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ag TODAY

Exploring the Connection between Agriculture and You!

ialf Iowa Agriculture Literacy Foundation

ISSUE 3

Iowa's Invaluable Natural Resources

Just like us, plants and animals on farms need natural resources to live!

Sun The sun is a source of energy for all life. Plant leaves capture sunlight to make food, or energy, to grow. Farm animals eat plants. By eating food from plants and animals, the sun gives us energy too!

Soil The soil beneath our feet is as important as the air we breathe and the water we drink. Soil holds water and nutrients plants need. Animals and people depend on plants for food, so we need soil too!

Water Plants drink water just like we do! Plant roots absorb water from the soil. Farm animals also need plenty of clean water to grow and stay healthy.

Air Plants and animals need clean air to live. Plants take in carbon dioxide that we breathe out. Animals and humans breathe in oxygen that plants release.

Iowa's natural resources are our treasures to protect. Agriculture depends on them - and we depend on agriculture!



— WHY — Iowa?

Iowa is one of the top farming states in the country! But why?

OUR CLIMATE. Iowa has a growing season that is long and warm enough to grow corn and soybeans well. Rainfall is usually adequate and regular. **IRRIGATION**, or watering systems, are expensive and usually not needed for most corn and soybean farmers in Iowa.

OUR SOIL. Iowa has deep rich soils. We have the prairie plants that once covered our state to thank! Their deep fibrous roots created fertile topsoil that today's crops thrive in.

THINK & DISCUSS -
What are some things that farmers can do to manage natural resources like sun, soil, water and air?



Water, Water, Water! Water!

All plants need water. Water carries sugars and other nutrients through the plant. Too little or too much water affects plants' ability to grow.

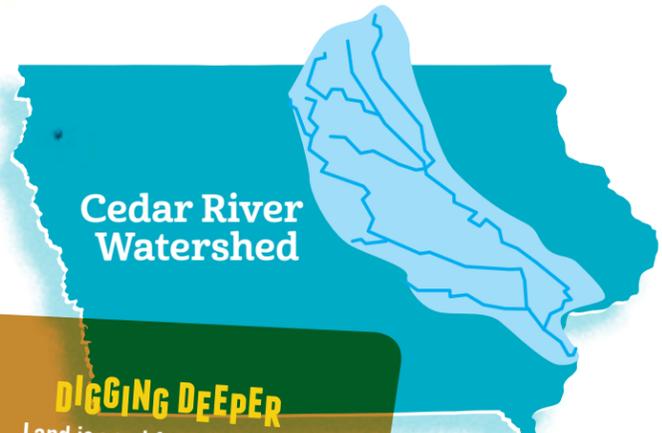
If a plant does not have enough water, the nutrients it needs cannot travel from the roots to the leaves. The plant becomes weak and cannot support its own weight. Some plants have developed adaptations to help cope with dry conditions. Soybean leaves, for example, are covered with tiny hairs that reflect light. This lowers the leaf temperature and helps reduce water loss through leaves.

Too much water in the soil can cause plant roots to rot. Without healthy roots, a plant cannot grow. Too much water can also cause nutrients in the soil, like nitrogen, to run off, and enter streams and ponds. Farmers tile their fields to increase drainage and prevent flooding.

DID YOU KNOW?
Soybeans are used for more than food, feed, and fuel. They are used to make thousands of products we use every day. Soybeans are in crayons, newspaper ink, shampoo, paint, plastics, and more!

What's a watershed?

A **watershed** is the area of land that water drains off of and into a lake or stream. They are everywhere. Watersheds can be small, like the area around a small creek near your school. Watersheds are also big, like all of the land that drains into the Cedar River. This watershed spans 5,020,914 acres or 7,485 square miles. It includes land in 29 counties in Iowa and Minnesota.



Cedar River Watershed

DIGGING DEEPER
Land is used for agriculture, industry, recreation and housing. Conduct research to find examples of these four uses in the Cedar River Watershed. How do they each affect the watershed?



FARMING GOES DIGITAL...

and helps protect the environment

The satellites that circle the Earth help us map our travel. They can find lost cell phones and steer tractors, too! Today's combines and tractors have **global positioning system (GPS)** receivers. They connect with satellites to guide tractors across fields.

