NEW MEXICO
Public Education Department

SCIENCE:
ENVIRONMENTAL SCIENCE

END-OF-COURSE EXAM | GRADE 9–12 | YEAR 19-20

ASSESSMENT BLUEPRINT

EoC
NEW MEXICO END-OF-COURSE EXAMS

Purpose Statement
Environmental Science

The Environmental Science End-of-Course (EOC) exam is intended to measure student proficiency of the New Mexico Science Standards. This course-level exam is provided to all students who have completed Environmental Science or related courses. This exam can be given for the following STARS course codes:

1751 – Environmental Science
1752 – AP Environmental Science

EoCs are intended to serve as a summative exam covering a range of content, skills, and applications. Scores are reported to the teacher, school, district, and state levels and may be used to contribute to a portion of the student's course grade and for graduation determinations.

"The EOCs are exams written by New Mexico Teachers for New Mexico Students."
During the 2018 summer, teachers were brought together in person or online as part of the blueprint and exam revision process. The NM PED extends our gratitude to all those who contributed to this improvement process. Although we were unable to implement every suggestion due to conflicting viewpoints at times, this blueprint reflects the best collaborative effort among dedicated peers.

The NM PED would like to especially recognize the following people who led the revision of this blueprint:

- *Geizi Llanes-Dejka, Farmington Municipal Schools, Blueprint Lead*
- *Anastacia Cadena, Alamogordo Public Schools*
- *Dana Cantrell, Alamogordo Public Schools*
- *Irina Cislaru, Santa Fe Public Schools*
- *Joy Rosario, Central Consolidated Schools*
- *Larie Laudato, Gallup-McKinley County Schools*
- *Emily Clauss, Albuquerque Public Schools*

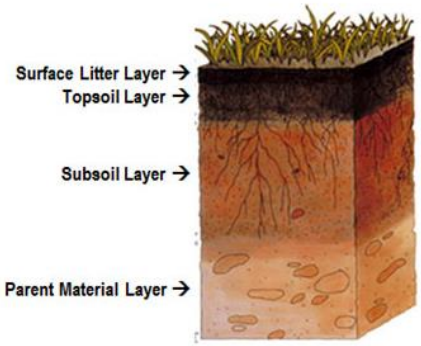
Explanation of Blueprint Layout & Test Specifications Table

Topics	Clarifications on Test Item Specifications:
The performance expectations (PEs) identified in this portion of the blueprint are aligned to the New Mexico STEM-Ready! Science Standards. *The PEs have been deconstructed to highlight the three dimensionality. Consult your NM STEM Ready! Science Standards for the full PE:* *https://webnew.ped.state.nm.us/bureaus/math-science/nm-stem-ready-science/nm-stem-ready-science-standards/* *and High School Recommended Discipline-Specific Course Map:* *https://webnew.ped.state.nm.us/bureaus/math-science/nm-stem-ready-science/nm-stem-ready-science-standards/recommended-secondary-course-maps/* *New Mexico Teachers identified the PEs to be measured on the EOC exam using the following criteria: 1) a great deal of instructional time is spent on the PE as identified in the curriculum and/or; 2) the PE is important to subsequent learning.* *It is important to note that the PEs in the blueprint are only a **subset** of PEs to be measured with the understanding that teachers cover more PEs during the course of instruction than what has been selected to be measured.*	● *This portion of the blueprint identifies the DCI students will have to demonstrate knowledge of during the exam. These items are not fully aligned to the science and engineering practices (SEPs) and the crosscutting concepts (CCC).* ● *Although the PE measures other dimensions, the item specifications may place constraints on portions of the DCI in order to provide more transparency as to what specifically will be measured relative to the PE.* ● *Items on this year's NM STEM Ready! transition EOC are content aligned and are items from the existing EOC and/or SBA item banks. PED will be field testing NM STEM Ready! cluster items for EOCs, which are optional for school participation.*
	Item Types: *The item types for this EOC exam are limited to:* *MC = multiple choice with or without stimulus (e.g., picture, graph, chart)*
	Sample Question: *A sample question has been provided for some PEs to assist teachers to correlate the questions with the performance standards and the test item specification, when applicable. Sample questions could not be provided for all PEs due to the limitations in the existing EOC and SBA item bank.* ● *An * denotes the correct answer* ● *DOK = Depth of Knowledge* ● *Some sample questions may be items released items from prior EOC exams*

