

AgMag **TEACHER GUIDE**

Volume 21, Issue 3 2006/2007

WHY AG IN THE CLASSROOM?

In times past, people were very aware of the role agriculture played in their lives. It meant survival! Nearly everyone - men, women and children - worked the land.

Agriculture still means survival. That will never change. But as time goes on, fewer and fewer people have close contact with farming. They're not aware of their own - and the nation's - total dependence on agriculture. Think about it:

- Less than two out of 100 Americans work in production agriculture (farming). This small group meets the food and fiber needs of the nation as well as many people abroad.
- Agriculture, along with its related occupations, is the nation's largest industry. It generates billions of dollars each year; one out of every five jobs depends on it in some way. It has massive impact on the American economy, greatly influences the U.S. international balance of trade and directly affects the number of jobs here at home.

Our citizens must be agriculturally literate in order to make responsible decisions affecting this giant lifeline. Building that literacy in tomorrow's leaders is what Ag in the Classroom is all about.

ACADEMIC STANDARDS CONNECTION

The student Minnesota AgMag and other educational materials from Minnesota Agriculture in the Classroom can meet many of the new academic standards. These materials can serve as a wonderful "real life" connection and supporting piece as you incorporate the standards into your classroom activities. Here are a few examples of potential connections:

SOCIAL STUDIES (Geography Strand) Standard: The student will give examples that demonstrate how people are connected to each other and the environment.

(Geography Strand) Standard: The student will identify examples of the changing relationships between the patterns of settlement and land use in Minnesota.

(Geography Strand) Standard: The student will identify and locate geographic features associated with the development of Minnesota.

SCIENCE (Earth and Space Science Strand) Standard: The student will investigate the impact humans have on the environment.

(History and Nature of Science Strand) Standard: The student will know that science and technology are human efforts that both influence and are influenced by society.

LANGUAGE ARTS (Reading and Literature Strand) Standard: The student will use a variety of strategies to expand reading, listening and speaking vocabularies

ABOUT YOUR AGMAG

Your AgMag is distributed primarily to teachers in grades studying Minnesota (usually fourth or sixth). If the magazine fits better into the curriculum program at another grade level, we encourage you to pass the material on to the appropriate teachers. Offered at no cost to you, the AgMag is a product of Minnesota Agriculture in the Classroom. Here is your third and final Minnesota Agriculture Magazine for the 2006 - 2007 school year. This issue of your AgMag is designed to help you:

- provide students with a base of information for identifying and understanding the connections between agriculture and natural resources
- foster a stewardship ethic toward land, water and air
- develop awareness of Minnesota's water resources, drainage basins and water pollution challenges
- build understanding of renewable energy and how it helps conserve natural resources
- show some of the ways native plants and rain gardens protect the environment
- explore modern modes of transportation and the movement of agricultural products to customers around the world.

HELLO OUT THERE

MINNESOTA AGRICULTURE IN THE CLASSROOM

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Go to www.mda.state.mn.us/maic and find:
Student answer to Mystery Photo on
AgMag Page 8



Visit the National Ag in the Classroom web site to find great educational resources available from other state programs.
www.agclassroom.org



Check out these web sites to further enhance AgMag Issue 3 content:

www.mncorn.org
www.mnsoybean.org
www.mda.state.mn.us/renewable
www.mda.state.mn.us/mngrown
www.pca.state.mn.us/water/basins/index.html
www.mnlandscape.org
www.umn.edu/iree
www.windustry.org

INTEGRATION

Experienced classroom teachers create your AgMag materials. An Editorial Review Committee of teachers and subject matter experts provides content ideas and reviews each issue for accuracy and relevance.

Some teachers use the magazine as a separate lesson; others integrate magazine content into specific areas of the curriculum. The subject matter and skills listed will help you select appropriate AgMag activities to integrate into other curriculum areas.

Language Arts, Reading: Use the articles and activities to develop a variety of skills: outlining, reading for the main idea, vocabulary development and spelling words (bold words).

Social Studies: After reading pages 2 and 3, invite students to tell about things they are doing to help the environment. Encourage ideas about things they would like to study or projects they would like to take on to further help and understand the environment. Some of their ideas will bridge into science, environmental education and other areas.

Geography: See maps and related activities on pages 2 and 8 in the AgMag and reproducible page 5 in this Teacher Guide.

