

AgMag

Agriculture:

Helping you every day!



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Caring for Our Natural Resources

Minnesota, the "Land of 10,000 Lakes,"

is really the land of nearly 20,000 lakes, ponds, and marshes of five acres or more. Forests cover one-third of our state. End to end, our rivers 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 agricultural industries depend on these natural resources. We depend on agriculture. That's why our farmers and others must act as **stewards** of the land, 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, 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 stewards of the land?

Find teacher guide and student resources at www.mnagmag.org





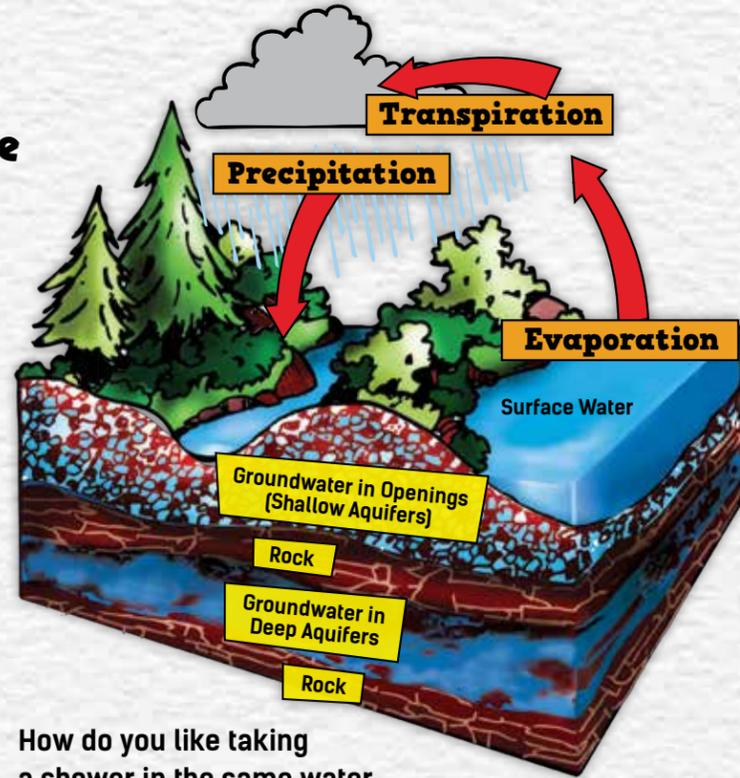
Celebrating Our Natural Resources

Water

Where Does Our Water Come From?

Water is so important for agriculture. Plants need it to grow. Animals need it to live. But where does it 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**. Groundwater is water that exists underground. The biggest use for groundwater is to irrigate crops. That is why groundwater is important for agriculture.

That is also why it is important for groundwater to be clean. **Aquifers** are underground areas that are made of gravel, sand, or fractured rock. When water moves through an aquifer, the aquifer acts like a filter. It helps take impurities out of the water. 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 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 crop irrigation is pumped from groundwater aquifers.



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. We want it to be safe for all human uses and for aquatic creatures, too.

Cool Water Facts

- **97.2%** of Earth's water is salt water. Just **2.8%** is fresh water and available for human and animal needs.
- 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.
- Water from **31 states** drains into the Mississippi River.
- The federal Clean Water Act requires states to set **water quality** standards. These rules limit how much pollution can be in lakes, rivers, streams, or groundwater before the water becomes unsafe for drinking, fishing, swimming, and more.
- Water covers about **70%** of the earth's surface.
- 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)?

Soil

Why is Soil Important?

Farms need soil to grow plants. Soil holds roots in the ground so plants don't fall over or blow away. It also helps plants absorb moisture, and it holds minerals and nutrients that plants use for food. Soil is also home to other living things helpful to plants. Some of those plants are used to feed animals.

The soil beneath our feet is as important as the air we breathe and the water we drink. Farms and forests make up two-thirds of our state's landscape. Who should care for the soil? Farmers and foresters have a big role to play. But we must also help. Here are things we all can do:

- Cover bare soil with new plants or mulch so soil won't wash or blow away.
- Stay on sidewalks and trails.

