Water: Essential for All

An educator's toolkit of lessons and videos for a 5th-8th grade audience.

Water

Introduction:
In this agricultural focused phenomenon-based inquiry, learners will engage with the following concepts:

- The Water Cycle
- Erosion
- Soil Composition
- Soil Saturation
- Watersheds
- Humans Effects on Ecosystems
- Water Quality

Classroom Application:

The lessons in the experience are developed as a progression with the culminating experience challenging students investigate their local watersheds.

The progression of lessons is developed in a way so that teachers can engage with concepts lesson by lesson, in groups of lessons, or by focusing on concept groupings.

Lessons 1-5 focuses on a broad overview of the water cycle as it moves from surface to ground water. Lessons 6-9 focuses on the development of best practices within the industry and how private and public partnerships can work together to conserve the environment and support agricultural production.

Each lesson is designed with a short informative text for the development of background knowledge of the concepts in the lesson. If a teacher would like to engage in a single lesson or group of lessons, it is suggested that students read through all the informative texts allowing for a more knowledgeable engagement with a single lesson or group of lessons.

Matrix Map

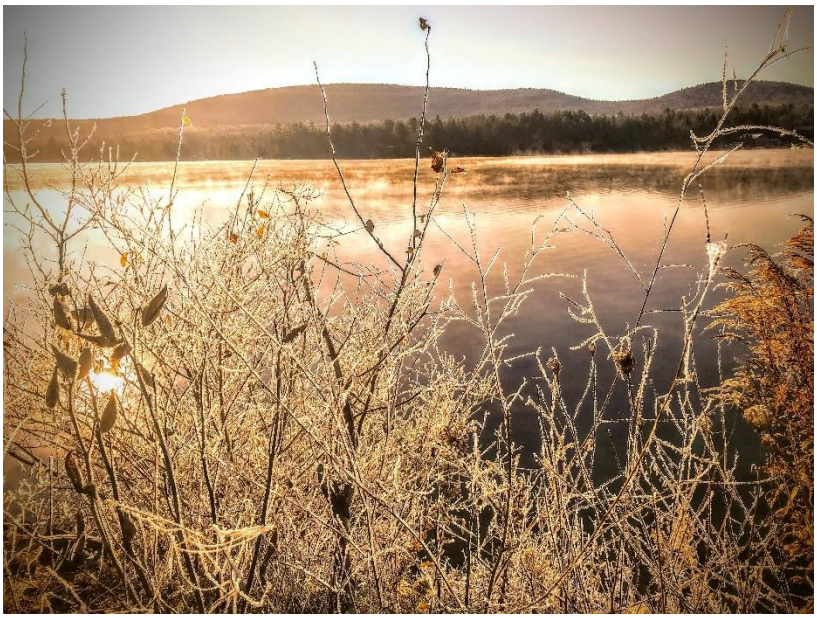
Click on the corresponding numbers to move directly to the lesson information.

	Lesson	Description	Time
	Part 1: Water: Essential for All		
1	Water Supply	Students observe the change of water states as it moves through the water cycle	1- 1-2 hour ongoing session
2	What's in Soil?	Students identify the components of soil and demonstrate that soil contains air and water.	1- 50-minute session
3	Soil Texture and Water Percolation	Students determine the water holding and draining capacities of different soils and investigate how organic matter affects the amount of water soil will hold.	2- 30-minute session
4	Keeping Soil in Its Place	Students demonstrate rain drop splash (splash erosion) and determine its impact on bare soil by visually identifying types of erosion.	1- 90-minute session
	Part 2: Agriculture and Water		
5	Wad-a-Watershed	Students examine the basic geography of a watershed, how water flows through the system, and how people can impact the quality of our water.	1- 45-minute session
6	Fertilizers and the Environment	Students will recognize that fertile soil is a limited resource to produce food for a growing population, describe the role fertilizer plays to increase food productivity, distinguish between organic and commercial fertilizers, and recognize how excess nutrients are harmful to the environment.	1- 45-minute session
7	Growing Our State History	Students will investigate what makes a community livable and explore the influence of agriculture on the history of their state.	3-30 minute sessions
8	Learn, Protect, and Promote Water!	Students learn about water sources, water pollution, and water protection. Students participate in an activity where they demonstrate the water cycle and see the potential for our water supply to become contaminated.	1- 30–45-minute session
9	Water Quality	Students investigate the effects of added soil nutrients on water quality, perform chemical and physical tests on water samples, collect and identify macroinvertebrates from a freshwater system and compare physical, chemical, and biological factors of an aquatic ecosystem to determine water health.	4- 45-minute sessions

