The Book Planter
Ag in the Classroom
Post Office Box 27766 | Raleigh, NC 27611 | (919) 782-1705
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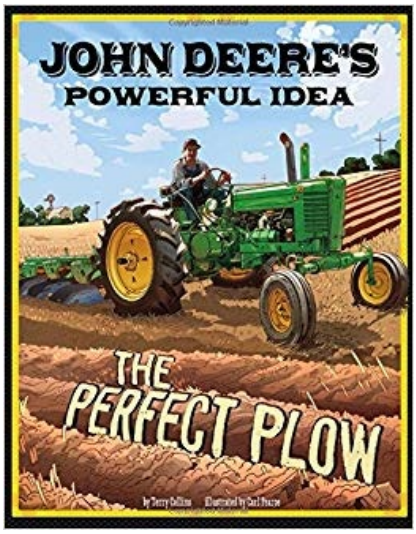
John Deere's Powerful Idea: The Perfect Plow
Written by: Terry Collins



Times were tough in the 19th century. Many men had to leave home to seek work to be able to provide for their families. John Deere's father, and John Deere alike, were no exception. John Deere made his living as a blacksmith. His innovation and expertise allowed him to create the first self-cleaning plow, allowing farmers to cover more ground in less time. These technological advances shaped and changed agriculture, and became a cornerstone for how farmers worked the land in the late 1800s. Word got out about John's "Singing Plow" and farmers were hooked. He started a business which would eventually become what we know today as Deere & Company.

Fun Facts

- Before John Deere created the steel plow, plows were made of cast iron which was why soil stuck to the blades.
- John got the idea to use steel from seeing a broken saw blade.
- In 1873, John was elected the mayor of Moline, Illinois and served for two years.[1]
- Even though Deere & Co. is known for its green tractors, John Deere was not alive to see the first gasoline tractor.[1]
- Early Egyptians used hand-held digging sticks, or hoes, to create places where seeds could be planted.[2]
- In the 1800s, horses, mules, and oxen were extremely important animals on North Carolina farms. They were needed to pull plows, and haul wagons.[3]
- Today, some North Carolina farmers opt to use "no-till" or "minimum-till" agricultural practices to help preserve soil, and prevent erosion.[4]

Discussion Questions

Use *John Deere's Powerful Idea: The Perfect Plow* to answer the questions below. Cite examples from the book to support your answers.

1. Why do you think John Deere's father left the family behind?
2. What did the note John Deere's father left him say? What do you think this phrase means?
3. Why did John Deere leave his family?
4. Where did John Deere go? Why?

5. What were the farmers frustrated about in Illinois?
6. Describe the steps John took to create his first steel plow. Start with him listening to the farmers' soil problems.
7. What changes did John make to the plow? Why was this important?
8. How did John Deere & Company start?
9. Explain how John's plow got the nickname, "The Singing Plow."
10. What year did John's family reunite with him? How many years were they apart?
11. How did the John Deere Company start producing equipment other than plows?
12. What is John Deere's company best known for? (answers could vary: green tractors, tractors, logo, etc.)

Vocabulary
Anvil: a large steel block with a flat top
Apprenticeship: a work arrangement in which someone works for a skilled person, often for a basic wage, in order to learn that person's skills
Blacksmith: a person who makes and fixes iron tools
Debt: money that a person owes
Elder: older
Frustrating: upsetting
Insist: to say in a strong, firm way
Partner: a person who runs a business with one or more other persons
Prairie: a large area of flat or rolling grassland with few or no trees
Production: the making of something
Prototype: the first version of an invention that tests an idea to see if it will work
Provider: someone who gives what is needed or wanted
Producer: a person or company that makes, grows, or supplies goods or services
Consumer: a person who purchases goods and services for personal use

Interest Approach/Producers & Consumers[5]
1. Ask students, "What does it mean to produce something?" Allow several students to answer and discuss different options. Next, ask, "What is a producer? Who would be an example of a producer?" Explain that producers can produce either a good or a service.
2. After discussing producers, ask the students what it means to consume. Some students might respond that consume means to eat. Explain that consuming does mean eating, but it can also mean buying a good or service from producers. Discuss that producers provide goods or services and consumers buy or use those goods and services.
3. Ask students about various people in the community and different careers. Do these people/careers produce goods or provide services for us? (ex. A chef produces meals for us to eat, a baker produces breads and cakes, a police man provides services by keeping the community safe, etc.) Who are the consumers of these producers?
4. Explain that producers see what other people need, and provide that good or service for them.

