



Conserve Water for Food

Elementary School Educational Resources

Background

The availability of fresh water for irrigation of edible food crops is strained due to human demand and climate change. Increases in the human population increase demand for agricultural water as well as water used for other purposes including drinking, hygiene, recreation, and energy. Ground water resources are declining, and surface water contamination from human activity further limits freshwater supplies that can be used for agriculture. Climate change impacts the quality and availability of freshwater due to more frequent and prolonged drought or flooding in different geographical regions as well as rising sea levels that can lead to intrusion of salt water into freshwater resources.

Consequently, the reuse of water from nontraditional irrigation water sources (e.g., recycled water) has become a priority to ensure the security of agricultural water and the sustainable production of food. Because water can serve as a transmission vehicle for disease agents and pollutants, nontraditional irrigation water sources must be evaluated for the presence of biological and chemical contaminants and then treated accordingly to protect public health in accordance with water quality requirements of the Food Safety Modernization Act's Produce Safety Rule.

CONSERVE is transdisciplinary team of scientists and science educators engaged in research, extension, and education related to the safe reuse of water for sustainable agriculture. Research efforts are directed to provide for safe reuse of water, to inform policy, and to educate producers and the public on issues related to water scarcity and conservation.

Elementary Educational Resources

Advancing the understanding of the issues surrounding the safety and availability of water and the consequent impacts on the food supply is essential to developing science-literate community members who can affect positive change through personal and professional action. Issues surrounding the safe reuse of water for agriculture support educational concepts and skills taught in primary, secondary, and post-secondary education. Educational resources prepared by CONSERVE for the elementary school community consist of animations, infographics, digital narratives, glossary, informational text, and questions to exercise and evaluate student knowledge gained from utilization of these resources.

- **Animations**

- *Water, Food & Our World*

- <https://www.youtube.com/watch?v=ShYjTA-2sVk> (3 minutes, 52 seconds)

- This animation provides an overview of the sources, types, and uses of water. The animation also addresses the need to conserve and appropriately reuse water for food production due to increases in demand and shortages of clean water. Research efforts underway to address these challenges are presented.

- *Humans & Food Are Part of the Water Cycle*

- <https://www.youtube.com/watch?v=-QONmSugRVo> (2 minutes, 38 seconds)

- This animation provides an overview of historical and current water uses for irrigation of food crops. The animation addresses the water cycle, water sources, and water recycling for sustainable agriculture.

- **Informational Text and Question Bank**

- **Informational Text**

- <https://www.udel.edu/academics/colleges/canr/departments/animal-and-food-sciences/affiliated-centers/conserve/>

- This 2-page informational text describes the cycle of safe water reuse and importance to the production of food.

- **Question Bank**

- A set of questions is provided to exercise and evaluate student understanding of the informational text as applied to various class subjects including English Language Arts, Science, Mathematics, Social Studies, and Health.

- **Glossary: *Recycled Water and Related Terms Relevant for Agriculture***

- https://www.udel.edu/content/dam/udelImages/canr/pdfs/anfs/conserve/CO_NSERVE_RecycledWater_Agriculture_Terms.pdf

- This 5-page glossary provides definitions for terms related to types of water and water treatment technologies, processes and products as related to agriculture.

- **Infographics**

- *Evolutionary Water Systems*

- https://www.udel.edu/content/dam/udelImages/canr/pdfs/anfs/conserve/CO_NSERVE-Infographic-Timeline-Water-Systems.pdf

- This infographic provides an historical perspective and timeline on water transport, reclamation, and policy.

- *Revolutions in Urban Water*

- <https://www.udel.edu/content/dam/udelImages/canr/pdfs/anfs/conserve/Revolutions-Urban-Water-infographic.pdf>

This infographic provides historical perspective on societal efforts to obtain and render water safe for human use.

- **Digital Narratives**

- *Water Research – Virus Detection*

- <https://drive.google.com/file/d/106hlB4ih-pwyRTCGim7hwhsmV65jB4Eq/view>

- This digital narrative (less than 4 minutes) features a student researcher who describes and demonstrates the purpose and approach for research in which water samples are collected and analyzed for the presence of virus to evaluate the microbiological safety of the water.