Phenomena

The planet Earth is unique and like no other planet as it is the only planet where plants, animals, and humans can survive. Unlike other planets in our solar system, natural Earth cycles allow life to not only exist but thrive. There is a reason that Earth is nicknamed the “blue planet” as seventy one percent of its surface is covered with water. The water cycle, one of Earth’s main cycles, is essential for the disbursement of water across Earth’s crust.

Much of Earth’s water is **unpotable** or unusable by most living things. Only point five percent of water on the planet is considered **fresh water** as it is void or low in dissolved minerals and can be consumed by living things. Because of the water cycle, fresh water sources are continuously replenished through the processes of evaporation, transpiration, condensation, and precipitation.



Mountain Lake (NYAITC)

For us humans, fresh water does more than provide something to drink. We are dependent on water to grow things that our needed for our survival. The process of growing plants and raising animals is called **agriculture** or farming. Agriculture provides us with the food we eat, the clothes we wear, the wood used to build shelter, and even fuel to power our cars.

With so little of Earth’s water available for use by living things, it might seem impossible for there to be enough water to drink and farm yet, through **conservation** and **best practices,** agriculturalists are able to make what seems impossible possible.

In this agricultural focused phenomena-based inquiry, students will engage with a real family of beef farmers who are not only farming to produce nutritious beef protein but conserving and improving their land to benefit millions of others.

To develop an understanding of this phenomena, have students learn about the water cycle and our water supply.

Water Supply		
Interest Approach		
Identify and discuss that water is essential for all life and vital for agriculture.		
Activities		
Activity 1	Students observe the effects of heat on different states of water	1 hour ongoing observation
Activity 2	Create a working model of the water cycle	1 hour ongoing observation
Activity 3	Discussion and demonstration on the percent of fresh water available on earth	20 minutes

Vocabulary

agriculture- the practice of cultivating plants and livestock
aquatic organism- animals which live in water for the majority or all of their lifecycle
best practices- methods developed through experience and research which are identified as being most productive, ethical, humane, and sustainable
compaction- the forcing of things together
composition- the parts that make up a whole
conservation- the prevention of wasteful
contaminant- pollution or substance that makes something unpure
erosion- the washing away of soil, rock, and other material
fresh water- water in streams, rivers, lakes, ponds, glaciers, and other water sources which contain low concentrations of dissolved minerals such as salt
impervious surface- surface water cannot penetrate
infiltration- to allow in
pervious surface- surface water can penetrate
remediation- practice used to prevent, stop, and reverse pollution
reservoirs- a natural or human made lake used for storing water as a fresh water source
runoff- when water drains or washes off a surface layer
steward- a person that manages, cares for, or looks after a resource/system
watershed-body of land of which water sources, streams, creeks, tributaries, etc…, flow into a main body of water
yield- amount of agricultural good produced

Water

Essential for All

Meet the Coombe Family

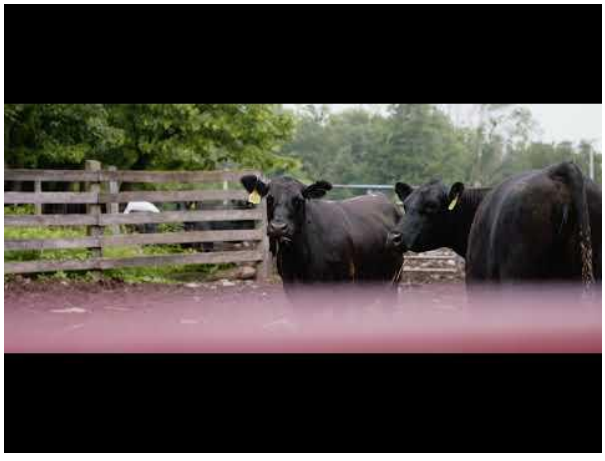
Coombe Family
(Coombe Family)

In 1958, brothers Richard (Rich) and Phillip, purchased their first six Angus beef cows and put them in pastures on their family farm. As the herd and farm grew, Rich's son Ric and later grandson Patrick and their families would join the brothers to help manage the farm. Currently, there have been five generations of Coombe's who have worked their family's land which lies north of New York City in the Cat-Del **watershed**, a mass of land that funnels water to a major water source.

