Grade 5

Standard 1
The Nature of Science and Technology

Students work collaboratively to carry out investigations. They observe and make accurate measurements, increase their use of tools and instruments, record data in journals, and communicate results through chart, graph, written, and verbal forms. Students repeat investigations, explain inconsistencies, and design projects.

The Scientific View of the World

5.1.1 Recognize and describe that results of similar scientific investigations may turn out differently because of inconsistencies in methods, materials, and observations.

How Many Bears Can Live in This Forest? p. 23
Tracks! p. 30
Microtrek Treasure Hunt p. 82
Ecosystem Facelift p. 166
Checks and Balances p. 387

Eat and Glow p. 69
What's in the Air? p. 136
Where Have All the Salmon Gone? p. 166

Scientific Inquiry

5.1.2 Begin to evaluate the validity of claims based on the amount and quality of the evidence cited.

Interview a Spider p. 12
How Many Bears Can Live in This Forest? p. 23
Microtrek Treasure Hunt p. 82
Move Over Rover p. 144
Wildlife in National Symbols p. 186
Cartoons and Bumper Stickers p. 192
For Your Eyes Only p. 197
Ethi-Reasoning p. 203
Wildlife Bibliography p. 253
To Zone or Not to Zone p. 321
Rare Bird Eggs for Sale p. 335
Pro and Con: Consumptive and Nonconsumptive Uses of Wildlife p. 338
Riparian Zone p. 341
Changing the Land p. 345
Litter We Know p. 434

Eat and Glow p. 69
Edge of Home p. 75
Mermaids and Manatees p. 80
Something's Fishy Here! p. 145
To Dam or Not to Dam p. 170
Dragonfly Pond p. 184

The Scientific Enterprise

5.1.3 Explain that doing science involves many different kinds of work and engages men, women, and children of all ages and backgrounds.

Wild Words p. 41
History of Wildlife Management p. 267
To Zone or Not to Zone p. 321
Riparian Zone p. 341
Changing the Land p. 345
Wildwork p. 385

Technology and Science

5.1.4 Give examples of technology, such as telescopes, microscopes, and cameras, that enable scientists and others to observe things that are too small or too far away to be seen without them and to study the motion of objects that are moving very rapidly or are hardly moving.

Noisy Neighbors p. 317

Micro Odyssey p. 49

5.1.5 Explain that technology extends the ability of people to make positive and/or negative changes in the world.

Here Today, Gone Tomorrow p. 1
Time Lapse p. 158
Does Wildlife Sell? p. 213
Lobster in Your Lunch Box p. 245
No Water Off a Duck's Back p. 305
Shrinking Habitat p. 310
Flip the Switch for Wildlife p. 319
Litter We Know p. 434
Enviro-Ethics p. 443

Migration Headache p. 15
Hooks and Ladders p. 43
Net Gain, Net Effect p. 85
What's in the Air? p. 136
To Dam or Not to Dam p. 170
Dragonfly Pond p. 184

5.1.6 Explain how the solution to one problem, such as the use of pesticides in agriculture or the use of dumps for waste disposal, may create other problems.

Oh Deer! p. 36
What Did Your Lunch Cost Wildlife? p. 68
Planting Animals p. 152
Here Today, Gone Tomorrow p. 154
Ecosystem Facelift p. 166
Prairie Memoirs p.188
Ethi-Reasoning p. 203
Lobster in Your Lunch Box p. 245
Changing Societies p. 258
No Water Off a Duck's Back p. 305
Migration Barriers p. 308
Shrinking Habitat p. 310
Smokey Bear Said What? p. 314
Flip the Switch for Wildlife p. 319
To Zone or Not to Zone p. 321

(5.1.6 continued)
Hazardous Links, Possible Solutions p. 326
World Travelers p. 330
Riparian Zone p. 341
Changing the Land p. 345
Career Critters p. 371

Checks and Balances p. 387
Litter We Know p. 434
Planning for People and Wildlife p. 436
Improving Wildlife Habitat in the Community p. 440
Enviro-Ethics p. 443

Migration Headache p. 15
Where Does Water Run? p. 21
Hooks and Ladders p. 43
Blue-Ribbon Niche p. 52
Eat and Glow p. 69
Net Gain, Net Effect p. 85
What's in the Air? p. 136
What's in the Water? p. 140
Something's Fishy Here! p. 145
Alice in Waterland p. 151
Turtle Hurdles p. 158
Aquatic Roots p. 163
To Dam or Not to Dam p. 170
Dragonfly Pond p. 184

5.1.7 Give examples of materials not present in nature, such as cloth, plastic, and concrete, that have become available because of science and technology.

What You Wear Is What They Were p. 210
Hazardous Links, Possible Solutions p. 326
Litter We Know p. 434

Net Gain, Net Effect p. 8

Standard 2
Scientific Thinking

Students use a variety of skills and techniques when attempting to answer questions and solve problems. Students describe their observations accurately and clearly using numbers, words, and sketches, and are able to communicate their thinking to others. They compare, contrast, explain, and justify both information and numerical functions.

Computation and Estimation

5.2.1 Multiply and divide whole numbers mentally, on paper, and with a calculator.

Bearly Growing p. 19
How Many Bears Can Live in This Forest? p. 23
I'm Thirsty p. 134
Lobster in Your Lunch Box p. 245
Changing Societies p. 258
World Travelers p. 330
Checks and Balances p. 387

Where Does Water Run? p. 21
Puddle Wonders! p. 114
How Wet Is Our Planet? p. 121
Watershed p. 132
Water's Going On? p. 149

5.2.2 Use appropriate fractions and decimals when solving problems.

I'm Thirsty p. 134
Lobster in Your Lunch Box p. 245
World Travelers p. 330
Checks and Balances p. 387

Where Does Water Run? p. 21
Puddle Wonders! p. 114
How Wet Is Our Planet? p. 121
Watershed p. 132

Manipulation and Observation

5.2.3 Choose appropriate common materials for making simple mechanical constructions and repairing things.

My Kingdom for a Shelter p. 28
Planning for People and Wildlife p. 436

Designing a Habitat p. 19

5.2.4 Keep a notebook to record observations and be able to distinguish inferences from actual observations.

Wild Words p. 41
Urban Nature Search p. 70
Museum Search for Wildlife p. 182
For Your Eyes Only p. 197
Changing Attitudes p. 255
Noisy Neighbors p. 317
World Travelers p. 330

Water Canaries p. 24
Micro Odyssey p. 49
Eat and Glow p. 69
Edge of Home p. 75

Puddle Wonders! p. 114

5.2.5 Use technology, such as calculators or spreadsheets, in determining area and volume from linear dimensions. Find area, volume, mass, time, and cost, and find the difference between two quantities of anything.


Lobster in Your Lunch Box p. 245


Where Does Water Run? p. 21
Puddle Wonders! p. 114
How Wet Is Our Planet? p. 121
Watershed p. 132

Communication Skills

5.2.6 Write instructions that others can follow in carrying out a procedure.

5.2.7 Read and follow step-by-step instructions when learning new procedures.

Critical Response Skills

5.2.8 Recognize when and describe that comparisons might not be accurate because some of the conditions are not kept the same.


My Kingdom for a Shelter p. 28
Seed Need p. 98
Ecosystem Facelift p. 166


Water Canaries p. 24
Eat and Glow p. 69
Puddle Wonders! p. 114
What's in the Air? p. 136

Standard 3
The Physical Setting

Students continue to investigate changes of Earth and the sky. They explore, describe, and classify materials, motion, and energy.

The Universe

5.3.1 Explain that telescopes are used to magnify distant objects in the sky, including the moon and the planets.

5.3.2 Observe and describe that stars are like the sun, some being smaller and some being larger, but they are so far away that they look like points of light.

5.3.3 Observe the stars and identify stars that are unusually bright and those that have unusual colors, such as reddish or bluish.

Earth and the Processes That Shape It

5.3.4 Investigate that when liquid water disappears it turns into a gas (vapor) mixed into the air and can reappear as a liquid when cooled or as a solid if cooled below the freezing point of water.


Water Wings p. 110

5.3.5 Observe and explain that clouds and fog are made of tiny droplets of water.


Where Does Water Run? p. 21

Alice in Waterland p. 151

Water Wings p. 110

5.3.6 Demonstrate that things on or near Earth are pulled toward it by Earth's gravity.

5.3.7 Describe that, like all planets and stars, Earth is approximately spherical in shape.

Matter and Energy

5.3.8 Investigate, observe, and describe that heating and cooling cause changes in the properties of materials, such as water turning into steam by boiling and water turning into ice by freezing. Notice that many kinds of changes occur faster at higher temperatures.

5.3.9 Investigate, observe, and describe that when warmer things are put with cooler ones, the warm ones lose heat and the cool ones gain it until they are all at the same temperature. Demonstrate that a warmer object can warm a cooler one by contact or at a distance.

5.3.10 Investigate that some materials conduct heat much better than others, and poor conductors can reduce heat loss.

Forces of Nature

5.3.11 Investigate and describe that changes in speed or direction of motion of an object are caused by forces. Understand that the greater the force, the greater the change in motion and the more massive an object, the less effect a given force will have.

5.3.12 Explain that objects move at different rates, with some moving very slowly and some moving too quickly for people to see them.

5.3.13 Demonstrate that Earth's gravity pulls any object toward it without touching it.

Standard 4
The Living Environment

Students learn about an increasing variety of organisms – familiar, exotic, fossil, and microscopic. They use appropriate tools in identifying similarities and differences among these organisms. Students explore how organisms satisfy their needs in their environments.

Diversity of Life

5.4.1 Explain that for offspring to resemble their parents there must be a reliable way to transfer information from one generation to the next.

5.4.2 Observe and describe that some living things consist of a single cell that needs food, water, air, a way to dispose of waste, and an environment in which to live.