5. Ask students if they have ever heard of John Deere. Allow students to answer; some of them might recognize that their family has a John Deere lawnmower, or they've seen a tractor before. Explain to students that they are going to learn about a man named John Deere and how he became a famous producer for farmers.
6. Read the book, *John Deere's Powerful Idea: The Perfect Plow* by Terry Collins.
7. Ask students, "Who is the producer in this story? Who is the consumer? Can someone be a producer and a consumer?" Discuss these questions as a class and allow students to share some ideas.

Agricultural Mechanics Master[6]

Chances are, most of you have been in a car this week. You've probably seen a grown-up using a kitchen gadget, such as an electric mixer or a toaster. We see machines every day. Did you know that farmers and ranchers rely on machines every day to get their job done? Machines help farmers and ranchers care for animals, and work the land while conserving our resources. Many of the complex machines we know today have evolved because of the understanding of six simple machines: a pulley, a lever, a wedge, a wheel and axle, an inclined plane, and a screw.

Instructions:

You are now the head mechanic on a farm. You have a lot of rookies on the team who need you to show them the ropes. Help them to understand the basics by completing the activity below.

1. Look at the vocabulary words below.
2. Check out the pictures of machinery from the farm and label each of the images using a word from the vocabulary box.
3. Use the "Machine Master" guide if you get stuck.

Vocabulary Words:

- Inclined Plane
- Wheel and Axle
- Wedge
- Pulley
- Screw
- Lever

1._____

2._____

3._____

4._____

5._____

6._____

Machine Master Guide:

Lever

A lever is a simple machine that consists of a solid object (usually a bar) and a pivot. If you push down on one side of the lever, the other side moves up while the pivot point takes most of the weight. This makes it easier to move large or heavy objects. Often times, people will use the claw of a hammer or a crow bar to pry something apart, or push down on the handle of a shovel to pull dirt up from the earth. Even when you are on the seesaw at the park – you are actually taking a ride on a lever!

Wheel and Axle

A wheel is something that is round and is attached to a bar or solid object in its center. This object is called the axle. When the wheel rolls, the axle rotates, which magnifies the force. Many of our modes of transportation (form a bicycle to a school bus) utilize a wheel and axle to move about the road or sidewalk. We also see this simple machine in the kitchen - if you've seen a grown-up roll out dough using a rolling pin, you've seen them flattening the dough with a type of wheel and axle!

Inclined Plane

An inclined plane is a surface that is set at an angle. This makes it easier to move things, including heavy boxes or even animals up and down more easily. Think about how much easier it would be to roll a cart up a ramp than to lift it up straight onto the back of a truck. Inclined planes are used for work and play! If you or a friend has ever skated or rode their bike off of a ramp, you've witnessed one of the many uses of an inclined plane.

Wedge

A wedge is a double-inclined plane (both sides are inclined) that is used to lift and separate an object or push two objects apart. If we look closely, we can see wedges all around us! Lots of

people use an axe to chop wood and when you see somebody use a knife to cut into a piece of
cake or split a peanut butter and jelly sandwich, they are using the sharp edge of knife – which is actually a wedge!

Screw

A screw is a long cylinder that has an inclined groove along its surface (appearing to "wrap around" the shaft). When you twist the screw, the groove pulls or pushes the object. When we tighten the lid on a soda bottle or jar of jelly, it is a screw that helps us to get the lid extra tight! The most obvious example of a screw would be…a screw! Lots of structures use metal screws to hold them together and when somebody tightens the bolts on a piece of equipment, they are using a screw as well!

Pulley

A pulley is a wheel with a groove along its edge, where a rope, string or cable can be placed. The rope can have a hook or an object on one end of it. When force is applied to the opposite end, it allows you to lift heavy objects and the wheel takes most of the weight! Cranes use pulleys to lift heavy objects utilizing less energy and force. If you haven't seen somebody using a crane, look for a pulley in your own home. When somebody pulls on the string to raise the blinds on a window, it is a pulley that allows them to let the sun in so easily!