The Coombe family's farm is unique as it lies in the middle of the Cat-Del watershed. This watershed is the source of ninety percent of New York Cities drinking water. What happens on farms like Thunder View and other lands in the Cat-Del impacts the nine-million residents of New York City who are dependent on the water that falls and flows south from this source. The Coombe family are aware that their land provides both food and water for so many people and identify as "the current **stewards**" or protectors and managers of this valuable resource.

Click the following videos, to meet Thunder View cofounder Rich Coombe and his son Ric Coombe who share the history of Thunder View Farm and identify the importance of agricultural lands to the ecosystems and water cycle which these agricultural lands are a part of.

Click the picture to meet Rich and Ric Coombe.



Lesson 2
Soil

Tractor
(Black Mountain Visuals)

Ric Coombe identified how agricultural lands and forests are an essential component to the water cycle. Fields and forests act as a natural filter as they contain grasses and trees that hold dense layers of **pervious** soils. Pervious materials such as soil allow water to flow through them. As water flows through different soil layers, it is filtered and purified from **containments** which are found on the surface. As Ric highlights, the development of these fields and forests into infrastructure such as roads and parking lots can greatly impact the quality of water. Much of the infrastructure needed in towns and cities are considered **impervious surfaces** or surfaces water cannot penetrate.

When rain falls on an impervious surface it causes **runoff** because there are no soils, trees, and grasses to hold the water from flowing. Without proper city planning, runoff can lead to **erosion** of soils and hillsides as the faster moving water strips away the land.

As identified, varying types of soil is an important contributor to clean potable water. To learn more about the science of soil engage with “What’s in Soil?”.

What's in Soil?		
Interest Approach		
Discuss and identify the importance of soil to agriculture		
Activities		
Activity 1	Soil Inventory-identify components of soil samples	20 minutes
Activity 2	Soil moisture experiment	10 minutes
Activity 3	Soil air experiment	20 minutes

Lesson 3
Soil Filtration

Boots and Soil
(Black Mountain Visuals)

What's in Soil? identified that there are many different types of soils. Different types of soils have different blends of organic matter, water, air, and minerals. Certain **compositions** of soil are more pervious than others. Other factors that affect the **infiltration** or the process of allowing water to seep in are soil cover and soil **compaction**.

The following lesson on soil texture and water percolation will help to further develop an understanding on how soil composition effects the ability of water to penetrate into soil as well as the ability of different soils samples to hold water.

Soil Texture and Water Percolation		
Interest Approach		
Students will consider and hypothesize where rain goes once it falls to the ground		
Activities		
Activity 1	Graph the flow of water through different medias	30 minutes
Activity 2	Rerun percolation experiment with the addition of organic matter	30 minutes

Lesson 4
Erosion

Thunder View Farms Buffer Zones
(Black Mountain Visuals)

Signs of erosion are all around us. Erosion can be a natural event caused by the weather, geological phenomenon, or the movement of water. Erosion can also be caused by our impact on an ecosystem. Erosion can have long lasting and irreversible effects on a water quality and ecosystems as the natural soils and overburden are removed.

To prevent runoff and erosion, engineers, conservations, scientists, and farmers work together to develop and implement conservation plans to prevent erosion and control water runoff. These groups often work together to revitalize or rebuild ecosystems. The following lesson will help to build an understanding of the effect of water on bare soils, the types of erosion, and mitigation processes that can be used to prevent runoff and erosion.

Keeping Soil in Its Place		
Interest Approach		
Identify the different types of erosion and discuss possible effects of erosion on soil and ecosystems		
Activities		
Activity 1	Identify the effects on bare soil from water droplets	30 minutes
Activity 2	Engage and classify different types of erosion	30 minutes
Activity 3	Work as a class to identify different types of erosion mitigation that can be constructed	30 minutes

To learn more about soil health and soil science see our Beef STEM Soil Toolkit which provides additional lessons and interviews with agriculturalists.

