Environmental Science CURRICULUM

Board Approved: November, 2024

Course Information

Course Description:
The students will explore various fundamental and advanced ecological concepts. Topics include ecosystems, water quality, air quality, solid waste management, populations, and natural resources. Environmental responsibility will be emphasized through class discussions, lab situations/simulations, and fieldwork.

Transfer Goals:

- Approach science as a reliable and tentative way of knowing and explaining the natural world.
- Weigh evidence and use scientific approaches to ask questions, investigate, and make informed decisions.
- Use critical thinking, science, and engineering practices to analyze ideas and phenomena to solve problems.
- Recognize that science is an ongoing human endeavor that helps us understand our universe.

Curriculum Standards: Science Missouri Learning Standards

Curriculum Resource(s): None

Unit 1: Foundations of Environmental Science

Timeframe: *2 weeks*

Unit Description: This unit will introduce students to the foundation of environmental science, which is the study of how living things interact with each other and their nonliving environment.	
Enduring Understandings: ● Applying scientific skills is crucial for interpreting and understanding interactions within the biosphere. ● The distribution of resources, money, and pollution can lead to unfair decisions and/or biased environmental practices. ● Earth's resources must be available for future generations. ● Economic and political considerations may impact environmental decisions.	**Essential Questions:** ● How are human activities affecting the biosphere? ● How do scientific skills enhance our understanding of the complex interactions within the biosphere? ● How does the unequal distribution of global resources, money, and pollution contribute to environmental practices? ● How can we ensure Earth's resources are conserved and managed sustainably for future generations? ● How do economic and political factors influence environmental decision-making?

Unit 1 Standard	
STANDARD CODE	**STUDENTS WILL KNOW, BE ABLE TO, AND UNDERSTAND:**
LS2.C.2	● **I can explain how human activities affect the biosphere and contribute to environmental changes.** ● **I can use scientific skills to analyze and understand the complex interactions within the biosphere.** ● **I can describe how the unequal distribution of global resources, wealth, and pollution impacts environmental practices and sustainability.** ● **I can identify ways to conserve and manage Earth's resources sustainably for future generations.** ● **I can evaluate how economic and political factors influence environmental decision-making and policies.** ● **I can evaluate the importance of sustainability.**

**priority standards indicated in bold*

Unit 2: Water Quality

Timeframe: *6 weeks*

Unit Description: In this unit, students will explore how water sustains life, removes wastes and pollutants, and recycles them through the hydrologic cycle. This unit will also cover the importance of clean water for ecosystems and human health, emphasizing the need for responsible water management.

Enduring Understandings:	**Essential Questions:**
● Water is essential for sustaining life. ● Water is cleaned through natural processes. ● Wastewater is generated by every human action and must be purified. ● The availability of water varies and can cause social and economic conflict. ● Water conservation practices must be implemented to ensure quality water resources for all living things. ● To maintain high-quality water for all living organisms, the causes of and prevention strategies for water pollution must be understood.	● How can we ensure that water quality is sufficient to sustain life? ● What natural processes are involved in the cleaning of water? ● How effective are the natural processes in ensuring water quality? ● How can wastewater generated by human activities be effectively purified to mitigate environmental impacts and protect public health? ● How does the variability in water availability contribute to social and economic conflicts, and what strategies can be implemented to address these conflicts effectively? ● How can effective water conservation practices be implemented to safeguard quality water resources for all forms of life? ● What are the root causes of water pollution, and what strategies can prevent it to preserve high-quality water for all living organisms?

Unit 2 Standard	
STANDARD CODE	**STUDENTS WILL KNOW, BE ABLE TO, AND UNDERSTAND:**
ESS2.C.1 ESS3.C.2	● I can describe how water dissolves substances. ● I can describe how water leeches in the environment. ● I can describe eutrophication and its causes. ● I can differentiate between the types of water pollution. ● I can identify environmental issues caused by water pollution. ● I can analyze the water quality of a freshwater ecosystem.

Unit 3: Air Quality

Timeframe: *4 weeks*

Unit Description: In this unit, students will explore why maintaining good air quality is essential for life on Earth. They will examine how human activities impact air quality and learn about the sources and effects of air pollution.	
Enduring Understandings: ● Energy sources include renewable and nonrenewable resources, which have varied environmental impacts. ● Burning fossil fuels and deforestation contribute to declining air quality, impacting life on Earth. ● Indoor and outdoor air pollution can be detrimental to living organisms. ● Excess combustion products in the atmosphere lead to acid deposition.	**Essential Questions:** ● How has the use of fossil fuels and deforestation impacted the environment? ● How do indoor and outdoor air pollution affect living organisms, and what strategies can mitigate its harmful effects? ● How do excess combustion products in the atmosphere contribute to acid deposition, and what are the ecological and environmental consequences of this phenomenon?

