ACALANES UNION HIGH SCHOOL DISTRICT
COURSE OF STUDY: CURRICULAR AREA – SCIENCE

COURSE TITLE:	THE LIVING EARTH
GRADE LEVEL:	9, 10
COURSE LENGTH:	One Year
PREFERRED PREVIOUS COURSE OF STUDY:	None
CREDIT:	10 Credits
UC/CSU CREDIT:	Meets UC/CSU credit for lab science requirement; subject area (“d”)
GRADUATION REQUIREMENT:	Fulfills life science requirement for graduation
STANDARDS AND BENCHMARKS:	Next Generation Science Standards
ADOPTED:	May 15, 2017
INSTRUCTIONAL MATERIALS:	Biology: Exploring Life; Campbell, Williamson, Heyden (Prentice Hall); 2006

COURSE DESCRIPTION:

The Living Earth course, based on the Next Generation Science Standards, explores relationships between the living and nonliving components of Earth's systems. By using science and engineering practices, cross-cutting disciplinary concepts, and evidence from experiments, research, and observations, students will learn how to formulate questions, evaluate claims, and develop models to make interpretations and investigate the natural world. Topics will include: Ecosystems Interactions and Energy, History of Earth's Atmosphere: Photosynthesis and Respiration, Evidence of Evolution, Inheritance of Traits, Structure, Function, and Growth (from cells to organisms) and Ecosystem Stability and the Response to Climate Change.

DEFINITIONS:

Instructional Segment: Grouping elements or concepts from multiple performance expectations (PEs) in lessons, units, and/or assessments that students can develop and use together to build toward proficiency on a set of PEs in a coherent manner.

Performance Expectation: The NGSS is not a set of daily standards, but a set of expectations for what students should be able to do by the end of instruction (years or grade-bands). So, the performance expectations set the learning goals for students, but do not describe how students get there.

Crosscutting Concepts: These are concepts that hold true across the natural and engineered world. Students can use them to make connections across seemingly disparate disciplines or situations, connect new learning to prior experiences, and more deeply engage with material across the other dimensions. The NGSS requires that students explicitly use their understanding of the CCCs to make sense of phenomena or solve problems.

Assessment Boundary: Specifies limits to large-scale assessment (ex. California State Assessment). It is not meant to put limits on what can be taught or how it is taught, but to provide guidance.

Disciplinary Core Ideas: The fundamental ideas that are necessary for understanding a given science discipline. The core ideas all have broad importance within or across science or engineering disciplines, provide a key tool for understanding or investigating complex ideas and solving problems, relate to societal or personal concerns, and can be taught over multiple grade levels at progressive levels of depth and complexity.

Science and Engineering Practices: The practices are what students do to make sense of phenomena. They are both a set of skills and a set of knowledge to be internalized. The SEPs reflect the major practices that scientists and engineers use to investigate the world and design and build systems.

Phenomenon: Observable events to be used as an opportunity for students to apply their scientific knowledge and understanding in a meaningful way.

Course Codes:
LS - Life Science
ESS - Earth and Space Science
ETS - Engineering and Technology and Applications of Science

COURSE INSTRUCTIONAL SEGMENTS:

1. Ecosystems Interactions and Energy
2. History of Earth's Atmosphere: Photosynthesis and Respiration
3. Evidence of Common Ancestry and Diversity
4. Inheritance of Traits
5. Structure, Function, and Growth (From Cells to Organisms)
6. Ecosystem Stability and the Response to Climate Change

CURRICULAR PRACTICES: Within the Living Earth course, there are three distinct and equally important dimensions to learning science. These dimensions are combined to form each standard—or performance expectation—and each dimension works with the other two to help students build a cohesive understanding of science over time.

The Three Dimensions:

- The Science and Engineering Practices are what scientists/engineers DO.
- The Disciplinary Core Ideas are what scientists/engineers KNOW.
- The Crosscutting Concepts are HOW scientists/engineers THINK.

