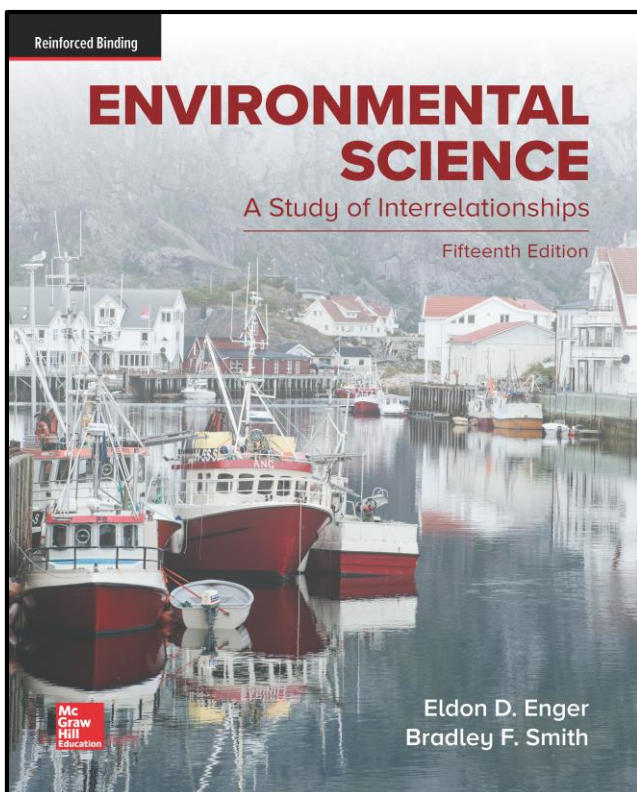




2018 College- and Career Readiness
Standards for Science
Environmental Science



ENVIRONMENTAL SCIENCE

A Study of Interrelationships

Fifteenth Edition

© 2019

STANDARDS

PAGE REFERENCES

ENV.1 Biosphere and Biodiversity

ENV.1 Students will investigate the interdependence of diverse living organisms and their interactions with the components of the biosphere.

ENV.1.1 *Identify, investigate, and evaluate the interactions of the abiotic and biotic factors that determine the types of organisms that live in major biomes.*

Student Edition:
82, 84-86, 91-98, 100-109, 120-140
Critical Thinking Questions 112
Figure 5.1 82
Figure 5.3 85
Figure 5.5 & 5.6 86
Figure 5.19 94

STANDARDS	PAGE REFERENCES
<p><i>Continued from previous cell...</i></p> <p>ENV.1.1 Identify, investigate, and evaluate the interactions of the abiotic and biotic factors that determine the types of organisms that live in major biomes.</p>	<p><i>Continued from previous cell...</i></p> <p>Figure 5.29 102</p> <p>Figure 5.31 107</p> <p>Figure 5.32 109</p> <p>Figure 6.7 120</p> <p>Focus On 105, 141</p> <p>Issues & Analysis 110</p> <p>Review Questions 111, 144 #3-#4</p> <p>Science, Politics, & Policy 83</p>
<p>ENV.1.2 Evaluate evidence in nonfiction text to explain how biological or physical changes within biomes affect populations and communities and how changing conditions may result in altered ecosystems.</p>	<p>Student Edition:</p> <p>258-260</p> <p>Critical Thinking Questions 112 #3; 346 #1-#2</p> <p>Figure 11.18 261</p> <p>Focus On 141, 263</p> <p>Human Impact 125, 126, 127, 128, 129-130, 131, 132, 133, 138, 140</p> <p>Invasive Species 147</p> <p>Issues & Analysis 110, 143</p> <p>Science, Politics, & Policy 83, 142</p>
<p>ENV.1.3 Use models to explain why the flow of energy through an ecosystem can be illustrated by a pyramid with less energy available at the higher trophic levels compared to lower levels.</p>	<p>Student Edition:</p> <p>Figure 5.25 & 5.26 99</p> <p>Review Questions 111 #18</p>
<p>ENV.1.4 Describe symbiotic relationships (e.g., mutualism, parasitism, and commensalism) and other co-evolutionary (e.g., predator-prey, cooperation, competition, and mimicry) relationships within specific environments.</p>	<p>Student Edition:</p> <p>91-96</p> <p>Figure 5.16 & 5.17 92</p> <p>Figure 5.20 & 5.21 95</p> <p>Figure 5.22 & 5.23 96</p> <p>Review Questions 111 #13</p>
<p>ENV.1.5 Develop and use models to diagram the flow of nitrogen, carbon, and phosphorus through the environment.</p>	<p>With classroom discussion, the teacher can introduce developing and using models to diagram these cycles.</p> <p>Student Edition:</p> <p>Figure 5.29 102</p> <p>Figure 5.30 104</p> <p>Figure 5.31 107</p> <p>Figure 5.32 109</p> <p>Review Questions 111 #20-#24</p>

