8/14/18

7th Grade Unit 5 (~28 Days)

Biodiversity and Changes

Performance Expectations included in Unit 5

7-MS-LS2-4: Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

7-MS-LS2-5: Undertake a design project that assists in maintaining diversity and ecosystem services.

7-MS-ESS3-5: Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.

Unit 5 Anchor Phenomenon: BP Oil Spill Video

Unit 5 Anchor Phenomenon: BP Oil Spill Image

Unit 5 Anchor Phenomenon: Glacier National Park is Melting

7-MS-LS2-4 (Ecosystems:Interactions, Energy, and Dynamics) Investigative Phenomenon: Ocean acidification caused by excessive amounts of CO2

7-MS-LS2-4 (Ecosystems:Interactions, Energy, and Dynamics) Investigative Phenomenon: Ocean acidification Article

7-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.

Clarification Statement

Emphasis is on recognizing patterns in data, making inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems.

Science and Engineering Practice	Disciplinary Core Idea
Engaging in argument from evidence: Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s). • Construct, use, and/or present an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.	**ECOSYSTEM DYNAMICS, FUNCTIONING, AND RESILIENCE** Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations. (MS.LS2C.a)

Crosscutting Concepts

STABILITY AND CHANGE
Small changes in one part of a system might cause large changes in another part.

Concepts

Ecosystems are dynamic in nature.

The characteristics of ecosystems can vary over time.

Disruptions to any physical or biological component of an ecosystem can lead to shifts in all the ecosystems populations.

The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health.

Small changes in one part of an ecosystem might cause large changes in another part.

Patterns in data about ecosystems can be recognized and used to make warranted inferences about changes in populations.

Evaluating empirical evidence can be used to support arguments about changes to ecosystems.

Ecosystems naturally change over time.

Disruptions to an ecosystem can affect all its populations.

Organisms and their environments are interconnected. Changes in one part of the system will affect other parts of the system.

Changes in an organism’s environment may cause a shift in populations.

Ways to check for understanding

Construct an argument to support or refute an explanation for the changes to populations in an ecosystem caused by disruptions to a physical or biological component of that ecosystem. Empirical evidence and scientific reasoning must support the argument.

Use scientific rules for obtaining and evaluating empirical evidence.

Recognize patterns in data and make warranted inferences about changes in populations.

Students should be able to: Recognize examples of ecosystems shifting in population composition and abundance and changes in the physical environment over time.

Identify catalysts of change within an ecosystem both biologically and anthropologically caused. For example, the fall of canopy trees may occur due to cataclysmic events, such as volcanic eruptions or may be induced by human activity, such as resource extraction, adverse land use patterns, pollution, introduction of nonnative species, and/or global climate change.

Sample Guiding Questions

How do physical changes to an ecosystem affect populations?

How do biological changes to a ecosystem affect populations?

What factors influence changes in populations?

What are the components of an ecosystem?

What components of an ecosystem do populations rely on?

Key Vocabulary

Physical Disruptions (rainfall, fire), biological disruptions (predator removal, species introduction), population change (e.g. size, species present, prevalence of species in ecosystem, ecosystem, stability and change

Evaluate empirical evidence supporting arguments about changes to ecosystems.

Additional Teacher Resources

LS2A - Interdependent Relationships in Ecosystems

LS2B - Cycles of Matter and Energy Transfer

LS2C - Ecosystem Dynamics, Functioning and Resilience

LS2D - Social Interactions and Group Behavior

MS-LS2-4 NGSS Evidence Statement

Sample Activities

Won't You Be My Sea Urchin? Data Nugget

Coral Bleaching

Ocean Bully

Exploring Systems in Ecosystems

Sample 5E Lesson Plan

7-MS-LS2-4 Sample Lesson Plan

7-MS-LS2-5 (Ecosystems: Interactions, Energy, and Dynamics) Investigative Phenomenon: Ecosystem Services

7-MS-LS2-5 (Ecosystems: Interactions, Energy, and Dynamics) Investigative Phenomenon: Overfishing

7-MS-LS2-5 (Ecosystems: Interactions, Energy, and Dynamics)

Undertake a design project that assists in maintaining diversity and ecosystem services.