Science, Environmental Education: The entire AgMag is directed toward environmental education. See pages 4 and 5 for science and technology developments in creating home grown energy and page 6 for information about rain gardens, landscaping with native plants and the energy-saving possibilities of buying locally grown products.

History: Page 7 is the modern-day segment of this year's history series, tracing transportation through the ages.

Math: See *Plot the Points*, Teacher Guide page 4.

IN THIS GUIDE: DON'T MISS

- SHOW WHAT YOU KNOW pretest and post-test on page 6. Check your students' knowledge of key agricultural concepts before and after reading the AgMag.
- Discussion prompts, background information, extended activities and answers.
- Reproducible activities designed to increase understanding of Minnesota's water resources and drainage basins, and a plotting activity that reveals a renewable product.

GLOSSARY

Each AgMag contains several words that may be unfamiliar to your students. You may wish to preteach these words, or take time to define them as they appear throughout the magazine. In most cases, the words appear in bold type and/or are defined in the magazine. Highlighted words in this issue are: **natural resources** (cover); **drainage basin, watershed, photosynthesis, aquatic, ballast, alien invaders** (pages 2 and 3); **cooperatives, biodiesel, biomass, methane, fertilizer** (pages 4 and 5); **native plants** (page 6); **cubic meters, cubic feet** (page 8).

DISCUSSION PROMPTERS

AgMag Cover (Social Studies, Science, Environmental Studies)

1. Just what are "Minnesota's natural resources"? (*Brainstorm a list; think about all the wonderful things that occupy our air, land and water. Don't forget people!*) Why is it necessary to protect these treasures?
2. Why do we say farmers are some of our most important environmentalists? (*They manage such a large amount of land—over 46% nationally—so the ways they care for and protect resources are very important.*)

AgMag Pages 2 and 3 (Economics, Social Studies, Science)

1. How many ways do you use water each day? How much water do you use? (*Showering, 5 gal./min; toilet flushing, 6 gal.; brushing teeth, 2 gal.; hand washing, 2 gal.; automatic dishwasher, 15 gal./load; washing machine, 20-30 gal./load.*) NOTE: The 200 gallons of water needed to produce each person's food for a day includes all the water used to grow, clean, process, preserve and get the food to the table.
2. Minnesota is richly blessed with water resources. Two of them are Lake Superior and the Mississippi River.
 - a. Do you think Lake Superior's waters should be for sale to other low-supply states that need it? There is so much water that you could drain the other Great Lakes and refill them from Superior, with enough left over for three extra Lake Eries. (*Encourage thinking about pros and cons, including the fact that much of Superior's shoreline belongs to Canada. What benefits would there be in selling the water? What impact would there be in the surrounding areas if the water line dropped several feet?*)
 - b. Why is it so important to control pollution of the Mississippi River? (*The Mississippi River drains all or part of 31 states and two Canadian Provinces. It is 2,350 miles long, flowing from Lake Itasca in northern Minnesota to the Gulf of Mexico. Many communities, including Minneapolis, get drinking water from the Mississippi. The Indians called it the "Father of Waters:" Misi (big) Sipi (water).*)
3. What are some causes of water impairment? (*Growing population; greater per capita water use; changing agricultural practices affecting water such as irrigation, stock watering and feedlots; excessive suburban water use; development decisions like cutting trees, human activities around shoreline, leaving trash or pollution that kills fish or destroys their habitat.*)

AgMag Pages 4 and 5 (Science, Social Studies)

1. The articles on these pages show some of the leading efforts going on in Minnesota to create "home grown energy." Most are self explanatory.
2. How are each of these activities helping ease pressure on the environment? (*Each uses renewable resources.*) How are they creating more income for farmers? (*Farmers have more markets for the things they produce.*) How are they providing more jobs off the farm? (*Each of these activities create jobs as the farm products are changed and processed into new uses. Examples: ethanol plant workers, construction workers, electrical plant workers, scientists and researchers developing new ideas, turbine salespeople and installers.*)
3. Minnesota's strong partnerships between environmental and energy groups mean strong public and political support for wind energy. Who owns the wind? Supposedly everyone does. But the machinery and efforts to harvest the wind belong to individual companies and in some cases, farmers. There will be plenty of questions about who has a right to wind (and sun) power in the years ahead. What do students think about this?
4. Encourage students to think about ways the United States is vulnerable if we continue to depend on other countries for oil as a main source of energy. Many countries are researching renewable, clean forms of energy such as wind, solar, water, geothermal and biomass power, which we can produce right here at home. How important do students feel this research needs to be? What determines research success? (*Research needs funding. Government funding makes a big difference.*)
5. Does your school district set any practices to reduce air pollution near the school? (*Students should never intentionally breathe any vehicle exhaust.*)