5.4.3 Observe and explain that some organisms are made of a collection of similar cells that benefit from cooperating. Explain that some organisms' cells, such as human nerve and muscle cells, vary greatly in appearance and perform very different roles in the organism.

Interdependence of Life and Evolution

5.4.4 Explain that in any particular environment, some kinds of plants and animals survive well, some do not survive as well, and some cannot survive at all.

Habitat Rummy p. 14
Oh Deer! p. 36
Who Fits Here? p. 64
Which Niche? p. 66
Urban Nature Search p. 70
Rainfall and the Forest p. 73
Microtrek Treasure Hunt p. 82
Ants on a Twig p. 88
Quick-Frozen Critters p. 122
Polar Bears in Phoenix? p.125
Adaptation Artistry p. 128
I'm Thirsty p. 134
Move Over Rover p. 144
Planting Animals p. 152
Here Today, Gone Tomorrow p. 154
Time Lapse p. 158
Ecosystem Facelift p. 166
Let's Talk Turkey p. 248
World Travelers p. 330
Career Critters p. 371
Improving Wildlife Habitat in the Community p. 440

Fishy Who's Who p. 8
Whale of a Tail p. 10
Migration Headache p. 15
Designing a Habitat p. 19
Water Canaries p. 24
Blue-Ribbon Niche p. 52
Pond Succession p. 66
Eat and Glow p. 69
Edge of Home p. 75
Puddle Wonders! p. 114
Riparian Retreat p. 118
Aquatic Roots p. 163

5.4.5 Explain how changes in an organism's habitat are sometimes beneficial and sometimes harmful.

How Many Bears Can Live in This Forest? p. 23
Oh Deer! p. 36
Habitat Lap Sit p. 61
Stormy Weather p. 85
Eco-Enrichers p. 102
I'm Thirsty p. 134
Planting Animals p. 152
Here Today, Gone Tomorrow p. 154
Time Lapse p. 158
Ecosystem Facelift p. 166
Prairie Memoirs p. 188
Let's Talk Turkey p. 248
Changing Societies p. 258
No Water Off a Duck's Back p. 305
Migration Barriers p. 308
Shrinking Habitat p. 310
Smokey Bear Said What? p. 314
To Zone or Not to Zone p. 321
Hazardous Links, Possible Solutions p. 326
World Travelers p. 330
Rare Bird Eggs for Sale p. 335
Riparian Zone p. 341
Changing the Land p. 345
Career Critters p. 371
Checks and Balances p. 387
Litter We Know p. 434
Improving Wildlife Habitat in the Community p. 440

(5.4.5 continued)

Migration Headache p. 15
Hooks and Ladders p. 43
Micro Odyssey p. 49 **(E)**
Blue-Ribbon Niche p. 52
Pond Succession p. 66
Eat and Glow p. 69
Watered-Down History p. 91
Puddle Wonders! p. 114
What's in the Air? p. 136
What's in the Water? p. 140
Something's Fishy Here! p. 145
Turtle Hurdles p. 158
Aquatic Roots p. 163
To Dam or Not to Dam p. 170
Dragonfly Pond p. 184

5.4.6 Recognize and explain that most microorganisms do not cause disease and many are beneficial.

Energy Pipeline p. 105 **(E)**

Water Canaries p. 24
Micro Odyssey p. 49
Eat and Glow p. 69
Kelp Help p. 181

5.4.7 Explain that living things, such as plants and animals, differ in their characteristics, and that sometimes these differences can give members of these groups (plants and animals) an advantage in surviving and reproducing.

Interview a Spider p. 12
Habitat Rummy p. 14
Who Fits Here? p. 64
Which Niche? p. 66
Urban Nature Search p. 70
Ants on a Twig p. 88
Quick-Frozen Critters p. 122
Adaptation Artistry p. 128
I'm Thirsty p. 134
World Travelers p. 330

Fishy Who's Who p. 8
Whale of a Tail p. 10
Designing a Habitat p. 19
Blue-Ribbon Niche p. 52
Puddle Wonders! p. 114
Aquatic Roots p. 163

5.4.8 Observe that and describe how fossils can be compared to one another and to living organisms according to their similarities and differences.

Human Identity

5.4.9 Explain that like other animals, human beings have body systems.

Standard 5
The Mathematical World

Students apply mathematics in scientific contexts. They make more precise and varied measurements in gathering data. Their geometric descriptions of objects are comprehensive, and their graphing demonstrates specific connections. They identify questions that can be answered by data distribution, e.g., "Where is the middle?" and their support of claims or answers with reasons and analogies becomes important.

Numbers

5.5.1 Make precise and varied measurements and specify the appropriate units.

Where Does Water Run? p. 21
Puddle Wonders! p. 114
What's in the Air? p. 136

Shapes and Symbolic Relationships

5.5.2 Show that mathematical statements using symbols may be true only when the symbols are replaced by certain numbers.

5.5.3 Classify objects in terms of simple figures and solids.

5.5.4 Compare shapes in terms of concepts, such as parallel and perpendicular, congruence, and symmetry.

5.5.5 Demonstrate that areas of irregular shapes can be found by dividing them into squares and triangles.

Where Does Water Run? p. 21
Puddle Wonders! p. 114
Watershed p. 132

5.5.6 Describe and use drawings to show shapes and compare locations of things very different in size.

Tracks! p. 30
Adaptation Artistry p. 128

Whale of a Tail p. 10
Puddle Wonders! p. 114

Reasoning and Uncertainty

5.5.7 Explain that predictions can be based on what is known about the past, assuming that conditions are similar.

Bearly Growing p. 19
Eco-Enrichers p. 102
Time Lapse p. 158
Ecosystem Facelift p. 166
No Water Off a Duck's Back p. 305
Migration Barriers p. 308
Improving Wildlife Habitat in the Community p. 440

Migration Headache p. 15
Water Canaries p. 24
Pond Succession p. 66
Eat and Glow p. 69
Watered-Down History p. 91
Puddle Wonders! p. 114
What's in the Air? p. 136

5.5.8 Realize and explain that predictions may be more accurate if they are based on large collections of objects or events.

Bearly Growing p. 19
How Many Bears Can Live in This Forest? p. 23
Eco-Enrichers p. 102
Time Lapse p. 158
Ecosystem Facelift p. 166
No Water Off a Duck's Back p. 305

Water Canaries p. 24
Eat and Glow p. 69
Watered-Down History p. 91
Puddle Wonders! p. 114
What's in the Air? p. 136

5.5.9 Show how spreading data out on a number line helps to see what the extremes are, where they pile up, and where the gaps are.

Oh Deer! p. 36
Litter We Know p. 434

Where Have All the Salmon Gone? p. 166

5.5.10 Explain the danger in using only a portion of the data collected to describe the whole.

Standard 6
Common Themes

Students work with an increasing variety of systems and begin to modify parts in systems and models and notice the changes that result.

Systems

5.6.1 Recognize and describe that systems contain objects as well as processes that interact with each other.

How Many Bears Can Live in This Forest? p. 23
Oh Deer! p. 36
Habitat Lap Sit p. 61
Rainfall and the Forest p. 73
What's for Dinner? p. 96
Eco-Enrichers p. 102
Energy Pipeline p. 105
Time Lapse p. 158
Ecosystem Facelift p. 166
Prairie Memoirs p. 188
Wildlife Bibliography p. 253

Changing Societies p. 258
Smokey Bear Said What? p. 314
Hazardous Links, Possible Solutions p. 326
World Travelers p. 330
Career Critters p. 371
Checks and Balances p. 387
Improving Wildlife Habitat in the Community p. 440


Migration Headache p. 15
Designing a Habitat p. 19
Where Does Water Run? p. 21
Wetland Metaphors p. 39
Hooks and Ladders p. 43
Micro Odyssey p. 49
Pond Succession p. 66
Eat and Glow p. 69
Watershed p. 132
What's in the Air? p. 136
What's in the Water? p. 140
Something's Fishy Here! p. 145
Alice in Waterland p. 151
Dragonfly Pond p. 184

Models and Scale

5.6.2 Demonstrate how geometric figures, number sequences, graphs, diagrams, sketches, number lines, maps, and stories can be used to represent objects, events, and processes in the real world, although such representation can never be exact in every detail.


Rainfall and the Forest p. 73
Migration Barriers p. 308
World Travelers p. 330
Changing the Land p. 345
Planning for People and Wildlife p. 436


Fishy Who's Who p. 8
Whale of a Tail p. 10
Migration Headache p. 15
Designing a Habitat p. 19
Pond Succession p. 66
Puddle Wonders! p. 114
Where Have All the Salmon Gone? p. 166

5.6.3 Recognize and describe that almost anything has limits on how big or small it can be.


How Many Bears Can Live in This Forest? p. 23
Oh Deer! p. 36
Checks and Balances p. 387
Planning for People and Wildlife p. 436


Turtle Hurdles p. 158

Constancy and Change

5.6.4 Investigate, observe, and describe that things change in steady, repetitive, or irregular ways, such as toy cars continuing in the same direction and air temperature reaching a high or

low value. Note that the best way to tell which kinds of changes are happening is to make a table or a graph of measurements.

Oh Deer! p. 36
Time Lapse p. 158

Migration Headache p. 15
Pond Succession p. 66
Eat and Glow p. 69

World Travelers p. 330 **(E)**

Puddle Wonders! p. 114
Where Have All the Salmon Gone? p. 166

Grade 6

Standard 1
The Nature of Science and Technology

Students design investigations. They use computers and other technology to collect and analyze data; they explain findings and can relate how they conduct investigations to how the scientific enterprise functions as a whole. Students understand that technology has allowed humans to do many things, yet it cannot always provide solutions to our needs.