Air

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

Plants and animals grow and thrive better with clean air. Air moves, so polluted air can blow in from near and far. There are many people who work hard to clean up the air. Car makers build engines that pollute less. Laws set rules for companies to dispose of waste. 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!



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:

- Learn safest ways to use and handle crop-protection chemicals.
- Plant crops in strips, alternating row crops (such as corn) with hay or pasture crops.
- Plan and time crop irrigation.
- Keep livestock away from rivers, wetlands, and lakes.
- Keep manure contained.
- Leave plant remnants (stalks, leaves) on fields after harvesting instead of plowing them under.
- Apply just the right amount of fertilizer at the right time to feed the crops and reduce the risk of runoff.
- Use grass waterways, terraces, water retention basins, and other structures to reduce erosion and runoff.

Why do farmers do these things?

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

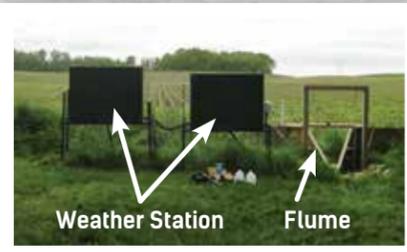
- Help keep pollution out of water supplies.
- Help reduce loss of soil to wind or water erosion.
- Conserve and protect water.
- Help keep animal manure out of rivers, wetlands, and lakes.

Farmers Taking Care of Natural Resources

Now that you know how important water, soil, and air are to farmers, you can see why it is important to take care of them. Farmers everywhere continue to learn more about ways to keep our natural resources in good shape so they can continue to provide us with the agricultural products we need and use every day.



The Meyer Family



Weather Station Flume



Inspecting the flume



Water going through the flume

Meyer Dairy

In Minnesota, there are farms that do research to learn how to protect water on farmland. These projects are called **Discovery Farms Minnesota**. Meyer Dairy, in Stearns County near Sauk Centre, is a Discovery Farm with a weather station and water monitoring station ("flume") on the edge of one field to test water quality and monitor runoff. Runoff is water that moves so fast that the land cannot absorb it. The runoff on the surface is directed through a flume. The flume may be made of wood, concrete, or hard plastic. The runoff that goes through the flume is measured and sampled for sediment and nutrients.

They learned that the timing of weather events has an impact on runoff. For example, a large rainstorm during planting season can cause a high amount of runoff because no crop is yet rooted in the field. When runoff occurs, it can erode the soil. It can also move pollutants across the land and into other water sources. Understanding when and how the water moves helps farmers and scientists learn how to manage runoff.

"Through the Discovery Farms research at our farm, we have proven that farmers have been and will continue to protect water and soil quality," said Tara Meyer.



Farm Conservation Practices

Farmers today have many different ways to protect the land. Here are a few:

- **Crop and pasture rotations.** This means farmers do not plant the same crop in the same place each year, or let their livestock graze in the same pasture all the time. By moving the crops and livestock around, it keeps the soil from being depleted of nutrients. It can also help cut down on insect populations that are pests.
- **No-till.** This is used to help keep soil from eroding by not disturbing it more than necessary. For example, instead of plowing all the dried cornstalks and leaves into the soil, the farmer allows them to remain on the ground until it is time for the next planting. That way the soil does not blow away or wash away with rain.

Little Timber Farms

Little Timber Farms, owned and operated by the Nord and Gray family, raises cattle in Beltrami County, near Blackduck. They are a part of the **Conservation Stewardship Project**. They work to make their farmland healthier by using rotational grazing. This means that rather than cattle eating grass in the same field all the time, they move the cattle from place to place, giving the soil time to rest and replenish its nutrients. Then the soil will grow better-quality grass that is more nutritious for the cattle. The farmers also plant many pollinator plants to attract bees and butterflies that are beneficial to farms.

