

# ENVIRONMENTAL LITERACY CURRICULUM DRAFT

## Standard 1.0 Environmental Issues

The student will investigate and analyze environmental issues ranging from local to global perspectives and develop and implement a local action project that protects, sustains, or enhances the natural environment.

### TOPIC

#### A. ENVIRONMENTAL ISSUE INVESTIGATION

INDICATOR	CARROLL COUNTY CURRICULUM SCIENCE RESEARCH
1. Identify an environmental issue.	Students will determine how a hypovirulent soup mixture treatment will affect the biomass of American Chestnut trees with cankers and trees without cankers.
INDICATOR	
2. Develop and write research questions related to an environmental issue.	Students will develop questions relating to the effect of a hypovirulent soup mixture treatment on the biomass of Chestnut trees affected by the blight.
INDICATOR	
3. Given a specific issue, communicate the issue, the stakeholders involved and the stakeholders' beliefs and values.	Students will communicate in writing and/or orally the results of the hypovirulent soup mixture treatment affecting the biomass of American Chestnut trees.
INDICATOR	
4. Design and conduct the research.	<p>Conduct an experiment to determine the biomass of American Chestnut trees.</p> <p>Conduct an experiment to determine how a hypovirulent soup mixture treatment will affect the biomass of American Chestnut trees with cankers and trees without cankers.</p> <p>Explain various sampling methods that can be used in the experimental design process by having students sample sections of their school's chestnut orchards or a soil bed.</p>
INDICATOR	
5. Use data and references to interpret findings to form conclusions.	<p>Students will interpret the findings of how the hypovirulent soup mixtures affects the biomass of Chestnut trees with cankers and without cankers.</p> <p>Explain the importance of determining variance when analyzing data by examining the sample of Chestnut canker width and analyzing their variation.</p>

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	<p>Students will use regression to determine if there is a correlation between the size of the cankers measured on the American chestnut trees and the actual resistance rating given by the researcher.</p> <p>Students will examine various relationships between characteristics of chestnut trees using hypothesis testing to determine statistical significance.</p>
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**TOPIC**

**B. ACTION COMPONENT**

INDICATOR	
<p>1. Use recommendation(s) to develop and implement an environmental action plan.</p>	<p>Students will utilize understanding from research on how the hypovirulent soup mixture affects the biomass of chestnut trees, along with student designed experiments based on their research, students will use this knowledge in treating Chestnut trees with the blight in their school based Chestnut orchards.</p>
INDICATOR	
<p>2. Communicate, evaluate and justify personal views on environmental issue and alternate ways to address them.</p>	<p>Students will communicate their views on how the Chestnut trees in school orchards with and without cankers should be treated or not treated.</p>
INDICATOR	
<p>3. Analyze the effectiveness of the action plan in terms of achieving the desired outcomes.</p>	<p>Students will continue to monitor the health of the Chestnut trees in their school orchards after their treatment with the hypovirulent soup mixture to trees that received the treatment and will compare them to trees that did not receive the treatment.</p>

# ENVIRONMENTAL LITERACY CURRICULUM DRAFT

## Standard 2: Interactions of Earth's Systems

The student will analyze and apply the properties of systems thinking and modeling to the study of Earth's systems.

### TOPIC

#### A. EARTH SYSTEMS

INDICATOR	
1. Analyze and explain the interactions of earth's systems.	Students will explain how the carbon cycle relates to the biomass of American chestnut trees.

### TOPIC

#### B. SYSTEMS THINKING

INDICATOR	
1. Analyze, explain and apply the properties of systems thinking to earth systems interactions.	Students will explain how various reservoirs of carbon are interconnected by pathways of exchange through the Earth's atmosphere, the biosphere, the oceans, and the Earth's soils when understanding how to determine the biomass of American chestnut trees.

INDICATOR **	
2. Modeling: Use models and computer simulations to extent his/her understanding of scientific concepts.	Students will explain how the American chestnut tree and its environment plays a part in the various cycles, such as the carbon, water, and nitrogen cycle through their research on determining the biomass of chestnut trees.

\*\*See Science State Curriculum Skills and Processes

# ENVIRONMENTAL LITERACY CURRICULUM DRAFT

## Standard 3: Flow of Matter and Energy

The student will analyze and explain the movement of matter and energy through interactions of earth's systems (*biosphere, geosphere, hydrosphere, atmosphere, and cryosphere*) and the influence of this movement on weather patterns, climatic zones, and the distribution of life.

### TOPIC

#### A. CONSERVATION OF MATTER WITHIN EARTH SYSTEMS

INDICATOR	
1. Demonstrate that matter cycles through and between living systems and the physical environment, constantly being recombined in different ways.	

### TOPIC

#### B. ENERGY DISTRIBUTION THROUGH EARTH SYSTEMS

INDICATOR	
1. Analyze how the position and movement of the Earth in space determine distribution of heat and light.	
INDICATOR	
2. Explain that transfer of thermal energy between the atmosphere and the land or oceans produces temperature and density gradients in the atmosphere and the oceans.	
INDICATOR	
3. Explain that transfer of thermal energy between the atmosphere and the land or oceans influences climate patterns.	

### TOPIC

#### C. INTERACTION OF PHYSICAL SYSTEMS AND THE BIOSPHERE

INDICATOR	
1. Analyze and explain the movement of matter and energy through earth's systems and the influence of this movement on the distribution of life.	