STANDARDS	PAGE REFERENCES
<p>ENV.1.6 Use mathematics, graphics, and informational text to determine how population density-dependent and density-independent limiting factors affect populations and diversity within ecosystems. Use technology to illustrate and compare a variety of population-growth curves.</p>	<p>The definition and explanation of population factors are in the following references. Student Edition: 152-155, 281-282 Field & Laboratory Exercises: <i>Exercise 5 Population Dynamics 30-37</i></p>
<p>ENV.1.7 Analyze and interpret quantitative data to construct explanations of how the carrying capacity of an ecosystem may change as the availability of resources changes.</p>	<p>The teacher can introduce the following standard with classroom discussion using the following references. Student Edition: 154-155, 281-282 <i>Figure 7.8 154</i> Field & Laboratory Exercises: <i>Exercise 7 Human Population Dynamics 45-52</i></p>
<p>ENV.1.8 Utilize data to communicate changes within a given population and the environmental factors that may have impacted these changes (e.g., weather patterns, natural disasters)</p>	<p>The teacher can introduce the following standard with classroom discussion using the following references. Student Edition: <i>Issues & Analysis 174</i></p>
<p>ENV.1.9 Evaluate and communicate data that explains how human activity may impact biodiversity (e.g., introduction, removal, and reintroduction of an organism within an ecosystem; land usage) and genetic variations of organisms, including endangered and threatened species.</p>	<p>Student Edition: 243, 250-263 <i>Critical Thinking Questions 272, 346</i> <i>Figure 11.6 & 11.7 251</i> <i>Focus On 250, 262, 263, 270, 334</i> <i>Review Questions 272 #1-#6</i> Field & Laboratory Exercises: <i>Exercise 1 Primary Productivity 10</i></p>
<p>ENV.1.10 Enrichment: Engage in scientific argument from evidence the benefits versus harm of genetically modified organisms.</p>	<p>The teacher can introduce the following standard with classroom discussion using the following reference. Student Edition: 340-342</p>

STANDARDS

PAGE REFERENCES

ENV.2 Natural Resources Use and Conservation

ENV.2 Students will relate the impact of human activities on the environment, conservation activities, and efforts to maintain and restore ecosystems.

ENV.2.1 Differentiate between renewable and nonrenewable resources, and compare and contrast the pros and cons of using these resources.

Student Edition:

196-218, 223-237

Critical Thinking Questions 220

Focus On 225

Hydraulic Fracturing 195

Review Questions 219 #1, #8-#13, #19; 240 #7-#8, #11

ENV.2.2 Investigate and research the pros and cons of using traditional sources of energy (e.g., fossil fuels) and alternative sources of energy (e.g., water, wind, geothermal, biomass/biofuels, solar).

Student Edition:

Energy Return on Investment 222

Review Questions 240 #7-#8, #11

Field & Laboratory Exercises:

Exercise 14 Evaluating Renewable Energy Sources 105-112

ENV.2.3 Compare and contrast biodegradable and nonbiodegradable wastes and their significance in landfills.

Student Edition:

Focus On 343

Field & Laboratory Exercises:

Exercise 22 Solid Waste Assessment 165-169

ENV.2.4 Examine solutions for developing, conserving, managing, recycling, and reusing energy and mineral resources to minimize impacts in natural systems (e.g., agricultural soil use, mining for coal, construction sites, and exploration of petroleum and natural gas sources).

Student Edition:

312-318

Figure 10.5 227

Figure 10.9 231

Going Green 316

Issues & Analysis 321

Review Questions 322 #9-#10

ENV.2.5 Research various resources related to water quality and pollution (e.g., nonfictional text, EPA's *Surf Your Watershed*, MDEQ publications) and communicate the possible effects on the environment and human health.

