Environmental Science Ecology

Month	Content Sub-Category or Strand	National Common Core Standards Code & Language	Michigan Standards High School Content Expectations (HSCEs) Code & Language	Essential Skills	Examples of Formative Assessments	Vocabulary
Aug. - Sept.	**Introduction to Environmental Science**		E2.1A Explain why earth is a closed system in terms of matter.	1) Students will be able to describe how earth's unique conditions support life on earth. 2) Students will understand earth's main types of resources (renewable, nonrenewable and perpetual) and how they can be depleted or degraded.	Video: Habitable Planet, Video: The Lorax, Text: Chapter 1	Moderate Climate, Atmosphere, Hydrosphere, Lithosphere, Biosphere, Natural Resource, Nonrenewable Resource, Renewable Resource, Perpetual Resource, Nutrient cycling, Depletion, Degradation,

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			E2.1B Analyze the interactions between the major systems (lithosphere, atmosphere, hydrosphere, biosphere) that make up the Earth.	1) Students will be able to list the four life support systems on earth (hydrosphere, lithosphere, atmosphere and biosphere. 2) Through real world examples, students will learn how changing the conditions in one system will impact all systems. 3) Students will list the four scientific principles of natural sustainability and their importance.	Text: Chapter 1	Sustainability, Natural Resource, Natural Service, Natural Capital, Biodiversity,

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			E2.1C Explain, using specific examples, how a change in one system affects the other Earth systems. E2.4B Explain how the impact of human activities on the environment can be understood through the analysis of interactions between the four Earth systems.	1) By researching case studies, like Chattanooga, Tennessee, students will describe the consequences of human activities on earth's systems and provide solutions. 2) Students will describe the main types of pollution (point source and non-point source) and what we can do about pollution. 3) Contrast the two solutions to pollution: prevention versus clean up 4) Students will list the key environmental problems	Case Study: Chattanooga, Tennessee, Internet: myecologicalfootprint.com, National Geographic Video: Human Footprint, Text: Chapter 1	Tragedy of the commons, Ecological footprint, Point Source Pollution, Nonpoint source pollution

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			B3.5 Populations of living things increase and decrease in size as they interact with other populations and with the environment. The rate of change is dependent upon relative birth and death rates. B3.4C Examine the negative impact of human activities. B3.5A Graph changes in population growth given a data table.	1) Students will be able to explain how fast the human population is growing, using data, charts and graphs. 2) Students will be able to calculate growth rate given births and deaths for a population over a given time period. 3) Students will define exponential growth, growth rate, natality and mortality. 4) Using a world map students will identify areas in the world experiencing the fastest human growth rates and list factors contributing to it. 5) Students will calculate doubling time. 6) Students will explain the impact of human exponential growth rate on biodiversity and a sustainable society.	Baby Dice Island activity, Nova Video: The World in balance, Text: Chapter 1	Exponential growth, natality, mortality, growth rate, developing country, developed country,
			E1.2k Analyze how science and society interact from a historical, political	1) Students will explain the harmful effects of poverty and affluence on the environment and sustainability. 2) Students will list the major human cultural changes that have taken place and how they have	Text: Chapter 1	Poverty, Affluence, Affluenza, Environmental

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Oct. - Nov.	Ecology		B1.1E Describe a reason for a given conclusion, using evidence from an investigation.B1.1g Using empirical evidence to explain and critique the reasoning used to draw conclusions. B1.1A Generate new questions that can be investigated in the lab or field. B1.1C Conduct scientific investigations using appropriate tools and techniques.	1) Students will list and define the levels of organization of life in nature. 2) Students will be able to define and give examples of biotic and abiotic factors in an ecosystem. 3) Students will analyze the interactions between members of an ecosytem and predict outcomes, using real life examples	Text: Chapter 3,Video: wolves and yellowstone	species, keystone species, population, community, ecosystem, biome, biosphere, abiotic, biotic, plot study

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				1) Students will learn how to estimate population size, using various methods 2) Students will conduct a plot study and estimate the number of different kinds of trees in a forest ecosystem. 3) Students will distinguish between a species, population, community ecosystem, biome and biosphere.		Mark Recapture, Quadrat Sampling, Census Sampling,