The Scientific View of the World

6.1.1 Explain that some scientific knowledge, such as the length of the year, is very old and yet is still applicable today. Understand, however, that scientific knowledge is never exempt from review and criticism.

Migration Barriers p. 308
Smokey Bear Said What? p. 314
Checks and Balances p. 387
Enviro-Ethics p. 443

Aquatic Roots p. 163

Scientific Inquiry

6.1.2 Give examples of different ways scientists investigate natural phenomena and identify processes all scientists use, such as collection of relevant evidence, the use of logical reasoning, and the application of imagination in devising hypotheses and explanations, in order to make sense of the evidence.

Interview a Spider p. 12
How Many Bears Can Live in This Forest? p. 23
Tracks! p. 30 (E)
Rainfall and the Forest p. 73
Owl Pellets p. 100
Eco-Enrichers p. 102
Planting Animals p. 152
History of Wildlife Management p. 267
Noisy Neighbors p. 317
World Travelers p. 330
Rare Bird Eggs for Sale p. 335
Checks and Balances p. 387

Where Does Water Run? p. 21
Water Canaries p. 24
Eat and Glow p. 69
Puddle Wonders! p. 114
Something's Fishy Here! p. 145

6.1.3 Recognize and explain that hypotheses are valuable, even if they turn out not to be true, if they lead to fruitful investigations.

Eco-Enrichers p. 102
Time Lapse p. 158
Wildlife in National Symbols p. 186
No Water Off a Duck's Back p. 305
Flip the Switch for Wildlife p. 319

Water Canaries p. 24
Eat and Glow p. 69
Watered-Down History p. 91
Puddle Wonders! p. 114
What's in the Air? p. 136

The Scientific Enterprise

6.1.4 Give examples of employers who hire scientists, such as colleges and universities, businesses and industries, hospitals, and many government agencies.

Which Niche? p. 66
History of Wildlife Management p. 267
Wildwork p. 385

6.1.5 Identify places where scientists work, including offices, classrooms, laboratories, farms, factories, and natural field settings ranging from space to the ocean floor.

Which Niche? p. 66
Polar Bears in Phoenix? p.125 **(E)**
Planting Animals p. 152
History of Wildlife Management p. 267
No Water Off a Duck's Back p. 305
Wildwork p. 385
Planning for People and Wildlife p. 436

6.1.6 Explain that computers have become invaluable in science because they speed up and extend people's ability to collect, store, compile, and analyze data; prepare research reports; and share data and ideas with investigators all over the world.

Technology and Science

6.1.7 Explain that technology is essential to science for such purposes as access to outer space and other remote locations, sample collection and treatment, measurement, data collection and storage, computation, and communication of information.

6.1.8 Describe instances showing that technology cannot always provide successful solutions for problems or fulfill every human need.

6.1.9 Explain how technologies can influence all living things.

Standard 2
Scientific Thinking

Students use computers and other tools to collect information, calculate, and analyze data. They prepare tables and graphs, using these to summarize data and identify relationships.

Computation and Estimation

6.2.1 Find the mean and median of a set of data.


Water's Going On? p. 149 (E)

6.2.2 Use technology, such as calculators or computer spreadsheets, in analysis of data.


I'm Thirsty p. 134
Time Lapse p. 158
Lobster in Your Lunch Box p. 245


Where Does Water Run? p. 21
Puddle Wonders! p. 114

Manipulation and Observation

6.2.3 Select tools, such as cameras and tape recorders, for capturing information.


Tracks! p. 30
Time Lapse p. 158
Noisy Neighbors p. 317

6.2.4 Inspect, disassemble, and reassemble simple mechanical devices and describe what the various parts are for. Estimate what the effect of making a change in one part of a system is likely to have on the system as a whole.

Communication Skills

6.2.5 Organize information in simple tables and graphs and identify relationships they reveal. Use tables and graphs as examples of evidence for explanations when writing essays or writing about lab work, fieldwork, etc.


Habitat Rummy p. 14
Bearly Growing p. 19
Urban Nature Search p. 70 (E)

Microtrek Treasure Hunt p. 82 (E)
Seed Need p. 98 (E)
Here Today, Gone Tomorrow p. 154

(6.2.5 continued)

Migration Headache p. 15
Water Canaries p. 24
Eat and Glow p. 69
Net Gain, Net Effect p. 85
Time Lapse p. 158 (E)
Lobster in Your Lunch Box p. 245
World Travelers p. 330
Checks and Balances p. 387
What's in the Air? p. 136
What's in the Water? p. 140
Where Have All the Salmon Gone? p. 166

6.2.6 Read simple tables and graphs produced by others and describe in words what they show.


Habitat Rummy p. 14
Bearly Growing p. 19
Oh Deer! p. 36
Here Today, Gone Tomorrow p. 154
Lobster in Your Lunch Box p. 245
World Travelers p. 330
Checks and Balances p. 387


Water Canaries p. 24

6.2.7 Locate information in reference books, back issues of newspapers and magazines, CD-ROMs, and computer databases.


Interview a Spider p. 12
Habitat Rummy p. 14
My Kingdom for a Shelter p. 28
Spider Web Geometry p. 34
Wild Words p. 41
Who Fits Here? p. 64
Which Niche? p. 66
Ants on a Twig p. 88 (E)
Good Buddies p. 91
What's for Dinner? p. 96
Muskox Maneuvers p. 130 (E)
Move Over Rover p. 144
Planting Animals p. 152
Here Today, Gone Tomorrow p. 154
Time Lapse p. 158
Ecosystem Facelift p. 166
Wildlife in National Symbols p. 186
Wildlife Bibliography p. 253
Changing Attitudes p. 255 (E)
Changing Societies p. 258 (E)
History of Wildlife Management p. 267
Smokey Bear Said What? p. 314
Noisy Neighbors p. 317
Flip the Switch for Wildlife p. 319
To Zone or Not to Zone p. 321
Hazardous Links, Possible Solutions p. 326
World Travelers p. 330

Pro and Con: Consumptive and Nonconsumptive Uses of Wildlife p. 338
Riparian Zone p. 341

Fishy Who's Who p. 8
Whale of a Tail p. 10
Migration Headache p. 15 **(E)**
Designing a Habitat p. 19
Water Canaries p. 24 **(E)**
Hooks and Ladders p. 43 **(E)**
Micro Odyssey p. 49
Blue-Ribbon Niche p. 52
Mermaids and Manatees p. 80
Changing the Land p. 345
Career Critters p. 371 **(E)**
Planning for People and Wildlife p. 436

Watered-Down History p. 91
What's in the Water? p. 140 **(E)**
Something's Fishy Here! p. 145
Alice in Waterland p. 151
Aquatic Roots p. 163
Aquatic Times p. 174
Kelp Help p. 181
Dragonfly Pond p. 184 **(E)**

6.2.8 Analyze and interpret a given set of findings, demonstrating that there may be more than one good way to do so.

Bearly Growing p. 19
How Many Bears Can Live in This Forest? p. 23
Tracks! p. 30
Oh Deer! p. 36
Urban Nature Search p. 70
Rainfall and the Forest p. 73
Eco-Enrichers p. 102
I'm Thirsty p. 134
Here Today, Gone Tomorrow p. 154
Time Lapse p. 158
Wildlife in National Symbols p. 186
Ethi-Reasoning p. 203
Lobster in Your Lunch Box p. 245
Changing Attitudes p. 255
Changing Societies p. 258
No Water Off a Duck's Back p. 305
Migration Barriers p. 308
Noisy Neighbors p. 317
Flip the Switch for Wildlife p. 319
To Zone or Not to Zone p. 321
Hazardous Links, Possible Solutions p. 326
World Travelers p. 330
Pro and Con: Consumptive and Nonconsumptive Uses of Wildlife p. 338
Riparian Zone p. 341
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Improving Wildlife Habitat in the Community p. 440

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Edge of Home p. 75
Puddle Wonders! p. 114
What's in the Air? p. 136
What's in the Water? p. 140
Where Have All the Salmon Gone? p. 166

Critical Response Skills

6.2.9 Compare consumer products, such as generic and brand-name products, and consider reasonable personal trade-offs among them on the basis of features, performance, durability, and costs.

What Did Your Lunch Cost Wildlife? p. 68
What You Wear Is What They Were p. 210
Does Wildlife Sell? p. 213
Lobster in Your Lunch Box p. 245
Litter We Know p. 434

Standard 3
The Physical Setting

Students collect and organize data to identify relationships between physical objects, events, and processes. They use logical reasoning to question their own ideas as new information challenges their conceptions of the natural world.

The Universe

6.3.1 Compare and contrast the size, composition, and surface features of the planets that comprise the solar system, as well as the objects orbiting them. Explain that the planets, except Pluto, move around the sun in nearly circular orbits.

6.3.2 Observe and describe that planets change their position relative to the background of stars.

6.3.3 Explain that Earth is one of several planets that orbit the sun, and that the moon, as well as many artificial satellites and debris, orbit around Earth.

Earth and the Processes That Shape It

6.3.4 Explain that we live on a planet which appears at present to be the only body in the solar system capable of supporting life.

6.3.5 Use models or drawings to explain that Earth has different seasons and weather patterns because it turns daily on an axis that is tilted relative to the plane of Earth's yearly orbit around the sun. Know that because of this, sunlight falls more intensely on different parts of Earth during the year (the accompanying greater length of days also has an effect) and the difference in heating produces seasons and weather patterns.

Rainfall and the Forest p. 73

6.3.6 Use models or drawings to explain that the phases of the moon are caused by the moon's orbit around Earth, once in about 28 days, changing what part of the moon is lighted by the sun and how much of that part can be seen from Earth, both during the day and night.