Student Edition:

Critical Thinking Questions 464 #2

Issues & Analysis 462

Field & Laboratory Exercises:

Exercise 15 Toxicity Testing 113-121

STANDARDS	PAGE REFERENCES
<p>ENV.2.6 Enrichment: Obtain water from a local source (e.g., stream on campus, rainwater, ditch water) to monitor water quality over time, using a spreadsheet program to graphically represent collected data.</p>	<p>To access resources for this standard, please visit Connect at connect.mheducation.com. There you will find interactive exercises.</p> <p>Field & Laboratory Exercises: <i>Exercise 10 Stream Ecology & Assessment 68-78</i></p>
ENV.3 Human Activities and Climate Change	
ENV.3 Students will discuss the direct and indirect impacts of certain types of human activities on the Earth's climate.	
<p>ENV.3.1 Use a model to describe cycling of carbon through the ocean, atmosphere, soil, and biosphere and how increases in carbon dioxide concentrations have resulted in atmospheric and climate changes.</p>	<p>With classroom discussion, the teacher can introduce this standards using a model to diagram this cycle.</p> <p>Student Edition: 102-103 <i>Figure 5.29 102</i> <i>Figure 5.30 104</i></p>
<p>ENV.3.2 Interpret data and climate models to predict how global and regional climate change can affect Earth's systems (e.g., precipitation, temperature, impacts on sea level, global ice volumes, and atmosphere and ocean composition).</p>	<p>Student Edition: <i>Focus On 417</i></p> <p>Field & Laboratory Exercises: <i>Exercise 19 Global Indicators of Climate Change 145-155</i></p>
<p>ENV.3.3 Use satellite imagery and other resources to analyze changes in biomes over time (e.g., glacial retreat, deforestation, desertification) and propose strategies to reduce the impact of human activities leading to these issues.</p>	<p>Student Edition: <i>Focus On 417</i></p>
<p>ENV.3.4 Enrichment: Determine mathematically an individual's impact on the environment (carbon footprint, water usage, landfill contribution) and develop a plan to reduce personal contribution.</p>	<p>Student Edition: <i>Acting Green 37 #1</i></p> <p>Field & Laboratory Exercises: <i>Exercise 11 Personal Energy Consumption 79-91</i> <i>Exercise 19 Global Indicators of Climate Change 155</i> <i>Exercise 20 Evaluating Ecological Footprint Calculations 156-159</i></p>

ENV.4 Human Sustainability

ENV.4 Students will demonstrate an understanding of the interdependence of human sustainability and the environment.

ENV.4.1 Identify human impact and develop a solution for protection of the atmosphere, considering pollutants (e.g., acid rain, air pollution, smog, ozone layer, or increased levels of greenhouse gases) and the impacts of pollutants on human health (e.g., asthma, COPD, emphysema, and cancer).

Student Edition:
384-387, 391-392, 396-399, 409-412
Critical Thinking Questions 404 #1
Figure 16.3 384
Figure 16.13 392
Figure 16.16 393
Issues & Analysis 402

ENV.4.2 Evaluate data and other information to explain how key natural resources (e.g., water sources, fertile soils, concentrations of minerals, and fossil fuels), natural hazards, and climate changes influence human activity (e.g., mass migrations, human health).

Student Edition:
414-415
Focus On 166
Issues & Analysis 110
Review Questions 423 #8

ENV.4.3 Enrichment: Research and analyze case studies to determine the impact of human-related and natural environmental changes on human health and communicate possible solutions to reduce/resolve the dilemma.

To access resources for this standard, please visit Connect at connect.mheducation.com. There you will find interactive exercises.

ENV.4.4 Enrichment: Explore online resources related to air pollution to determine air quality in a geographic area and communicate the possible effects on the environment and human health.

To access resources for this standard, please visit Connect at connect.mheducation.com. There you will find interactive exercises.

Field & Laboratory Exercises:
Exercise 18 Air Pollution 138-144

ENV.4.5 Enrichment: Use an engineering design process to define a problem, design, construct, evaluate, and improve a device or method to reduce or prevent human impact on a natural resource (e.g., build a water filter, design an air purifier, develop a method to prevent parking lot pollution from entering a watershed).*

To access resources for this standard, please visit Connect at connect.mheducation.com. There you will find interactive exercises.