SCIENCE

INVESTIGATING OUR NATURAL AND ENGINEERED WORLD.

Environmental Science Teaching & Learning Framework					
Unit 1 **2 wks BLOCK/ 4 wks YR**	**Unit 2** **3 weeks BLOCK/6 weeks YR**	**Unit 3** **2 wks BLOCK/4 wks YR**	**Unit 4** **4 weeks BLOCK/8 weeks YR**	**Unit 5** **3 weeks BLOCK/6 weeks YR**	**Unit 6** **3 weeks BLOCK/6 weeks YR**
Intro to Environmental Science SEV5a,c,d	**Ecology** **SEV1a-c, SEV2c**	**Biomes** **SEV1d, e**	**Populations and Biodiversity** **SEV2d, SEV4c, SEV5a-c**	**Water, Air & Land Pollution** **SEV2a, b, SEV4a-c**	**Energy and Waste Populations** **SEV3a-d, SEV4a, SEV5b**
SEV5. Obtain, evaluate, and communicate information about the effects of human population growth on global ecosystems. a. Construct explanations about the relationship between the quality of life and human impact on the environment in terms of population growth, education, and gross national product. c. Construct an argument from evidence regarding the ecological effects of human innovations (Agricultural, Industrial, Medical, and Technological Revolutions) on global ecosystems. d. Design and defend a sustainability plan to reduce your individual contribution to environmental impacts, taking into account how market forces and societal demands (including political, legal, social, and economic) influence personal choices.	**SEV1. Obtain, evaluate, and communicate information to investigate the flow of energy and cycling of matter within an ecosystem.** a. Develop and use a model to compare and analyze the levels of biological organization including organisms, populations, communities, ecosystems, and biosphere. b. Develop and use a model based on the Laws of Thermodynamics to predict energy transfers throughout an ecosystem (food chains, food webs, and trophic levels). (Clarification statement: The first and second law of thermodynamics should be used to support the model.) c. Analyze and interpret data to construct an argument of the necessity of biogeochemical cycles (hydrologic, nitrogen, phosphorus, oxygen, and carbon) to support a sustainable ecosystem. **SEV2. Obtain, evaluate, and communicate information to construct explanations of stability and change in Earth's ecosystems.** c. Construct an argument to predict changes in biomass, biodiversity, and complexity within ecosystems, in terms of ecological succession.	**SEV1. Obtain, evaluate, and communicate information to investigate the flow of energy and cycling of matter within an ecosystem.** d. Evaluate claims, evidence, and reasoning of the relationship between the physical factors (e.g., insolation, proximity to coastline, topography) and organismal adaptations within terrestrial biomes. e. Plan and carry out an investigation of how chemical and physical properties impact aquatic biomes in Georgia. (Clarification statement: Consider the diverse aquatic ecosystems across the state such as streams, ponds, coastline, estuaries, and lakes.)	**SEV2. Obtain, evaluate, and communicate information to construct explanations of stability and change in Earth's ecosystems.** d. Construct an argument to support a claim about the value of biodiversity in ecosystem resilience including keystone, invasive, native, endemic, indicator, and endangered species. **SEV4. Obtain, evaluate, and communicate information to analyze human impact on natural resources.** c. Construct an argument to evaluate how human population growth affects food demand and food supply (GMOs, monocultures, desertification, Green Revolution). **SEV5. Obtain, evaluate, and communicate information about the effects of human population growth on global ecosystems.** a. Construct explanations about the relationship between the quality of life and human impact on the environment in terms of population growth, education, and gross national product. b. Analyze and interpret data on global patterns of population growth (fertility and mortality rates) and demographic transitions in developing and developed countries. c. Construct an argument from evidence regarding the ecological effects of human innovations (Agricultural, Industrial, Medical, and Technological Revolutions) on global ecosystems.	**SEV2. Obtain, evaluate, and communicate information to construct explanations of stability and change in Earth's ecosystems.** a. Analyze and interpret data related to short-term and long-term natural cyclic fluctuations associated with climate change. b. Analyze and interpret data to determine how changes in atmospheric chemistry (carbon dioxide and methane) impact the greenhouse effect. **SEV4. Obtain, evaluate, and communicate information to analyze human impact on natural resources.** a. Construct and revise a claim based on evidence on the effects of human activities on natural resources. b. Design, evaluate, and refine solutions to reduce human impact on the environment including, but not limited to, smog, ozone depletion, urbanization, and ocean acidification. c. Construct an argument to evaluate how human population growth affects food demand and food supply (GMOs, monocultures, desertification, Green Revolution).	**SEV3. Obtain, evaluate, and communicate information to evaluate types, availability, allocation, and sustainability of energy resources.** a. Analyze and interpret data to communicate information on the origin and consumption of renewable forms of energy (wind, solar, geothermal, biofuel, and tidal) and non-renewable energy sources (fossil fuels and nuclear energy). b. Construct an argument based on data about the risks and benefits of renewable and nonrenewable energy sources. c. Obtain, evaluate, and communicate data to predict the sustainability potential of renewable and non-renewable energy resources. d. Design and defend a sustainable energy plan based on scientific principles for your location. **SEV4. Obtain, evaluate, and communicate information to analyze human impact on natural resources.** a. Construct and revise a claim based on evidence on the effects of human activities on natural resources. **SEV5. Obtain, evaluate, and communicate information about the effects of human population growth on global ecosystems.** b. Analyze and interpret data on global patterns of population growth (fertility and mortality rates) and demographic transitions in developing and developed countries.