Agriculture and Water

Providing

Lesson 5
Watershed Science

As water rains on higher lands and flows into streams, lakes, rivers, and then on to seas and oceans, it moves across many different ecosystems which make up a watershed. Watersheds can have a mix of natural lands which are without humans, agricultural and rural lands containing fields and forests, or be highly developed in towns and cities. Each of these different areas impact the quality of water as it moves through the watershed. Like dominos, what happens in one area trickles down to the areas lower down in the watershed.

Wad-a-Watershed will build an understanding of why these landforms are so essential to living things as well as agriculture.

Thunder View Farms Holding Pond
(Black Mountain Visuals)

Wad-a-Watershed		
Interest Approach		
Identify and discuss products produced through agriculture, the inputs that are needed to produce them, and the importance of water in their production.		
Activities		
Activity 1	Use waded paper to create a 3D map of a watershed, identify how rain flows through the watershed, and discuss how the flow of water through the watershed affects the activities and environments that take place	45 minutes

Lesson 6

Fresh Water Needed

Cattle
(Black Mountain Visuals)

Human civilizations have always been dependent on water for drinking, irrigation, and travel. What once started as small towns along coastlines and riverways have now become large towns and even metropolitans like New York City.

As one could imagine, for a city with a population of nearly nine million people, fresh water, food, and fiber are extremely important to their populations. To be able to meet the food and fiber needs of a city like New York City, farmers have to increase the **yield** or amount of food and fiber which can be harvested from a crop in lands often higher up in a watershed. To increase yields, farmers often add fertilizes and amendments to their fields. As water flows across the land, there is potential for these fertilizers to enter into water sources in a watershed.

In the mid 1800's, New York city officials began to purchase land and create **reservoirs** or man-made lakes that held water in counties north of the city. Many of the early leaders began to be concerned with what types of pollutants were seeping in or could seep into the city's water sources.

The following lesson will highlight the cause and effect of fertilizers on the environment.

Fertilizers and the Environment		
Interest Approach		
Discuss the availability and viability of agricultural lands		
Activities		
Activity 1	Divide and apple to create a visual understanding that agriculture lands are finite	5 minutes
Activity 2	Work as a class to identify the effect of population growth and lack of agricultural lands; create solutions to "grow more with less"	20 minutes
Activity 3	Identify the need for added amendments (fertilizers) to increase production as well as the potential positive and negative effects of amendment use on ecosystems	20 minutes

Thunder View Farms Barn
(Black Mountain Visuals)

Lesson 7
Conflict

With the increased demand on an already limited resource of fresh water, an increased demand of food and fiber, and desire to protect these resources, New York City and New York State agencies created and impelemented policies or rules that affected what could be done on and around property owned by the city in the Hudson Valley. As these policies were shared to the public, residents in the watersheds north of New York City became concerned. Many of the proposed rules not only affected the land owned by the city but put land usuage requirements on land which held water sources that flowed to the land owned by the city. These proposed changes coul drastically impact the farmers and residents of the Cat-Del watershed.

In the following video, Rich shares the obstacles that were being faced by Cat-Del farmers.

Click the picture to learn about the obstacles faced by Cat-Del Farmers.

As the conversation between New York City officials, Cat-Del farmers and residents, scientists, and other officials progressed, it was realized that proposed regulations could be adjust to better conserve land, protect water sources, and allow for the production of food and fiber in the region. To make these adjustments to the initial regulations, a strong **public-private partnership** was formed. This group was tasked to combine their expertise to identify and create best practices. As the partnership worked together, they created a new plan which would allow farmers to provide the food and fiber needs of residents of the region while protecting the important Cat-Del habitat. In the following video, Rick discusses some of the best practices utilized on their beef farm.

Click the picture to learn about the drought prevention improvements on Thunder View Farm

Through the work of the public-private partnership new and improved farming practices were developed with water preservation and land conservation in mind. Farmers rotationally grazed their cattle moving them from field to field instead of keeping them in a single field. This allowed grass to grow and the cow manure to fertilize the fields. The dense organic matter that developed increased soil health. In turn, healthy soils improves water quality.