AgMag, Page 6 (Science, Social Studies, and Environmental Studies)

- How many students have seen rain gardens? Does anyone have a rain garden?
Many towns and cities are encouraging citizens to plant rain gardens near hard surfaces like sidewalks and parking lots. Some communities are building cooperative rain gardens that serve whole neighborhoods. Where could you go to get information on how to make a rain garden? (Go to google.com and you'll have a host of sources.)
- What kinds of foods and other materials can people easily "buy locally" in your community? We will always buy some things from far away, but how can we learn more about what we CAN buy locally?

AgMag Page 7 (Social Studies, History)

- Why is it less expensive to ship many products by barge? (Accept reasonable answers, such as more volume can be moved in one load; trains and trucks require more fuel; trains and semis require more workers and may have more mechanical problems, etc. Fast facts: 1 barge load can haul the same amount of wheat as 15 train cars or 58 semi trucks. One barge can be as long as two football fields and half as wide. Limitations of barge shipment are the access to a waterway and the slow speed of barge travel.)

- What are some advantages of railroads over roads? (One rail car moves about as much grain as four trucks. Fewer trucks on the road mean safer highways. Rail transport is less expensive than truck transport. It saves wear on highways and it takes less energy than moving things by highway.)
- What are some advantages of shipping by truck? (Trucks can go anywhere there are adequate roads. They are efficient for short trips. They can link farmer's fields directly to markets or carry products to rail lines and docks. They are faster than barges and can be refrigerated trailers, tankers, grain bins, house movers, livestock carriers and much more.)
- How would you ship fresh flowers? Frozen bagels? Fresh seafood? Paper? Racehorses? Iron ore? Corn? Apples? Eggs? Explain your choice for each.
- How did agricultural transportation contribute to the growth of Minnesota cities? (Agricultural products were transported to the towns and cities for processing and shipment to markets throughout the growing nation. These agricultural activities created jobs and people moved to be near their jobs.)

ANSWERS: AgMag

Please Note: If answers are supplied in the AgMag itself, they are not repeated here.

NATURAL RESOURCES CONNECTIONS, COVER

Accept any reasonable answers. The fire photo shows burning corn cobs.

NATURAL RESOURCES, p. 2

Resources enjoyed: water; soil; air. Wildlife, plants and all living things benefit from healthy resources.

CARE FOR THE SOIL, p. 2

soil

CARE FOR THE WATER, p. 3

Did you know? 250 gallons of water equals one ton.

What do you know about water?

- c
- b
- a

HOME GROWN ENERGY, pgs. 4 and 5

Think and Discuss

What do higher corn prices mean? Cattle, hog and poultry farmers will pay more for corn which means they will have to charge more for their products. Food processors will do the same. Many of our common foods are sweetened with corn syrup. Soda pop, bakery goods, ketchup and candy are examples.

Harvesting the Wind

Wind generated energy requires no water and sends no pollution into the air.

Poop Power

Fertilizer is spread on cropland to improve and enrich the soils. Improved soils mean better crops.

BUY LOCALLY, p. 6

Check the Greener Choice

Buy strawberries from a local farmers' market. Buy milk from a nearby dairy. Drink water from the tap.

Food that travels a shorter distance is the greener choice because it saves handling, transportation costs, energy and it is generally fresher.

RIVER REACH, p. 8

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

MYSTERY PHOTO, p. 8

Soybean

NAME THE DAY, p. 8

Arbor Day, on Friday, April 27, 2007.