6.3.7 Understand and describe the scales involved in characterizing Earth and its atmosphere. Describe that Earth is mostly rock, that three-fourths of its surface is covered by a relatively thin layer of water, and that the entire planet is surrounded by a relatively thin blanket of air.

6.3.8 Explain that fresh water, limited in supply and uneven in distribution, is essential for life and also for most industrial processes. Understand that this resource can be depleted or polluted, making it unavailable or unsuitable for life.

Habitat Lap Sit p. 61
What Did Your Lunch Cost Wildlife? p. 68
Rainfall and the Forest p. 73
I'm Thirsty p. 134
No Water Off a Duck's Back p. 305
Enviro-Ethics p. 443

(6.3.8 continued)

Migration Headache p. 15
Where Does Water Run? p. 21
Water Canaries p. 24
Wetland Metaphors p. 39
Hooks and Ladders p. 43
Eat and Glow p. 69
Water Wings p. 110
Riparian Retreat p. 118
How Wet Is Our Planet? p. 121
Watershed p. 132
What's in the Air? p. 136
What's in the Water? p. 140
Something's Fishy Here! p. 145
Water's Going On? p. 149
Alice in Waterland p. 151
Turtle Hurdles p. 158
Dragonfly Pond p. 184

6.3.9 Illustrate that the cycling of water in and out of the atmosphere plays an important role in determining climatic patterns.

Rainfall and the Forest p. 73

Where Does Water Run? p. 21
Water Wings p. 110

6.3.10 Describe the motions of ocean waters, such as tides, and identify their causes.

6.3.11 Identify and explain the effects of oceans on climate.

6.3.12 Describe ways human beings protect themselves from adverse weather conditions.

Stormy Weather p. 85
What You Wear Is What They Were p. 210

6.3.13 Identify, explain, and discuss some effects human activities, such as the creation of pollution, have on weather and the atmosphere.

What's in the Water? p. 140
Something's Fishy Here! p. 145

6.3.14 Give examples of some minerals that are very rare and some that exist in great quantities. Explain how recycling and the development of substitutes can reduce the rate of depletion of minerals.

What You Wear Is What They Were p. 210
Enviro-Ethics p. 443

6.3.15 Explain that although weathered rock is the basic component of soil, the composition and texture of soil and its fertility and resistance to erosion are greatly influenced by plant roots and debris, bacteria, fungi, worms, insects, and other organisms.

Eco-Enrichers p. 102
Energy Pipeline p. 105 **(E)**

6.3.16 Explain that human activities, such as reducing the amount of forest cover, increasing the amount and variety of chemicals released into the atmosphere, and farming intensively, have changed the capacity of the environment to support some life forms.

Habitat Lap Sit p. 61
What Did Your Lunch Cost Wildlife? p. 68
Here Today, Gone Tomorrow p. 154
Ecosystem Facelift p. 166
Prairie Memoirs p. 188
Ethi-Reasoning p. 203
Let's Talk Turkey p. 248
Changing Societies p. 258
No Water Off a Duck's Back p. 305
Migration Barriers p. 308
Shrinking Habitat p. 310
Smokey Bear Said What? p. 314
To Zone or Not to Zone p. 321
Hazardous Links, Possible Solutions p. 326
World Travelers p. 330
Rare Bird Eggs for Sale p. 335
Riparian Zone p. 341
Changing the Land p. 345
Career Critters p. 371
Litter We Know p. 434
Planning for People and Wildlife p. 436
Enviro-Ethics p. 443

Migration Headache p. 15
Where Does Water Run? p. 21
Hooks and Ladders p. 43
Blue-Ribbon Niche p. 52
Eat and Glow p. 69
Watered-Down History p. 91
Watershed p. 132
What's in the Air? p. 136
What's in the Water? p. 140
Something's Fishy Here! p. 145
Turtle Hurdles p. 158
Aquatic Roots p. 163
Dragonfly Pond p. 184

Matter and Energy

6.3.17 Recognize and describe that energy is a property of many objects and is associated with heat, light, electricity, mechanical motion, and sound.

6.3.18 Investigate and describe that when a new material, such as concrete, is made by combining two or more materials, it has properties that are different from the original materials.

6.3.19 Investigate that materials may be composed of parts that are too small to be seen without magnification.

6.3.20 Investigate that equal volumes of different substances usually have different masses as well as different densities.

Forces of Nature

6.3.21 Investigate, using a prism for example, that light is made up of a mixture of many different colors of light, even though the light is perceived as almost white.

6.3.22 Demonstrate that vibrations in materials set up wavelike disturbances, such as sound and earthquake waves, that spread away from the source.

6.3.23 Explain that electrical circuits provide a means of transferring electrical energy from sources such as generators to devices in which heat, light, sound, and chemical changes are produced.

Flip the Switch for Wildlife p. 319

Standard 4
The Living Environment

Students recognize that plants and animals obtain energy in different ways, and they can describe some of the internal structures of organisms related to this function. They examine the similarities and differences between humans and other species. They use microscopes to observe cells and recognize cells as the building blocks of all life.

Diversity of Life

6.4.1 Explain that one of the most general distinctions among organisms is between green plants, which use sunlight to make their own food, and animals, which consume energy-rich foods.

What's for Dinner? p. 96
Energy Pipeline p. 105

6.4.2 Give examples of organisms that cannot be neatly classified as either plants or animals, such as fungi and bacteria.

6.4.3 Describe some of the great variety of body plans and internal structures animals and plants have that contribute to their being able to make or find food and reproduce.

What's for Dinner? p. 96
Adaptation Artistry p. 128

Fishy Who's Who p. 8
Whale of a Tail p. 10

Hooks and Ladders p. 43
Puddle Wonders! p. 114

6.4.4 Recognize and describe that a species comprises all organisms that can mate with one another to produce fertile offspring.

6.4.5 Investigate and explain that all living things are composed of cells whose details are usually visible only through a microscope.

6.4.6 Distinguish the main differences between plant and animal cells, such as the presence of chlorophyll and cell walls in plant cells and their absence in animal cells.

6.4.7 Explain that about two-thirds of the mass of a cell is accounted for by water. Understand that water gives cells many of their properties.

Interdependence of Life and Evolution

6.4.8 Explain that in all environments, such as freshwater, marine, forest, desert, grassland, mountain, and others, organisms with similar needs may compete with one another for resources, including food, space, water, air, and shelter. Note that in any environment, the growth and survival of organisms depend on the physical conditions.

How Many Bears Can Live in This Forest? p. 23
My Kingdom for a Shelter p. 28
Oh Deer! p. 36
Habitat Lap Sit p. 61
Who Fits Here? p. 64
Which Niche? p. 66 (E)
Urban Nature Search p. 70
Rainfall and the Forest p. 73
Stormy Weather p. 85
Good Buddies p. 91
Quick-Frozen Critters p. 122

Polar Bears in Phoenix? p.125
Adaptation Artistry p. 128
Muskox Maneuvers p. 130
I'm Thirsty p. 134
Move Over Rover p. 144
Planting Animals p. 152
Here Today, Gone Tomorrow p. 154
Ecosystem Facelift p. 166


Fishy Who's Who p. 8
Whale of a Tail p. 10
Migration Headache p. 15
Designing a Habitat p. 19
Water Canaries p. 24
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Blue-Ribbon Niche p. 52
Eat and Glow p. 69
No Water Off a Duck's Back p. 305
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Smokey Bear Said What? p. 314
World Travelers p. 330
Checks and Balances p. 387
Litter We Know p. 434
Improving Wildlife Habitat in the Community p. 440

Puddle Wonders! p. 114
What's in the Air? p. 136
What's in the Water? p. 140
Something's Fishy Here! p. 145
Alice in Waterland p. 151
Turtle Hurdles p. 158
Aquatic Roots p. 163

6.4.9 Recognize and explain that two types of organisms may interact in a competitive or cooperative relationship, such as producer/consumer, predator/prey, or parasite/host.


Oh Deer! p. 36
Good Buddies p. 91
Seed Need p. 98
Owl Pellets p. 100
Quick-Frozen Critters p. 122
Muskox Maneuvers p. 130
Ecosystem Facelift p. 166
Prairie Memoirs p. 188
World Travelers p. 330
Checks and Balances p. 387
Improving Wildlife Habitat in the Community p. 440


Fishy Who's Who p. 8
Aquatic Roots p. 163

6.4.10 Describe how life on Earth depends on energy from the sun.

Human Identity

6.4.11 Describe that human beings have body systems for obtaining and providing energy, defense, reproduction, and the coordination of body functions.

6.4.12 Explain that human beings have many similarities and differences and that the similarities make it possible for human beings to reproduce and to donate blood and organs to one another.

6.4.13 Give examples of how human beings use technology to match or exceed many of the abilities of other species.

Enviro-Ethics p. 443

Standard 5
The Mathematical World

Students apply mathematics in scientific contexts. They use mathematical ideas, such as relations between operations, symbols, shapes in three dimensions, statistical relationships, and the use of logical reasoning in the representation and synthesis of data.

Numbers

6.5.1 Demonstrate that the operations addition and subtraction are inverses and that multiplication and division are inverses of each other.

6.5.2 Evaluate the precision and usefulness of data based on measurements taken.

Shapes and Symbolic Relationships

6.5.3 Explain why shapes on a sphere like Earth cannot be depicted on a flat surface without some distortion.

6.5.4 Demonstrate how graphs may help to show patterns — such as trends, varying rates of change, gaps, or clusters — which can be used to make predictions.