Environmental Science Standards

The Georgia Standards of Excellence are designed to provide foundational knowledge and skills for all students to develop proficiency in science. The Project 2061's *Benchmarks for Science Literacy* and the follow up work, *A Framework for K-12 Science Education* were used as the core of the standards to determine appropriate content and process skills for students. The Georgia Standards of Excellence focus on a limited number of core disciplinary ideas and crosscutting concepts which build from Kindergarten to high school. The standards are written with the core knowledge to be mastered integrated with the science and engineering practices needed to engage in scientific inquiry and engineering design. Crosscutting concepts are used to make connections across different science disciplines.

The Georgia Standards of Excellence for Science drive instruction. Hands-on, student-centered, and inquiry-based approaches should be the emphasis of instruction. The standards are a required minimum set of expectations that show proficiency in science. However, instruction can extend beyond these minimum expectations to meet student needs.

Science consists of a way of thinking and investigating, as well a growing body of knowledge about the natural world. To become literate in science, students need to possess sufficient understanding of fundamental science content knowledge, the ability to engage in the science and engineering practices, and to use scientific and technological information correctly. Technology should be infused into the curriculum and the safety of the student should always be foremost in instruction.

The Georgia Excellence for Environmental Science are designed to continue the student investigations that began in grades K-8. These standards integrate the study of many components of our environment, including the human impact on our planet. Students investigate the flow of energy and cycling of matter within ecosystems, and evaluate types, availability, allocation, and sustainability of energy resources. Instruction should focus on student data collection and analysis from field and laboratory experiences. Some concepts are global; in those cases, interpretation of global data sets from scientific sources is strongly recommended. Chemistry, physics, mathematical, and technological concepts should be integrated throughout the course. Whenever possible, careers related to environmental science should be emphasized.

Environmental Science

SEV1. Obtain, evaluate, and communicate information to investigate the flow of energy and cycling of matter within an ecosystem.

a. Develop and use a model to compare and analyze the levels of biological organization including organisms, populations, communities, ecosystems, and biosphere.

b. Develop and use a model based on the Laws of Thermodynamics to predict energy transfers throughout an ecosystem (food chains, food webs, and trophic levels).

(*Clarification statement:* The first and second law of thermodynamics should be used to support the model.)

c. Analyze and interpret data to construct an argument of the necessity of biogeochemical cycles (hydrologic, nitrogen, phosphorus, oxygen, and carbon) to support a sustainable ecosystem.

d. Evaluate claims, evidence, and reasoning of the relationship between the physical factors (e.g., insolation, proximity to coastline, topography) and organismal adaptations within terrestrial biomes.

e. Plan and carry out an investigation of how chemical and physical properties impact aquatic biomes in Georgia.

(*Clarification statement:* Consider the diverse aquatic ecosystems across the state such as streams, ponds, coastline, estuaries, and lakes.)

SEV2. Obtain, evaluate, and communicate information to construct explanations of stability and change in Earth's ecosystems.

a. Analyze and interpret data related to short-term and long-term natural cyclic fluctuations associated with climate change.

(*Clarification statement:* Short-term examples include but are not limited to El Niño and volcanism. Long-term examples include but are not limited to variations in Earth's orbit such as Milankovitch cycles.)

b. Analyze and interpret data to determine how changes in atmospheric chemistry (carbon dioxide and methane) impact the greenhouse effect.

c. Construct an argument to predict changes in biomass, biodiversity, and complexity within ecosystems, in terms of ecological succession.

d. Construct an argument to support a claim about the value of biodiversity in ecosystem resilience including keystone, invasive, native, endemic, indicator, and endangered species.

SEV3. Obtain, evaluate, and communicate information to evaluate types, availability, allocation, and sustainability of energy resources.

a. Analyze and interpret data to communicate information on the origin and consumption of renewable forms of energy (wind, solar, geothermal, biofuel, and tidal) and non-renewable energy sources (fossil fuels and nuclear energy).

b. Construct an argument based on data about the risks and benefits of renewable and nonrenewable energy sources.

(*Clarification statement:* This may include, but is not limited to, the environmental, social, and economic risks and benefits.)

c. Obtain, evaluate, and communicate data to predict the sustainability potential of renewable and non-renewable energy resources.

d. Design and defend a sustainable energy plan based on scientific principles for your location.

SEV4. Obtain, evaluate, and communicate information to analyze human impact on natural resources.

a. Construct and revise a claim based on evidence on the effects of human activities on natural resources.

Human Activities	**Natural Resources**
Agriculture	Land
Forestry	Water
Ranching	Air
Mining	Organisms
Urbanization	
Fishing	
Water use	
Pollution	
Desalination	
Waste water treatment	

b. Design, evaluate, and refine solutions to reduce human impact on the environment including, but not limited to, smog, ozone depletion, urbanization, and ocean acidification.

c. Construct an argument to evaluate how human population growth affects food demand and food supply (GMOs, monocultures, desertification, Green Revolution).

SEV5. Obtain, evaluate, and communicate information about the effects of human population growth on global ecosystems.

a. Construct explanations about the relationship between the quality of life and human impact on the environment in terms of population growth, education, and gross national product.

b. Analyze and interpret data on global patterns of population growth (fertility and mortality rates) and demographic transitions in developing and developed countries.

c. Construct an argument from evidence regarding the ecological effects of human innovations (Agricultural, Industrial, Medical, and Technological Revolutions) on global ecosystems.

d. Design and defend a sustainability plan to reduce your individual contribution to environmental impacts, taking into account how market forces and societal demands (including political, legal, social, and economic) influence personal choices.