Teacher Guide

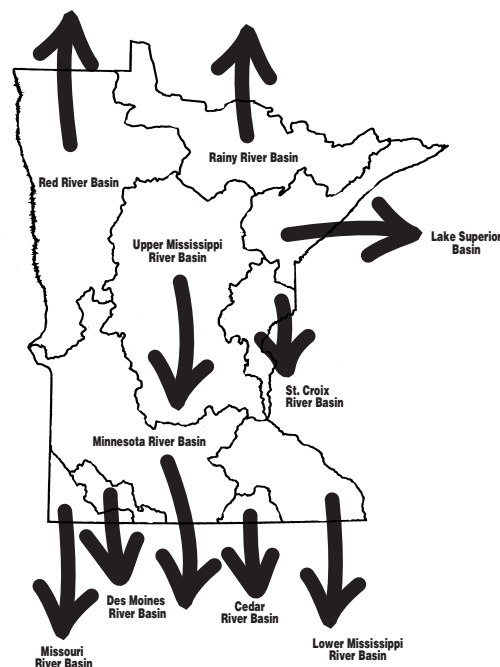
PLOT THE POINTS

The soy ink symbol is on page 8 of the magazine. The plants used in this product are soybeans. The product is soy ink.

SHOW WHAT YOU KNOW!

- b; 2. c; 3. b; 4. a; 5. b;
- d; 7. a; 8. a; 9. d; 10. a.

MINNESOTA DRAINAGE BASINS!



Plot the Points

Energy is just one important non-food product from plants. Many industrial materials start out as plants, too. Plot the points and you'll discover a symbol you see on newspapers and magazines every day.



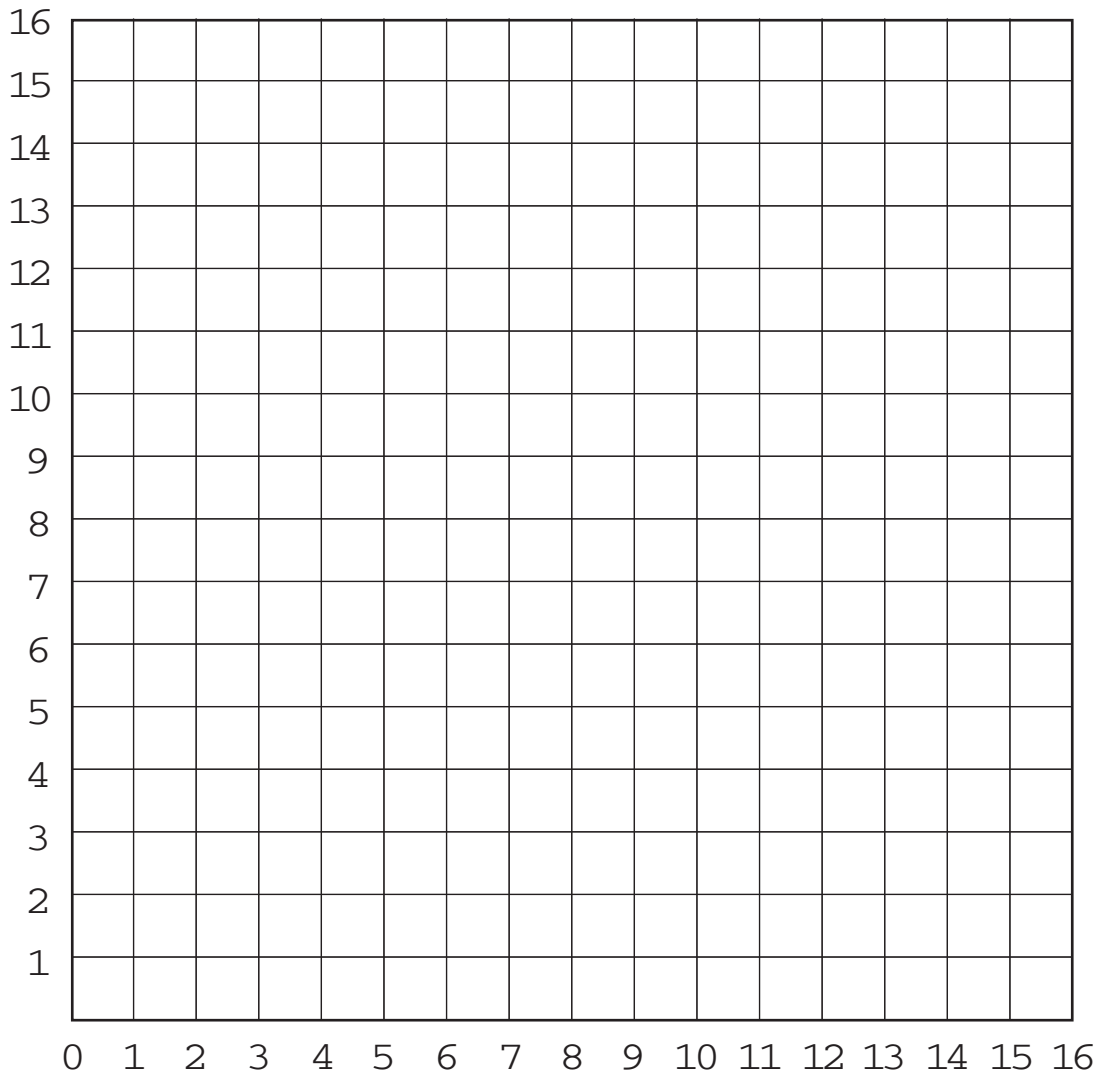
Tips: A point is named by the place it is found on the graph. Place your pencil at the lower left corner of the graph paper where the zero is located.