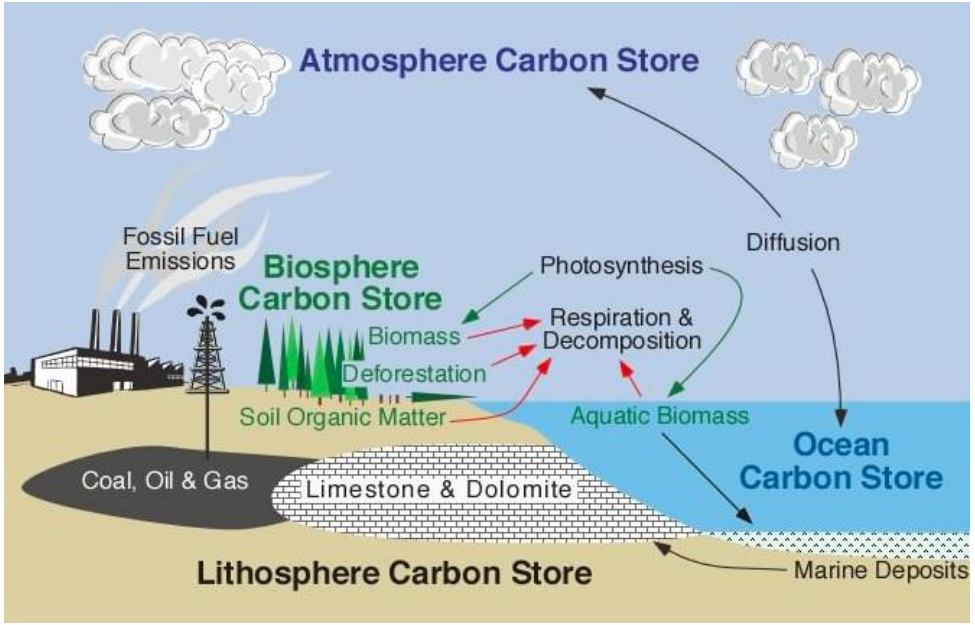
Blueprint Table – Environmental Science

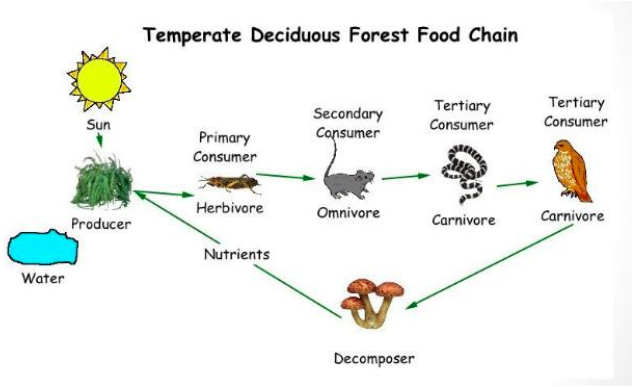
Topic: Photosynthesis	DCI with Test Item Specifications:
HS-LS1-5 **SEP**: Use a model to illustrate how **DCI**: photosynthesis transforms light energy into stored chemical energy. **CCC**: to illustrate how **Clarification Statement:** Emphasis is on illustrating inputs and outputs of matter and the transfer and transformation of energy in photosynthesis by plants and other photosynthesizing organisms. Examples of models could include diagrams, chemical equations, and conceptual models. **Assessment Boundary:** Does not include specific biochemical steps.	**<u>LS1.C: Organization for Matter and Energy Flow in Organisms</u>** The process of photosynthesis converts light energy to stored chemical energy by converting carbon dioxide plus water into sugars plus released oxygen. **Essential Questions:** **How do organisms obtain and use the matter and energy they need to live and grow?** **Item Types:** *MC = multiple choice with or without stimulus* **Sample Question:** Which of the following represents the movement of energy from one organism to another? a. Biomass b. Food Chain. * c. Water Cycle d. Carbon Cycle

Topic: Photosynthesis	DCI with Test Item Specifications:
HS-LS2-5 **SEP**: Develop a model to illustrate the role of **DCI**: photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. **CCC**: to illustrate the role … among the biosphere, atmosphere, hydrosphere, and geosphere. **Clarification Statement:** Examples of models could include simulations and mathematical models. **Assessment Boundary:** Does not include the specific chemical steps of photosynthesis and respiration.	**<u>LS2.B: Cycles of Matter and Energy Transfer in Ecosystems</u>** Photosynthesis and cellular respiration are important components of the carbon cycle, in which carbon is exchanged among the biosphere, atmosphere, oceans, and geosphere through chemical, physical and geological, and biological processes. **<u>PS3.D: Energy in Chemical Processes</u>** The main way that solar energy is captured and stored on Earth is through the complex technical process known as photosynthesis. *(secondary)* **Essential Questions:** **How do matter and energy move through an ecosystem?** **How do food and fuel provide energy?** **If energy is conserved, why do people say it is produced or used?**
	Item Types: *MC = multiple choice with or without stimulus*
	Sample Question: Which process is the ***most*** significant cause of increased carbon dioxide concentration in our atmosphere? a. Decaying of Plants b. Burning of Fossil Fuels * c. Cutting down trees in forests d. Burning Wood in Fireplaces

Topic: Recycling and Regeneration	DCI with Test Item Specifications:
HS-ESS2-1 **SEP**: Develop a model to illustrate how **DCI**: Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features. **CCC**: temporal scales **Clarification Statement:** Emphasis is on how the appearance of land features (such as mountains, valleys, and plateaus) and sea-floor features (such as trenches, ridges, and seamounts) are a result of both constructive forces (such as volcanism, tectonic uplift, and orogeny) and destructive mechanisms (such as weathering, mass wasting, and coastal erosion) **Assessment Boundary:** Does not include memorization of the details of the formation of specific geographic features of Earth's surface.	**<u>ESS2.A: Earth Materials and Systems</u>** Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes. **<u>ESS2.B: Plate Tectonics and Large-Scale System Interactions</u>** Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework for understanding its geologic history. Plate movements are responsible for most continental and ocean-floor features and for the distribution of most rocks and minerals within Earth's crust. *(ESS2.B Grade 8 GBE)* **Essential Questions:** **How do Earth's major systems interact?** **Why do the continents move, and what causes earthquakes and volcanoes?** **Item Types:** *MC = multiple choice with or without stimulus* **Sample Question:** Direction: Use the diagram provided to answer the question:  Which layer contains the most nutrients and water? a. Subsoil layer b. Topsoil layer * c. Surface litter layer d. Parent material layer

