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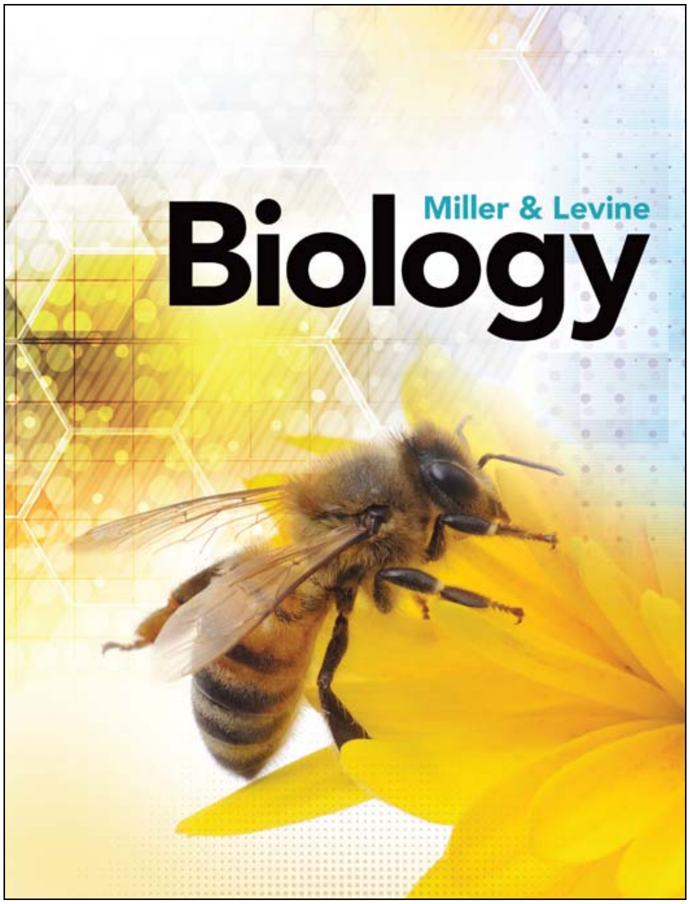

To the

Arkansas K-12 Science Standards Biology Integrated, 2016

INTRODUCTION

This document demonstrates how ***Miller & Levine Biology ©2019*** supports the **Arkansas K-12 Science Standards Biology Integrated, 2016**. Correlation page references are to the Student and Teacher's Editions and cited at the page level.

Renowned Author Team Ken Miller and Joe Levine have created a comprehensive on-level program to inspire students to interact with trusted and up-to-date biology content. The authors' unique storytelling style engages students in biology, with a greater focus on written and visual analogies. This innovative and fresh new program was developed for modern biology classrooms with a focus on STEM integration and 21st century education.

Problem-Based Learning The Problem-Based Learning Strand introduced in each unit opener immerses students in an active learning environment with lab investigations, STEM projects, virtual activities, and authentic readings. When students each the end of the unit, they use their newly acquired scientific knowledge and data to design, test, and evaluate a solution to the presented problem.

Performance-Based Assessment Authentic assessments of STEM learning allow students to demonstrate mastery of the chapter concepts and new standards. All Performance-Based Assessments feature real-world problems and focus on science inquiry, engineering, and STEM practices.

Case Studies Students directly interact with science phenomena in every chapter as they learn about a real-world science problem. Throughout the lessons, students find case study connections in data analysis activities, labs, diagrams, illustrations, and interactivities.

Interactive Learning Students interact with digital art, videos, and animations through interactive prompts or questions, making ***Miller & Levine Biology*** relevant to their lives.

Reading and Study Support *Biology Foundations: Reading and Study Guide Workbook* includes lesson summaries, vocabulary help, and reading tools. Practice focuses on key concepts and science literacy to improve students' understanding of scientific text.

PearsonRealize.com PearsonRealize.com is your online destination for the complete Miller & Levine Biology digital curriculum. A single sign-on provides access to biology content, assessments, resources, management tools, and real-time student data. Realize directly syncs with providers such as Google® and OpenEd to provide a seamless digital experience.