Answers:

1. Wheel and axle
2. Inclined plane
3. Wedge
4. Lever
5. Screw
6. Pulley

To Till or Not to Till

Some farmers are beginning to adopt no-till practices on their farms. **No-till farming** involves preparing the land for farming, without mechanically disturbing the soil.[7] However, some crops such as potatoes, require tilling, or plowing the land. In no-till farming, there is an increased chemical herbicide usage, which poses problems for farmers growing organic crops that have restrictions on the chemicals that can be used. Ask students to brain storm the benefits of both methods: plowing and no-till. See below for a guide. They may also use viable sources on the internet to research further.

<u>Benefits of Plowing</u>:

- All crops can be planted without specific equipment
- No increased herbicide usage

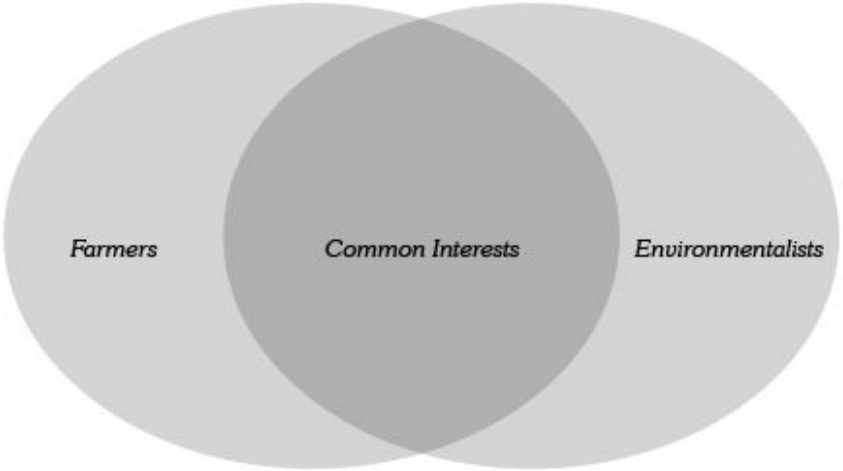
<u>Benefits of No-Till Farming</u>:

- Reduced soil erosion
- Does not disturb topsoil layer, which contains nutrients

Ask students to imagine they are farmers. What farming practices would they adopt? Tell them to explain their answer in a short essay or paragraph.

Caring for the Land[8]

1. Ask students to think about people they know who are farmers or environmentalists. Can farmers be environmentalists?
2. Continue discussing on the topic to create interest and gauge the students' prior knowledge using the following questions:
    a. Why would farmers be motivated to protect natural resources like soil and water?
    b. What motivates environmentalists to protect natural resources?
    c. What are some methods farmers use to protect soil and water quality?
3. Ask students to describe and define in their own terms the words: *farmer*, *environmentalist*, and *environmental activist*.
4. Ask students if they have heard any news reports about conflicts between farmers and environmental activists (endangered species preservation, invasive species management, public land use, wetland preservation, etc.).
5. Draw a Venn diagram on the whiteboard (see examples below), and ask students to list things about which farmers and environmental activists disagree and the things they have in common. For example, both care about the land, both need food to eat. Note: You may have to make very large circles



6. Share the background information (attached to this activity sheet) and discuss problems/solution and cause/effect relationships.
7. Divide your class into three groups, and hand out copies of one of the *Caring for the Land activity sheets* (attached, and in **Links** section) to each group.

8. Ask students to read the situation described in the text carefully to identify the cause and effect, the problem and solution, and any alternatives and their effects. Ask each group to share what they discussed with the class.
9. Discuss the following questions:
    a. Why do we need farmers? (food, clothes, shelter, other manufactured goods)
    b. Who should decide how to use the land?
    c. How should we decide how to use the land?

Disappearing Soil

Materials:

- Two open flat seed trays
- Potting soil
- Grass seed
- Blocks of wood or cinderblocks
- Bucket, or vessel for collecting water

Instructions:

1. Fill the two seed trays with potting soil.
2. Plant the grass seed on one tray, and leave the other tray bare.
3. When the grass has grown an inch high (should take 4-5 days or less), prop both trays up on one side, using the blocks of wood.
4. Place a bucket or saucer below each tray.
5. Pour water down the trays.
6. Tell students to observe:
    a. How much soil is washed out of each tray?
    b. Explain why more soil washed out of the bare tray. This is an example of **erosion**.
    c. What happens if you make furrows across the tray with the bare soil and try step 5 again?