GPS does more than just steer tractors. Farmers use GPS to get data about their fields. This data helps farmers be more exact when they are working in the field.

GPS systems help to get pictures of the land or **soil maps**. With soil maps, farmers can spot erosion in their fields or identify different soil types. Then, they can choose the amount of seeds they plant or whether to till the soil.

Farmers want to make sure they get all their fields planted and crop protectants sprayed. But, they don't want to plant or spray an area twice. GPS helps keep track of where a tractor has already been.

Farmers can also use GPS maps of their fields to apply fertilizer. If just a small part of a big field is low in nutrients, the whole field doesn't need the same amount of fertilizer. Using the maps, farmers apply only the fertilizer that is needed. This reduces the impact on the environment.

Technology plays a big role in agriculture today. Farmers rely on it to care for the Earth and their crops. Where can it take them next?



CAREER CORNER: AGRICULTURE ENGINEER

As a software engineering manager for Ag Leader Technology, **Mark Barglof** creates tools to help farmers. Mark makes software for tractors, combines and sprayers that use GPS. These products help farmers plan, plant, apply chemicals, and harvest crops better. Students interested in technology or engineering could consider a career like his. He says, "It is important to find a career that you are passionate about and love doing."





FARMERS CARE ABOUT WATER AND SOIL... and you should too!

Rain is essential for plants to grow. But too much rain can be a problem. With heavy rainfall, water can carry soil away through **water erosion**. Wind too can be a problem that farmers have to manage. Strong winds can lift soil off of a field and carry it away. This is called **wind erosion**. Soil is a valuable resource that farmers want to keep on their fields.

A lot of water on a field can also wash nutrients in the soil like **nitrogen** into the watershed. Too much nitrogen in water can be harmful to humans. Nitrogen is important because it helps keep plants healthy. Farmers want to keep nitrogen on the fields. Nitrogen can come from the air, from fertilizer, or from animal waste like manure.

There are several things that farmers can do to practice good conservation.

THINK & DISCUSS - What are some problems that farmers face with water and soil?

COVER CROPS

Farmers can plant **cover crops** in the fall after harvest. The growing plant roots help hold the soil in place during winter and early spring. Wind and water erosion can be greatly reduced. Cover crops can also absorb extra nutrients in the soil (like nitrogen). This prevents them from running into watersheds. Cover crops can increase soil health, water retention, and even yield.



Photo courtesy of Iowa Learning Farms.

NO-TILL FARMING

Many farmers till their fields to loosen soil and make it better for seeds to start growing. Loose soil is more at risk to wind and water erosion. Some farmers choose to plant their fields using **no-till** farming methods. No-till is when seeds are planted without plowing. The organic matter from previous years helps hold the soil in place. No-till helps preserve the **microorganisms** that live in the soil. Microorganisms are things like bacteria, fungi, worms and insects that live in the soil. They help keep soil healthy.



Photo courtesy of John Deere.

BUFFER ZONES

Buffer zones are sections of plants between fields and streams, creeks, lakes and wetlands. Buffer zones filter water runoff. They help stop soil washing off the fields. They also provide wildlife habitat and help rain water absorb into the ground naturally.



Photo courtesy of Iowa Soybean Association

TERRACES

Terraces reduce erosion by holding back the water on a field. They also slow water down. Terraces are manmade structures. They are used on hillsides and in steep areas of a field.



Photo Courtesy of USDA-NRCS, Iowa

BIOREACTORS

Helping land drain water can improve crop yield. Farmers use tile systems to drain the land. The systems also move nitrate-nitrogen which can cause problems. A **bioreactor** is an underground trench of woodchips at the end of a tile line. Water from the tile flows through the woodchips before entering a stream or river. Microorganisms live in the woodchips. These microorganisms "breathe" the nitrate-nitrogen from the water. Then they release the nitrogen into the air, making it harmless.



CAREER CORNER: SOIL SCIENCE

Celia Takachi's career as a soil scientist has taken her all around the world. She was born in Brazil and studied in Japan. She now works at Solum, Inc. helping Iowa farmers. Farmers need to know how much fertilizer to add to their fields. She tests soil and helps farmers get a good yield. She says, "We all need food and soil is the key."