Topic: Recycling and Regeneration	DCI with Test Item Specifications:
HS-ESS2-3 **SEP**: Develop a model based on evidence of … to describe **DCI**: Earth's interior … the cycling of matter by thermal convection. **CCC**: based on evidence of …the cycling matter **Clarification Statement:** Emphasis is on both a one-dimensional model of Earth, with radial layers determined by density, and a three-dimensional model, which is controlled by mantle convection and the resulting plate tectonics. Examples of evidence include maps of Earth's three-dimensional structure obtained from seismic waves, records of the rate of change of Earth's magnetic field (as constraints on convection in the outer core), and identification of the composition of Earth's layers from high-pressure laboratory experiments **Assessment Boundary:** None	**ESS2.A: Earth Materials and Systems:** Evidence from deep probes and seismic waves, reconstructions of historical changes in Earth's surface and its magnetic field, and an understanding of physical and chemical processes lead to a model of Earth with a hot but solid inner core, a liquid outer core, a solid mantel and crust. Motions of the mantle and its place occur primarily through thermal convection, which involves the cycling of matter due to the outward flow of energy from Earth's interior and gravitational movement of denser materials toward the interior. **ESS2.B: Plate Tectonics and Large – Scale System Interactions** The radioactive decay of unstable isotopes continually generates new energy within Earth's crust and mantle, providing the primary source of the heat that drives mantle convection. Plate tectonics can be viewed as the surface expression of mantle convection. **PS4.A: Wave Properties** Geologists use seismic waves and their reflection at interfaces between layers to probe structures deep in the planet. *(secondary to HS-ESS2-3)* **Essential Questions:** **How do Earth's major systems interact?** **Why do the continents move, and what causes earthquakes and volcanoes?** **What are the characteristic properties and behaviors of waves?**
	Item Types: *MC = multiple choice with or without stimulus*
	Sample Question: Old Earth's crusts get recycled at areas known as: a. Submarine zones b. Sustainable zones c. Subduction zones * d. Transform zones

Topic: Recycling and Regeneration	DCI with Test Item Specifications:
HS-ESS2-6 **SEP**: Develop a quantitative model to describe **DCI**: the cycling of carbon among the hydrosphere atmosphere, geosphere, and biosphere. **CCC**: the cycling of carbon **Clarification Statement:** Emphasis is on modeling biogeochemical cycles that include the cycling of carbon through the ocean, atmosphere, soil, and biosphere (including humans), providing the foundation for living organisms. **Assessment Boundary:** None	**<u>ESS2.D: Weather and Climate</u>** Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen. Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate **Essential Questions:** **What regulates weather and climate?** **Item Types:** *MC = multiple choice with or without stimulus* **Sample Question** Refer to the Carbon Cycle diagram below:  What will be the most immediate effect if many trees are cleared by deforestation? a. Decreased combustion of fossil fuels b. Increased production of organic compounds c. Decreased use of atmospheric carbon dioxide * d. Increased rates of decomposition *Image from Physical Geography.net*

Topic: Recycling and Regeneration	DCI with Test Item Specifications:
HS-LS2-4 **SEP**: Use mathematical representations to support claims for **DCI**: the cycling of matter and flow of energy among organisms in an ecosystem. **CCC**: the cycling of matter and flow of energy **Clarification Statement:** Emphasis is on using a mathematical model of stored energy in biomass to describe the transfer of energy from one trophic level to another and that matter and energy are conserved as matter cycles and energy flows through ecosystems. Emphasis is on atoms and molecules such as carbon, oxygen, hydrogen and nitrogen being conserved as they move through an ecosystem. **Assessment Boundary:** Assessment is limited to proportional reasoning to describe the cycling of matter and flow of energy.	**<u>LS2.B: Cycles of Matter and Energy Transfer in Ecosystems:</u>** Plants or algae form the lowest level of the food web. At each link upward in a food web, only a small fraction of the matter consumed at the lower level is transferred upward, to produce growth and release energy in cellular respiration at the higher level. Given this inefficiency, there are generally fewer organisms at higher levels of a food web. Some matter reacts to release energy for life functions, some matter is stored in newly made structures, and much is discarded. The chemical elements that make up the molecules of organisms pass through food webs and into and out of the atmosphere and soil, and they are combined and recombined in different ways. At each link in an ecosystem, matter and energy are conserved. **Essential Questions:** **How do matter and energy move through an ecosystem?**
	Item Types: *MC = multiple choice with or without stimulus*
	Sample Question: Refer to the food web below:  Image adapted from "Energy Flow in Ecosystems Environmental Science Chapter 5, Section 1 (2013-2014)." Which of the following is the fundamental source of energy from the food web? a. Mouse b. Snake c. Mushroom d. Sun *