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Biology - Integrated	
Topic 1: Cycling of Matter and Energy	
BI-LS1-5 Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. [AR Clarification Statement: This PE is fully addressed in this course. 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.]	**SE/TE:** 286-290, 291-295, 298-299, 305, (Q23), 306, Q34)
BI-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. [Clarification Statement: 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.]	**SE/TE:** 310-313, 314-320, 321-323, 334, (Q37) Modeling Lab: Making a Model of Cellular Respiration
BI-LS2-3 Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions. [Clarification Statement: 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.]	**SE/TE:** 114-117, 123-131 Digital Course: Comparing Cellular Respiration and Fermentation

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BI-LS2-4 Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. [AR clarification Statement: This PE is fully addressed in this course. Emphasis is on the transfer of energy and matter between trophic levels and the relative proportion of organisms at each trophic level.] [Assessment Boundary: Assessment is limited to proportional reasoning to describe the cycling of matter and flow of energy.	**SE/TE:** 118-122, 121, 123-131, 302-303
BI-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. [Clarification Statement: Examples of models could include simulations and mathematical models.] [Assessment Boundary: Assessment does not include the specific chemical steps of photosynthesis and respiration.]	**SE/TE:** 123-131, 136-137, 286-290, 291-297, 302-303, 310-313
BI-ESS2-6 Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere. [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.]	**SE/TE:** 126-128, 131, (Q5), 136-137

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Topic 2: Structure and Function	
BI-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 Boundary: 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.]	**SE/TE:** 249-251, 267-268, 416-417, 418-423, 445-450, 466-467, 469 (Q27)
BI-LS1-2 Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. [AR Clarification Statement: Emphasis is on functions at the organism system level such as nutrient uptake, water delivery, and organism movement in response to neural stimuli. Examinations could include all types of multicellular organisms. Examples of an interacting system could include an artery depending on the proper function of elastic tissue and a smooth muscle regulating and delivering proper amounts of blood within the circulatory system]. [Assessment Boundary: Assessment does not include interactions and functions at the molecular or chemical reaction level.]	**SE/TE:** 267-268, 762-775, 857, (Q5), 870-875, 876-879, 888-889, 896-897, 904-906, 910-922, 923-932, 952, (Q38)
BI-LS1-3 Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. [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.]	**SE/TE:** 260-265, 266-269, 776-783, 801, 888-891, 907-909, 930-932, 95, (Q37) Exploration Lab: Exercise and Heart Rate

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BI-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. [Clarification Statement: 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.]	**SE/TE:** 52-57, 58-61, 291-295 Digital Course: Interactivity Carbon Compounds
Topic 3: Biodiversity and Population Dynamics	
BI-LS2-1Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems 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: Assessment does not include deriving mathematical equations to make comparisons.]	**SE/TE:** 144-151, 152-157, 158-161 Argument-Based Inquiry: Estimating Population Size
BI-LS2-2 Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of 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.]	**SE/TE:** 85-91, 92-101, 102-103, 152-157, 158-161, 162-163, 166-167, 174-181, 182-185, 194-195, 206-217, 218-222

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BI-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. [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.]	**SE/TE:** 182-185, 186-189 In Your Neighborhood Lab: Biodiversity on the Forest Floor
BI-LS2-7 Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. [AR Clarification Statement: This PE is fully addressed in this course. Emphasis is on the impact of human activities on biodiversity such as dissemination of invasive species, habitat degradation, and water quality.] [AR Assessment Boundary: Assessment is to include student choice from multiple scenarios.]	**SE/TE:** 166-167, 182-185, 186-189, 194-195, 202-205, 206-217, 218-222, 223-225, 226-227, 230-231, 862-863, 858-859, 862-863 Develop a Solution Lab: Calculating Ecological Footprints
BI-LS2-8 Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce. [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.]	**SE/TE:** 822-827 Lab: The Role of Group Behavior

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BI-LS4-6 Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity. [AR Clarification Statement: Emphasis is on refining solutions for a proposed problem related to threatened or endangered species, genetic variation of organisms for multiple species, and biodiversity.]	**SE/TE:** 186-189, 206-217 Digital Course: Controlling Invasives
BI3-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. [AR Clarification Statement: Problems could include effect of logging on animal or human populations, response to invasive species, agricultural practices, creating dams, and maintaining fish populations in public lakes.]	**SE/TE:** 30-31, 34-35, 62-63, 102-103, 136-137, 190-191, 270-271, 274-275, 466-467, 710-711, 714-715, 896-897, 944-945
BI3-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. [AR Clarification Statement: Examples could include simulations of population dynamics, genetic drift, evolution, and migration.]	**SE/TE:** Digital Course: Controlling Invasives

