SOIL&WATER

CONSERVATION VIRTUAL FIELD TRIP

UofA DIVISION OF AGRICULTURE RESEARCH & EXTENSION University of Arkansas System

USDA United States Department of Agriculture Natural Resources Conservation Service

By Diedre Young, Soybean Science Challenge

7E Lesson for

Judd Hill Foundation Farm

Soil Moisture and Irrigation Scheduling Practices Virtual Field Trip

Grade 9-12 Integrated Chemistry, Environmental Science and Agricultural Science

Arkansas NGSS Suggestions:

Chemistry:

Topic One: Matter and Chemical Reactions:

Cl-ESS2-5: Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.

Science and Engineering Practices: Planning and Carrying Out Investigations (CL-ESS2-5)

Crosscutting Concepts: Structure and Function (CL-ESS2-5)

Disciplinary Core Ideas: ESS2.C: The roles of water in Earth's Surface Processes (CL-ESS2-5)

Connections to the Arkansas Disciplinary Literacy Standards: WHST.9-12.7

Connections to the Arkansas Mathematic Standards: HSN.Q.A.3

Cl1-ETS1-2: Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering

Science and Engineering Practices: Constructing Explanations and Designing Solutions (Cl1-ETS1-2)

Disciplinary Core Ideas: ETS1.C: Optimizing the Design Solution (Cl1-ETS1-2)

Connections to the Arkansas Mathematic Standards: MP.4

Environmental Science:

Topic One: Systems

EVS-ESS2-5: Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.

Science and Engineering Practices: Planning and Carrying Out Investigations (EVS-ESS2-5)

Crosscutting Concepts: Structure and Function (EVS-ESS2-5)

Disciplinary Core Ideas: ESS2.C The roles of water in Earth's Surface Processes (EVS-ESS2-5)

Connections to the Arkansas Disciplinary Literacy Standards: WHST.9-12.7

Connections to the Arkansas Mathematic Standards: HSN.Q.A.3

EVS1-ETS1-1: Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

Science and Engineering Practices: Asking Questions and Defining Problems. (EVS1-ETS1-1)

Crosscutting Concepts: Influence of Engineering, Technology and Science on Society and the Natural World. (EVS1-ETS1-1)

Disciplinary Core Ideas: ETS1.A: Defining and Delimiting Engineering Problems. (EVS1-ETS1-1)

Connections to the Arkansas Disciplinary Literacy Standards: RST.11-12.7, RST.11-12.8, RST.11-12.9

Connections to the Arkansas Mathematic Standards: MP.2, MP.4

Topic 4: Sustainability

EVS-ESS3-2: Evaluate competing design solutions for developing, managing and utilizing energy and mineral resources based on cost-benefit ratios.

Science and Engineering Practices: Engage an Argument from Evidence (EVS-ESS3-2)

Crosscutting Concepts: Influence of Science, Engineering and Technology on Society and the Natural World. Science Addresses Questions about the Natural and Material World. (EVS-ESS3-2).

Disciplinary Core Ideas: ESS3.A: Natural Resources. ETS1.B: Developing Possible Solutions (EVS-ESS3-2),

Connections to the Arkansas Disciplinary Literacy Standards: RST.11-12.8

Connections to the Arkansas Mathematic Standards: MP.2

EVS-LS2-7: Design, evaluate and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

Science and Engineering Practices: Constructing Explanations and Designing Solutions (EVS-LS2-7).

Crosscutting Concepts: Stability and Change (EVS-LS2-7)

Disciplinary Core Ideas: LS2.C: Ecosystem Dynamics, Functioning, and Resilience, ESS3.A: Natural Resources, ESS3.C: Human Impacts on Earth Systems, ETS1.B: Developing Possible Solutions. (EVS-LS2-7).

Connections to the Arkansas Disciplinary Literacy Standards: RST.9-10.8, RST.11-12.1, RST.11-12.8, WHST.9-12.7

Connections to the Arkansas Mathematic Standards: MP.2, HSN.Q.A.1, HSN.Q.A.2, HSN.Q.A.3

EVS-LS4-6: Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.

Science and Engineering Practices: Using Mathematics and Computational Thinking (EVS-LS4-6).

Crosscutting Concepts: Cause and Effect (EVS-LS4-6).

Disciplinary Core Ideas: LS4.C: Adaptation, LS4.D: Biodiversity and Humans, ETS1.B: Developing Possible Solutions (EVS-LS4-6).

Connections to the Arkansas Disciplinary Literacy Standards: WHST.9-12.5, WHST.9-12.7.

EVS4-ETS1-3: Evaluate a solution to a complex real world problem based on prioritized criteria and tradeoffs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts

Science and Engineering Practices: Using Mathematics and Computational Thinking (EVS-ESS3-3)

Crosscutting Concepts: Cause and Effect (EVS-LS4-6), Stability and Change (EVS-ESS3-3), Systems and System Models (EVS-ESS3-6)

Disciplinary Core Ideas: ETS1.B: Developing Possible Solutions (EVS-LS4-6).

Connections to the Arkansas Mathematic Standards: MP.2.

Objective: Students will understand the importance of irrigation watering in regards to conservation of water and the lessening of the environmental impact contaminated runoff water will have on the local ecosystem.

Assessment: Students will write a reflection paper on what they learned about irrigation conservation in the Judd Hill Virtual Field Trip video.

Key Points: Conservation Tillage Management, aquifer recharge, soil moisture, soil runoff chemistries.