Bearly Growing p. 19
Oh Deer! p. 36

Migration Headache p. 15
Eat and Glow p. 69
Net Gain, Net Effect p. 85
What's in the Air? p. 136
Time Lapse p. 158 (E)
World Travelers p. 330

What's in the Water? p. 140
Where Have All the Salmon Gone? p. 166

Reasoning and Uncertainty

6.5.5 Explain the strengths and weaknesses of using an analogy to help describe an event, object, etc.

Wetland Metaphors p. 39

6.5.6 Predict the frequency of the occurrence of future events based on data.

How Many Bears Can Live in This Forest? p. 23

Oh Deer! p. 36
Time Lapse p. 158

Pond Succession p. 66
Eat and Glow p. 69

Watered-Down History p. 91
Puddle Wonders! p. 114

6.5.7 Demonstrate how probabilities and ratios can be expressed as fractions, percentages, or odds.

Standard 6
Historical Perspectives

Students gain understanding of how the scientific enterprise operates through examples of historical events. Through the study of these events, they understand that new ideas are limited by the context in which they are conceived, are often rejected by the scientific establishment, sometimes spring from unexpected findings, and grow or transform slowly through the contributions of many different investigators.

6.6.1 Understand and explain that from the earliest times until now, people have believed that even though countless different kinds of materials seem to exist in the world, most things can be made up of combinations of just a few basic kinds of things. Note that there has not always been agreement, however, on what those basic kinds of things are, such as the theory of long ago that the basic substances were earth, water, air, and fire. Understand that this theory seemed to explain many observations about the world, but as we know now, it fails to explain many others.

6.6.2 Understand and describe that scientists are still working out the details of what the basic kinds of matter are on the smallest scale, and of how they combine, or can be made to combine, to make other substances.

6.6.3 Understand and explain that the experimental and theoretical work done by French scientist Antoine Lavoisier in the decade between the American and French Revolutions contributed crucially to the modern science of chemistry.

Standard 7
Common Themes

Students use mental and physical models to conceptualize processes. They recognize that many systems have feedback mechanisms that limit changes.

Systems

6.7.1 Describe that a system, such as the human body, is composed of subsystems.

Models and Scale

6.7.2 Use models to illustrate processes that happen too slowly, too quickly, or on too small a scale to observe directly, or are too vast to be changed deliberately, or are potentially dangerous.


Time Lapse p. 158


Pond Succession p. 66
Watered-Down History p. 91

Constancy and Change

6.7.3 Identify examples of feedback mechanisms within systems that serve to keep changes within specified limits.


How Many Bears Can Live in This Forest? p. 23
Oh Deer! p. 36
Smokey Bear Said What? p. 314
Career Critters p. 371
Checks and Balances p. 387


Hooks and Ladders p. 43

Grade 7

Standard 1
The Nature of Science and Technology

Students further their scientific understanding of the natural world through investigations, experiences, and readings. They design solutions to practical problems by using a variety of scientific methodologies.

The Scientific View of the World

7.1.1 Recognize and explain that when similar investigations give different results, the scientific challenge is to judge whether the differences are trivial or significant, which often takes further studies to decide.

Enviro-Ethics p. 443

Puddle Wonders! p. 114
Where Have All the Salmon Gone? p. 166

Scientific Inquiry

7.1.2 Explain that what people expect to observe often affects what they actually do observe and provide an example of a solution to this problem.

Saturday Morning Wildlife Watching p. 184
For Your Eyes Only p. 197
Changing Attitudes p. 255
Enviro-Ethics p. 443

7.1.3 Explain why it is important in science to keep honest, clear, and accurate records.

Enviro-Ethics p. 443

7.1.4 Describe that different explanations can be given for the same evidence, and it is not always possible to tell which one is correct without further inquiry.

Tracks! p. 30 **(E)**
Enviro-Ethics p. 443

Something's Fishy Here! p. 145
Where Have All the Salmon Gone? p. 166

The Scientific Enterprise

7.1.5 Identify some important contributions to the advancement of science, mathematics, and technology that have been made by different kinds of people, in different cultures, at different times.

Wild Words p. 41
Power of a Song p. 194
For Your Eyes Only p. 197
Changing Societies p. 258
History of Wildlife Management p. 267
Enviro-Ethics p. 443

Net Gain, Net Effect p. 85

7.1.6 Provide examples of people who overcame bias and/or limited opportunities in education and employment to excel in the fields of science.

Technology and Science

7.1.7 Explain how engineers, architects, and others who engage in design and technology use scientific knowledge to solve practical problems.

To Zone or Not to Zone p. 321
Riparian Zone p. 341
Changing the Land p. 345
Planning for People and Wildlife p. 436

Designing a Habitat p. 19
Dragonfly Pond p. 184

7.1.8 Explain that technologies often have drawbacks as well as benefits. Consider a technology, such as the use of pesticides, which helps some organisms but may hurt others, either deliberately or inadvertently.

What Did Your Lunch Cost Wildlife? p. 68
Here Today, Gone Tomorrow p. 154
Prairie Memoirs p. 188
What You Wear Is What They Were p. 210
Lobster in Your Lunch Box p. 245
No Water Off a Duck's Back p. 305
Shrinking Habitat p. 310
Noisy Neighbors p. 317
Flip the Switch for Wildlife p. 319
Hazardous Links, Possible Solutions p. 326
World Travelers p. 330
Litter We Know p. 434
Enviro-Ethics p. 443

Migration Headache p. 15
Where Does Water Run? p. 21
Hooks and Ladders p. 43
Net Gain, Net Effect p. 85

What's in the Air? p. 136
What's in the Water? p. 140
Something's Fishy Here! p. 145
Alice in Waterland p. 151
Turtle Hurdles p. 158
To Dam or Not to Dam p. 170
Dragonfly Pond p. 184

7.1.9 Explain how societies influence what types of technology are developed and used in fields such as agriculture, manufacturing, sanitation, medicine, warfare, transportation, information processing, and communication.


Prairie Memoirs p. 188
Wildlife Bibliography p. 253
Changing Societies p. 258
Enviro-Ethics p. 443


Net Gain, Net Effect p. 85

7.1.10 Identify ways that technology has strongly influenced the course of history and continues to do so.


Prairie Memoirs p. 188
Enviro-Ethics p. 443


Net Gain, Net Effect p. 85
Watered-Down History p. 91
Where Have All the Salmon Gone? p. 166

7.1.11 Illustrate how numbers can be represented using sequences of only two symbols, such as 1 and 0 or on and off, and how that affects the storage of information in our society.

Standard 2
Scientific Thinking

Students use instruments and tools to measure, calculate, and organize data. They frame arguments in quantitative terms when possible. They question claims and understand that findings may be interpreted in more than one acceptable way.

Computation and Estimation

7.2.1 Find what percentage one number is of another and figure any percentage of any number.


How Many Bears Can Live in This Forest? p. 23
Lobster in Your Lunch Box p. 245
World Travelers p. 330


How Wet Is Our Planet? p. 121

7.2.2 Use formulas to calculate the circumferences and areas of rectangles, triangles, and circles, and the volumes of rectangular solids.

Where Does Water Run? p. 21
Puddle Wonders! p. 114
Watershed p. 132
What's in the Air? p. 136

7.2.3 Decide what degree of precision is adequate, based on the degree of precision of the original data, and round off the result of calculator operations to significant figures that reasonably reflect those of the inputs.

7.2.4 Express numbers like 100, 1,000, and 1,000,000 as powers of 10.

7.2.5 Estimate probabilities of outcomes in familiar situations, on the basis of history or the number of possible outcomes.


How Many Bears Can Live in This Forest? p. 23

Manipulation and Observation

7.2.6 Read analog and digital meters on instruments used to make direct measurements of length, volume, weight, elapsed time, rates, or temperatures, and choose appropriate units.


Noisy Neighbors p. 317

Where Does Water Run? p. 21

Communication Skills

7.2.7 Incorporate circle charts, bar and line graphs, diagrams, scatterplots, and symbols into writing, such as lab or research reports, to serve as evidence for claims and/or conclusions.

Where Have All the Salmon Gone? p. 166 **(E)**

Critical Response Skills

7.2.8 Question claims based on vague attributes, such as "Leading doctors say ...," or on statements made by celebrities or others outside the area of their particular expertise.


Saturday Morning Wildlife Watching p. 184
Cartoons and Bumper Stickers p. 192
For Your Eyes Only p. 197
Ethi-Reasoning p. 203
Does Wildlife Sell? p. 213
To Zone or Not to Zone p. 321
Rare Bird Eggs for Sale p. 335
Pro and Con: Consumptive and Nonconsumptive Uses of Wildlife p. 338
Riparian Zone p. 341
Changing the Land p. 345
Enviro-Ethics p. 443

Standard 3
The Physical Setting

Students collect and organize data to identify relationships between physical objects, events, and processes. They use logical reasoning to question their own ideas as new information challenges their conceptions of the natural world.

The Universe

7.3.1 Recognize and describe that the sun is a medium-sized star located near the edge of a disk-shaped galaxy of stars and that the universe contains many billions of galaxies and each galaxy contains many billions of stars.

7.3.2 Recognize and describe that the sun is many thousands of times closer to Earth than any other star, allowing light from the sun to reach Earth in a few minutes. Note that this may be compared to time spans of longer than a year for all other stars.

Earth and the Processes That Shape It

7.3.3 Describe how climates sometimes have changed abruptly in the past as a result of changes in Earth's crust, such as volcanic eruptions or impacts of huge rocks from space.

7.3.4 Explain how heat flow and movement of material within Earth causes earthquakes and volcanic eruptions and creates mountains and ocean basins.

7.3.5 Recognize and explain that heat energy carried by ocean currents has a strong influence on climate around the world.

7.3.6 Describe how gas and dust from large volcanoes can change the atmosphere.

7.3.7 Give examples of some changes in Earth's surface that are abrupt, such as earthquakes and volcanic eruptions, and some changes that happen very slowly, such as uplift and wearing down of mountains and the action of glaciers.