Topic: Ecosystems	DCI with Test Item Specifications:
HS-ESS2-2 **SEP**: Analyze geoscience data to make a claim that **DCI**: one change to Earth's surface can create feedbacks that cause changes to other Earth systems. **CCC**: can create feedbacks that cause changes **Clarification Statement:** Examples should include climate feedbacks, such as how an increase in greenhouse gases causes a rise in global temperatures that melts glacial ice, which reduces the amount of sunlight reflected from Earth's surface, increasing surface temperatures and further reducing the amount of ice. Examples could also be taken from other system interactions, such as how the loss of ground vegetation causes an increase in water runoff and soil erosion; how dammed rivers increase groundwater recharge, decrease sediment transport, and increase coastal erosion; or how the loss of wetlands causes a decrease in local humidity that further reduces the wetland extent. **Assessment Boundary:** None	**ESS2.A: Earth Materials and System:** Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes. **ESS2.D: Weather and Climate:** The foundation for Earth's global climate systems is the electromagnetic radiation from the sun, as well as the reflection, absorption, storage and redistribution among the atmosphere, ocean and land systems, and this energy's re-radiation into space. **Essential Questions:** **How do Earth's major systems interact?** **Item Types:** *MC = multiple choice with or without stimulus* **Sample Question:** A large volcanic eruption blocked the amount of sunlight that reached the Earth's surface, thus decreasing the average temperature. What effect would the decrease in average temperatures have on our society? a. Crops would fail * b. Buildings would collapse c. Vehicles would be damaged d. Mudflows would be produced

Topic: Ecosystems	DCI with Test Item Specifications:
HS-ESS2-4 **SEP**: Use a model to describe how **DCI**: variations in the flow of energy into and out of Earth's systems result in changes in climate **CCC**: result in **Clarification Statement:** Examples of the causes of climate change differ by timescale, over 1-10 years: large volcanic eruption, ocean circulation; 10-100s of years: changes in human activity, ocean circulation, solar output; 10-100s of thousands of years: changes to Earth's orbit and the orientation of its axis; and 10-100s of millions of years: long-term changes in atmospheric composition. **Assessment Boundary:** Assessment of the results of changes in climate is limited to changes in surface temperatures, precipitation patterns, glacial ice volumes, sea levels, and biosphere distribution.	**ESS1.B: Earth and the Solar System** Cyclical changes in the shape of Earth's orbit around the sun, together with changes in the tilt of the planet's axis of rotation, both occurring over hundreds of thousands of years, have altered the intensity and distribution of sunlight falling on the earth. These phenomena cause a cycle of ice ages and other gradual climate changes. **ESS2.A: Earth Materials and Systems** The geological record shows that changes to global and regional climate can be caused by interactions among changes in the sun's energy output or Earth's orbit, tectonic events, ocean circulation, volcanic activity, glaciers, vegetation, and human activities. These changes can occur on a variety of time scales from sudden (e.g., volcanic ash clouds) to intermediate (ice ages) to very long-term tectonic cycles. **ESS2.D: Weather and Climate** The foundation for Earth's global climate systems is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space. **Essential Questions:** **What are the predictable patterns caused by Earth's movement in the solar system?** **How do Earth's major systems interact?** **What regulates weather and climate?**
	Item Types: *MC = multiple choice with or without stimulus*
	Sample Question: What would immediately increase if there was a slight increase in the amount of solar energy that reached the Earth? a. volcanic activity b. groundwater flow c. erosion d. evaporation. *

Topic: Ecosystems	DCI with Test Item Specifications:
HS-ESS2-5 **SEP**: Plan and conduct an investigation of **DCI**: the properties of water and its effects on Earth materials and surface processes. **CCC**: the properties of water and its effects **Clarification Statement:** Emphasis is on mechanical and chemical investigations with water and a variety of solid materials to provide the evidence for connections between the hydrologic cycle and system interactions commonly known as the rock cycle. Examples of mechanical investigations include stream transportation and deposition using a stream table, erosion using variations in soil moisture content, or frost wedging by the expansion of water as it freezes. Examples of chemical investigations include chemical weathering and recrystallization (by testing the solubility of different materials) or melt generation (by examining how water lowers the melting temperature of most solids **Assessment Boundary:** None	**<u>ESS2.C: The Roles of Water in Earth's Surface Processes</u>** The abundance of liquid water on Earth's surface and its unique combination of physical and chemical properties are central to the planet's dynamics. These properties include water's exceptional capacity to absorb, store and release large amounts of energy, transmit sunlight, expand upon freezing, dissolve and transport materials, and lower the viscosities and melting points and rocks. **Essential Questions:** **How do the properties and movements of water shape Earth's surface and affect its systems?** **Item Types:** *MC = multiple choice with or without stimulus* **Sample Question:** In comparison to land surface temperature changes, water surface temperature changes occur: a. Faster because water has a higher specific heat. b. Faster because water has a lower specific heat. c. Slower because water has a higher specific heat. * d. Slower because water has a lower specific heat.

Topic: Ecosystem	DCI with Test Item Specifications:

HS-LS2-1

SEP: Use mathematical and/or computational representations to support explanations

DCI: of factors that affect carrying capacity of ecosystems at different scales.