John Deere Shapes

1. Provide the students with tangrams, and allow them to explore the tangrams for several minutes before beginning.
2. Ask the students to think about the tools John Deere needed to complete his task of building a steel plow.
3. Tell the students to pick a tool, or object from the book, *John Deere's Powerful Idea: The Perfect Plow*, and build its shape using the tangrams. Examples could include: a hammer, a horse, a saw, or a plow.
4. Ask the students to identify the geometric figures they used in their creation. Have them trace and label each unique piece.
5. Allow students to take a "tour" of the **forge** to see what their classmates built.

Links

- History of the Tractor (infographic timeline) http://www.sodgod.com/tractor-history/
- All about North Carolina Soil https://www.soils4teachers.org/files/s4t/k12outreach/nc-state-soil-booklet.pdf
- Caring for the Land Activity Sheet https://naitc-api.usu.edu/media/uploads/2018/01/09/caringfortheland.pdf
- Thrive Game (from My American Farm webgames) http://www.myamericanfarm.org/classroom/games
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Sources

1. https://www.deere.com/en/our-company/john-deere-careers/interview-resources/fun-facts/
2. https://kids.kiddle.co/Plough
3. https://www.ncmuseumofhistory.org/story-north-carolina-farm-chores-early-1800s-gallery-cart
4. https://www.ncpedia.org/agriculture/technology
5. https://www.agclassroom.org/teacher/matrix/lessonplan.cfm?lpid=639&author_state=0&search_term_lp=john%20deere
6. http://www.myamericanfarm.org/activities/MechanicsMaster.pdf
7. https://geneticliteracyproject.org/2016/06/02/no-till-agriculture-offers-vast-sustainability-benefits-so-why-do-organic-farmers-reject-it/
8. https://www.agclassroom.org/teacher/matrix/lessonplan.cfm?lpid=136&author_state=0&search_term_lp=soil

K-5 Subject Areas

Reading, Speaking and Listening, Mathematics, Science, and Social Studies

Common Core/Essential Standards

Reading

- **RL.K.1** With prompting and support, ask and answer questions about key details in a text.
- **RL.1.1** Ask and answer questions about key details in a text**.**
- **RL.2.1** Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding **of key** details in a text.
- **RL.3.1** Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the **basis for** the answers**.**
- **RL.4.1** Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.
- **RL.5.1** Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.
- **RL.K.10** Actively engage in group reading activities with purpose and understanding.
- **RL.1.10** With prompting and support, read and understand literature of appropriate complexity for grade 1 for sustained periods of time.
- **RL.2.10** By the end of grade 2, read and understand literature within the 2-3 text complexity band proficiently and independently for sustained periods of time. Connect prior knowledge and experiences to text.
- **RL.3.10** By the end of grade 3, read and understand literature at the high end of the 2-3 text complexity band proficiently and independently for sustained periods of time. Connect prior knowledge and experiences to text.
- **RL.4.10** By the end of grade 4, read and understand literature within the 4-5 text complexity band proficiently and independently for sustained periods of time. Connect prior knowledge and experiences to text.
- **RL.5.10** By the end of grade 5, read and understand literature at the high end of the 4-5 text complexity band proficiently and independently for sustained periods of time. Connect prior knowledge and experiences to text.
- **RI.K.1** With prompting and support, ask and answer questions about key details in a text.

- **RI.1.1** Ask and answer questions about key details in a text.
- **RI.2.1** Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text.
- **RI.3.1** Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.
- **RI.4.1** Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.
- **RI.5.1** Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.

