

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 BIOLOGY
1. Identify an environmental issue.	American Chestnut Tree Blight and Reforestation
INDICATOR	
2. Develop and write research questions related to an environmental issue.	Students develop a question about genetic make up of the American Chestnut and related species and how that relates to genetic back cross resistant chestnuts.
INDICATOR	
3. Given a specific issue, communicate the issue, the stakeholders involved and the stakeholders' beliefs and values.	Communicate experimental gel electrophoresis results of DNA patterns.
INDICATOR	
4. Design and conduct the research.	Conduct an experiment to determine relatedness of species among several Chestnut trees including backcross hybrids.
INDICATOR	
5. Use data and references to interpret findings to form conclusions.	Utilize Gel electrophoresis to determine DNA patterns of Chestnuts.

TOPIC

B. ACTION COMPONENT

INDICATOR	
1. Use recommendation(s) to develop and implement an environmental action plan.	Utilizing understanding from research, instruction and gel electrophoresis experiments students plan or work to maintain school based Chestnut research orchards.
INDICATOR	
2. Communicate, evaluate and justify personal views on environmental issue and alternate ways to address them.	
INDICATOR	
3. Analyze the effectiveness of the action plan in terms of achieving the desired outcomes.	

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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.	

TOPIC

B. SYSTEMS THINKING

INDICATOR	
1. Analyze, explain and apply the properties of systems thinking to earth systems interactions.	

INDICATOR **	
2. Modeling: Use models and computer simulations to extent his/her understanding of scientific concepts.	Gel electrophoresis

****See Science State Curriculum Skills and Processes**

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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.	

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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.	Students study how removing a key stone species can drastically alter the ecosystem for hundreds of years.

TOPIC

B. POPULATION DYNAMICS

INDICATOR	
1. Analyze the growth or decline of populations and identify a variety of responsible factors.	Students study the demise of the American Chestnut tree caused by the fungal blight and explore ways to help in the reforestation efforts.

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.	Students study how removing a key stone species can drastically alter the ecosystem for hundreds of years.

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.	Classification of Chestnut species anatomical similarities Gel electrophoresis: students analyze genetic similarities of species.
INDICATOR	
2. Use models and provide examples to show how species' interactions may generate ecosystems that are stable for hundreds or thousands of years.	Classification of Chestnut species anatomical similarities Gel electrophoresis: students analyze genetic similarities of species.

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.	Utilize gel electrophoresis to analyze the genetic relatedness of chestnut species and back cross breeding results to study bio diversity. Students study naturally resistant trees to determine why they are used in the back cross breeding program. Students explore selecting for desired traits to better understand how back cross breeding can help restore a blight resistant American chestnut characteristic tree to the ecosystem in their life time.

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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.	History of the American Chestnut tree. Deforestation: erosion, change in carbon sequestering capabilities of the forests, change in oxygen production.
INDICATOR	
2. Analyze the effects of human activities that deliberately or inadvertently alter the equilibrium of natural processes.	History of the American Chestnut tree. Deforestation: erosion, change in carbon sequestering capabilities of the forests, change in oxygen production

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.	Introduction of the blight to the United States caused the death of 4 billion American Chestnut trees. Efforts to restore the American Chestnut through back cross breeding may once again reforest the country with these trees.

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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.	Introduction of the blight to the United States. Ornamental Asian Chestnut trees carrying the blight caused the demise of the American Chestnut. Reduction in American Chestnut tree population decreased a once important food source and valuable lumber source. Affected the economic development of many areas along the east coast of the United States.

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.	Introduction of the blight to the United States. Ornamental Asian Chestnut trees carrying the blight caused the demise of the American Chestnut.

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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.	Investigate how the deforestation of the American Chestnut decreases carbon sequestering capabilities of the forest. Change in oxygen production levels by chestnuts as their numbers dwindled.

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 genetic make up of the back cross breeding of the American chestnut. They determine blight resistance characteristics of back cross results.

TOPIC

C. CULTURAL PERSPECTIVES AND THE ENVIRONMENT

INDICATOR	
1. Investigate cultural perspectives and dynamics and apply their understanding in context	Students study the culture affects of the destruction of the American chestnut on the survival of the people of the Appalachian region.

TOPIC

D. POLITICAL SYSTEMS AND THE ENVIRONMENT

INDICATOR	
1. Understand how different political systems account for, manage, and affect natural resources and environmental quality.	

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.	Utilizing Gel electrophoresis to examine the genetic make up and relatedness of several chestnut species as well as the hybrid back cross results of the back cross breeding program.