Farmers also built, improved, or rebuilt buffers of trees and wild grasses which separated crop and grazing lands from watersheds. These buffers captured and held water in the soil filtering rainwater before entering watersheds. Buffer zones also helped to prevent runoff and erosion of the rich soil developed in fields. In the following video, Ric shares one of the practices that was developed by the partnership.

Click the picture to about the use of best practice on Thunder View Farm.

Both Rich and Ric identified that there was a concern of citizens in the Cat-Del Watershed about policies that were being drafted without the input from those who lived in the watershed. Once concern was that, if implemented, many of the new rules could cause multi-generational farms In the Cat-Del watershed to shut down. The loss of Cat-Del farms would impact not only those that lived in the watershed but the 9 million residents of New York City as there would be less food and fiber produced in this region as well as potential development of farmland that is vital in naturally filtering the water that is used by Cat-Del and New York City residents.

To prevent the loss of these resources, the public-private partnership worked creatively to develop well thought out plans on how to persevere the land and agricultural production in the watershed. The following lesson helps build the understanding of how populations developed in a region over time, the consequences of depletion of resources, and the need that these populations have for agriculture and agricultural lands.

Growing Our State History		
Interest Approach		
Students will investigate what makes a community livable and explore the influence of agriculture on the history of their state.		
Activities		
Activity 1	Identify where everyday necessities come from.	30 minutes
Activity 2	Identify what makes a location good for settlement	30 minutes
Activity 3	Identify why agriculture is important to my community	30 minutes

Lesson 8
Put it into Practice

Thunder View Farms Pounds
(Black Mountain Visuals)

When Rich and his brother Phil took over farm operations at Thunder View Farms, their goal was to provide a highly nutritious top quality beef protein. As Thunder View Farms is a multi-generational farm, the brothers knew how to raise and handle livestock. As time progressed, the brothers identified that they were not just “farmers” but “stewards” of the land. The brothers are proud of the fact that Thunder View Farms not only provides quality beef protein to consumers but, more importantly, that they have developed a healthy well managed farm which produces naturally filtered clean potable water for so many.

Today, Rich’s son Ric and grandson Patrick have taken over more of the farm operations. Together three generations of Coombe members have continued to improve upon the farm and farm management at Thunder View through advancements of science, science based best practices, and strong partnerships. In the following video, Ric shares the successes of Thunder View Farm in protecting and conserving water, the importance of cooperation of many groups in working towards a common goal and highlights the importance of using agriculture to protect and promote water.

Click the picture to learn about how the Coombe family protects the water in the Cat-Del watershed.

Learn, Protect, and Promote Water!		
Interest Approach		
Students will brainstorm how carbon, methane, and ruminates are part of the carbon cycle.		
Activities		
Activity 1	Review the carbon cycle and brainstorm cattle's contribution to the carbon cycle	30 minutes
Activity 2	Understand the process of digestion in ruminates and engage with how byproducts from these systems contribute to the carbon cycle	45 minutes
Activity 3	Identify the need for cattle in food networks and identify the level of contribution of gases to the carbon cycle	45 minutes

Lesson 9

Students
(NYAITC)

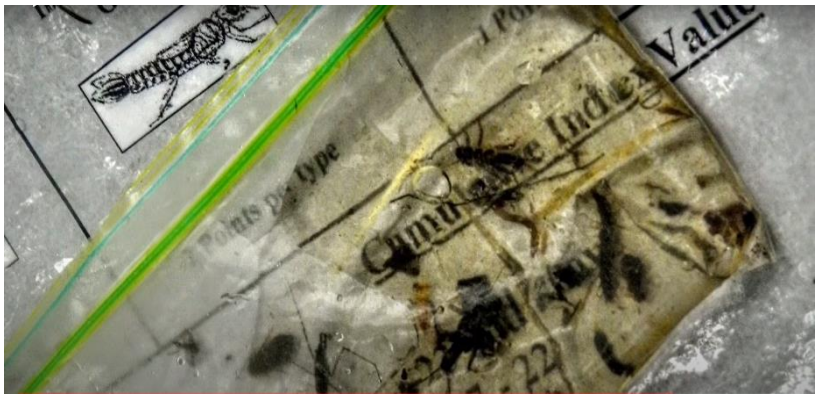
As you have learned, water quality is important for living things. When an ecosystem becomes polluted, many larger organisms will move away from the polluted water source. This is not always the case for **aquatic organisms**. These organisms spend most if not all of their lives in the water and cannot easily vacate an ecosystem once it becomes polluted.

