How Climate Change Is Affecting Life on Earth

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INTERNATIONAL FUND FOR ANIMAL WELFARE

U.S. Standards Correlation
Grades 6–8

	Text	Lesson 1	Lesson 2
Science			
Scientific and Engineering Practices			
1. Asking questions and defining problems			✓
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			✓
Crosscutting Concepts			
1. **Patterns.** Observed patterns of forms and events guide organization and classification, and they prompt questions about relationships and the factors that influence them.		✓	
2. **Cause and effect: Mechanism and explanation.** Events have causes, sometimes simple, sometimes multifaceted. A major activity of science is investigating and explaining causal relationships and the mechanisms by which they are mediated. Such mechanisms can then be tested across given contexts and used to predict and explain events in new contexts.	✓		✓
3. **Scale, proportion, and quantity.** In considering phenomena, it is critical to recognize what is relevant at different measures of size, time, and energy and to recognize how changes in scale, proportion, or quantity affect a system's structure or performance.			✓
4. **Systems and system models.** Defining the system under study—specifying its boundaries and making explicit a model of that system—provides tools for understanding and testing ideas that are applicable throughout science and engineering.			✓
5. **Energy and matter: Flows, cycles, and conservation.** Tracking fluxes of energy and matter into, out of, and within systems helps one understand the systems' possibilities and limitations.	✓		
6. **Structure and function.** The way in which an object or living thing is shaped and its substructure determine many of its properties and functions.	✓		
7. **Stability and change.** For natural and built systems alike, conditions of stability and determinants of rates of change or evolution of a system are critical elements of study.			✓

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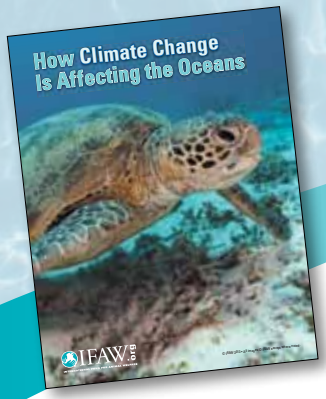
U.S. Standards Correlation (continued)

	Text	Lesson 1	Lesson 2
Disciplinary Core Ideas: *Physical Sciences*			
Motion and stability: Forces and interactions PS2.C Stability and instability in physical systems. *Why are some physical systems more stable than others?*	✓	✓	
Energy PS3.A Definitions of energy. *What is energy?* PS3.B Conservation of energy and energy transfer. *What is meant by conservation of energy? How is energy transferred between objects or systems?*	✓ ✓	✓	
Waves and their applications in technologies for information transfer PS4.B Electromagnetic radiation. *What is light? How can one explain the varied effects that involve light? What other forms of electromagnetic radiation are there?*		✓	
Disciplinary Core Ideas: *Life Sciences*			
Ecosystems: Interactions, energy, and dynamics LS2.A Interdependent relationships in ecosystems. *How do organisms interact with the living and nonliving environments to obtain matter and energy?* LS2.B Cycles of matter and energy transfer in ecosystems. *How do matter and energy move through an ecosystem?* LS2.C Ecosystem dynamics, functioning, and resilience. *What happens to ecosystems when the environment changes?*	✓ ✓ ✓	✓	✓
Biological evolution: Unity and diversity LS4.C Adaptation. *How does the environment influence populations of organisms over multiple generations?*	✓		
Disciplinary Core Ideas: *Earth and Space Sciences*			
Earth's systems ESS2.A Earth materials and systems. *How do Earth's major systems interact?* ESS2.C The roles of water in Earth's surface processes. *How do the properties and movements of water shape Earth's surface and affect its systems?* ESS2.D Weather and climate. *What regulates weather and climate?*	✓ ✓	 ✓	✓
Earth and human activity ESS3.D Global climate change. *How do people model and predict the effects of human activities on Earth's climate?*	✓	✓	✓
Disciplinary Core Ideas: *Engineering, Technology, and Applications of Science*			
Engineering design ETS1.B Developing possible solutions. *What is the process for developing potential design solutions?*	✓		✓
Links among engineering, technology, science, and society ETS2.B Influence of engineering, technology, and science on society and the natural world. *How do science, engineering, and the technologies that result from them affect the ways in which people live? How do they affect the natural world?*	✓		