You have two coordinates, or numbered pairs (8, 15 for example); the first number in the pair tells you how many lines to the right to move your pencil. The second number tells you how many lines up to move your pencil.

With (8, 15), you move your pencil point to the right eight lines and stop on the 8. Next, move your pencil point up to line 15. Make a dot with your pencil where line 8 and line 15 intersect.

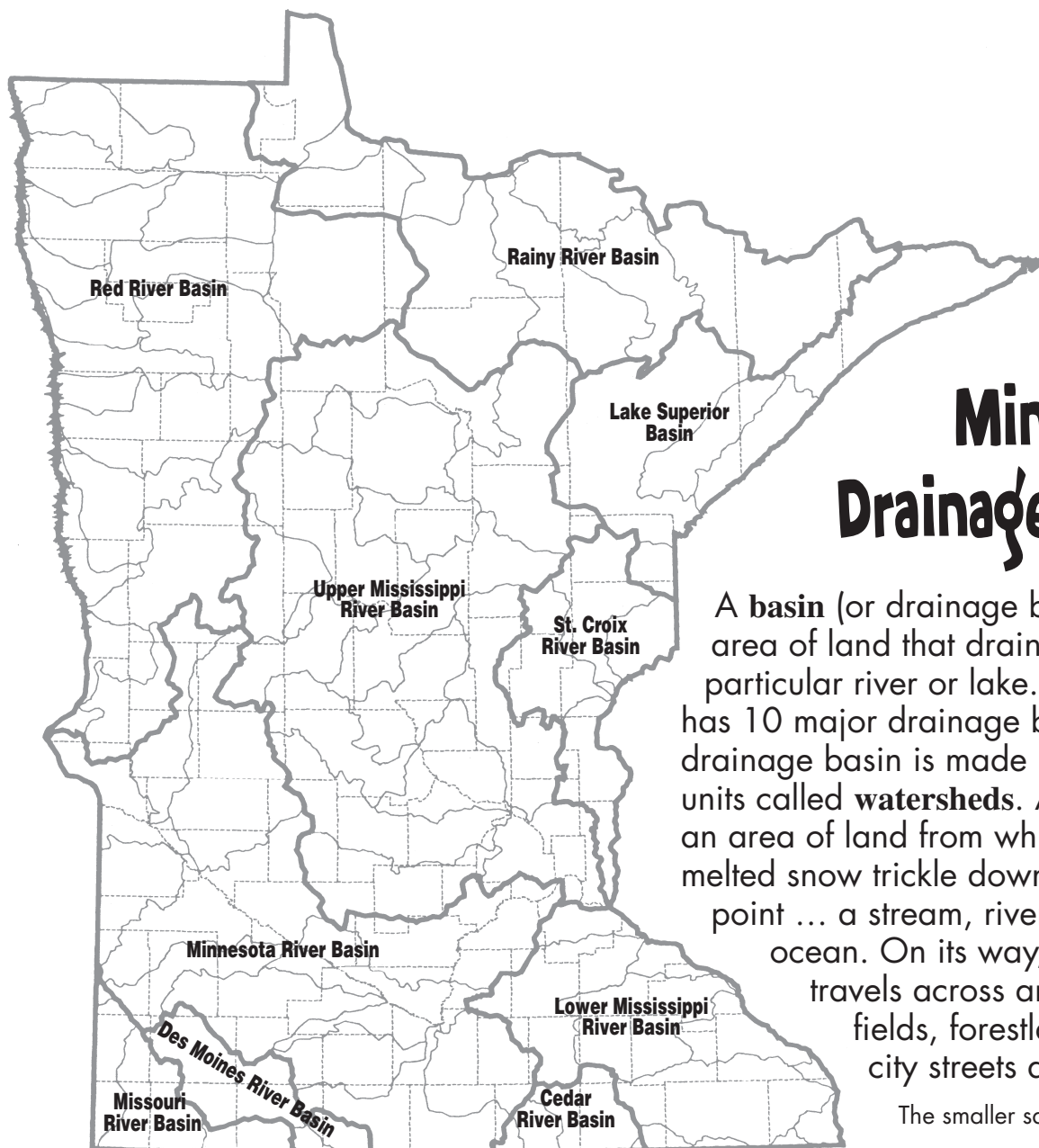
- Read the second set of numbered pairs from the list below. Place a dot where (7, 13) intersect. Then draw a line from the first dot to the second dot.
- Find the third numbered pair and continue down the list until all your dots are connected. By looking at your finished picture you'll discover the symbol.
- Now write the page number where you find this symbol in your Ag/Mag: _____

