
How is Agriculture Being Conservation Aware? Strategies for Safeguarding our Natural Resources

Grade Levels: 3-5

Purpose:

Students will understand how science, engineering, and management practices help farmers and ranchers conserve our natural resources.

Materials:

Interest Approach

- Large apple
- Knife
- Cutting board

Activity 1

- Tootsie Rolls, 1 per student

Activity 2

- Worksheet: Conservation Aware
- YouTube videos on modern agriculture tools and methods

Vocabulary:

- | | | |
|----------------|---------------------|-----------|
| • Conservation | • Livestock Grazing | • Tillage |
| • Drone | • Precision | • Topsoil |
| • Drought | Agriculture | |
| • GPS | • Riparian Buffer | |

Background Agricultural Connections:

In the 1940s, one farmer in the United States produced enough food to feed 19 people. Today, one US farmer produces enough to feed 165 people (Source: American Farm Bureau Federation). The advancement of agricultural technology is directly related to the increase of U.S. food production.

The Food and Agriculture Organization (FAO) of the United Nations (UN) projects the world's population to reach 9.7 billion people by the year 2050. With 9.7 billion people on Earth, the world's farmers will need to grow about 60-70 percent more food than what is now being produced. As the global population increases, farmers will need to utilize innovative technologies to produce more food with fewer resources.

The land is the livelihood of farmers and ranchers. 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.

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.

Today, farmers and agricultural researchers are working on ways to solve food production challenges 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.

Interest Approach:

The Earth as an apple (Source: Adapted from an Iowa Agriculture Literacy Foundation lesson)

1. (Hold up the apple) This apple represents planet Earth. We're going to cut the apple into pieces to see how much soil is left on planet Earth to grow food for more than 6.4 billion people and all the animals in our care.
2. (Cut the apple lengthwise in four equal parts and take away three.) These three parts represent the water on Earth.
 - a. Where do we find water on planet Earth? *In oceans, rivers, lakes, ponds, streams, etc. The piece that is left, one-fourth of the apple, represents the land on Earth.*
3. (Cut the remaining quarter in half lengthwise and take away half.) This half represents the areas on Earth that are too hot, too cold, or too wet for the plants we eat to grow.
 - a. What places are too hot? *Deserts, equator*
 - b. What places are too cold? *The poles, places where there is frozen ground*
 - c. What places other than bodies of water are too wet? *Swamps*
4. (Cut the remaining portion crosswise into four equal parts and take away three.) These three parts represent areas of Earth where the plants we eat can't grow roots into the ground. We call these surfaces impervious, which means incapable of penetrating or being passed through.
 - a. What things cover soil and make the ground impenetrable? *Roads, houses, businesses, shopping malls, schools, parking lots, mountains, forests, etc.*

- The fourth portion – only 1/32 of Earth – represents the land that can grow crops for the more than 6.4 billion people and all the animals in our care.
- Do plants grow into the core of the earth? *No*
 - What do you call the layer of soil where plants grow? *Topsoil*
5. (Peel the skin off the remaining section.) This skin represents topsoil, the part of the soil that plants grow in. This is the amount of soil on planet Earth that grows the food to feed all the people and animals that live around the world.
- Is there very much topsoil on planet Earth to grow our food? *No*
 - What should we do to take care of this valuable resource? *Be responsible and keep the soil healthy so that it can grow food for many generations*
6. We've been talking about water and how farmers protect and conserve it. Farmer and landowners also have to protect and conserve soil. What does this mean? *They need to save the soil from wind and water erosion and be responsible when applying chemicals. They should work to keep the soil healthy so that it will continue to nourish plants*
7. Let's explore ways that farmers and ranchers are working to conserve and protect natural resources.

Procedures:

Activity 1 – Tootsie Roll Conversation About Conservation Terms

Source: Utah Agriculture in the Classroom

- Divide the class into three groups and give each student a Tootsie Roll or other that will demonstrate points below.
- Instruct each group as follows:
Group 1: These students are to eat the Tootsie Roll immediately.
Group 2: These students may unwrap the Tootsie Roll, but they may only lick the candy, they can't eat it.
Group 3: These students may not unwrap their Tootsie Roll during this activity. They may look at it, smell it, measure it, but NOT eat it.
- Terms:
 - The students in group one are the indiscriminate users.
 - Group two, the conservationists.
 - Group three, the preservationists.
- Discussion:
 - Which group uses the candy but not so fast that more candy can be made?
 - Would it make a difference if we determined the reason for having the candy?
 - What if the group had not eaten in three days, would that make a difference?
 - Which group would be the wisest group?
 - What if the goal was to have the same number of Tootsie Rolls a year from now? Which group would have met that goal?
 - Like any areas of decision making there are no right or wrong answers. Students are encouraged to examine a lot of aspects of the situation, make their decision and be

able to defend that decision.