Clarification Statement

Examples of ecosystem services could include water purification, nutrient recycling, habitat conservation or soil erosion mitigation. Examples of design solution constraints could include scientific, economic, or social considerations.

Science and Engineering Practice	Disciplinary Core Idea
Constructing explanations and designing solutions: Constructing explanations (science) and designing solutions (engineering) in 6–8 builds on K– 5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.	**ECOSYSTEM DYNAMICS, FUNCTIONING, AND RESILIENCE** Biodiversity describes the variety of species found in Earth's terrestrial and aquatic ecosystems. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health. (MS.LS2C.b) **BIODIVERSITY AND HUMANS** Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services on which humans rely. (MS. LS4D.a)

Concepts

Biodiversity describes the variety of species found in Earth's terrestrial and oceanic ecosystems.

The completeness, or integrity, of an ecosystem's biodiversity is often used as a measure of its health.

Changes in biodiversity can influence humans' resources, such as food, energy, and medicines.

Changes in biodiversity can influence ecosystem services that humans rely on.

There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.

A solution needs to be tested and then modified on the basis of the test results, in order to improve it.

Models of all kinds are important for testing solutions.

The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution.

• Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints.	LS4D.a) **ENGINEERING DESIGN: DEVELOPING POSSIBLE SOLUTIONS** A solution needs to be tested to prove the validity of the design and then modified on the basis of the test results in order to improve it. There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. Models of all kinds are important for testing solutions (MS.ETS1B.a)	Small changes in one part of a system might cause large changes in another part. Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. Organisms and populations of organisms are dependent on their environmental interactions both with other living things and with nonliving factors. . Growth of organisms and population increases are limited by access to resources. In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction. Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Biodiversity refers to the variety of life an ecosystem contains (i.e., numbers of different species). An ecosystem's health is measured by its biodiversity or the variety of life it contains. A change in an ecosystem's biodiversity can impact humans. Humans rely on ecosystems for resources (e.g., food, energy, medicine). Humans and other organisms impact biodiversity. Design solutions must be tested. Tests are often designed to identify failure points or difficulties. Testing a solution involves investigating how well it performs under a range of likely conditions. Solutions are modified on the basis of the test results. Different solutions can be combined to create a better solution. Designing solutions to problems is a systematic process. There are many types of models. Models can be used to investigate how a design might work. Models allow the designer to better understand the features of a design problem. Engineering design is tested and altered due to criteria and constraints.
Crosscutting Concepts		
STABILITY AND CHANGE Small changes in one part of a system might cause large changes in another part. *Students should be able to: Apply understanding of matter to the atomic scale, so too should their models and their explanations of stability and change. Furthermore, they can begin to appreciate more subtle or conditional situations and the need for feedback to maintain stability.*		
Sample Guiding Questions		
What are some factors influencing biodiversity? What is an ecosystem service? What is biodiversity? How can water purification help maintain biodiversity? How can nutrient recycling help maintain biodiversity? How can prevention of soil erosion help maintain biodiversity? What kinds of science must be part of the solution to maintaining biodiversity? What kinds of economics must be part of the solution to maintaining biodiversity? What kinds of social considerations must be part of the solution to maintain biodiversity?		
Key Vocabulary		
biodiversity, ecosystem, terrestrial, oceanic, abiotic factors, biotic factors, stability and change		
Sample 5E Lesson Plan		**Ways to check for understanding**
7-MS-LS2-5 Sample Lesson Plan		Construct a convincing argument that supports or refutes claims for solutions about the natural and designed world(s). Develop a model to generate data to test ideas about designed

	systems, including those representing inputs and outputs.
	Create design criteria for design solutions for maintaining biodiversity and ecosystem services.
	Evaluate competing design solutions based on jointly developed and agreed upon design criteria.
	Additional Teacher Resources
	LS2A - Interdependent Relationships in Ecosystems LS2B - Cycles of Matter and Energy Transfer LS2C - Ecosystem Dynamics, Functioning and Resilience LS2D - Social Interactions and Group Behavior **MS-LS2-5 NGSS Evidence Statement**
	Sample Activities
	Saving the World: One Ecosystem at a Time Teaching with tarantulas Soil Erosion Dueling Mandates