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				1) Students will be able to explain the flow of energy through an ecosystem, using an energy pyramid. 2) Students will explain the transfer of energy through a food chain using the second law of thermodynamics. 3) Students will explain why it is most efficient to feed a growing human population a vegetarian diet. 4) Students will build a food web and predict the outcome of an extinction in the web. 5) Students will define gross primary productivity and net primary productivity and identify most and least productive areas on a world map. 6) Students will measure net primary productivity by measuring biomass of local quadrant sample. 7) Students will memorize and compare the chemical reactions for photosynthesis, cellular respiration and chemosynthesis.		Energy pyramid, NPP, net primary productivity, GPP, gross primary productivity, producer, autotroph, heterotroph, primary consumer, secondary consumer, tertiary consumer, trophic level, second law of thermodynamics, biomass, photosynthesis, chemosynthesis, cellular respiration

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				1) Students will demostrate their understanding of nutrient cycles through concept maps and various diagrams. 2) Students will measure the nutrient content of soil sample collected from a local plot. 3) Students will explain the importance of nutrients to plant growth.		
Nov.- Dec	Terrestrial Biomes and Terrestrial Biodiversity			1) Understand soil formation and soil profiles, 2) Describe the components of soil and read a soil triangle, 3) Through real-life examples, learn the importance of soil in sustaining life on earth, 4) Learn how to test a sample of soil for composition, pH, organic content, nutrient content and invertebrate biodiversity		
				1) Learn the unique characteristics of terrrestrial biomes, climate, vegetation and animals of the eight types of terrestrial biomes of the world, 2) Understand how latitude affects solar insolation, which affects the kinds of plants that grow at that latitude. 3)Describe several plant and animal adaptations for each terrestrial biome		

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				1) List and describe the 3 types of forest biomes, 2) Understand and describe the major threats to forest biomes, 3) Describe several methods to managing forests sustainably, including the advantages and disadvantages of four kinds ot tree harvesting methods: clear cutting, selective cutting, contour or strip cutting, and creaming. 4) Understand and explain the importance of fires on lodgepine forest biomes, including the jack pine forest (kirkland's warbler habitat), 5) Understand the development and management of the national parks in the United States as well as teh development of nature preserves, 6) Describe three features and dilemmas of a National park or natuer preserve in the United States, 7) Identify on a map and describe several features the three national parks in Michigan		

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Dec.- Jan.	Water Resources and Aquatic Biodiversity			1) Explain the unique properties of water, including polarity, cohesion, adhesion, capillary action, arrangement of molecules in solid, liquid and gas phases, 2) Determine the dissolved oxygen content of water and how the levels affect aquatic life, for example different oxygen requirements of different species of fishes, 3) Explain how heat energy influences the temperature and density of water and the importance of the density of ice as opposed to liquid water to life on earth, 4) Explain the affect of melting ice in the spring and freezing of ice in the autumn on nutrient and oxygen levels in the lake,		

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				1) List and describe the different types of freshwater on Earth, 2) Compare types of ground water, for example, water table, confined aquifer, unconfined aquifers, 3) Explain using a diagram the processes involved in ground water systems and surface water systems, 4) Explain how humans alter the flow of the hydrological cycle, 5) Describe how humans are impacting both ground water supplies and surface freshwater water suplies, using the folloiwng terms, consumptive and nonconsumptive use, reliable runoff, 6) Describe several surface water and ground water issues, 7) Describe several solutions to overuse, ie. water conservation methods, desalination, cloud seeding, iceburgs		

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				1) List and describe several kinds of water pollution, 2) Explain how water pollution is measured, 3) List several kinds of point and non-point kinds of water pollution, 4) Describe several solutions to surface water and ground water pollution, 5) Understand how a waster water treatment uses natural processes to purify waste water, 6) Learn how to measure the chlorine content of drinking water and graph the results, 7) Understand different methods of purifying drinking water, like chlorination and the affects on humans and aquatice life		
				1) Research a Michigan "hotspot" in terms of water quality, sources of pollution and clean up efforts		
				1) Learn several species of fish in Michigan, 2) Understand how fisheries have been impacted by humans in the last century ,ie Time article "End of the Line," or "Four Fishes" book 3) Describe fish sustainabile practices and aquacultural methods for farming fish,		