Time Lapse p. 158

Pond Succession p. 66

7.3.8 Describe how sediments of sand and smaller particles, sometimes containing the remains of organisms, are gradually buried and are cemented together by dissolved minerals to form solid rock again.

7.3.9 Explain that sedimentary rock, when buried deep enough, may be reformed by pressure and heat, perhaps melting and recrystallizing into different kinds of rock. Describe that these reformed rock layers may be forced up again to become land surface and even mountains, and subsequently erode.

7.3.10 Explain how the thousands of layers of sedimentary rock can confirm the long history of the changing surface of Earth and the changing life forms whose remains are found in successive layers, although the youngest layers are not always found on top, because of folding, breaking, and uplifting of layers.

Matter and Energy

7.3.11 Explain that the sun loses energy by emitting light. Note that only a tiny fraction of that light reaches Earth. Understand that the sun's energy arrives as light with a wide range of wavelengths, consisting of visible light and infrared and ultraviolet radiation.

7.3.12 Investigate how the temperature and acidity of a solution influences reaction rates, such as those resulting in food spoilage.

7.3.13 Explain that many substances dissolve in water. Understand that the presence of these substances often affects the rates of reactions that are occurring in the water as compared to the same reactions occurring in the water in the absence of the substances.

7.3.14 Explain that energy in the form of heat is almost always one of the products of an energy trans-formation, such as in the examples of exploding stars, biological growth, the operation of machines, and the motion of people.

7.3.15 Describe how electrical energy can be produced from a variety of energy sources and can be transformed into almost any other form of energy, such as light or heat.

Flip the Switch for Wildlife p. 319

7.3.16 Recognize and explain that different ways of obtaining, transforming, and distributing energy have different environmental consequences.

Flip the Switch for Wildlife p. 319
Enviro-Ethics p. 443

Water's Going On? p. 149 (E)

Forces of Nature

7.3.17 Investigate that an unbalanced force, acting on an object, changes its speed or path of motion or both, and know that if the force always acts toward the same center as the object moves, the object's path may curve into an orbit around the center.

7.3.18 Describe that light waves, sound waves, and other waves move at different speeds in different materials.

7.3.19 Explain that human eyes respond to a narrow range of wavelengths of the electromagnetic spectrum.

7.3.20 Describe that something can be "seen" when light waves emitted or reflected by it enter the eye just as something can be "heard" when sound waves from it enter the ear.

Standard 4
The Living Environment

Students begin to trace the flow of matter and energy through ecosystems. They recognize the fundamental difference between plants and animals and understand its basis at the cellular level. Students distinguish species, particularly through an examination of internal structures and functions. They use microscopes to observe cells and recognize that cells function in similar ways in all organisms.

Diversity of Life

7.4.1 Explain that similarities among organisms are found in external and internal anatomical features, including specific characteristics at the cellular level, such as the number of chromosomes. Understand that these similarities are used to classify organisms since they may be used to infer the degree of relatedness among organisms.

Rare Bird Eggs for Sale p. 335

7.4.2 Describe that all organisms, including the human species, are part of and depend on two main interconnected global food webs, the ocean food web and the land food web.

Oh Deer! p. 36
What Did Your Lunch Cost Wildlife? p. 68
Good Buddies p. 91
What's for Dinner? p. 96
Owl Pellets p. 100
Eco-Enrichers p. 102
Energy Pipeline p. 105
Quick-Frozen Critters p. 122
Muskox Maneuvers p. 130
Ecosystem Facelift p. 166
Lobster in Your Lunch Box p. 245
Hazardous Links, Possible Solutions p. 326
Career Critters p. 371
Checks and Balances p. 387

Fishy Who's Who p. 8
Whale of a Tail p. 10
Migration Headache p. 15
Micro Odyssey p. 49
Blue-Ribbon Niche p. 52
Eat and Glow p. 69
Kelp Help p. 181

7.4.3 Explain how, in sexual reproduction, a single specialized cell from a female merges with a specialized cell from a male and this fertilized egg carries genetic information from each parent and multiplies to form the complete organism.

7.4.4 Explain that cells continually divide to make more cells for growth and repair and that various organs and tissues function to serve the needs of cells for food, air, and waste removal.

7.4.5 Explain that the basic functions of organisms, such as extracting energy from food and getting rid of wastes, are carried out within the cell and understand that the way in which cells function is similar in all organisms.

Interdependence of Life and Evolution

7.4.6 Explain how food provides the fuel and the building material for all organisms.

What Did Your Lunch Cost Wildlife? p. 68

Energy Pipeline p. 105
Lobster in Your Lunch Box p. 245

7.4.7 Describe how plants use the energy from light to make sugars from carbon dioxide and water to produce food that can be used immediately or stored for later use.

What's for Dinner? p. 96
Energy Pipeline p. 105

7.4.8 Describe how organisms that eat plants break down the plant structures to produce the materials and energy that they need to survive, and in turn, how they are consumed by other organisms.

What's for Dinner? p. 96
Energy Pipeline p. 105

Muskox Maneuvers p. 130

7.4.9 Understand and explain that as any population of organisms grows, it is held in check by one or more environmental factors. These factors could result in depletion of food or nesting sites and/or increased loss to increased numbers of predators or parasites. Give examples of some consequences of this.

How Many Bears Can Live in This Forest? p. 23
Oh Deer! p. 36
Quick-Frozen Critters p. 122
Muskox Maneuvers p. 130
Ecosystem Facelift p. 166
Changing Societies p. 258

Smokey Bear Said What? p. 314
Career Critters p. 371
Checks and Balances p. 387
Planning for People and Wildlife p. 436
Improving Wildlife Habitat in the Community p. 440

Migration Headache p. 15
Hooks and Ladders p. 43
Puddle Wonders! p. 114

Turtle Hurdles p. 158
Where Have All the Salmon Gone? p. 166

Human Identity

7.4.10 Describe how technologies having to do with food production, sanitation, and disease prevention have dramatically changed how people live and work and have resulted in changes in factors that affect the growth of human population.

What Did Your Lunch Cost Wildlife? p. 68
Lobster in Your Lunch Box p. 245

7.4.11 Explain that the amount of food energy (calories) a person requires varies with body weight, age, sex, activity level, and natural body efficiency. Understand that regular exercise is important to maintain a healthy heart/lung system, good muscle tone, and strong bone structure.

7.4.12 Explain that viruses, bacteria, fungi, and parasites may infect the human body and interfere with normal body functions. Recognize that a person can catch a cold many times because there are many varieties of cold viruses that cause similar symptoms.

7.4.13 Explain that white blood cells engulf invaders or produce antibodies that attack invaders or mark the invaders for killing by other white blood cells. Know that the antibodies produced will remain and can fight off subsequent invaders of the same kind.

7.4.14 Explain that the environment may contain dangerous levels of substances that are harmful to human beings. Understand, therefore, that the good health of individuals requires monitoring the soil, air, and water as well as taking steps to keep them safe.

Hazardous Links, Possible Solutions p. 326

Planning for People and Wildlife p. 436
Enviro-Ethics p. 443

Where Does Water Run? p. 21
Riparian Retreat p. 118
What's in the Air? p. 136

What's in the Water? p. 140
Something's Fishy Here! p. 145

Standard 5
The Mathematical World

Students apply mathematics in scientific contexts. They use mathematical ideas, such as relations between operations, symbols, statistical relationships, and the use of logical reasoning, in the representation and synthesis of data.

Numbers

7.5.1 Demonstrate how a number line can be extended on the other side of zero to represent negative numbers and give examples of instances where this is useful.

Shapes and Symbolic Relationships

7.5.2 Illustrate how lines can be parallel, perpendicular, or oblique.

Spider Web Geometry p. 34

7.5.3 Demonstrate how the scale chosen for a graph or drawing determines its interpretation.


Whale of a Tail p. 10

Reasoning and Uncertainty

7.5.4 Describe that the larger the sample, the more accurately it represents the whole. Understand, however, that any sample can be poorly chosen and this will make it unrepresentative of the whole.


Water Canaries p. 24

Standard 6
Historical Perspectives

Students gain understanding of how the scientific enterprise operates through examples of historical events. Through the study of these events, they understand that new ideas are limited by the context in which they are conceived, are often rejected by the scientific establishment, sometimes spring from unexpected findings, and grow or transform slowly through the contributions of many different investigators.

7.6.1 Understand and explain that throughout history, people have created explanations for disease. Note that some held that disease had spiritual causes, but that the most persistent biological theory over the centuries was that illness resulted from an imbalance in the body fluids. Realize that the introduction of germ theory by Louis Pasteur and others in the nineteenth century led to the modern understanding of how many diseases are caused by microorganisms, such as bacteria, viruses, yeasts, and parasites.

7.6.2 Understand and explain that Louis Pasteur wanted to find out what caused milk and wine to spoil. Note that he demonstrated that spoilage and fermentation* occur when microorganisms enter from the air, multiply rapidly, and produce waste products, with some desirable results, such as carbon dioxide in bread dough, and some undesirable, such as acetic acid in wine. Understand that after showing that spoilage could be avoided by keeping germs out or by destroying them with heat, Pasteur investigated animal diseases and showed that microorganisms were involved in many of them. Also note that other investigators later showed that specific kinds of germs caused specific diseases.

7.6.3 Understand and explain that Louis Pasteur found that infection by disease organisms (germs) caused the body to build up an immunity against subsequent infection by the same organisms. Realize that Pasteur then demonstrated more widely what Edward Jenner had shown for smallpox without understanding the underlying mechanism: that it was possible to produce vaccines that would induce the body to build immunity to a disease without actually causing the disease itself.