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Topic 4: Genetic Variations in Organisms	
BI-LS1-4 Use a model to illustrate the role of the cell division (mitosis) and differentiation in producing and maintaining complex organisms. [Assessment Boundary: Assessment does not include specific gene control mechanisms or rote memorization of the steps of mitosis.]	**SE/TE:** 238-242, 243-248, 338-342, 343-349, 355-358, 370 (Q30) Exploration Lab: Regeneration in Planaria
BI-LS3-1Ask 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.]	**SE/TE:** 343-344, 393-399, 412-417, 418-423, 428-429, 432-433, 440-444, 445-450, 451-456, 457-461, 466-467, 474-479, 480-484, 485-493, 494-495, 498-499, 516-523 Labs: Using DNA to Solve Crimes, Gel Electrophoresis
BI-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. [Clarification Statement: 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.]	**SE/TE:** 393-399, 424-427, 426, 456, 457-459, 460-461, 582-583, 597, 710-711 Quick Lab: 426 Labs: A Model of Meiosis, The Effect of Mutations
BI-LS3-3Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. [Clarification Statement: 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.]	**SE/TE:** 378-382, 383-387, 388, 389-392, 400-401, 404-405, 581, 583, 584, 585-591, 599, 604-605 Analyzing Data: 599

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Topic 5: Evolution by Natural Selection	
BI-LS4-1 Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. [Clarification Statement: 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.]	**SE/TE:** 544-548, 549-554, 560-567, 619-629, 630-631, 634-635, 666-667 Exploration Lab: Evidence of Evolution: Argument-Based Inquiry: Construct a Cladogram
BI-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. [Clarification Statement: 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.]	**SE/TE:** 544-548, 549-554, 555-559, 560-567, 573, (Q4)

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BI-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. [Clarification Statement: 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.]	**SE/TE:** 555-559, 585-591, 604-605
BI-LS4-4 Construct an explanation based on evidence for how natural selection leads to adaptation of populations. [Clarification Statement: 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.]	**SE/TE:** 544-548, 555-559, 592-595, 596-599, 600-601 Modeling Lab: Competing for Resources
BI-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. [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.]	**SE/TE:** 596-599, 652-658, 670-671

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BI-ESS2-7 Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth. [AR Clarification Statement: This PE is fully addressed in this course. Emphasis in the course is on developing a claim and evaluating and critiquing the evidence for simultaneous co-evolution. Emphasis is on the causes, effects, and feedback loops between the biosphere and Earth's other systems which continuously alters Earth's surface. Examples could include how photosynthetic life altered the atmosphere through the production of oxygen, which increased weathering rates and allowed for the evolution of animal life; how microbial life on land increased the formation of soil which allowed for the evolution of land plants; and how the evolution of corals created reefs which altered patterns of erosion and deposition along coastlines and provided habitats for the evolution of 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.]	**SE/TE:** 648-651, 654-657, 658, (Q4), 666-667, 670-671, 673, (Q29)

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Topic 6: Life and Earth's Systems	
BI-ESS2-2 Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems. [Clarification Statement: Examples could 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.]	**SE/TE:** 218-219, 220-221, 221 (Case Study)
BI-ESS2-4 Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate. [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.]	**SE/TE:** 85-91, (Q2, 5), 102-103, 106-107, 109, (Q36, 37)