Crosscutting Concepts:

1. Patterns
2. Cause and effect
3. Scale, proportion and quantity
4. Systems and system models
5. Energy and matter: flows, cycles and conservation
6. Structure and function
7. Stability and change of systems

Science and Engineering Practices:

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

<u>ASSESSMENT:</u>

The Living Earth incorporates a variety of assessment activities that mirror the variety in NGSS-aligned instruction. The distinction between instructional activities and assessment activities may be blurred, particularly when the assessment purpose is formative. Assessments will focus on:

1. Tasks that have multiple components so they can yield evidence of three-dimensional learning (and multiple performance expectations)
2. Explicit attention to the connections among scientific concepts.
3. The gathering of information about how far students have progressed along a defined sequence of learning.

GRADING GUIDELINES: See AUHSD Grading Guidelines: Final Mark Rubric and Final Course Mark Determination Components

COURSE CONTENT:

Living Earth Instructional Segments	
Instructional Segment 1: Ecosystem Interactions and Energy	
Guiding Questions: What factors affect the size of populations within an ecosystem? What are common threats to remaining natural ecosystems and biodiversity? How can these threats be reduced?	
Students who demonstrate understanding can:	**Clarification Statement:**
HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.	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: Assessment does not include deriving mathematical equations to make comparisons.*
HS-LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.	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.*

<table>
<tr><td>HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.</td><td colspan="2">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.</td></tr>
<tr><td>HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.</td><td colspan="2">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.</td></tr>
<tr><td>**Highlighted Science and Engineering Practices**</td><td>**Highlighted Disciplinary Core Ideas**</td><td>**Highlighted Crosscutting Concepts**</td></tr>
<tr><td>● Developing and using models
● Using mathematics and computational thinking
● Engaging in argument from evidence</td><td>● LS2.A: Interdependent relationships in ecosystems
● LS 2.D: Social interactions and group behavior</td><td>● Cause and effect
● Scale, proportion, and quantity
● Systems and system models
● Energy and matter</td></tr>
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Living Earth Instructional Segments	
Instructional Segment 2: History of Earth's Atmosphere: Photosynthesis and Respiration	
Guiding Questions: How do living things acquire energy and matter for life? How do organisms store energy? How are photosynthesis and cellular respiration connected? How do organisms use the raw materials they ingest from the environment? How has the cycling of energy and matter changed over Earth's history?	
Students who demonstrate understanding can:	**Clarification Statement:**
HS-LS1-5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.	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: Assessment does not include specific biochemical steps.*
HS-LS1-6. Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.	Emphasis is on using evidence from models and simulations to support explanations. *Assessment Boundary: Assessment does not include the details of the specific chemical reactions or identification of macromolecules.*

HS-LS1-7. Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.	Emphasis is on the conceptual understanding of the inputs and outputs of the process of cellular respiration. *Assessment Boundary: Assessment should not include identification of the steps or specific processes involved in cellular respiration.*]
HS-LS2-3. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.	Emphasis is on conceptual understanding of the role of aerobic and anaerobic respiration in different environments. *Assessment Boundary: Assessment does not include the specific chemical processes of either aerobic or anaerobic respiration.*
HS-LS2-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.	Examples of models could include simulations and mathematical models. *Assessment Boundary: Assessment does not include the specific chemical steps of photosynthesis and respiration.*
HS-ESS1-6. Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.	Emphasis is on using available evidence within the solar system to reconstruct the early history of Earth, which formed along with the rest of the solar system 4.6 billion years ago. Examples of evidence include the absolute ages of ancient materials (obtained by radiometric dating of meteorites, moon rocks, and Earth's oldest minerals), the sizes and compositions of solar system objects, and the impact cratering record of planetary surfaces.
HS-ESS2-6. Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.	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.

HS-ESS2-7. Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.	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 of 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.
HS-ESS3-6. Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.*	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: Assessment does not include running computational representations but is limited to using the published results of scientific computational models. (Introduced but not fully assessed until IS6)

Highlighted Science and Engineering Practices	Highlighted Disciplinary Core Ideas	Highlighted Crosscutting Concepts
• Engaging in Argument from Evidence • Developing and Using Models • Using Mathematical and Computational Thinking • Constructing Explanations • Designing Solutions	• LS4.A: Evidence of Common Ancestry and Diversity • LS4.B: Natural Selection • LS4.C: Adaptation • ESS1.C: The History of Planet Earth • ESS2.C: The Roles of Water in Earth's Surface Processes	• Energy and Matter • Stability and Change • Systems and System Models