Materials:

- Access to the Internet to watch the Judd Hill Soil and Water Conservation Field Trip. Go to www.uaex.uada.edu/soywhatsup and click on the 'teacher curriculum' icon on the left-hand side of the page. This will take you to the link for the video.
- Paper writing utensils for students.

Preparation:

No significant preparation time is necessary.

Time Duration: 1-2 class periods

The video is about 45 minutes long. Assume about 15 minutes for students to look up vocabulary and prepare questions for the video session, 15 minutes to teach essential concepts and about 15 minutes for group discussion and reflection after the video.

Elicit:

Do a KWL Chart about irrigation and runoff water. Where does the water for irrigation in Arkansas come from? What happens if a farm isn't located near a water source? Get students thinking about the drawbacks of irrigation runoff by asking students how do farmers keep plants healthy (fertilizers) and do they think all the fertilizer that is placed on the field goes into the plant? If not, where does the excess fertilizer go? Considering the properties of water and the interaction water has on the environment, how could this excess fertilizer impact our ecosystem?

Engage:

Tell the students that they are going to watch a video titled '*Judd Hill Soil and Water Conservation Virtual Field Trip'*. Before they start the video, have the students break into groups to define the following word groups:

- Conservation Tillage Management
- Conventional Tillage of Furrow
- Conservation Tillage of Furrow
- Poly-Pipe tubing furrow irrigation
- Cover Cropping
- Soil Horizon
- Hydrologist
- Hypoxic Zone
- Alluvial Aquifer in Arkansas
- Watermark Granular Matrix Sensors
- Cotton lint yield
- Nitrates in water
- Nitrites in water
- Ammonia in water
- Water Quality Analysis; focus on salts, pH, Salinity, Sediments and Solids in water.

Once all the words are defined, have each group come up with two questions they have about the above word groups that may be answered in the video. ***Their jobs are to turn in the questions and the answers by the end of the virtual field trip.***

Explain:

BEFORE THE VIDEO be sure the students understand that their city drinking water comes from the Alluvial Aquifer. If they are on a well, most likely their water is coming from either the Alluvial or the Sparta Aquifer.

If you are in chemistry, this is a good time to discuss the water cycle, the properties of water, the structure and function of the dipole molecule and its impact on systems around it.

Environmental Science concepts could involve ecosystem dynamics, natural resources, human impact and the role of water in surrounding systems.

Explore:

Farmers have to be constantly aware of the amount of water they use to irrigate their crops. Water availability has dropped in recent years, so farmers are always looking for ways to conserve; lower water usage means less cost, better sustainability and less contaminated water runoff.

Show the video *Judd Hill Soil and Water Conservation Virtual Field Trip.*

Elaborate:

After the video, break the students into three groups; the *Aquifer Recharge* Group, the *Conservation Tillage of Furrow* group and the *Water Quality Analysis* group. Have each group brainstorm how their conservation effort affects their daily lives. Tell students they need to come up with at least five ways and then report them to the rest of the class.

Evaluate:

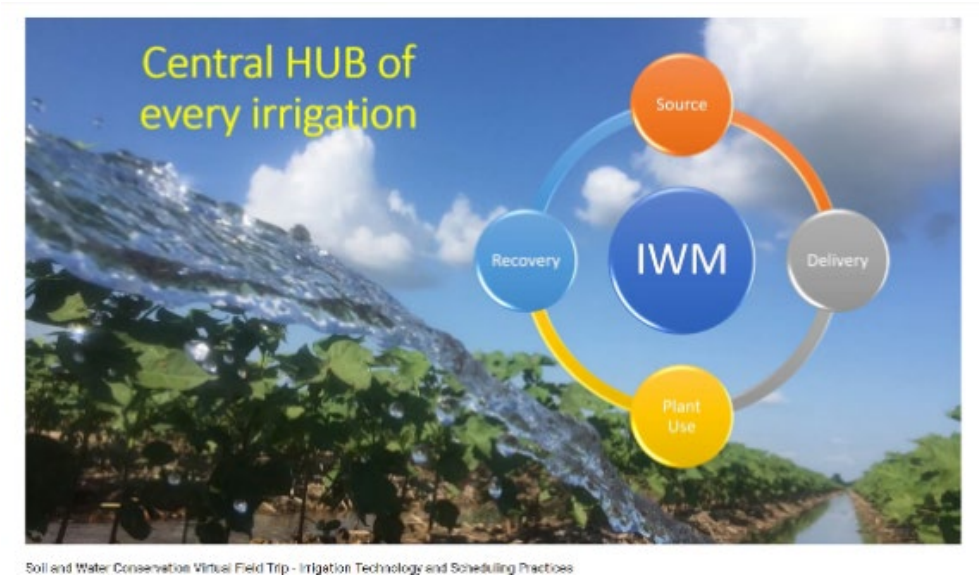
Students will turn in a two-paragraph reflection paper on what they learned and how these conservation efforts affect their personal lives and the answers to their two questions from the video.

Extend:

End the lesson with how conservation practices of farmers also have a huge impact on our personal lives through the water we use and the food we eat.

Assign a brainstorming project that allows students to design their own aquifer recharging project or alternate irrigation method.

Have an extension agent or local farmer come to your classroom and talk about irrigation of crops in your local community.



Soil and Water Conservation Virtual Field Trip - Irrigation Technology and Scheduling Practices

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