Student Investigation
(NYATIC)

To determine the quality of a watershed, scientists run field studies and carry out various experiments. Scientists will first observe and record the plant life and organisms which are found in a research location. Additionally, they will take and test water samples to identify the compounds and minerals found in a water source. Often, researchers collect different samples of animals and plants found in a testing location.

Once organisms are captured and classified, scientists can use this data to identify the health of an area as some plants and animals are more tolerant to pollution than others. When plants and animals with low tolerance to pollution are missing from an ecosystem, this usually means there is a source of pollution impacting an area.

When there is little diversity of organisms and plant life found in an ecosystem, this means that there could be a major source of pollution somewhere in a watershed.



Organisms (NYAITC)

To locate the source of pollution, researchers can carry out studies in multiple areas throughout a watershed. This can include taking and analyzing soil, water, and air samples, doing aerial and ground surveys of a watershed to visually identify sources of pollution, and create computer models on how pollution might move through an ecosystem. From their research, scientists can often pinpoint the sources of pollution and create **remediation** or practices followed to reduce or reverse the impact of a pollutant in an ecosystem.

In the culminating activity, students will become student scientists and carry out research in a local waterway. Students will capture aquatic organisms and classify them to determine the health of the watersheds in their community. To go deeper and assure that permits are not needed for collecting aquatic organisms, contact your local soil and water department, Cooperative Extension office, Department of Conservation, or Trout Unlimited chapter beforehand as these groups often have soil and water educational student programs and can help educators to attain permits if needed.

Water Quality

Interest Approach		
Students investigate the effects of added soil nutrients on water quality, perform chemical and physical tests on water samples, collect and identify macroinvertebrates from a freshwater system and compare physical, chemical, and biological factors of an aquatic ecosystem to determine water health.		
Activities		
Activity 1	Effects of Nutrients on a natural water source	45 minutes
Activity 2	Physical and Chemical water testing of a natural water sources	45 minutes
Activity 3	Biotic Sampling of a natural water source	45 minutes
Activity 4	Overall water quality analysis	45 minutes

Next Generation Learning Standards	
Lesson	**Standard Alignment**
Water Supply	**ELA** SL1: Engage effectively in a range of collaborative discussions with diverse partners; express ideas clearly and persuasively and build on those of others. **Math** Use appropriate tools strategically **Science** 5-ESS2-1 Develop a model using an example to describe ways in which the geosphere, biosphere, hydrosphere, and/or atmosphere interact. 5-LS2-1 Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
What's in Soil?	**ELA** L4: Determine or clarify the meaning of unknown and multiple-meaning words and phrases, choosing flexibly from a range of strategies. R1: Read closely to determine what the text says explicitly/implicitly and make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text. SL2 Integrate and evaluate information presented in diverse media and formats (including visual, quantitative, and oral). SL 1: Prepare for and participate effectively in a range of conversations and collaborations with diverse partners; express ideas clearly and persuasively and build on those of others. **Science** 5-ESS2-1 Ecosystems: Interactions, Energy, and Dynamics 5-LS2-1 Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
Soil Texture and Water Percolation	**Math** Model with mathematics. **Science** 5-ESS2-1 Develop a model using an example to describe ways in which the geosphere, biosphere, hydrosphere, and/or atmosphere interact. 5-LS2-1 Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
Keeping Soil in Its Place	**ELA** R4: Determine the meaning of words, phrases, figurative language, academic, and content-specific words and analyze their effect on meaning, tone, or mood. SL2 Integrate and evaluate information presented in diverse media and formats (including visual, quantitative, and oral). **Social Studies** NCSS People, Places, and Environments Objective 5 Physical changes in community, state, and region, such as seasons, climate, and weather, and their effects on plants and animals. Objective 7 Benefits and problems resulting from the discovery and use of resources **Science** 3-ESS3-1 Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard. 4-ESS2-1 Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.

