NGSS DISCIPLINARY CORE IDEAS and TOPICS addressed with SNAPSHOT DAY

EXAMPLE: 5th Grade **Earth's Systems**
Students who demonstrate understanding can:
Performance Expectations
Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. 5-ESS2-1
Clarification Statement: Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.
Assessment Boundary: Assessment is limited to the interactions of two systems at a time.

Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth. 5-ESS2-2
Clarification Statement: none **Assessment Boundary:** Assessment is limited to oceans, lakes, rivers, glaciers, ground water, and polar ice caps, and does not include the atmosphere.
Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment. 5-ESS3-1
Clarification Statement: none **Assessment Boundary:** none

EXAMPLE: Middle School **Human Impacts**
Students who demonstrate understanding can:
Performance Expectations
Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects. MS-ESS3-2
Clarification Statement: Emphasis is on how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions, but others, such as earthquakes, occur suddenly and with no notice, and thus are not yet predictable. Examples of natural hazards can be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events (such as hurricanes, tornadoes, and floods). Examples of data can include the locations, magnitudes, and frequencies of the natural hazards. Examples of technologies can be global (such as satellite systems to monitor hurricanes or forest fires) or local (such as building basements in tornado-prone regions or reservoirs to mitigate droughts). **Assessment Boundary:** none

Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. MS-ESS3-3
Clarification Statement: Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land).
Assessment Boundary: none

Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems. MS-ESS3-4
Clarification Statement: Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth's systems as well as the rates at which they change. The consequences of increases in human populations and consumption of natural resources are described by science, but science does not make the decisions for the actions society takes. **Assessment Boundary:** none

EXAMPLE: High School Human Sustainability

Students who demonstrate understanding can:

Performance Expectations

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. HS-ESS3-1

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

Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios. HS-ESS3-2

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

Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity. HS-ESS3-3

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.

Evaluate or refine a technological solution that reduces impacts of human activities on natural systems. HS-ESS3-4

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

Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity. HS-ESS3-6

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:** Assessment does not include running computational representations but is limited to using the published results of scientific computational models.

DISCIPLINARY CORE IDEAS

5-ESS3-1 Earth and Human Activity
Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.
Performance Expectation Grade: 3-5 | 5

MS-ESS3-3 Earth and Human Activity
Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.*
Performance Expectation Grade: Middle School (6-8)
MS-ESS3-4 Earth and Human Activity
Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.
Performance Expectation Grade: Middle School (6-8)

HS-ESS3-3 Earth and Human Activity
Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
Performance Expectation Grade: High School (9-12)
HS-ESS3-4 Earth and Human Activity
Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.*
Performance Expectation Grade: High School (9-12)

MS-LS2-4 Ecosystems: Interactions, Energy, and Dynamics
Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
Performance Expectation Grade: Middle School (6-8)
MS-LS2-5 Ecosystems: Interactions, Energy, and Dynamics
Evaluate competing design solutions for maintaining biodiversity and ecosystem services.*
Performance Expectation Grade: Middle School (6-8)

HS-LS2-2 Ecosystems: Interactions, Energy, and Dynamics
Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
Performance Expectation Grade: High School (9-12)
HS-LS2-6 Ecosystems: Interactions, Energy, and Dynamics
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. Performance Expectation Grade: High School (9-12)
HS-LS2-7 Ecosystems: Interactions, Energy, and Dynamics
Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.*
Performance Expectation Grade: High School (9-12)

5-LS2-1 Ecosystems: Interactions, Energy, and Dynamics
Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
Performance Expectation Grade: 3-5 | 5

MS-LS2-1 Ecosystems: Interactions, Energy, and Dynamics
Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
Performance Expectation Grade: Middle School (6-8)
MS-LS2-2 Ecosystems: Interactions, Energy, and Dynamics
Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
Performance Expectation Grade: Middle School (6-8)

HS-LS2-1 Ecosystems: Interactions, Energy, and Dynamics
Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
Performance Expectation Grade: High School (9-12)

MS-LS2-4 Ecosystems: Interactions, Energy, and Dynamics
Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
Performance Expectation Grade: Middle School (6-8)
MS-LS2-5 Ecosystems: Interactions, Energy, and Dynamics
Evaluate competing design solutions for maintaining biodiversity and ecosystem services.*
Performance Expectation Grade: Middle School (6-8)

HS-LS2-2 Ecosystems: Interactions, Energy, and Dynamics
Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
Performance Expectation Grade: High School (9-12)
HS-LS2-6 Ecosystems: Interactions, Energy, and Dynamics
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.
Performance Expectation Grade: High School (9-12)
HS-LS2-7 Ecosystems: Interactions, Energy, and Dynamics
Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.*
Performance Expectation Grade: High School (9-12)