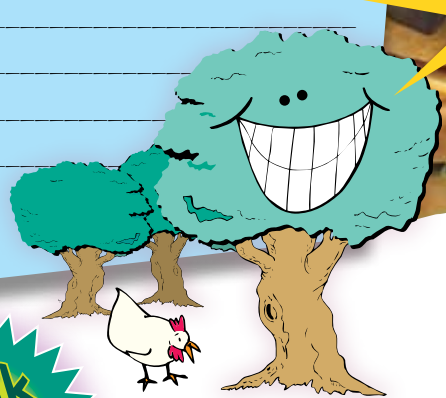
Average Person	Gallons
American	90
European	53
Sub-Saharan	3-5

Why is there such a big difference?

If H_2O is water, what is H_2O4?

A. It's for washing your hands!

It takes three liters of water to produce the plastic for a one-liter container of bottled water. It takes over 1.5 million barrels of crude oil to produce the plastic for bottled water sold in the U.S. each year. Many bottled waters come from city taps. Why not save your plastic bottle and fill it with your own good tap water?



Discover!

- What is the Great Lakes Pact?
- Play the Watershed game! See:

www.bellmuseum.umn.edu/games/watershed

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?

_____

_____

_____

Think Green

Green Squad

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

www.nrdc.org/greensquad/intro/intro_1.asp

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