CCC: at different scales

Clarification Statement: Emphasis is on quantitative analysis and comparison of the relationships among interdependent factors including boundaries, resources, climate, and competition. Examples of mathematical comparisons could include graphs, charts, histograms, and population changes gathered from simulations or historical data sets.

Assessment Boundary: Does not include deriving mathematical equations to make comparisons.

LS2.A: Interdependent Relationships in Ecosystems

Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors such as the availability of living and nonliving resources and from such challenges such as predation, completion, and disease. Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem.

Essential Questions:

How do organisms interact with the living and nonliving environments to obtain matter and energy?

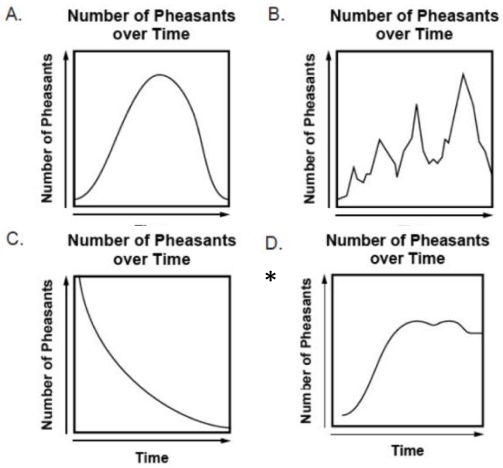
Item Types:

MC = multiple choice with or without stimulus

Sample Question:

Scientists introduce ten male pheasants and thirty female pheasants to an island on which pheasants have not previously lived. The island has a natural food source and no predators of pheasants.

Which graph best predicts the number of pheasants on the island 50 years after their introduction to the island?



Test Question Item adapted from: Department of Education, Louisiana Believes (2013)

Topic: Ecosystem	DCI with Test Item Specifications:
HS-LS2-2 **SEP:** Use mathematical representations to support and revise explanations based on evidence **DCI**: about factors affecting biodiversity and populations in ecosystems of different scales. **CCC**: at different scales **Clarification Statement:** Examples of mathematical representations include finding the average, determining trends, and using graphical comparisons of multiple sets of data. **Assessment Boundary:** Assessment is limited to provided data.	**<u>LS2.A: Interdependent Relationships in Ecosystems</u>** Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease. Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem. **<u>LS2.C: Ecosystem Dynamics, Functioning, and Resilience</u>** A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability. **Essential Questions:** **How do organisms interact with the living and nonliving environments to obtain matter and energy?** **What happens to ecosystems when the environment changes?**
	Item Types: *MC = multiple choice with or without stimulus*

Topic: Ecosystem	DCI with Test Item Specifications:
HS-LS2-7 **SEP**: Design, evaluate, and refine a solution for **DCI**: reducing the impacts of human activities on the environment and biodiversity. **CCC**: impacts of human activities **Clarification Statement:** Examples of human activities can include urbanization, building dams, and dissemination of invasive species. **Assessment Boundary:** None	**<u>LS2.C: Ecosystem Dynamics, Functioning and Resilience</u>** Moreover, anthropogenic changes (induced by human activity) in the environment—including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change—can disrupt an ecosystem and threaten the survival of some species. **<u>LS4.D: Biodiversity and Humans</u>** Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). *(secondary)* Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus, sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value. *(secondary) (Note: This Disciplinary Core Idea is also addressed by HS-LS4-6.)* **<u>ETS1.B: Developing possible solutions</u>** When evaluating solutions, it is important to take into account a range of constraints including cost, safety, reliability and aesthetics and to consider social, cultural and environmental impacts. *(secondary)* **Essential Questions:** **What happens to ecosystems when the environment changes?** **What is biodiversity, how do humans affect it, and how does it affect humans?** **What is the process for developing potential solutions?**
	Item Types: *MC = multiple choice with or without stimulus*
	Sample Question: A community currently uses coal to produce electricity. What would be an advantage of using nuclear energy instead? a. Uranium is safer than coal b. Nuclear energy produces no waste c. Uranium deposits are more abundant than coal d. Nuclear energy does not produce greenhouse gases *

Topic: Ecosystem	DCI with Test Item Specifications:
HS-ETS-1-3 **SEP**: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs **DCI**: that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts. **CCC**: as well as possible social, cultural, and environmental impacts **Clarification Statement:** None **Assessment Boundary:** None	**<u>ETS1.B: Developing Possible Solutions</u>** When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. **Essential Question:** **What is the process for developing potential design solutions?** **Item Types:** *MC = multiple choice with or without stimulus*

Topic: Population and Growth Studies	DCI with Test Item Specifications:
HS-ESS2-7 **SEP**: Construct an argument based on evidence about **DCI**: the simultaneous coevolution of Earth's systems and life on Earth. **CCC**: the simultaneous coevolution **Clarification Statement:** Emphasis is on the dynamic causes, effects, and feedbacks between the biosphere and Earth's other systems, whereby geoscience factors control the evolution of life, which in turn continuously alters Earth's surface. Examples include how photosynthetic life altered the atmosphere through the production of oxygen, which in turn increased weathering rates and allowed for the evolution of animal life; how microbial life on land increased the formation of soil, which in turn allowed for the evolution of land plants; or how the evolution of corals created reefs that altered patterns of erosion and deposition along coastlines and provided habitats for the evolution of new life forms. **Assessment Boundary:** Assessment does not include a comprehensive understanding of the mechanisms of how the biosphere interacts with all of Earth's other systems	**ESS2.D: Weather and Climate** Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen. **ESS2.E Biogeology** The many dynamic and delicate feedbacks between the biosphere and other Earth systems cause a continual co-evolution of Earth's surface and the life that exists on it. **Essential Question:** **What regulates weather and climate?** **How do living organisms alter Earth's processes and structures?** **Item Types:** *MC = multiple choice with or without stimulus*