7.6.4 Understand and describe that changes in health practices have resulted from the acceptance of the germ theory of disease. Realize that before germ theory, illness was treated by appeals to supernatural powers or by attempts to adjust body fluids through induced vomiting or bleeding. Note that the modern approach emphasizes sanitation, the safe handling

of food and water, the pasteurization of milk, quarantine, and aseptic surgical techniques to keep germs out of the body; vaccinations to strengthen the body's immune system against subsequent infection by the same kind of microorganisms; and antibiotics and other chemicals and processes to destroy microorganisms.

Standard 7
Common Themes

Students analyze the relationships within systems. They investigate how different models can represent the same data, rates of change, cyclic changes, and changes that counterbalance one another.

Systems

7.7.1 Explain that the output from one part of a system, which can include material, energy, or information, can become the input to other parts and this feedback can serve to control what goes on in the system as a whole.

Oh Deer! p. 36
Time Lapse p. 158
Ecosystem Facelift p. 166
Pay to Play p. 216
Smokey Bear Said What? p. 314
Career Critters p. 371
Checks and Balances p. 387

Where Does Water Run? p. 21
Wetland Metaphors p. 39
Hooks and Ladders p. 43
Pond Succession p. 66
Alice in Waterland p. 151

Models and Scale

7.7.2 Use different models to represent the same thing, noting that the kind of model and its complexity should depend on its purpose.

Whale of a Tail p. 10 **(E)**

Constancy and Change

7.7.3 Describe how physical and biological systems tend to change until they reach equilibrium and remain that way unless their surroundings change.

How Many Bears Can Live in This Forest? p. 23
Oh Deer! p. 36
Checks and Balances p. 387

Hooks and Ladders p. 43

7.7.4 Use symbolic equations to show how the quantity of something changes over time or in response to changes in other quantities.

Oh Deer! p. 36

Where Have All the Salmon Gone? p. 166

Grade 8

Standard 1
The Nature of Science and Technology

Students design and carry out increasingly sophisticated investigations. They understand the reason for isolating and controlling variables in an investigation. They realize that scientific knowledge is subject to change as new evidence arises. They examine issues in the design and use of technology, including constraints, safeguards, and trade-offs.

The Scientific View of the World

8.1.1 Recognize that and describe how scientific knowledge is subject to modification as new information challenges prevailing theories and as a new theory leads to looking at old observations in a new way.

Changing Attitudes p. 255
Hazardous Links, Possible Solutions p. 326
Rare Bird Eggs for Sale p. 335
Checks and Balances p. 387
Enviro-Ethics p. 443

8.1.2 Recognize and explain that some matters cannot be examined usefully in a scientific way.

Scientific Inquiry

8.1.3 Recognize and describe that if more than one variable changes at the same time in an experiment, the outcome of the experiment may not be attributable to any one of the variables.

How Many Bears Can Live in This Forest? p. 23
Eco-Enrichers p. 102
Here Today, Gone Tomorrow p. 154
Time Lapse p. 158
Ecosystem Facelift p. 166

What's in the Air? p. 136

The Scientific Enterprise

8.1.4 Explain why accurate record keeping, openness, and replication are essential for maintaining an investigator's credibility with other scientists and society.

Enviro-Ethics p. 443

8.1.5 Explain why research involving human subjects requires that potential subjects be fully informed about the risks and benefits associated with the research and that they have the right to refuse to participate.

Technology and Science

8.1.6 Identify the constraints that must be taken into account as a new design is developed, such as gravity and the properties of the materials to be used.

What You Wear Is What They Were p. 210
Shrinking Habitat p. 310
Planning for People and Wildlife p. 436
Improving Wildlife Habitat in the Community p. 440

Designing a Habitat p. 19
Dragonfly Pond p. 184

8.1.7 Explain why technology issues are rarely simple and one-sided because contending groups may have different values and priorities.

Prairie Memoirs p. 188
What You Wear Is What They Were p. 210
No Water Off a Duck's Back p. 305
Shrinking Habitat p. 310
Noisy Neighbors p. 317
Flip the Switch for Wildlife p. 319
To Zone or Not to Zone p. 321
Riparian Zone p. 341
Changing the Land p. 345
Enviro-Ethics p. 443

Net Gain, Net Effect p. 85
Something's Fishy Here! p. 145
To Dam or Not to Dam p. 170
Dragonfly Pond p. 184

8.1.8 Explain that humans help shape the future by generating knowledge, developing new technologies, and communicating ideas to others.

What You Wear Is What They Were p. 210
Let's Talk Turkey p. 248
Wildlife Bibliography p. 253
Changing Attitudes p. 255
History of Wildlife Management p. 267
Enviro-Ethics p. 443

Watered-Down History p. 91

Standard 2
Scientific Thinking

Students use computers to organize and compare information. They perform calculations and determine the appropriate units for the answers. They weigh the evidence for or against an argument, as well as the logic of the conclusions.

Computation and Estimation

8.2.1 Estimate distances and travel times from maps and the actual size of objects from scale drawings.

8.2.2 Determine in what units, such as seconds, meters, grams, etc., an answer should be expressed based on the units of the inputs to the calculation.

I'm Thirsty p. 134

Where Does Water Run? p. 21
Watershed p. 132

Manipulation and Observation

8.2.3 Use proportional reasoning to solve problems.

8.2.4 Use technological devices, such as calculators and computers, to perform calculations.

I'm Thirsty p. 134

Where Does Water Run? p. 21
Puddle Wonders! p. 114

8.2.5 Use computers to store and retrieve information in topical, alphabetical, numerical, and keyword files and create simple files of students' own devising.

What's in the Air? p. 136

Communication

8.2.6 Write clear, step-by-step instructions (procedural summaries) for conducting investigations, operating something, or following a procedure.

8.2.7 Participate in group discussions on scientific topics by restating or summarizing accurately what others have said, asking for clarification or elaboration, and expressing alternative positions.

How Many Bears Can Live in This Forest? p. 23

Habitat Lap Sit p. 61
Rainfall and the Forest p. 73

Good Buddies p. 91
Polar Bears in Phoenix? p.125
Here Today, Gone Tomorrow p. 154
Prairie Memoirs p. 188
Ethi-Reasoning p. 203
What You Wear Is What They Were p. 210
Pay to Play p. 216
Lobster in Your Lunch Box p. 245
Let's Talk Turkey p. 248
Changing Attitudes p. 255
No Water Off a Duck's Back p. 305
Shrinking Habitat p. 310
Smokey Bear Said What? p. 314
To Zone or Not to Zone p. 321
Rare Bird Eggs for Sale p. 335

(8.2.7 continued)

Pro and Con: Consumptive and Nonconsumptive Uses of Wildlife p. 338
Riparian Zone p. 341
Changing the Land p. 345
Career Critters p. 371
Checks and Balances p. 387
Planning for People and Wildlife p. 436
Improving Wildlife Habitat in the Community p. 440
Enviro-Ethics p. 443


Fishy Who's Who p. 8
Where Does Water Run? p. 21
Edge of Home p. 75
What's in the Water? p. 140
Something's Fishy Here! p. 145
Water's Going On? p. 149
Where Have All the Salmon Gone? p. 166
To Dam or Not to Dam p. 170

8.2.8 Use tables, charts, and graphs in making arguments and claims in, for example, oral and written presentations about lab or fieldwork.


World Travelers p. 330


Where Have All the Salmon Gone? p. 166

Critical Response Skills

8.2.9 Explain why arguments are invalid if based on very small samples of data, biased samples, or samples for which there was no control sample.


Eat and Glow p. 69
What's in the Air? p. 136

8.2.10 Identify and criticize the reasoning in arguments in which fact and opinion are intermingled or the conclusions do not follow logically from the evidence given, an analogy is not apt, no mention is made of whether the control group is very much like the experimental

group, or all members of a group are implied to have nearly identical characteristics that differ from those of other groups.

Saturday Morning Wildlife Watching p. 184
Cartoons and Bumper Stickers p. 192
The Hunter p. 287
To Zone or Not to Zone p. 321
Rare Bird Eggs for Sale p. 335

To Dam or Not to Dam p. 170
Dragonfly Pond p. 184

Pro and Con: Consumptive and Nonconsumptive Uses of Wildlife p. 338
Riparian Zone p. 341
Changing the Land p. 345
Enviro-Ethics p. 443

Standard 3
The Physical Setting

Students collect and organize data to identify relationships between physical objects, events, and processes. They use logical reasoning to question their own ideas as new information challenges their conceptions of the natural world.

The Universe

8.3.1 Explain that large numbers of chunks of rock orbit the sun and some of this rock interacts with Earth.

Earth and the Processes That Shape It

8.3.2 Explain that the slow movement of material within Earth results from heat flowing out of the deep interior and the action of gravitational forces on regions of different density.

8.3.3 Explain that the solid crust of Earth, including both the continents and the ocean basins, consists of separate plates that ride on a denser, hot, gradually deformable layer of earth. Understand that the crust sections move very slowly, pressing against one another in some places, pulling apart in other places. Further understand that ocean-floor plates may slide under continental plates, sinking deep into Earth, and that the surface layers of these plates may fold, forming mountain ranges.

8.3.4 Explain that earthquakes often occur along the boundaries between colliding plates, and molten rock from below creates pressure that is released by volcanic eruptions, helping to build up mountains. Understand that under the ocean basins, molten rock may well up between separating plates to create new ocean floor. Further understand that volcanic activity along the ocean floor may form undersea mountains, which can thrust above the ocean's surface to become islands.

8.3.5 Explain that everything on or anywhere near Earth is pulled toward Earth's center by a gravitational force.

8.3.6 Understand and explain that the benefits of Earth's resources, such as fresh water, air, soil, and trees, are finite and can be reduced by using them wastefully or by deliberately or accidentally destroying them.