Speaking and Listening

- **SL.K.2** Confirm understanding of a text read aloud or information presented orally or through other media by asking and answering questions about key details and requesting clarification if something is not understood.
- **SL.1.2** Ask and answer questions about key details in a text read aloud or information presented orally or through other media**.**
- **SL.2.2** Recount or describe key ideas or details from a text read aloud or information presented orally or through other media.
- **SL.3.2** Determine the main ideas and supporting details of a text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.
- **SL.4.2** Paraphrase portions of a text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.
- **SL.5.2** Summarize a written text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.
- **SL.K.4** Speak audibly and express thoughts, feelings, and ideas clearly.
- **SL.1.4** Produce complete sentences to describe people, places, things, and events with relevant details, expressing ideas and feelings clearly.
- **SL.2.4** Tell a story or recount an experience with appropriate facts and relevant, descriptive details, speaking audibly in coherent and complete sentences.
- **SL.3.4** Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly in complete sentences at an understandable pace.
- **SL.4.4** Report on a topic or text, tell a story, or recount an experience in an organized manner, using appropriate facts and relevant, descriptive details to support main ideas or themes; adjust speech as appropriate to formal and informal discourse.
- **SL.5.4** Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; adapt speech to a variety of contexts and tasks.

Mathematics

- **NC.K.G.1** Describe objects in the environment using names of shapes, and describe the relative positions of objects using positional terms.
- **NC.1.G.1** Distinguish between defining and non-defining attributes and create shapes with defining attributes by:
    - • Building and drawing triangles, rectangles, squares, trapezoids, hexagons, circles.
    - • Building cubes, rectangular prisms, cones, spheres, and cylinders

Science

- **1.P.1** Understand how forces (pushes or pulls) affect the motion of an object.

Social Studies

- **K.G.2.2** Explain ways people use environmental resources to meet basic needs and wants (shelter, food, clothing, etc.).
- **2.G.2.1** Give examples of ways in which people depend on the physical environment and natural resources to meet basic needs.
- **2.G.2.2** Explain how people positively and negatively affect the environment.
- 2.E.1.2 Explain the roles and impact producers and consumers have on the economy.
- 4.G.1.2 Explain the impact that human activity has on the availability of natural resources in North Carolina.
- **4.G.1.3** Exemplify the interactions of various peoples, places and cultures in terms of adaptation and modification of the environment.

- **5.G.1.2** Explain the positive and negative effects of human activity on the physical environment of the United States, past and present.
- **5.G.1.3** Exemplify how technological advances (communication, transportation and agriculture) have allowed people to overcome geographic limitations.

The land is the livelihood of **farmers**. Most people, farmers included, try to avoid practices that harm their way of life. When raising crops and livestock, farmers actively manage soil, water, plants, and animals. Farming is one of the closest working relationships that people have with the environment, and sometimes farming practices lead to environmental problems. Often, it takes years for the environmental impacts of human activity to become evident, and it can be complicated to identify and change environmentally damaging actions. Farmers work both to produce food and to care for the land that is their livelihood. There are many different strategies for accomplishing these goals.

Considering the history of environmental issues can put modern-day controversies into context. People began polluting long ago. Early settlers in the United States dumped their trash into rivers and streams without considering the harm it might do. Before gasoline-powered tractors began releasing exhaust fumes, work horses created pollution problems of their own. The average farm horse produces 35 pounds of solid waste and 2 gallons of liquid waste each day. Although horse manure can be an excellent **fertilizer** when spread across a field, large amounts in small areas can create high concentrations of nitrogen and bacteria that can **contaminate** the water supply.

Thousands of years ago, people began to farm because they found they could produce more food in a more reliable manner by growing crops than by hunting and gathering. Over the years, people discovered that some farming practices harmed the land. Cutting down trees, clearing vegetation, and allowing animals to overgraze left the topsoil unprotected and vulnerable to erosion by wind and water. Planting the same crop on the same field year after year used up all the soil's nutrients, and the fields lost their ability to produce good crops.

Early farmers learned from their mistakes and developed better farming methods. They learned to farm on the contour and build terraces—ridges of soil built across the slope to slow water runoff. They learned to rotate their crops (**crop rotation**), moving them

from one field to another to let the soil rest. They learned how to spread animal manure on their fields to restore organic matter and nutrients.

When European settlers came to the New World, they were dazzled by what seemed like endless resources—acres and acres of rich soil. Many farmers abandoned the methods their ancestors used to protect the land. When one field began to produce poor crops, the farmer would simply abandon it and move farther into the wilderness.