What is the plant used in the product? _____
 What is the renewable product? _____



- Numbered Pairs**
1. (8, 15)
 2. (7, 13)
 3. (5, 11)
 4. (3, 8)
 5. (2.5, 6)
 6. (3, 4)
 7. (5, 2)
 8. (8, 1)
 9. (11, 2)
 10. (13, 4)
 11. (13.5, 6)
 12. (13, 8)
 13. (11, 11)
 14. (9, 13)
 15. (8, 15)

F u n f a c t : One acre of soybeans can produce over 82,000 soy-based crayons.



Minnesota Drainage Basins

A **basin** (or drainage basin) is the area of land that drains to a particular river or lake. Minnesota has 10 major drainage basins. Each drainage basin is made up of smaller units called **watersheds**. A watershed is an area of land from which rain and melted snow trickle down to the lowest point ... a stream, river, lake or ocean. On its way, the water travels across and under farm fields, forestlands, lawns, city streets and gardens.

The smaller squiggly lines on the map show watersheds.

Show the Flow!

The water in Minnesota's drainage basins flows in three directions. Mark arrows on the map to show the direction each basin flows:

1. The Red River of the North Basin and the Rainy River Basin flow *north* to Hudson Bay.
2. The Lake Superior Basin drains *east* to the Atlantic Ocean.
3. The remaining seven basins drain *south* to the Gulf of Mexico. This includes the Minnesota, Missouri, Des Moines, Root and St. Croix Rivers. All are part of the greater Mississippi River Basin.

Think & DISCUSS

- Mark your area of your basin. In which direction does your drainage basin flow?
- In which smaller rivers and lakes does the water from your drainage basin end up? For example, the major watersheds of the Lake Superior Basin are the St. Louis River, the Cloquet River, Lake Superior (North) and Lake Superior (South).
- If you pollute water in your community, who is affected? (HINT: Remember your answer to the question above.)

Note to Teachers:

You are encouraged to send the Pretest and Post-test results to Ag in the Classroom to help document student learning. Use the attached postage-paid evaluation card.

Name _____

Check one Pretest Post-test

SHOW WHAT YOU KNOW!

Take this short quiz before you read your AgMag, then again after reading the magazine. See the improvement!

1. "Minisota" is a Dakota Indian name that means
a. a small soda drink. b. "The Land of Sky Blue Waters."
c. "Land Where the Buffalo Roam."

2. The two main natural resources affected by agriculture are
a. iron ore and minerals. b. air and natural gas. c. soil and water.

3. A rain garden is
a. a garden with many fountains.
b. a collecting pool that filters water.
c. a garden with goldfish ponds and water lilies.

4. The water we use today is the same water that was here when dinosaurs roamed the earth.
a. True b. False

5. Nearly three-fourths of the land in Minnesota is owned by
a. Native Americans. b. farmers and other private landowners.
c. banks.

6. Trees and plants help the environment by
a. releasing oxygen. b. holding soil.
c. providing habitat for animals. d. a, b, and c.

7. Fossil fuels include
a. coal, natural gas and petroleum.
b. ethanol. c. manure.

8. A watershed is
a. an area of land from which rain and melted snow trickle down to the lowest point: a river, lake or ocean.
b. a small building protecting a well. c. a new kind of raincoat material.

9. By protecting soil and water, we protect
a. wildlife. b. the human food supply.
c. trees and plants. d. a, b, and c.

10. Minnesota's Arbor Day is always the last Friday in April.
a. True b. False