Living Earth Instructional Segments	
Instructional Segment 3: Evidence of Common Ancestry and Diversity	
Guiding Questions: How do layers of rock form and how do they contain fossils? Why do we see fossils across the world from each other but living organisms that are very different from each other? What evidence shows that different species are related? How did modern day humans evolve?	
Students who demonstrate understanding can:	**Clarification Statement:**
HS-LS4-1. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.	Emphasis is on a conceptual understanding of the role each line of evidence has relating to common ancestry and biological evolution. Examples of evidence could include similarities in DNA sequences, anatomical structures, and order of appearance of structures in embryological development.

HS-LS4-2. Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.	Emphasis is on using evidence to explain the influence each of the four factors has on number of organisms, behaviors, morphology, or physiology in terms of ability to compete for limited resources and subsequent survival of individuals and adaptation of species. Examples of evidence could include mathematical models such as simple distribution graphs and proportional reasoning. Assessment Boundary: Assessment does not include other mechanisms of evolution, such as genetic drift, gene flow through migration, and co-evolution
HS-LS4-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations.	Emphasis is on using data to provide evidence for how specific biotic and abiotic differences in ecosystems (such as ranges of seasonal temperature, long-term climate change, acidity, light, geographic barriers, or evolution of other organisms) contribute to a change in gene frequency over time, leading to adaptation of populations.
HS-LS4-5. Evaluate the evidence supporting claims that 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.	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.
HS-ESS1-5. Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.	Emphasis is on the ability of plate tectonics to explain the ages of crustal rocks. Examples include evidence of the ages oceanic crust increasing with distance from mid-ocean ridges (a result of plate spreading) and the ages of North American continental crust increasing with distance away from a central ancient core (a result of past plate interactions). *Introduced, but assessed in High School Chemistry in the Earth System course.*

HS-ESS2-5. Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.	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).
HS-ESS3-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.	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.
HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems	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)
HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of	

constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.		
Highlighted Science and Engineering Practices	**Highlighted Disciplinary Core Ideas**	**Highlighted Crosscutting Concepts**
● Planning and Carrying Out Investigations ● Analyzing and Interpreting Data ● Engaging in Argument from Evidence ● Using Mathematical and Computational Thinking ● Constructing Explanations ● Designing Solutions ● Obtaining, Evaluating and Communication Information	● LS1.A: Structure and Function ● LS1.B: Growth and Development of Organisms	● Patterns ● Cause and Effect ● Structure and Function

Living Earth Instructional Segments	
Instructional Segment 4: Inheritance of Traits	
Guiding Questions: How are characteristics of one generation passed to the next? What allows traits to be transmitted from parents to offspring? How does variation affect a population under selective pressures?	
Students who demonstrate understanding can:	**Clarification Statement:**
HS-LS3-1. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.	Assessment Boundary: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.
HS-LS3-2. Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.	Emphasis is on using data to support arguments for the way variation occurs. Assessment Boundary: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.
HS-LS3-3. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.	Emphasis is on the use of mathematics to describe the probability of traits as it relates to genetic and environmental factors in the expression of traits. Assessment Boundary: Assessment does not include Hardy-Weinberg calculations.

HS-LS4-2. Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.	Emphasis is on using evidence to explain the influence each of the four factors has on number of organisms, behaviors, morphology, or physiology in terms of ability to compete for limited resources and subsequent survival of individuals and adaptation of species. Examples of evidence could include mathematical models such as simple distribution graphs and proportional reasoning. Assessment Boundary: Assessment does not include other mechanisms of evolution, such as genetic drift, gene flow through migration, and co-evolution.	
HS-LS4-3. Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.	Emphasis is on analyzing shifts in numerical distribution of traits and using these shifts as evidence to support explanations. Assessment Boundary: Assessment is limited to basic statistical and graphical analysis. Assessment does not include allele frequency calculations	
Highlighted Science and Engineering Practices	**Highlighted Disciplinary Core Ideas**	**Highlighted Crosscutting Concepts**
• Asking Questions and Defining Problems • Developing and Using Models • Analyzing and Interpreting Data • Constructing Explanations and Designing Solutions • Engaging in Argument from Evidence	• LS1.B: Growth and Development of Organisms • LS3.A: Inheritance of Traits • LS3.B: Variation of Traits • LS4.B: Natural Selection	• Patterns • Cause and Effect • Scale, Proportion and Quantity • Systems and System Models