The farm works with the Natural Resources Conservation Service (NRCS). The NRCS sends technicians to the farm to help the farmer learn what can be done to improve things like water quality, animal habitat, pollinator plots, and even help with soil problems. Some of the things they have farmers do include planting trees for windbreaks, making sure fences are marked with special noisy reflectors so animals can see them, and even creating areas for ducks and geese. "Farmers are concerned about making sure their farm is there for generations to come, and having a well-thought-out conservation plan makes that possible," said Rachel Gray, Little Timber Farms.

Both Discovery Farms and the Conservation Stewardship Project help farmers make the land and water better for them and for future generations of farmers.

Think and Discuss

1. What are some reasons for runoff?
2. What happens if runoff is not controlled?
3. Why is it valuable for farmers to raise plants that attract pollinators?

Cause and Effect

Do you know what cause and effect are? That is when something happens (cause), and that causes something else to happen in response (effect).

Read the text on pages 4 and 5 again. Then list 3 examples of cause and effect that are described in the text.

Example: Drip irrigation delivers water to the root of the plant (cause). That way, less water evaporates into the air (effect).

1. Cause: _____
Effect: _____
2. Cause: _____
Effect: _____
3. Cause: _____
Effect: _____



The Nord and Gray Family



Cattle drink fresh water from tanks in each rotational grazing area instead of using streams, rivers, or ponds. This helps the rivers and streams stay clean, and the cattle be healthier.



Area set aside for wildlife

Farms and Schools: Healthy Partnerships

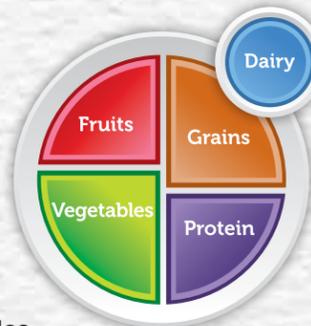


Did you know that many schools and farms are teaming up to improve the food at schools? They are getting food grown by local farmers onto school lunch trays. Kids in many schools see winter squash, sweet corn, melons, potatoes, and apples from local farmers. Locally grown food tastes great and is fresher because it's produced nearby.

Over 1,350 Minnesota schools, representing more than 600,000 students, participate in farm to school programs. Linking schools with local farms means healthy meals in school cafeterias. It means learning lifelong healthy habits while supporting local farmers. Do you know where YOUR school lunch comes from?

Eat Well, Be Well!

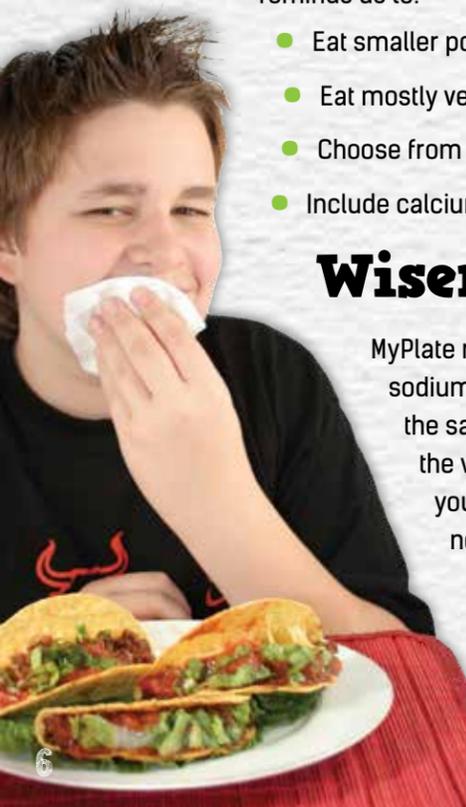
What do you know about better food choices? What does it mean to eat healthier? MyPlate is a great reminder. It's a healthy eating guide from the U.S. Department of Agriculture (USDA). MyPlate shows how to divide your plate for a healthy meal. It shows the proportions and also details the food groups of vegetables, fruits, grains, proteins, and dairy. A look at MyPlate reminds us to:



- Eat smaller portions.
- Eat mostly vegetables, fruits, and whole grains.
- Choose from a big variety of proteins.
- Include calcium-rich foods.