Wad-a-Watershed	**ELA** 5SL1: Engage effectively in a range of collaborative discussions with diverse partners; express ideas clearly and persuasively and build on those of others. 5SL1a: Come to discussions prepared, having read or studied required material; draw on that preparation and other information known about the topic to explore ideas under discussion **Social Studies - Geography** Geography Standard 16 (Grades 3-4): The changes that occur in the meaning, use, distribution, and importance of resources. Objective 1 The characteristics of renewable, nonrenewable, and flow resources. Objective 2 The spatial distribution of types of resources. Objective 3 The sustainable use of resources in daily life. Geography Standard 16 (Grade 5): The changes that occur in the meaning, use, distribution, and importance of resources. Objective 1 People can have different viewpoints regarding the meaning and use of resources. Objective 2 The formation and spatial distribution of types of resources. Objective 3 Humans can manage resources to sustain or prolong their use. **Science** 5-ESS3: Earth and Human Activity 5-ESS3-1 Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.
Fertilizers and the Environment	**ELA** R8: Trace and evaluate an argument and specific claims in a text, assessing whether the reasoning is valid, and the evidence is relevant and sufficient and recognizing when irrelevant evidence is introduced. 8R9: Choose and develop criteria in order to evaluate the quality of texts. Make connections to other texts, ideas, cultural perspectives, eras, and personal experiences. 8W1f: Maintain a style and tone appropriate to the writing task. 8W2a: Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information using strategies such as definition, classification, comparison/contrast, and cause/effect. W5: Draw evidence from literary or informational texts to support analysis, reflection, and research. SL1: Engage effectively in a range of collaborative discussions with diverse partners; express ideas clearly and persuasively and build on those of others. SL1a: Come to discussions prepared, having read or researched material under study; draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion. 8L5: Demonstrate understanding of figurative language, word relationships, and nuances in word meanings. **Career & Technical Education** AFNR (Grades 6-8) Natural Resource Systems Career Pathway NRS.02.02 Assess the impact of human activities on the availability of natural resources. AFNR (Grades 6-8) Plant Science Systems Career Pathway PS.01.03 Develop and implement a fertilization plan for specific plants or crops. **Science** MS-ESS3: Earth and Human Activity MS-ESS3-3 Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. MS-ESS3-4 Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth’s systems.

Growing Our State History	**ELA** R4: Determine the meaning of words, phrases, figurative language, academic, and content-specific words and analyze their effect on meaning, tone, or mood. SL1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners; express ideas clearly and persuasively and build on those of others. SL2 Integrate and evaluate information presented in diverse media and formats (including visual, quantitative, and oral). **Geography** Geography Standard 4: The physical and human characteristics of places. Objective 2 Physical and human characteristics of places change. Geography Standard 9: The characteristics, distribution, and migration of human populations on Earth's surface. Objective 1 Demographic concepts help explain the structures of populations. Objective 2 The distribution and density of population varies over space and time. Objective 3 There are multiple causes and effects of migration. Geography Standard 12: The processes, patterns, and functions of human settlement. Objective 1 Different types of functions can influence the success or failure of settlements. Objective 2 A combination of a favorable location and human activities lead to the growth of settlements. Objective 3 There are patterns of settlements in regions. Geography Standard 11: The patterns and networks of economic interdependence on Earth's surface. Objective 2 Access to factors of production, such as capital, labor, raw materials, and energy, influence the location of economic activities.
Learn, Protect, and Promote Water!	**ELA** SL2 Integrate and evaluate information presented in diverse media and formats (including visual, quantitative, and oral). **Science** MS-ESS2: Earth's Systems MS-ESS2-4 Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. MS-ESS3: Earth and Human Activity MS-ESS3-3 Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. MS-ESS3-4 Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.
Water Quality	**Science** MS-ESS3: Earth and Human Activity MS-ESS3-3 Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. MS-LS2 Ecosystems: Interactions, Energy, and Dynamics MS-LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

Made possible by

New York Beef Council and the Cattleman's Beef Checkoff
New York Agriculture in the Classroom

Lesson Matrix

Media and photography:

Black Mountain Visuals
New York Agriculture in the Classroom