Science Standards from the National Research Council (http://www.nationalacademies.org/education)



How Climate Change Is Affecting the Oceans

U.S. Standards Correlation
Grades 6–8

	Text	Lesson 1	Lesson 2
Science			
Scientific and Engineering Practices			
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		✓	✓
Crosscutting Concepts			
1. **Patterns.** Observed patterns of forms and events guide organization and classification, and they prompt questions about relationships and the factors that influence them.	✓	✓	
2. **Cause and effect: Mechanism and explanation.** Events have causes, sometimes simple, sometimes multifaceted. A major activity of science is investigating and explaining causal relationships and the mechanisms by which they are mediated. Such mechanisms can then be tested across given contexts and used to predict and explain events in new contexts.	✓	✓	✓
3. **Scale, proportion, and quantity.** In considering phenomena, it is critical to recognize what is relevant at different measures of size, time, and energy and to recognize how changes in scale, proportion, or quantity affect a system's structure or performance.	✓		✓
4. **Systems and system models.** Defining the system under study—specifying its boundaries and making explicit a model of that system—provides tools for understanding and testing ideas that are applicable throughout science and engineering.		✓	
5. **Energy and matter: Flows, cycles, and conservation.** Tracking fluxes of energy and matter into, out of, and within systems helps one understand the systems' possibilities and limitations.	✓		
7. **Stability and change.** For natural and built systems alike, conditions of stability and determinants of rates of change or evolution of a system are critical elements of study.	✓		

How Climate Change Is Affecting the Oceans

U.S. Standards Correlation (continued)

	Text	Lesson 1	Lesson 2
Disciplinary Core Ideas: *Physical Sciences*			
Matter and its interactions			
PS1.A Structure and properties of matter. *How do particles combine to form the variety of matter one observes?*	✓		
PS1.B Chemical reactions. *How do substances combine or change (react) to make new substances? How does one characterize and explain these reactions and make predictions about them?*			✓
Motion and stability: Forces and interactions			
PS2.C Stability and instability in physical systems. *Why are some physical systems more stable than others?*	✓		
Energy			
PS3.A Definitions of energy. *What is energy?*	✓		
PS3.B Conservation of energy and energy transfer. *What is meant by conservation of energy? How is energy transferred between objects or systems?*	✓		
Disciplinary Core Ideas: *Life Sciences*			
From molecules to organisms: Structures and processes			
LS1.C Organization for matter and energy flow in organisms. *How do organisms obtain and use the matter and energy they need to live and grow?*	✓		
Ecosystems: Interactions, energy, and dynamics			
LS2.A Interdependent relationships in ecosystems. *How do organisms interact with the living and nonliving environments to obtain matter and energy?*	✓		
LS2.B Cycles of matter and energy transfer in ecosystems. *How do matter and energy move through an ecosystem?*	✓		
LS2.C Ecosystem dynamics, functioning, and resilience. *What happens to ecosystems when the environment changes?*	✓		
Disciplinary Core Ideas: *Earth and Space Sciences*			
Earth's systems			
ESS2.A Earth materials and systems. *How do Earth's major systems interact?*	✓	✓	
ESS2.C The roles of water in Earth's surface processes. *How do the properties and movements of water shape Earth's surface and affect its systems?*	✓	✓	
ESS2.D Weather and climate. *What regulates weather and climate?*	✓	✓	
ESS2.E Biogeology. *How do living organisms alter Earth's processes and structures?*	✓		
Earth and human activity			
ESS3.A Natural resources. *How do humans depend on Earth's resources?*	✓		
ESS3.C Human impacts on Earth systems. *How do humans change the planet?*	✓		
ESS3.D Global climate change. *How do people model and predict the effects of human activities on Earth's climate?*	✓		
Disciplinary Core Ideas: *Engineering, Technology, and Applications of Science*			
Engineering design			
ETS1.B Developing possible solutions. *What is the process for developing potential design solutions?*		✓	✓
ETS1.C Optimizing the design solution. *How can the various proposed design solutions be compared and improved?*			✓

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