Unit 3 Standard	
STANDARD CODE	**STUDENTS WILL KNOW, BE ABLE TO, AND UNDERSTAND:**
ESS2.D.1 ESS3.D.2	● I can describe how the increased use of fossil fuels has caused environmental problems. ● I can explain what has caused the ozone thinning at the poles and what has been done globally to decrease this. ● I can describe the sources of indoor pollution. ● I can identify major greenhouse gasses and explain why these gas emissions may be reduced. ● I can explain the Air Quality Index.

Unit 4: Solid Waste Management

Timeframe: *4 weeks*

Unit Description: This unit will explore the increasing amount of solid waste humans produce. Students will explore waste management options and why waste must be responsibly managed.	
Enduring Understandings: ● Solid waste is a human-induced problem that is dealt with in many ways. ● Solid waste is not generated equally among all people worldwide, creating global challenges. ● Some solid waste is hazardous and causes serious pollution problems.	**Essential Questions:** ● How do various methods of solid waste management address the human-induced problem of waste accumulation, and what are their respective impacts on the environment and society? ● How does the unequal generation of solid waste among different populations worldwide contribute to global challenges, and what strategies can be implemented to address this disparity effectively? ● How does hazardous solid waste contribute to pollution problems, and what measures can be taken to mitigate its impact on the environment and human health?

Unit 4 Standard	
STANDARD CODE	**STUDENTS WILL KNOW, BE ABLE TO, AND UNDERSTAND:**
ESS3.C.1	● **I can examine and give examples of how chemicals can move through a food chain (biomagnification).** ● **I can explain how environmental policy varies between developed and developing countries.**
ESS3.C.2	● **I can describe techniques to decrease the impact of solid waste.** ● **I can summarize the negative effects of pollutants on the environment.**

Unit 5: Human Population Impacts

Timeframe: *4 Weeks*

Unit Description: This unit will examine the relationship between human population growth and the sustainability of our planet. They will explore how increasing population pressures impact natural resources, ecosystems, and the environment. This unit will also cover strategies for promoting sustainability and the role individuals and societies play in shaping a sustainable future.

Enduring Understandings:	**Essential Questions:**
● Populations change in predictable patterns. ● Human population growth in developed and developing countries is not equal, and the demographics predict what will happen to the population in the future. ● Resource use, waste and pollution production, human service availability, and wealth distribution are not equal among countries. ● Countries with high population growth struggle with famine and disease. ● Cultural differences are essential in addressing population growth issues.	● What factors influence the predictable patterns of population growth, and what are the implications of these patterns for society and the environment? ● How do demographic trends in developed and developing countries differ? ● What do demographic trends predict for the future of global population growth and its implications? ● How does the unequal distribution of resource use, waste production, pollution, human services availability, and wealth among countries impact global sustainability and social equity, and what strategies can be implemented to address these disparities? ● How does high population growth in certain countries contribute to challenges such as famine and disease, and what measures can be taken to address these issues effectively? ● How do cultural differences impact efforts to address population growth, and what strategies can be employed to navigate and reconcile these differences in addressing the issue effectively?

Unit 5 Standard	
STANDARD CODE	**STUDENTS WILL KNOW, BE ABLE TO, AND UNDERSTAND:**
ETS1.B.1	● I can describe and analyze patterns of population growth. ● I can identify factors influencing population growth patterns (immigration and emigration). ● I can recognize that exponential growth occurs with unlimited resources.

**priority standards indicated in bold*

	● I can identify a carrying capacity within a population. ● I can evaluate and compare the disparities in human population growth between developed and developing countries. ● I can utilize demographic data to forecast future population trends and their potential impacts. ● I can examine differences in how resources are used, waste is produced, pollution occurs, access to services is available, and wealth is distributed among countries and understand how these disparities affect global sustainability and social fairness. ● I can recognize that countries experiencing high population growth often face challenges related to famine and disease. ● I can acknowledge that cultural differences pose challenges in addressing the issue of population growth.

Unit 6: Energy

Timeframe: *4 weeks*

Unit Description: In this unit, students will explore how energy availability influences social, economic, and environmental systems. They will investigate the role of energy in driving economic growth and affecting social equity. The unit will also examine global environmental sustainability.	
Enduring Understandings: ● Energy conservation is an important step toward meeting the world's energy needs. ● Clean, renewable energy technologies are necessary for meeting the world's sustainable energy needs. ● There are advantages and disadvantages to both renewable and non-renewable sources of energy. ● Social and economic forces shape current energy policies.	**Essential Questions:** ● How can energy conservation initiatives contribute to meeting the global energy demand? ● What are the implications of prioritizing energy conservation in addressing energy needs worldwide? ● How can adopting and developing clean, renewable energy technologies contribute to fulfilling the world's sustainable energy requirements? ● What barriers must be addressed to facilitate the widespread implementation of renewable energy technology? ● What are the key advantages and disadvantages of renewable and non-renewable energy sources, and how can these factors inform decisions about energy policy and resource allocation? ● How do social and economic factors influence the formulation and implementation of current energy policies, and what are the implications of these policies on energy sustainability and accessibility?