Living Earth Instructional Segments	
Instructional Segment 5: Structure, Function, and Growth (From Cells to Organisms)	
Guiding Questions: What happens if a cell in our body dies? How does the structure of DNA affect how cells look and behave? How do systems work in a multi-celled organism and what happens if there is a change in the system? How do organisms survive even when there are changes in their environment?	
Students who demonstrate understanding can:	**Clarification Statement:**
HS-LS1-1. Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.	Assessment does not include identification of specific cell or tissue types, whole body systems, specific protein structures and functions, or the biochemistry of protein synthesis.
HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.	Emphasis is on functions at the organism system level such as nutrient uptake, water delivery, and organism movement in response to neural stimuli. An example of an interacting system could be an artery depending on the proper function of elastic tissue and smooth muscle to regulate and deliver the proper amount of blood within the circulatory system. Assessment Boundary: Assessment does not include interactions and functions at the molecular or chemical reaction level.

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<tr><td>HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis</td><td colspan="2">Clarification Statement: Examples of investigations could include heart rate response to exercise, stomate response to moisture and temperature, and root development in response to water levels.
Assessment Boundary: Assessment does not include the cellular processes involved in the feedback mechanism.</td></tr>
<tr><td>HS-LS1-4. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.</td><td colspan="2">Assessment Boundary: Assessment does not include specific gene control mechanisms or rote memorization of the steps of mitosis.</td></tr>
<tr><td>Highlighted Science and Engineering Practices</td><td>Highlighted Disciplinary Core Ideas</td><td>Highlighted Crosscutting Concepts</td></tr>
<tr><td>Developing and Using Models
Planning and Carrying Out Investigations
Constructing Explanations and Designing Solutions</td><td>LS1.C: Organization for Matter and Energy Flow in Organisms
LS2.B: Cycles of Matter and Energy Transfer in Ecosystems
ESS1.C: The History of Planet Earth
ESS2.D: Weather and Climate
ESS2.E: Biogeology</td><td>Systems and System Models
Structure and Function
Stability and Change</td></tr>
</table>

Living Earth Instructional Segments	
Instructional Segment 6: Ecosystem Stability and the Response to Climate Change	
Guiding Questions: What effects changes in ecosystems that ultimately affect populations? What are the changes that are happening in the climate and what effects are those having on life? How are human activities impacting Earth's systems and how does that affect life on Earth? What can humans do to mitigate their negative impact on the environment?	
Students who demonstrate understanding can:	**Clarification Statement:**
HS-LS2-6. Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.	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.
HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.*	Examples of human activities can include urbanization, building dams, and dissemination of invasive species.
HS-LS4-5. Evaluate the evidence supporting claims that 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.	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

HS-LS4-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.*	Emphasis is on designing solutions for a proposed problem related to threatened or endangered species, or to genetic variation of organisms for multiple species.
HS-ESS3-5. Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.	Examples of evidence, for both data and climate model outputs, are for climate changes (such as precipitation and temperature) and their associated impacts (such as on sea level, glacial ice volumes, or atmosphere and ocean composition). Assessment Boundary: Assessment is limited to one example of a climate change and its associated impacts
HS-ESS3-6. Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.	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: Assessment does not include running computational representations but is limited to using the published results of scientific computational models.
HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.	
HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.	

HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.		
HS-ETS1-4. Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.		
Highlighted Science and Engineering Practices	**Highlighted Disciplinary Core Ideas**	**Highlighted Crosscutting Concepts**
● Analyzing and Interpreting Data ● Using Mathematics and Computational Thinking ● Constructing Explanations and Designing Solutions ● Engaging in Argument from Evidence	● LS2.C: Ecosystem Dynamics, Functioning, and Resilience ● LS4.C: Adaptation ● LS4.D: Biodiversity and Humans ● ESS3.D: Global Climate Change	● Patterns ● Cause and Effect ● Systems and System Models ● Stability and Change ● Influence of Science, Engineering, and Technology on Society and the Natural World