Habitat Lap Sit p. 61
What Did Your Lunch Cost Wildlife? p. 68
I'm Thirsty p. 134
Here Today, Gone Tomorrow p. 154
Prairie Memoirs p. 188
What You Wear Is What They Were p. 210
Pay to Play p. 216
Let's Talk Turkey p. 248
Changing Societies p. 258
No Water Off a Duck's Back p. 305
Shrinking Habitat p. 310
To Zone or Not to Zone p. 321
Rare Bird Eggs for Sale p. 335
Riparian Zone p. 341
Changing the Land p. 345
Litter We Know p. 434
Enviro-Ethics p. 443

(8.3.6 continued)

Water Canaries p. 24
Hooks and Ladders p. 43
Water Wings p. 110
Riparian Retreat p. 118
How Wet Is Our Planet? p. 121
Watershed p. 132
What's in the Air? p. 136
What's in the Water? p. 140
Something's Fishy Here! p. 145
Water's Going On? p. 149
Alice in Waterland p. 151
Dragonfly Pond p. 184

8.3.7 Explain that the atmosphere and the oceans have a limited capacity to absorb wastes and recycle materials naturally.

Where Does Water Run? p. 21
Wetland Metaphors p. 39

Matter and Energy

8.3.8 Explain that all matter is made up of atoms which are far too small to see directly through an optical microscope. Understand that the atoms of any element are similar but are different from atoms of other elements. Further understand that atoms may stick together in well-defined molecules or may be packed together in large arrays. Also understand that different arrangements of atoms into groups comprise all substances.

8.3.9 Demonstrate, using drawings and models, the movement of atoms in a solid, liquid, and gaseous state. Explain that atoms and molecules are perpetually in motion.

8.3.10 Explain that increased temperature means that atoms have a greater average energy of motion and that most gases expand when heated.

8.3.11 Describe how groups of elements can be classified based on similar properties, including highly reactive metals, less reactive metals, highly reactive nonmetals, less reactive nonmetals, and some almost completely nonreactive gases.

8.3.12 Explain that no matter how substances within a closed system interact with one another, or how they combine or break apart, the total mass of the system remains the same. Understand that the atomic theory explains the conservation of matter: if the number of atoms stays the same no matter how they are rearranged, then their total mass stays the same.

8.3.13 Explain that energy cannot be created or destroyed but only changed from one form into another.

8.3.14 Describe how heat can be transferred through materials by the collision of atoms, or across space by radiation, or if the material is fluid, by convection currents that are set up in it that aid the transfer of heat.

8.3.15 Identify different forms of energy that exist in nature.

Forces of Nature

8.3.16 Explain that every object exerts gravitational force on every other object and that the force depends on how much mass the objects have and how far apart they are.

8.3.17 Explain that the sun's gravitational pull holds Earth and the other planets in their orbits, just as the planets' gravitational pull keeps their moons in orbit around them.

8.3.18 Investigate and explain that electric currents and magnets can exert force on each other.

8.3.19 Investigate and compare series and parallel circuits.

8.3.20 Compare the differences in power consumption in different electrical devices.

Flip the Switch for Wildlife p. 319
Enviro-Ethics p. 443

Standard 4
The Living Environment

Students trace the flow of matter and energy through ecosystems. They understand that the total amount of matter remains constant and that almost all food energy has its origin in sunlight.

Diversity of Life

8.4.1 Differentiate between inherited traits, such as hair color or flower color, and acquired skills, such as manners.

8.4.2 Describe that in some organisms, such as yeast or bacteria, all genes come from a single parent, while in those that have sexes, typically half of the genes come from each parent.

8.4.3 Recognize and describe that new varieties of cultivated plants, such as corn and apples, and domestic animals, such as dogs and horses, have resulted from selective breeding for particular traits.

What Did Your Lunch Cost Wildlife? p. 68 **(E)**
Let's Talk Turkey p. 248

Interdependence of Life and Evolution

8.4.4 Describe how matter is transferred from one organism to another repeatedly and between organisms and their physical environment.

Seed Need p. 98
Eco-Enrichers p. 102

8.4.5 Explain that energy can be transferred from one form to another in living things.

What's for Dinner p. 96
Eco-Enrichers p. 102
Energy Pipeline p. 105

8.4.6 Describe how animals get their energy from oxidizing their food and releasing some of this energy as heat.

8.4.7 Recognize and explain that small genetic differences between parents and offspring can accumulate in successive generations so that descendants are very different from their ancestors.

8.4.8 Describe how environmental conditions affect the survival of individual organisms and how entire species may prosper in spite of the poor survivability or bad fortune of individuals.

How Many Bears Can Live in This Forest? p. 23
My Kingdom for a Shelter p. 28
Oh Deer! p. 36
Habitat Lap Sit p. 61
Rainfall and the Forest p. 73
Stormy Weather p. 85
Quick-Frozen Critters p. 122
Polar Bears in Phoenix? p.125
Muskox Maneuvers p. 130
I'm Thirsty p. 134
Planting Animals p. 152
Here Today, Gone Tomorrow p. 154
No Water Off a Duck's Back p. 305
Smokey Bear Said What? p. 314
Noisy Neighbors p. 317
Litter We Know p. 434
Planning for People and Wildlife p. 436

Migration Headache p. 15
Water Canaries p. 24
Hooks and Ladders p. 43
Eat and Glow p. 69
Puddle Wonders! p. 114
What's in the Air? p. 136
Turtle Hurdles p. 158

Human Identity

8.4.9 Recognize and describe that fossil evidence is consistent with the idea that human beings evolved from earlier species.

Standard 5
The Mathematical World

Students apply mathematics in scientific contexts. Students use mathematical ideas, such as symbols, geometrical relationships, statistical relationships, and the use of key words and rules in logical reasoning, in the representation and synthesis of data.

Numbers

8.5.1 Understand and explain that a number must be written with an appropriate number of significant figures (determined by the measurements from which the number is derived).

Shapes and Symbolic Relationships

8.5.2 Show that an equation containing a variable may be true for just one value of the variable.

8.5.3 Demonstrate that mathematical statements can be used to describe how one quantity changes when another changes.

8.5.4 Illustrate how graphs can show a variety of possible relationships between two variables.

Bearly Growing p. 19
Oh Deer! p. 36

Migration Headache p. 15
Eat and Glow p. 69
Where Have All the Salmon Gone? p. 166
What's in the Air? p. 136

8.5.5 Illustrate that it takes two numbers to locate a point on a map or any other two-dimensional surface.

Reasoning and Uncertainty

8.5.6 Explain that a single example can never prove that something is always true, but it could prove that something is not always true.

8.5.7 Recognize and describe the danger of making over-generalizations when inventing a general rule based on a few observations.

8.5.8 Explain how estimates can be based on data from similar conditions in the past or on the assumption that all the possibilities are known.


Bearly Growing p. 19


Puddle Wonders! p. 114

8.5.9 Compare the mean, median, and mode of a data set.


Water's Going On? p. 149 (E)

8.5.10 Explain how the **comparison of data from two groups** involves comparing both their middles and the spreads.


Eco-Enrichers p.102
Lobster in Your Lunch Box p. 245


Eat and Glow p. 69

Standard 6
Historical Perspectives

Students gain understanding of how the scientific enterprise operates through examples of historical events. Through the study of these events, they understand that new ideas are limited by the context in which they are conceived, are often rejected by the scientific establishment, sometimes spring from unexpected findings, and grow or transform slowly through the contributions of many different investigators.

8.6.1 Understand and explain that Antoine Lavoisier's work was based on the idea that when materials react with each other, many changes can take place, but that in every case the total amount of matter afterward is the same as before. Note that Lavoisier successfully tested the concept of conservation of matter by conducting a series of experiments in which he carefully measured the masses of all the substances involved in various chemical reactions, including the gases used and those given off.

8.6.2 Understand and describe that the accidental discovery that minerals containing uranium darken photographic film, as light does, led to the discovery of radioactivity.

8.6.3 Understand that and describe how in their laboratory in France, Marie Curie and her husband, Pierre Curie, isolated two new elements that were the source of most of the radioactivity of uranium ore. Note that they named one radium because it gave off powerful invisible rays, and the other polonium in honor of Madame Curie's country of birth, Poland. Also note that Marie Curie was the first scientist ever to win the Nobel Prize in two different fields, in physics, shared with her husband, and later in chemistry.

8.6.4 Describe how the discovery of radioactivity as a source of Earth's heat energy made it possible to understand how Earth can be several billion years old and still have a hot interior.

Standard 7
Common Themes

Students analyze the parts and interactions of systems to understand internal and external relationships. They investigate rates of change, cyclic changes, and changes that counterbalance one another. They use mental and physical models to reflect upon and interpret the limitations of such models.

Systems

8.7.1 Explain that a system usually has some properties that are different from those of its parts but appear because of the interaction of those parts.


Ecosystem Facelift p. 166


Where Does Water Run? p. 21

8.7.2 Explain that even in some very simple systems, it may not always be possible to predict accurately the result of changing some part or connection.


Alice in Waterland p. 151

Models and Scale

8.7.3 Use technology to assist in graphing and with simulations that compute and display results of changing factors in models.

8.7.4 Explain that as the complexity of any system increases, gaining an understanding of it depends on summaries, such as averages and ranges, and on descriptions of typical examples of that system.


Rainfall and the Forest p. 73
Time Lapse p. 158
Ecosystem Facelift p. 166


Pond Succession p. 66

Constancy and Change

8.7.5 Observe and describe that a system may stay the same because nothing is happening or because things are happening that counteract one another.

8.7.6 Recognize that and describe how symmetry may determine properties of many objects, such as molecules, crystals, organisms, and designed structures.

8.7.7 Illustrate how things, such as seasons or body temperature, occur in cycles.


How Many Bears Can Live in This Forest? p. 23
Oh Deer! p. 36
Time Lapse p. 158
Changing Societies p. 258
Migration Barriers p. 308