As more people moved in, more land was needed for farms. In the early twentieth century, farmers began plowing up the native grasses of the Southern Plains to plant wheat. They had no way of knowing that their hard work would be the first step leading to what would come to be known as the Dust Bowl. A severe drought dried up the exposed soil. With no grass roots to hold the sandy soil in place, it simply blew away with the strong summer winds.

Recognizing a problem is the first step toward solving it. Farmers didn't know that plowing up large, flat tracts of land would cause the soil to blow away in the event of a drought. Once they saw what had happened, they did what farmers have been doing for thousands of years. They began thinking of different methods they could use that would protect the soil.

One method involved using chemicals on weeds instead of turning the soil with a plow. For many years, this method seemed like an excellent way to keep the soil in place while producing the food people needed. Then, scientists discovered that some chemicals were getting into the water supply and making birds, fish, animals, and people sick. Other chemicals have begun to lose their effectiveness as weeds develop resistance to them. Today, farmers and agricultural researchers are working on ways to solve food production problems while taking into consideration the growing world population, the state of food prices and economics, and the condition of environmental resources such as soil and water.

Caring for the Land

Identify the problem and the solution, as well as the main cause and effect relationship in the information that follows.

Soil Erosion

Erosion occurs when soil is washed or blown away. Plants, like trees and grass, help hold the soil in place. In Utah, annual rainfall is low; the state average is 14 inches a year. Erosion in Utah is primarily caused by wind. During the 1930s, livestock in Tooele County were allowed to overgraze the range. Between 1933 and 1935, the area had even less rainfall than usual. The severe drought killed crops and worsened overgrazing. Large swaths of land had no plant root system to anchor it, and much of the soil blew away. Dust and sand storms buried roads and houses. The Great Plains also experienced a drought during this time. Farmers seeded crops, but nothing would grow without rain, and repeated tilling left the soil loose, bare, and vulnerable. Clouds of dust from this area reached as far east as Washington, DC. We now know this as the Dust Bowl.

In response to the disaster, the federal government created the Soil Erosion Service and the Civilian Conservation Corps. Workers replanted grass, planted trees, and helped farmers develop and implement agricultural methods that would better protect the soil. Over time, the Soil Erosion Service has evolved and changed names; its modern-day equivalent is the Natural Resources Conservation Service. At the state level, citizens of a local area that concern themselves with the conservation of soils belong to a governing board called the Soil Conservation District. Today, these organizations help Utah farmers and ranchers develop and implement better land management strategies.

One method developed to prevent overgrazing is to move livestock regularly, giving the pasture plants a period of rest. In order to implement this practice—known as rotational grazing—someone must move the livestock regularly, and fences are often needed to keep livestock off of the pasture section that is resting. Rotational grazing requires more labor and infrastructure than allowing livestock to graze freely.

Another method to prevent erosion is no-till farming of annual crops, in which the farmer seeds directly into a field that still has last year's plant stems, stalks, and leaves on or in the ground. This ensures that the soil is never left bare and vulnerable to erosion. However, no-till farming is most effective when herbicides are used to control weeds, and some people worry that the herbicides used might pollute the water, harming people and ecosystems downstream.

Problem

_____

Cause

_____

Effect(s)

_____

Solution

_____

Does the solution create another problem? If so, what is it?

Caring for the Land

Identify the problem and the solution, as well as the main cause and effect relationship in the information that follows.

Chemical Pesticides and Fertilizers

In natural ecosystems, plants take nutrients from the soil and return them when leaves and other plant parts die and decompose. In agricultural systems, people harvest plant matter (e.g. vegetables, grains, hay), and by doing this, remove nutrients. Over time, if the nutrients aren't replaced, the soil will no longer support healthy plant growth. In early years, farmers replaced nutrients by adding animal manure, growing a legume crop, resting fields, or rotating crops from year to year so that soils could restore some of their nutrients through natural processes.

In the 1920s, farmers began using tractors instead of horses and mules. They began using inorganic nitrogen fertilizers to replace the organic nitrogen the fields had been getting from animal manure. Nitrogen is one of the major nutrients plants need to grow. In the 1940s, farmers learned to use chemicals to kill insects and weeds. These pesticides and fertilizers help American farmers provide enough food and fabric for many hundreds of non-farmers.