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BI-ESS2-5 Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes. [AR Clarification Statement: This PE is partially addressed in this course. Emphasis is on the properties of water and the water cycle.]	**SE/TE:** 125-126, 203 (Argument Based Inquiry), 208-209, 208 (Quick Lab) **TE:** 128 (Interactivity), 188 (Guided Inquiry Interactivity)
BI-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. [AR Clarification Statement: Examples of evidence (precipitation and temperature) for both data and climate models and the associated impacts (sea level changes, glacial ice volumes, and atmosphere and ocean composition) could be found at National Oceanic and Atmospheric Administration, National Weather Service, and United States Geological Survey.] [Assessment Boundary: Assessment is limited to one example of a climate change and its associated impacts.]	**SE/TE:** 226-227, 230-231, 234, (Q37-39), 828-829
BI6-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. [AR Clarification Statement: Proposed problems could include increases in pollution, greenhouse gases, water runoff and soil erosion, coastal erosion, and loss of wetlands.]	**SE/TE:** 34-35, 62-63, 102-103, 710-711, 714-715, 862-863 Lab: Algae in the Water

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BI6-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. [AR Clarification Statement: Solutions could include those designed by students or identified from scientific studies.]	**SE/TE:** 30-31, 34-35, 62-63, 102-103, 136-137, 190-191, 270-271, 274-275, 466-467, 710-711, 714-715, 896-897, 944-945
Topic 7: Human Impacts on Earth's Systems	
BI-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. [AR Clarification Statement: This PE is fully addressed in this course. Emphasis is on the way climate change has impacted human populations and how natural resources and natural hazards impact human societies. Examples of climate change results which affect populations or drive mass migrations could include changes to sea level, regional patterns of temperature and precipitation, and types of crops and livestock available. Examples of the dependence of human populations on technology to acquire natural resources and to avoid natural hazards could include damming rivers, natural gas fracking, thunderstorm sirens, and severe weather text alerts.]	**SE/TE:** 204-205, 205, (Q5), 210-217, 221, 222, (Q6), 224-225, 226-227 203 (Guided Inquiry), 224 (Interactivity)

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BI-ESS3-2 Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.* [AR Clarification Statement: This PE is fully addressed in this course. Emphasis is on the designs of possible solutions. Emphasis is on the conservation, recycling, and reuse of resources (minerals and metals), and on minimizing impacts. Examples could include developing best practices for agricultural soil use, mining (coal, tar sands, and oil shales), and pumping (petroleum and natural gas).]	**SE/TE:** 34-35, 274-275, 792-793
BI-ESS3-3 Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity. [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.]	**SE/TE:** 223-225, 226-227, 230-231, 944-945

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BI-ESS3-4 Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.* [AR Clarification Statement: This PE is partially addressed in this course. Examples of data on the impacts of human activities could include the quantities and types of pollutants released, changes to biomass and species diversity, and changes in land surface (urban development, agriculture or livestock, and surface mining). Examples for limiting future impacts could range from local efforts (reducing, reusing, and recycling resources) to large-scale bioengineering design solutions (altering global temperatures by making large changes to the atmosphere or ocean).]	**SE/TE:** 34-35, 226-227, 230-231, 298-299, 302-303 225 (Interactivities)
BI-ESS3-6 Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity. [AR Clarification Statement: Examples of Earth systems to be considered are the hydrosphere, atmosphere, cryosphere, geosphere, and biosphere. Examples of far-reaching impacts related to human activity, include how increases in one or more atmospheric gasses (COx, NOx, Sox), and volatile organic compounds), and particulate matter could impact other Earth systems. For example, an increase in carbon dioxide results in an increase in photosynthetic biomass and ocean acidification with resulting impacts on marine populations.] [Assessment Boundary: Assessment does not include running computational representations but is limited to using the published results of scientific computational models.]	**SE/TE:** 206-217, 218-222, 224-225, 226-227, 230-231, 234, (Q37-39, 40-43) 224 (Interactivity)

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BI7-ETS1-1 Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. [AR Clarification Statement: Examples could include recycling, increased atmospheric carbon dioxide, ocean acidification, impacts on marine populations, increased wildfire occurrence, deforestation, and overfishing.]	**SE/TE:** 223-225, 226-227, 230-231, 298-299, 302-303, 528-529, 710-711, 714-715, 862-863, 944-945 203 (Guided Inquiry)
BI7-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. [AR Clarification Statement: Simulations could include management of natural resources for sustainable yields, agricultural efficiency to feed a growing world population, and urban planning to maximize green space.]	**SE/TE:** TE: Simulation, 7, 77, 411, 681, 721, 39, 869 Digital Course: Controlling Invasives