- *Water Research – Parasite Detection*

- <https://drive.google.com/file/d/1NiU8w3BWjloK1h9lji01fDrlQDLTaGE/view>

- This digital narrative (less than 4 minutes) features a student researcher who describes and demonstrates the purpose and approach for research in which water samples are collected and analyzed for the presence of parasites to evaluate the microbiological safety of the water.

Education Content Standards Supported

- **English Language Arts (Common Core)**

- Reading Standards for Informational Text K-5, Craft and Structure, Grade 4
 - Reading Standards for Informational Text K-5, Key Ideas and Details, Grade 4
 - Writing Standards K-5, Research to Build and Present Knowledge, Grade 4

- **Science (Next Generation Science Standards)**

- 3-ESS3-1. Earth and Human Activity, Crosscutting Concepts, Connections to Nature of Science
 - 4-ESS3-1. Earth and Human Activity, Disciplinary Core Ideas
 - 5-ESS1. Earth's Place in the Universe, Crosscutting Concepts, Scale, Proportion, and Quantity
 - 3-5-ETS1-2. Engineering Design, Crosscutting Concepts, Influence of Engineering, Technology, and Science on Society and the Natural World
 - 5-LS2-1. Ecosystems: Interactions, Energy, and Dynamics, Crosscutting Concepts, Systems and System models

- **Mathematics (Common Core)**

- Geometry, Grade 3: Reason with shapes and their attributes
 - Geometry, Grade 5: Classify two-dimensional figures into categories based on their properties
 - Geometry, Grade 5: Graph points on the coordinate plane to solve real-world mathematical problems
 - Measurement and Data, Grades 3 to 5: Represent and interpret data.
 - Operations and Algebraic Thinking, Grade 4: Use the four operations with whole numbers to solve problems

- **Social Studies**

- Civics 4-5a: Students will understand that governments ... exist for many purposes ...
 - Civics K-3a: Students will understand that American citizens have distinct rights, responsibilities, and privileges.
 - Civics K-3b: Students will understand that positions of authority carry responsibilities and should be respected.

- Geography 4-5a: Students will apply knowledge of topography, climate, soils, and vegetation ... to understand how human society alters, and is affected by, the physical environment.
- **Health**
 - Standard 1.1: Describe the relationship between healthy behaviors and personal health
 - Standard 1.3: Describe ways in which a safe and healthy ... community environment can promote personal health.
 - Standard 1.3: Describe ways to prevent communicable diseases
 - Standard 2.5: Describe ways technology can influence personal health.
 - Standard 3.1: Recognize trusted adults and professionals who can help promote health.
 - Standard 5.1: Identify health-related situations that might require a thoughtful decision.

Learning Objectives

The educational resources support cross-curricular instruction on issues surrounding the availability and safety of environmental water needed for food production. The resources will support student understanding of the following:

1. Water resources are limited and must be protected to assure safe supply for food production.
2. Human activity can negatively impact water resources through overuse and contamination.
3. Human activity can positively impact water resources through treatment prior to and after use.
4. Scientific inquiry and policy shape societal practices around obtaining and using water.

Lesson Essential Concepts

1. Water is essential for human wellbeing and is used for many purposes including drinking, food production, hygiene, energy production, recreation, and transport.
2. Water is obtained from the environment and includes saltwater and freshwater sources. Freshwater is critical for food production.
3. The availability and safety of freshwater supplies for agriculture are strained due to human demand, pollution, drought, and flooding which can be exacerbated by climate change.
4. Contaminated and untreated environmental water can transfer hazardous biological and chemical agents to human food.
5. Environmental water is cleaned prior to and after use to protect human and environmental health.
6. Scientific studies are conducted to inform the needs and strategies to provide for safe water.
7. Actions by scientists, society leaders, and all individuals can impact the safety and availability of water needed for agriculture.

Recommendations for Use of Educational Materials

The educational resources are complementary but can be used independently. The resources are multifaceted to support learning styles and degrees of active learning. It is recommended the students view the animations and read the text to exercise reading comprehension. The provided questions are designed to support cross-curricular instruction and to illustrate how this topic draws on the knowledge and practices of several disciplines and impacts society through public health, resource utilization, technology, and policy. The questions can be used by subject matter or mixed to illustrate discipline connections around the content. The glossary supports key terms introduced in the text and other resources. Infographics provide historical context and are intended for display in the classroom. Digital narratives introduce viewers to actual researchers in a laboratory setting to visualize tools and technologies used to support scientific investigations.

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