Change Over Time

Since settlers first arrived in Iowa, farmers have **cultivated** or tilled soil to remove weeds and make fields ready for planting. How farmers cultivate has changed a lot in the last 200 years!

200 YEARS AGO

Early Iowa settlers used wood or iron plows pulled by horses to break through the deep prairie grass roots. Plowing brought the rich soil to the surface. This prepared the field for planting. Farmers had to stop the horses frequently to clean off the plow. In 1837 a blacksmith named John Deere made a plow out of steel. The sticky prairie soil easily slid off the polished steel, making plowing much easier.



State Historical Society of Iowa, Des Moines

100 YEARS AGO

In the early 1900's, tractors were used to pull plows. Tractors were expensive, but worked faster than horses. Plows completely turned the soil over like a shovel. The soil on the surface was left exposed to wind and water. Soil on hills would blow or wash away. So, farmers mainly farmed flat land.



State Historical Society of Iowa, Des Moines

50 YEARS AGO

In the 1960's, farmers began using chisel plows to prepare the soil for planting. The chisel would make deep slits into the soil. The soil doesn't get broken up as much. Farmers could grow crops on hills without losing as much soil to wind and water erosion. Minimally tilling the soil is called **conservation tillage**. It is still used today when tilling is necessary.



Kenneth Updike

TODAY

Now many farmers do not till the soil before planting! No-till farming is when farmers plant seeds directly into unbroken soil. Stems, leaves and roots from last year are left on the ground. This helps protect the soil from wind and water erosion.



Joseph L. Murphy/Iowa Soybean Association

THINK & DISCUSS:
What are some of the similarities and differences between wild fish and aquaculture and wild forests and tree plantations?

FARMING FISH, GOOD FOR THE ENVIRONMENT?



Where do the fish and other seafood we eat come from? Fish, shrimp and other shellfish are often caught wild from oceans and rivers. Seafood is a popular food in the United States and all over the world. Our love of seafood can lead to smaller populations in the wild.

Many fish and shellfish are farmed. **Aquaculture** (fish farming) helps sustain wild populations. These fish are raised in ponds or indoor tanks. They are cared for by fish farmers. Aquaculture is a type of agriculture. Instead of crops growing on land, these farmers grow fish in water.

Aquaculture produces fish and shellfish that meet many needs. Some fish are raised for food. Others are grown for fishing bait or restocking wild fish populations. There are even some fish that are grown as pets!

Almost half of the world's fish comes from farms. In the United States, aquaculture is a growing industry! Here in Iowa, many fish are farmed indoors. Iowa farmers grow shrimp and Barramundi. They also raise catfish and bluegill to stock ponds.

Two Iowa farmers turned an old elementary school into a shrimp farm. The shrimp grow in large swimming pools in a gym. The gym is kept warm and dark similar to the ocean. Farmers make sure the shrimp have the right amount of oxygen and nutrients.

Farming like this helps fish and shrimp grow quickly. It also provides fresh seafood to people in the Midwest. Aquaculture helps the environment by reducing the need to catch wild fish. Some fish farms help restock wild populations. Often, Iowa aquaculture creates a new use for old buildings too!

CAREER CORNER: AQUACULTURE TECHNICIAN

Mitch Downs works as an aquaculture technician. His job at VeroBlue farms is hands on with the fish. He takes water samples, keeps equipment up and running, and feeds fish. His work is all about keeping fish healthy. He tells students interested in aquaculture to study science and be willing to get their hands dirty!



Looking to *the future...*

Soil is really important. How can I reduce the amount of soil that runs off my fields?

Applying cover crops is expensive. Is it worth the extra cost to reduce the nitrogen and soil that may get into the river?

I don't like spraying pesticides if I don't have to. Will new seed technology allow me to spray less?

Caring for the land is really important to me. How will no-till farming help me improve the soil health?

Can grazing my cows in rotation help improve the plant life on my farm?

If I use the manure from my hog barn to fertilize my corn field, will I have to add as much other fertilizer?

How can I help keep the water in the rivers clean?

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