Wiser Choices

MyPlate reminds us 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. Without those nutrients, you will not grow up as healthily or have as much energy as if you get plenty of nutrients. Examples of foods with empty calories are sugary drinks; sweets like cookies, ice cream, and candy; white bread and white rice.



Farm to School Fun!

Food served in schools—urban, suburban, and rural—is constantly changing due to farm to school programs.

- Students on the White Earth Indian Reservation enjoy locally grown, traditional foods such as wild rice, hominy, and squash.
- Students at Lewiston-Altura Elementary School try new locally grown foods each week during Taste-Test Tuesdays. High school students in this district can enjoy burgers made from bison raised near Winona.
- All students in the Hopkins School District are enjoying pasta sauce made from local tomatoes throughout the entire school year.

Your Plate

Look at the MyPlate diagram on this page. Then look at your school's lunch menus. How does your lunch fit into MyPlate?



Minnesota Agriculture: 1970 - Today

Imagine a farm family from the 1800s stepping onto a modern farm today. How would they respond to 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. A robot may milk a cow. A drone may fly over fields surveying land or finding insects. Barns are temperature-controlled to keep animals comfortable.

Plant and Animal Breeding

Scientists have improved plants and animals through careful breeding for many years. Today's farmer produces a leaner meat animal, dairy cows that give more milk, and grows crops like wheat and corn that are more insect-, drought-, and disease-resistant. For example, corn that used to be knee-high by the fourth of July in 1900 is often shoulder-high by that date today. Consumers get higher quality and more abundant plant or animal food products.

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.

New Flavors in Minnesota Agriculture

Over 7% of Minnesota's population was born in another country. Some immigrants moved to small towns and rural areas to work in agriculture. For example, jobs at farms, processing, 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.

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. What do you enjoy most about the diversity of Minnesota's foods?



A robot pushes feed so cows can reach it.



A drone surveys fields.



Plant researchers studying pollination.

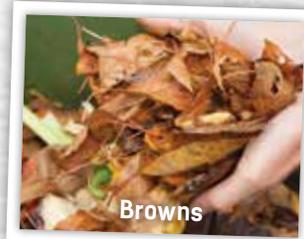


A tractor cab is the control center for field work.



Nutrients for Soil

Just like you need nutritious foods to keep your body healthy, the nutrients in soil need to be replaced too. One way to do that is to **compost**. Composting means taking things like food scraps and yard waste (dead leaves, grass clippings) and piling them together. (This happens on its own in nature—think about dead trees in forests, etc.) Over time, a process called **decomposing** causes the scraps to break down and eventually turn into soil. The new soil can be added to existing soil. The compost soil is rich in nutrients that come from the decomposed plants.



There are four main ingredients of compost: Air, water, greens, and browns. You know what air and water are. But what are “greens” and “browns”? These are the materials that air and water turn into compost. Greens are leftover scraps of vegetables and fruits, green leaves, and manure from livestock, things that have not dried out yet. Greens have lots of **nitrogen**. Browns are dry plant trimmings, like dried leaves or wood chips. Browns have lots of **carbon**. Your compost pile should be made of half greens and half browns to successfully decompose into soil. By turning and watering the pile, you will give it the air and water it needs to break down the greens and browns. When you have these four ingredients, you have the best start for the decomposers that will break down the ingredients: Bacteria, fungi, and insects.

Compost Essentials

Label the following compost items as “Browns” or “Greens”:

twigs _____

apple core _____

dried leaves _____

straw or hay _____

grass clippings _____

wood chips _____

potato peels _____

melon rind _____

For 7 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?

Learn about and order our **FREE** educational materials at mn.agclassroom.org.

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Bugs: Good for Soil!

Did you know that there are many bugs and insects that are good for soil? Yes! Ground Beetles eat all kinds of pests that live in the soil and can harm plants. Fungus Gnat Predators seek out other insects that are harmful to soil and destroy them. There are also critters called “decomposers” that help organic material, like food scraps and yard waste, break down and decompose.