Although they've greatly increased productivity, chemicals have also caused some problems. Chemical pesticides can kill organisms other than the ones for which they are intended. Some of the organisms they harm are useful ones that help crops grow. Chemical fertilizers cause reactions in the soil that, over time, can make the soil less desirable for plant growth. Chemicals used in agriculture can also contaminate the water we drink, moving through the soil into the underground water supply, or washing into lakes, rivers, and streams with rainwater.

Farmers are concerned about these problems. They are trying new methods that will help them use fewer chemicals on their fields while still growing enough food to meet our needs. One method is Integrated Pest Management (IPM). Farmers using this method begin by monitoring to find out what kind and how many pests they have. They don't use pesticides unless there are enough pests to cause economic damage. They often choose environmentally friendly pesticides or beneficial insects to control the pests.

Another method, called "precision farming," makes use of a computer installed in the farmer's tractor to more efficiently use fertilizer. The farmer takes soil samples from his or her fields and has them tested for nutrient deficiencies at a laboratory. The computer receives mapping information from a satellite in space and then uses the results of the soil tests to tell the fertilizer spreader where to place the fertilizer and how much to use.

Problem

_____

Cause

_____

Effect(s)

_____

Solution

_____

Does the solution create another problem? If so, what is it?

Caring for the Land

Identify the problem and the solution, as well as the main cause and effect relationship in the information that follows.

Wetlands

Wetlands are land areas saturated with water. There are many types of wetlands, including the shallows of small lakes, reservoirs, ponds, and streams; marshes and wet meadows; mud and salt flats; and playas that are only temporarily filled with water. Even wetlands that are small or seasonal can provide critical habitat for aquatic species and migrating birds, especially in arid areas. Although Utah is mostly arid, one of the largest and most important wetlands in the Intermountain West is found here. In 1991, the Great Salt Lake, along with its associated wetlands, was designated a Hemispheric Reserve in the Western Hemisphere Shorebird Reserve Network due to its importance to migratory waterfowl and shorebirds.

Wetlands are critical ecosystems. They support biodiversity, reduce flooding, and filter toxins out of water. People can enjoy spectacular wildlife viewing in wetlands, which act as important rest and food stops for migrating birds and provide homes for diverse populations of amphibians, reptiles, and fish. Many endangered plants and animals depend on wetlands.

Wetlands act like sponges, soaking up water from heavy rains that could otherwise cause floods and destroy homes, businesses, and farms. Wetlands store water, releasing it slowly into aquifers and underground streams—an important source of drinking water for many people. Wetlands also help purify water, filtering out harmful chemicals and waste. Dirty water gets a good cleaning when it flows slowly through a wetland area that is thick with the roots of many plants.

At the time of European settlement, there were about 221 million acres of wetlands in the lower 48 states. Since then, over half of these wetlands have been lost. Most were converted to agricultural uses. For many years, people thought of wetlands as obstacles to farming and breeding grounds for mosquitoes. The government even encouraged landowners to drain wetlands and turn them into dry lands for farming or building homes.

Now we know more about wetlands and recognize their importance. Federal laws have been passed to protect and preserve them. Some people don't like the wetland laws. People who have wetlands on their property think they should be able to use their property as they want. Draining a wetland and planting crops may mean earning money to support a family.

Problem

_____

Cause

_____

Effect(s)

_____

Solution

_____

Does the solution create another problem? If so, what is it?

Answers to "Caring for the Land" Activity Sheets

Soil Erosion

Problem:	soil erosion
Cause:	overgrazing, removing vegetation cover from soil
Effect(s):	soil washes or blows away
Solution:	rotational grazing, no-till farming
New problem:	increased labor and infrastructure needs with rotational grazing, overuse of pesticides may cause water pollution

Chemical Fertilizers and Pesticides

Problem:	chemical pollution
Cause:	using chemical fertilizers and pesticides
Effect(s):	increase production, pollute water, harm non-target organisms
Solution:	integrated pest management (IPM)
New problem:	none identified in text, but students may recognize that IPM and precision farming could require new, specialized equipment or increase labor requirements

Wetlands

Problem:	loss of wetlands
Cause:	draining or filling in wetlands
Effect(s):	flooding, loss of habitat for wildlife, loss of natural water purification
Solution:	passing laws to protect wetlands
New problem:	people are unable to use their property as they wish