# ENVIRONMENTAL LITERACY CURRICULUM DRAFT

## Standard 4: Populations, Communities and Ecosystems

The student will use physical, chemical, biological, and ecological concepts to analyze and explain the interdependence of humans and organisms in populations, communities and ecosystems.

### TOPIC

#### A. CYCLING OF MATTER AND ENERGY

INDICATOR	
1. Explain how organisms are linked by the transfer and transformation of matter and energy at the ecosystem level.	

### TOPIC

#### B. POPULATION DYNAMICS

INDICATOR	
1. Analyze the growth or decline of populations and identify a variety of responsible factors.	Students will study how and why the fungus affected the American Chestnut tree in order to determine an effective treatment for the trees.

### TOPIC

#### C. COMMUNITY AND ECOSYSTEM DYNAMICS

INDICATOR	
1. Explain how the interrelationships and interdependencies of organisms and populations contribute to the dynamics of communities and ecosystems.	

### TOPIC

#### D. STABILITY IN POPULATIONS, COMMUNITIES AND ECOSYSTEMS

INDICATOR	
1. Use models and provide examples to show how the interaction and interdependence of populations contribute to the stability of populations, communities and ecosystems.	
INDICATOR	
2. Use models and provide examples to show how species' interactions may generate ecosystems that are stable for hundreds or thousands of years.	

### TOPIC

#### E. DIVERSITY

INDICATOR	
1. Provide examples and evidence to show that a greater diversity of genes, species and/or environments increases the chance that at least some living things will survive in the face of large changes in the environment.	Students will explain the importance of treating chestnut trees with the hypovirulent soup in order to gain a better understanding of how treatments can help restore the American Chestnut tree population.

## ENVIRONMENTAL LITERACY CURRICULUM DRAFT

### Standard 5: Humans and Natural Resources

The student will use concepts from chemistry, physics, biology, and ecology to analyze and interpret both positive and negative impacts of human activities on earth's natural systems and resources.

#### TOPIC

##### A. HUMAN IMPACT ON NATURAL PROCESSES

INDICATOR	
1. Analyze the effects of human activities on earth's natural processes.	
INDICATOR	
2. Analyze the effects of human activities that deliberately or inadvertently alter the equilibrium of natural processes.	

#### TOPIC

##### B. HUMAN IMPACT ON NATURAL RESOURCES

INDICATOR	
1. Analyze, from local to global levels, the relationship between human activities and the earth's resources.	Once students review the demise of the American Chestnut tree from what they learned in previous science classes, they will explain restoration efforts such as hypovirulence and vegetative compatibility testing.

### Standard 6: Environment and Health

The student will use concepts from science, social studies and health to analyze and interpret both positive and negative impacts of natural events and human activities on human health.

#### TOPIC

##### A. NATURAL CHANGES AND HUMAN HEALTH

INDICATOR	
1. Identify and describe natural changes in the environment that may affect the health of human populations and individuals.	

#### TOPIC

##### B. HUMAN-INDUCED CHANGES AND HUMAN HEALTH

INDICATOR	
1. Describe and explain that many changes in the environment designed by humans bring benefits to society as well as cause risks.	

#### TOPIC

##### C. HAZARDS AND RISK ANALYSIS

INDICATOR	
1. Analyze and explain that human activities, products, processes, technologies and inventions can involve some level of risk to human health.	

# ENVIRONMENTAL LITERACY CURRICULUM DRAFT

## Standard 7: Environment & Society

The student will analyze how the interactions of heredity, experience, learning and culture influence social decisions and social change.

### TOPIC

#### A. ENVIRONMENTAL QUALITY

INDICATOR	
1. Investigate factors that influence environmental quality.	Students will investigate how restoration efforts such as testing for vegetative compatibility and utilizing the hypovirulent soup can change oxygen and carbon levels due to the increased number of chestnut trees.

### TOPIC

#### B. INDIVIDUAL AND GROUP ACTIONS AND THE ENVIRONMENT

INDICATOR	
1. Examine the influence of individual and group actions on the environment and explain how groups and individuals can work to promote and balance interests.	Students partner with the American Chestnut Foundation to examine methods in sampling cankers, testing for vegetative compatibility, and utilizing the hypovirulent soup as a treatment to trees with cankers.

### TOPIC

#### C. CULTURAL PERSPECTIVES AND THE ENVIRONMENT

INDICATOR	
1. Investigate cultural perspectives and dynamics and apply their understanding in context	

### TOPIC

#### D. POLITICAL SYSTEMS AND THE ENVIRONMENT

INDICATOR	
1. Understand how different political systems account for, manage, and affect natural resources and environmental quality.	Students will write grants as needed (ex.Chesapeake Bay Trust) in order to maintain the Chestnut orchards and for materials needed for the hypovirulent soup, vegetative compatibility testing, and sampling cankers.

### TOPIC

#### E. ECONOMICS AND ENVIRONMENT

INDICATOR	
1. Analyze and explain global economic and environmental connections.	

### TOPIC

#### F. TECHNOLOGY AND ENVIRONMENT

INDICATOR	
1. Investigate and examine the social and environmental impacts of various technologies and technological systems on the environment.	Design a method using GPS to determine the location of Carroll County's school chestnut orchards at North Carroll, NorthWest Middle, South Carroll, and Hashawha.