7-MS-ESS3-5 (Earth and Human Activity) Investigative Phenomenon: Penguins on ice in Antarctica

7-MS-ESS3-5 (Earth and Human Activity)		**Concepts**
Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.		Stability in Earth's surface temperature might be disturbed either by sudden events or gradual changes that accumulate over time.
Clarification Statement		Human activities and natural processes are examples of factors that have caused the rise in global temperatures over the past century.
Examples of factors include human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and the rates of human activities. Emphasis is on the major role that human activities play in causing the rise in global temperatures.)		Human activities play a major role in causing the rise in global temperatures.
		Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature (global warming).
Science and Engineering Practice	**Disciplinary Core Idea**	Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior, and on applying that knowledge wisely in decisions and activities.
Asking questions and defining problems: Asking questions (science) and defining problems (engineering) in 6-8 builds on K-5 experiences and progresses to specifying relationships between variables, clarifying arguments and making models. • Ask questions to identify and/or clarify evidence and/ or the premise	**GLOBAL CLIMATE CHANGE** Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature. Addressing climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities. (MS.ESS3D.a)	Evidence that some factors have caused the rise in global temperature over the last century can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and the rates of human activities
		Heat energy stored in the oceans and transferred by currents influence climate.
		A disruption of the circulation and temperature of the world's oceans

clarify evidence and/ or the premise (s) of an argument.

would foster climate change and have environmental and economic consequences.

Global climate change is driven by both natural phenomena and by human activities.

Global climate change could have large consequences for all of Earth's surface systems. With further scientific research, people can learn more about climate changes and help guide more effective responses.

Using science-based predictive models, humans can anticipate long-term change more effectively and plan accordingly.

Crosscutting Concepts

STABILITY AND CHANGE

Stability might be disturbed either by sudden events or gradual changes that accumulate over

Students should be able to: Understand the role of energy transfers in conjunction with the flow of matter into, out of, and within systems. By middle school, a more precise idea of energy—for example, the understanding that food or fuel undergoes a chemical reaction with oxygen that releases stored energy—can emerge. Mass/weight distinctions and the idea of atoms and their conservation (except in nuclear processes) are taught in grades 6-8.

Ways to check for understanding

Ask questions to identify and clarify a variety of evidence for an argument about the factors that have caused the rise in global temperatures over the past century.

Ask questions to clarify human activities and natural processes that are major factors in the current rise in Earth's mean surface temperature.

Sample Guiding Questions

What is global warming?

What causes global warming?

What impact does global warming have on an ecosystem?

What is a fossil fuel?

Additional Teacher Resources

ESS3A - Natural Resources

ESS3B - Natural Hazards

ESS3C - Human Impacts on Earth Systems

ESS3D - Global Climate Change

MS-ESS3-5 NGSS Evidence Statement

Key Vocabulary

global warming (natural causes - e.g. changes in solar radiation, volcanic activity; human causes - e.g. fossil fuel combustion, cement production, agriculture), global temperature, greenhouse gases (e.g. carbon dioxide, water vapor, methane), stability and change

Sample Activities

People and Climate Change

Case Study: Carbon Dioxide and Global Warming: What is the Evidence?

Using the Very, Very Simple Climate Model in the Classroom

What is the Future of Earth's Climate?

Sample 5E Lesson Plan

7-MS-ESS3-5 Sample Lesson Plan