<table>
<tr><th>Topic: Population and Growth Studies</th><th>DCI with Test Item Specifications:</th></tr>
<tr><td rowspan="3">HS-LS2-6

SEP: Evaluate claims, evidence and reasoning that

DCI: the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable but changing conditions may result in a new ecosystem.

CCC: the complex interactions in ecosystems maintain relatively consistent … in stable but changing conditions may result in

Clarification Statement: Examples of changes in ecosystem conditions could include modest biological or physical changes, such as moderate hunting or a seasonal flood; and extreme changes, such as volcanic eruption or sea level rise.

Assessment Boundary: None</td><td><u>LS2.C: Ecosystem Dynamics, Functioning and Resilience</u>
A complex set of interactions with an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability.

Essential Questions:
What happens to ecosystems when the environment changes?</td></tr>
<tr><td>Item Types:
MC = multiple choice with or without stimulus</td></tr>
<tr><td>Sample Question

Which of the following limiting factors would not be affected by the population density?

a. disease
b. drowning *
c. parasite
d. starvation</td></tr>
</table>

Topic: Population and Growth Studies	DCI with Test Item Specifications:
HS-LS2-8 **SEP**: Evaluate evidence for **DCI**: the role of group behavior on individual and species' chances to survive and reproduce. **CCC**: the role of **Clarification Statement:** Emphasis is on: (1) distinguishing between group and individual behavior, (2) identifying evidence supporting the outcomes of group behavior, and (3) developing logical and reasonable arguments based on evidence. Examples of group behaviors could include flocking, schooling, herding, and cooperative behaviors such as hunting, migrating, and swarming. **Assessment Boundary:** None	**<u>LS2.D: Social Interactions and Group Behavior</u>** Group behavior has evolved because membership can increase the chances of survival for individuals and their genetic relatives. **Essential Questions:** **How do organisms interact in groups so as to benefit individuals?** **Item Types:** *MC = multiple choice with or without stimulus* **Sample Question:** Which process allows certain traits to be passed on genetically to the next generation for survival? a. mutation b. extinction c. biotic change d. natural selection *

Topic: Pollution	DCI with Test Item Specifications:
HS-ESS3-6 **SEP**: Use a computational representation to illustrate **DCI**: the relationship among Earth systems and how those relationships are being modified due to human activity. **CCC**: the relationship among Earth systems **Clarification Statement:** Examples of Earth systems to be considered are the hydrosphere, atmosphere, cryosphere, geosphere, and/or biosphere. An example of the far-reaching impacts from a human activity is how an increase in atmospheric carbon dioxide results in an increase in photosynthetic biomass on land and an increase in ocean acidification, with resulting impacts on sea organism health and marine populations. **Assessment Boundary:** Does not include running computational representations but is limited to using the published results of scientific computational models.	**<u>ESS2.D: Weather and Climate</u>** Current models predict that, although future regional climate changes will be complex and varied, average global temperatures will continue to rise. The outcomes predicted by global climate models strongly depend on the amounts of human-generated greenhouse gases added to the atmosphere each year and by the ways in which these gases are absorbed by the ocean and biosphere. *(secondary)* **<u>ESS3.D: Global Climate Change</u>** Through computer simulations and other studies, important discoveries are still being made about how the ocean, the atmosphere, and the biosphere interact and are modified in response to human activities. **Essential Questions:** **What regulates weather and climate?** **How do people model and predict the effects of human activities on Earth's climate?** **Item Types:** *MC = multiple choice with or without stimulus*

Topic: Pollution	DCI with Test Item Specifications:
HS-LS4-5 **SEP**: Evaluate the evidence supporting claims that **DCI**: changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species. **CCC**: may result in **Clarification Statement:** Emphasis is on determining cause and effect relationships for how changes to the environment such as deforestation, fishing, application of fertilizers, drought, flood, and the rate of change of the environment affect distribution or disappearance of traits in species. **Assessment Boundary:** None	**<u>LS4.C: Adaptation</u>** Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline-and sometimes the extinction-of some species. Species become extinct because they can no longer survive and reproduce in their altered environment. If members cannot adjust to change that is too fast or drastic, the opportunity for the species' evolution is lost. **Essential Questions:** **How does the environment influence populatons of organisms over multiple generations?** **Item Types:** *MC = multiple choice with or without stimulus* **Sample Question:** During the Industrial Revolution, many jobs were created in urban areas. Factory work increased, mining increased, and large trade centers were formed. Which statement ***best*** summarizes a negative impact on the environment? a. People had a higher standard of living. b. People began using less wood for heating and cooling. c. Farmers used better farming techniques which increased crop yield. d. People began to build bigger more concentrated cities which displaced many natural ecosystems. *

Topic: Pollution	DCI with Test Item Specifications:

HS-LS4-6 **SEP:** Create or revise **DCI**: a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity. **CCC**: impacts **Clarification Statement:** Emphasis is on testing solutions for a proposed problem related to threatened or endangered species, or to genetic variation of organisms for multiple species. **Assessment Boundary:** None	**LS4.C: Adaptation** Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline–and sometimes the extinction–of some species. **LS4.D: Biodiversity and Humans** Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value. (Note: This Disciplinary Core Idea is also addressed by HS-LS2-7.) **ETS1.B: Developing Possible Solutions** When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. *(secondary)* Both physical models and computers can be used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs. *(secondary)* **Essential Questions:** **How does the environment influence populations of organisms over multiple generations?** **What is biodiversity, how do humans affect it, and how does it affect humans?** **What is the process for developing potential design solutions?**
	Item Types: *MC = multiple choice with or without stimulus*

Topic: Pollution	DCI with Test Item Specifications:

HS-ESS1-5 **SEP**: Evaluate evidence of **DCI**: the past and current movements of oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks. **CCC**: the past and current movements **Clarification Statement:** Emphasis is on the ability of plate tectonics to explain the ages of crustal rocks. Examples include evidence of the ages of oceanic crust increasing with distance from mid-ocean ridges (a result of plate spreading) and the ages of North American continental crust decreasing with distance away from a central ancient core of the continental plate (a result of past plate interactions. **Assessment Boundary:** None	**<u>ESS1.C: The History of Planet Earth</u>** Continental rocks, which can be older than 4 billion years, are generally much older than the rocks of the ocean floor, which are less than 200 million years old. **<u>ESS2.B: Plate Tectonics and Large-Scale System Interactions</u>** Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework for understanding its geologic history. *(ESS2.B Grade 8 GBE) (secondary)* **<u>PS1.C: Nuclear Processes</u>** Spontaneous radioactive decays follow a characteristic exponential decay law. Nuclear lifetimes allow radiometric dating to be used to determine the ages of rocks and other materials. *(secondary)* **Essential Questions:** **How do people reconstruct and date events in Earth's planetary history?** **Why do the continents move, and what causes earthquakes and volcanoes?** **What forces hold nuclei together and mediate nuclear processes?** **Item Types:** *MC = multiple choice with or without stimulus*

Topic: Pollution	DCI with Test Item Specifications:

HS-ETS1-2 **SEP**: Design a solution to a complex real-world problem **DCI**: by breaking it down into smaller, more manageable problems that can be solved through engineering. **CCC**: None **Clarification Statement:** None **Assessment Boundary:** None	**ETS1.C: Optimizing the Design Solution** Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (trade-offs) may be needed. **Essential Questions:** **How can the various proposed design solutions be compared and improved?** **What are the criteria and constraints of a successful solution?** **Item Types:** *MC = multiple choice with or without stimulus*

Topic: Conservation of Natural Resources	DCI with Test Item Specifications:

HS-ESS3-1 **SEP**: Construct an explanation based on evidence for how **DCI**: the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. **CCC**: have influenced human activity. **Clarification Statement:** Examples of key natural resources include access to fresh water (such as rivers, lakes, and groundwater), regions of fertile soils such as river deltas, and high concentrations of minerals and fossil fuels. Examples of natural hazards can be from interior processes (such as volcanic eruptions and earthquakes), surface processes (such as tsunamis, mass wasting and soil erosion), and severe weather (such as hurricanes, floods, and droughts). Examples of the results of changes in climate that can affect populations or drive mass migrations include changes to sea level, regional patterns of temperature and precipitation, and the types of crops and livestock that can be raised. **Assessment Boundary:** None	**ESS3.A: Natural Resources** Resource availability has guided the development of human society. **ESS3.B: Natural Hazards:** Natural hazards and other geologic events have shaped the course of human history; [they] have significantly altered the sizes of human populations and have driven human migrations. **Essential Questions:** **How do humans depend on Earth's resources?** **How do natural hazards affect individuals and societies?** **Item Types:** *MC = multiple choice with or without stimulus* **Sample Question:** How does the law of supply and demand for oil negatively impact the environment? a. When demand is low, the price increases and drilling increases. b. When demand is high, the price decreases and drilling increases. c. When demand is high, the price increases and drilling increases. * d. When demand is low, the price decreases and drilling decreases.

Topic: Conservation of Natural Resources	DCI with Test Item Specifications:

HS-ESS3-2 **SEP**: Evaluate competing design solutions for **DCI**: developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios. **CCC**: based on cost-benefit ratios **Clarification Statement:** Emphasis is on the conservation, recycling, and reuse of resources (such as minerals and metals) where possible, and on minimizing impacts where it is not. Examples include developing best practices for agricultural soil use, mining (for coal, tar sands, and oil shales), and pumping (for petroleum and natural gas). Science knowledge indicates what can happen in natural systems—not what should happen. **Assessment Boundary:** None	**ESS3.A: Natural Resources** All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical costs and risks as well as benefits. New technologies and social regulations can change the balance of these factors. **ETS1.B: Developing Possible Solutions** When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. *(secondary)* **Essential Question:** **How do humans depend on Earth's resources?** **What is the process for developing potential design solutions?** **Item Types:** *MC = multiple choice with or without stimulus*

