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 ECOLOGY
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 questions about the ecological impact of the loss of the American chestnut and its effects on other Maryland native species.
INDICATOR	
3. Given a specific issue, communicate the issue, the stakeholders involved and the stakeholders' beliefs and values.	• Communicate results of data collection on population dynamics and economic impact of the American chestnut tree through the EIS project.
INDICATOR	
4. Design and conduct the research.	• Conduct an experiment to determine the soil pH for the school chestnut orchard. • Research the ecological impact of the chestnut blight on native animal species populations – EIS Project • Use GPS to organize data about soil quality(type, pH, nutrient levels), tree species, growth parameters and other vital information.
INDICATOR	
5. Use data and references to interpret findings to form conclusions.	• Utilize data from soil pH and carbon footprint laboratories to determine the importance of the American chestnut in the ecosystem.

TOPIC
B. ACTION COMPONENT

INDICATOR	
1. Use recommendation(s) to develop and implement an environmental action plan.	• Develop a service-learning planting and maintenance plan based upon research conducted about the requirements of the American chestnut tree. • Analyze data from soil pH and EIS project to determine optimal growing conditions for the orchard.
INDICATOR	
2. Communicate, evaluate and justify personal views on environmental issue and alternate ways to address them.	• Complete a reflection on a current event article about the loss of native plant and animal biodiversity and use information gained to form personal viewpoints on addressing the issue presented.
INDICATOR	
3. Analyze the effectiveness of the action plan in terms of achieving the desired outcomes.	• Service-learning reflection to determine if project had desired positive environmental stewardship outcomes. • Future data collection of soil parameters and growth of chestnut trees in school orchard.

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.	

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

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.	• Analyze data for carbon compound levels as they relate to carbon sequestering by American chestnut trees in the local forest – How much carbon is in the forest? Part I

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.	• Analysis of carbon levels and its effects on biodiversity of plants in an ecosystem – How much carbon is in the forest? Part I

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 analyze the effects of removing a key stone species, the American chestnut and determine how it can drastically alter the biodiversity of the local ecosystem for hundreds of years – EIS Project

TOPIC
B. POPULATION DYNAMICS

INDICATOR	
1. Analyze the growth or decline of populations and identify a variety of responsible factors.	• Analyze population data on a variety of native animal species before and after the introduction of the blight. • Ecological Impact Statement Project will be produced to explain the correlation between the loss of the American chestnut and its effects on native animal populations.

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 loss of the American chestnut can drastically alter the community relationships of an 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.	• CyberEd models and Biodiversity Web quest will be used to introduce biodiversity and ecosystem stability topics. • Examine native biodiversity before and after the loss of the American chestnut tree population.
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.	

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.	• Effects of deforestation on the amount of erosion, the water quality in the watershed, the change in carbon sequestering capabilities of the forests and how it impacts climate change are all topics covered throughout the ecology course.
INDICATOR	
2. Analyze the effects of human activities that deliberately or inadvertently alter the equilibrium of natural processes.	• Effects of deforestation on the amount of erosion, the water quality in the watershed, the change in carbon sequestering capabilities of the forests and how it impacts climate change are all topics covered throughout the ecology course.

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.	• How much Carbon in the Forest? Part 1 – Students analyze data on carbon sequestering before and after the introduction of the blight by humans.

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.	• Ecological Impact Statement Project will include a discussion of the effects of the loss of the American chestnut on the human population. Some topics should include decreased water quality, decreased carbon sequestering and oxygen production, air pollution, acid rain and decrease in native biodiversity.

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.	

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.

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 plant and maintain chestnut orchards at the schools. They determine the best methods for planting and growing trees that will become part of the genetic research programs.

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.	

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.	• Using GPS, current and future chestnut orchards can be digitally mapped and used to organize data on soil type, species, pH, water level, and other growing parameters. This data can be utilized by future students to keep a record of chestnut information for the school and community. Data can also be organized and accessed more easily for ensuring growing success.