Unit 6 Standards	
STANDARD CODE	**STUDENTS WILL KNOW, BE ABLE TO, AND UNDERSTAND:**
. **ESS3.A.2**	● I can recognize the significance of energy conservation as a vital measure in addressing the global energy demand. ● I can understand the necessity of clean, renewable energy technologies to fulfill the world's sustainable energy requirements. ● I can identify and analyze the advantages and disadvantages associated with renewable and non-renewable energy sources. ● I can recognize how social and economic factors influence the

	development and implementation of current energy policies.

Unit 7: Ecosystems

Timeframe: *4 weeks*

Unit Description: In this unit, students will explore how ecosystems function, focusing on energy flow, matter cycling, and the roles organisms play in maintaining balance. They will study different ecosystems and learn why each is essential for the planet's health. The unit emphasizes the importance of biodiversity, ecosystem resilience, and conservation efforts while encouraging students to critically consider the impacts of human activity on natural systems and the need for environmental protection.

Enduring Understandings:	**Essential Questions:**
● Ecology is the study of connections in nature. ● Energy flows through the ecosystem, and matter cycles. ● Various ecosystems exist on the planet, and all are of significant value to its health. ● There are discrete roles within ecosystems that must be maintained. ● Biological communities differ in their physical structure, species diversity, and the ecological roles their species play.	● How do the interconnected relationships within ecosystems contribute to the functioning and balance of nature, and what are the implications for environmental management and conservation efforts? ● How do energy flows and matter cycles within ecosystems contribute to the overall functioning and sustainability of the environment, and what are the consequences of disruptions to these processes? ● How do diverse ecosystems contribute to the overall health and functioning of the planet, and what measures can be taken to preserve and protect their invaluable contributions? ● What are the specific roles and functions of different organisms within ecosystems, and how do these roles contribute to the overall stability and resilience of the ecosystem? ● How do variations in physical structure, species diversity, and ecological roles among biological communities influence their resilience and ability to adapt to environmental changes?

Unit 7 Standards	
STANDARD CODE	**STUDENTS WILL KNOW, BE ABLE TO, AND UNDERSTAND:**
LS2.B.2	● I can understand the ecological interactions between biotic and abiotic factors. ● I can model trophic-level connections between organisms. ● I can describe various steps and connections within the cycles of matter

**priority standards indicated in bold*

	(water, carbon, nitrogen, and phosphorus cycles).
LS2.C.2	• I can recognize how individual organisms play essential roles in the balance and maintenance of an ecosystem.
ESS3.C.1	• I can analyze data to explain how increases in human population and the consumption of natural resources affect the functioning of biomes.

Unit 8: Biodiversity

Timeframe: *5 weeks*

Unit Description: In this unit, students will explore the critical role biodiversity plays in maintaining the balance and sustainability of Earth's ecosystems. They will examine how human activities contribute to biodiversity loss and its impact on ecosystems and human well-being. The unit will highlight the importance of conserving public lands and resources as a key strategy for sustainability. Students will also develop an awareness of the natural world, gaining a deeper understanding of the value of biodiversity and how this awareness can inspire individual and collective actions toward conservation efforts.

Enduring Understandings:	**Essential Questions:**
Students will understand that: ● Human actions are primarily responsible for the loss of biodiversity. ● Conservation of public lands and resources is one way to ensure sustainability. ● Awareness of the natural world will lead citizens to understand the value of biodiversity better.	● How do human activities contribute to the loss of biodiversity? ● What are the potential consequences of biodiversity loss for ecosystems and human well-being? ● How does conserving public lands and resources contribute to achieving sustainability goals? ● What are the key factors influencing the effectiveness of conservation efforts in ensuring long-term environmental and human well-being? ● How does developing an awareness of the natural world contribute to enhancing citizens' understanding of the importance and value of biodiversity? ● How can biodiversity awareness influence individual and collective actions towards biodiversity conservation?

Unit 8 Standard	
STANDARD CODE	**STUDENTS WILL KNOW, BE ABLE TO, AND UNDERSTAND:**
LS2.C.2	● **I can identify causes that can lead to the endangerment of species.** ● **I can describe the importance of biodiversity within an ecosystem.** ● **I can explain the implications that can occur with decreased biodiversity.** ● **I can identify possible consequences for not managing certain wildlife populations.**

**priority standards indicated in bold*