Curriculum and Educational Resources for Educators (Grades 6-12)
The National 4-H Council’s 2020 Ag Innovators (AIE) Challenge is the Water Connects Us All Challenge that was developed at Iowa State University Extension and Outreach. This AIE Challenge is a STEM-focused annual program that challenges young people to explore a model of a wetland, foster critical thinking skills, and engage with a real-world agriculture challenge. This collaborative, hands-on challenge helps youth:

- Learn about the importance of water and how it connects us all
- Understand how wetlands provide important ecosystem services
- Create models engineered conservation practices that improve water quality
- Explore career connections related to agriculture and conservation
- Explore conservation practices that improve water quality.

Curriculum Overview
The Water Connects Us All Challenge uses a series of hands-on activities to teach youth about water, watersheds, ecosystem services, the intersection between the nitrogen cycle and crop production, issues with water pollution, and conservation practices to mitigate water pollution.

Activity 1: Background information via discussion and powerpoint
Activity 2: How wetlands work
Activity 3: Engineered Conservation Practices
Activity 4: Watershed Management Authority - Students negotiate with their team to identify and implement practices to have the greatest impact for the community.
Resources provided

- Facilitator Guide with directions for leading the activities
- PowerPoint that provides background information and fosters discussion
- Supplies to conduct the hands-on learning experiences
- Engagement with trained educators who can lead activities via video conference
- An opportunity for educators to participate in virtual professional development

NGSS Performance Expectations / Standards

- HS-ESS3-3
- HS-ESS3-4
- MS-ESS3-3

Developing and Using Models

For more information about Water Connects Us All please contact:

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To request resources for your school, please complete this google form:
Registration Form (https://forms.gle/RnTb3MSVoZbi8Bye9)
HS-ESS3-3 Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity. [Clarification Statement: Examples of factors that affect the management of natural resources include costs of resource extraction and waste management, per-capita consumption, and the development of new technologies. Examples of factors that affect human sustainability include agricultural efficiency, levels of conservation, and urban planning.]

HS-ESS3-4 Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.* [Clarification Statement: Examples of data on the impacts of human activities could include the quantities and types of pollutants released, changes to biomass and species diversity, or areal changes in land surface use (such as for urban development, agriculture and livestock, or surface mining). Examples for limiting future impacts could range from local efforts (such as reducing, reusing, and recycling resources) to large-scale geoengineering design solutions (such as altering global temperatures by making large changes to the atmosphere or ocean).]

MS-ESS3-3 Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. * [Clarification Statement: Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air and water)
Science and Engineering Practices:

A practice of both science and engineering is to use and construct models as helpful tools for representing ideas and explanations. These tools include diagrams, drawings, physical replicas, mathematical representations, analogies, and computer simulations.

**Developing and Using Models**

**9-12 Modeling Practices**

Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds

- Evaluate merits and limitations of two different models of the same proposed tool, process, mechanism or system in order to select or revise a model that best fits the evidence or design criteria.
- Design a test of a model to ascertain its reliability.
- Develop, revise, and/or use a model based on evidence to illustrate and/or predict the relationships between systems or between components of a system.
- Develop and/or use multiple types of models to provide mechanistic accounts and/or predict phenomena, and move flexibly between model types based on merits and limitations.
- Develop a complex model that allows for manipulation and testing of a proposed process or system.
- Develop and/or use a model (including mathematical and computational) to generate data to support explanations, predict phenomena, analyze systems, and/or solve problems.

**6-8 Modeling Practices**

Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

- Evaluate limitations of a model for a proposed object or tool.
- Develop or modify a model—based on evidence – to match what happens if a variable or component of a system is changed.
- Use and/or develop a model of simple systems with uncertain and less predictable factors.
- Develop and/or revise a model to show the relationships among variables, including those that are not observable but predict observable phenomena.
- Develop and/or use a model to predict and/or describe phenomena.
- Develop a model to describe unobservable mechanisms.
- Develop and/or use a model to generate data to test ideas about phenomena in natural or designed systems, including those representing inputs and outputs, and those at unobservable scales.