Topic: Conservation of Natural Resources	DCI with Test Item Specifications:
HS-ESS3-3 **SEP**: Create a computational simulation to illustrate **DCI**: the relationships among the management of natural resources, the sustainability of human populations, and biodiversity. **CCC**: the relationships among… the sustainability of human populations **Clarification Statement:** Examples of factors that affect the management of natural resources include costs of resource extraction and waste management, per-capita consumption, and the development of new technologies. Examples of factors that affect human sustainability include agricultural efficiency, levels of conservation, and urban planning. **Assessment Boundary:** Assessment for computational simulations is limited to using provided multi-parameter programs or constructing simplified spreadsheet calculations.	**<u>ESS3.C: Human Impacts on Earth Systems</u>** The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources. **Essential Question:** **How do humans change the planet?** **Item Types:** *MC = multiple choice with or without stimulus*

Topic: Conservation of Natural Resources	DCI with Test Item Specifications:
HS-ESS3-4 **SEP**: Evaluate or refine a technological solution **DCI**: that reduces impacts of human activities on natural systems. **CCC**: that reduces impacts **Clarification Statement:** Examples of data on the impacts of human activities could include the quantities and types of pollutants released, changes to biomass and species diversity, or areal changes in land surface use (such as for urban development, agriculture and livestock, or surface mining). Examples for limiting future impacts could range from local efforts (such as reducing, reusing, and recycling resources) to large-scale geoengineering design solutions (such as altering global temperatures by making large changes to the atmosphere or ocean). **Assessment Boundary:** None	**ESS3.C: Human Impacts on Earth Systems** Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation. **ETS1.B: Developing Possible Solutions** When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. *(secondary)* **Essential Questions:** **How do humans change the planet?** **What is the process for developing potential design solutions?** **Item Types:** *MC = multiple choice with or without stimulus*

Topic: Conservation of Natural Resources	DCI with Test Item Specifications:
HS-ETS-1-1 **SEP**: Analyze a major global challenge **DCI**: to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. **CCC**: for societal needs and wants **Clarification Statement:** None **Assessment Boundary:** None	**<u>ETS1.A: Defining and Delimiting Engineering Problems</u>** Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities. **Essential Question:** **What is a design for?** **What are the criteria and constraints of a successful solution?**
	Item Types: *MC = multiple choice with or without stimulus*

Topic: Conservation of Natural Resources	DCI with Test Item Specifications:
HS-SS-2 NM **SEP**: Construct an argument **DCI**: using claims, scientific evidence, and reasoning that helps decision makers with a New Mexico challenge or opportunity as it relates to science. **CCC**: using claims, scientific evidence, and reasoning … as it relates to science. **Clarification Statement:** Examples may include, but are not limited to, the Waste Isolation Pilot Plant (WIPP), mining, oil and gas production, solar energy production, environmental remediation, urbanization, water scarcity, forest fires, or flash floods **Assessment Boundary:** None	**<u>ETS1. A. Defining and Delimiting Engineering Problems</u>** Criteria and constraints also includes satisfying any requirements set by society such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and states in such a way that one can tell if a given design meets them. Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities. **<u>ETS1.B: Developing Possible Solutions</u>** When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability and aesthetics, and to consider social, cultural and environmental impacts. **Essential Questions:** **What is a design for?** **What are the criteria and constraints of a successful solution?** **What is the process for developing potential design solutions?**
	Item Types: *MC = multiple choice with or without stimulus*
	Sample Question: A green city, "Eco City", is envisioned as a more sustainable city for the future. Which description is a characteristic of an "Eco City"? a. Houses are large and are heated by coal. b. Solid waste products are buried in a large landfill. c. Mass transit buses transport people to work. * d. Industrial regulations are enforced after pollution has occurred.

Environmental Science – EoC Reporting Category Alignment Framework					
Reporting Category	**Performance Expectation**	**DOK (Count by DOK)**			**Grand Total**
		1	**2**	**3**	
Photosynthesis	HS – LS1 – 5				
	HS – LS2 – 5		1		**1**
Recycling and Regeneration	HS – ESS2 – 1	1	1		**2**
	HS – ESS2 - 3	2			**2**
	HS – ESS2 – 6	2			**2**
	HS-LS2-4	3	2		**5**
Ecosystems	HS – ESS2 - 2	1	3		**4**
	HS – ESS2 - 4		1		**1**
	HS – ESS2 - 5	1			**1**
	HS-LS2-1	2	1		**3**
	HS-LS2-2				
	HS-LS2-7	2	3		**5**
	HS-LS2-7 NM				
	HS-ETS1-3				
Population & Growth Studies	HS-ESS2-7		1		**1**
	HS-LS2-6		2		**2**
	HS-LS2-8		1		**1**
Pollution	HS-ESS3-6		2		**2**
	HS-LS4-5		2	1	**3**
	HS-LS4-6				
	HS-ESS1-5				

	HS-ETS1-2				
Conservation of Natural Resources	HS-ESS3-1	2	5		**7**
	HS-ESS3-2				
	HS-ESS3-3				
	HS-ESS3-4				
	HS-ETS1-1				
	HS-SS2-NM		1		**1**
	Grand Total	**14**	**32**	**3**	**49**