5. Applying to Areas of Conservation:

- Preservationists might want to save all trees and all forests no matter what.
- Indiscriminate users might cut down trees and forests no matter what.
- Conservationists might want to use the forest by harvesting trees and managing the forest so that it can regenerate itself.

Activity 2 – Conservation Aware

1. Pass out the worksheet: Conservation Aware
2. Instruct the students to read examples of tools and methods farmers and ranchers use to conserve natural resources. For each example they should identify the natural resources impacted by this tool or method and then draw a picture of how they think this looks in application in the real world.
3. Show the following videos on some of the tools mentioned for the students to compare their drawings to real life application.
 - a. Drones and the Future of Farming - <https://www.youtube.com/watch?v=v3YcZtlVrls>
 - b. Self-Driving Tractors Sow the Seeds for High Tech Farming - <https://www.youtube.com/watch?v=RbZkVq9hmTI>
 - c. Farmers Use Conservation Tillage to Prevent Soil Erosion and Protect Iowa Water Quality - <https://www.youtube.com/watch?v=rp0PBudddek>
 - d. What is a riparian buffer? https://www.youtube.com/watch?v=nc85xmY_VVs

Enriching Activities

- Lesson Plans on National Agriculture in the Classroom Curriculum Matrix at <https://www.agclassroom.org/teacher/matrix/>
 - High- Tech Farming (Grades 3-5)
 - Keeping Soil in Its Place (Grades 3-5)
 - Soil Texture and Water Percolation
 - Source Search (Grades 3-5)
 - The Ultimate Efficient Recycler
 - What's in Soil?
- Play the My American Farm interactive game Wild Water Adventures.
- Invite a soil and water conservationist into the classroom to talk to students.
- Have the students make posters to teach other students why we should not pollute water. Hang the posters around the school.
- 4-H National Youth Science Day 2016 Drones Discovery Challenge available at <https://4-h.org/parents/national-youth-science-day/4-h-nysd-2016-drone-discovery/>

Vocabulary

Conservation: Planned management of a natural resource to prevent exploitation, destruction, or neglect.

Drone: An unmanned aircraft or ship guided by remote control or onboard computers.

Drought: A prolonged period of abnormally low rainfall, leading to a shortage of water.

GPS (Global Positioning System): a network of orbiting satellites that send precise details of their position in space back to earth.

Livestock Grazing: To feed on growing grass and pasturage, as do cattle, sheep, etc.

Precision agriculture: Approach to farm management that uses technologies to increase crop yields and profitability while lowering the levels of traditional inputs needed to grow crops (land, water, fertilizer, herbicides and insecticides).

Riparian Buffer: A vegetated “buffer-strip” near a body of water, which helps to partially protect the stream from the impact of adjacent urban, industrial or agricultural land use.

Tillage: The practice of working land by plowing, sowing, and raising crops.

Topsoil: Surface soil usually including the organic layer in which plants have most of their roots and which the farmer turns over in plowing.

Educational Standards Addressed

Nevada Academic Content Science Standards/Next Generation Science Standards

5-ESS3-1 Obtain and combine information about ways individual communities use science ideas to protect the Earth’s resources and environment.

Nevada Academic Content Social Studies Standards

SS.4.24. Examine how and why Nevada’s landscape has been impacted by humans.

SS.4.25. Analyze how technological changes have impacted the environment and economy of Nevada.

SS.5.3.6 Describe ways humans depend on natural resources

Nevada Academic Content English Language Arts Standards/Common Core

Key Ideas and Details:

CCSS.ELA-LITERACY.RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

CCSS.ELA-LITERACY.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.

Craft and Structure:

CCSS.ELA-LITERACY.RI.3.4, 4.4, 5.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 3, grade 4, grade 5, topic or subject area.

Integration of Knowledge and Ideas:

CCSS.ELA-LITERACY.RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.

National Agricultural Literacy Outcomes

T1.3-4e Recognize the natural resources used in agricultural practices to produce food, feed, clothing, landscaping plants, and fuel. (Water)

T2.3-5e Understand the concept of stewardship and identify ways farmers/ranchers care for soil, water, plants, and animals.

T4.3-5.a Compare simple tools to complex modern machines used in agricultural systems to improve efficiency and reduce labor.

T4.3-5.b Describe how technology helps farmers/ranchers increase their outputs (crop and livestock yields) with fewer inputs (less water, fertilizer, and land) while using the same amount of space.

T4.3-5.d Provide examples of science being applied in farming for food, clothing, and shelter products.

Conservation Aware
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