National Standards:

Content Standard A:
Students should develop:
- Abilities necessary to do scientific inquiry
- Understandings about scientific inquiry

Content Standard D:
Students should develop an understanding of:
- Energy in the earth system
- Geochemical cycles

Content Standard E:
Students should develop:
- Abilities of technological design
- Understandings about science and technology

Content Standard F:
Students should develop an understanding of:
- Population growth
- Natural resources
- Environmental quality
- Natural and human-induced hazards
- Science and technology in local, national and global challenges

Iowa Core Statements

1. Understand and apply knowledge of biological evolution.

Principles that underlie the concept and/or skill include but are not limited to:

Species evolution
- Species evolve over time
- Evolution is consequence of: Population potential, genetic variability, finite resources and environmental selection
Species evolve over time. Evolution is the consequence of the interactions of (1) the potential for a species to increase its numbers, (2) the genetic variability of offspring due to mutation and recombination of genes, (3) a finite supply of the resources required for life, and (4) the ensuing selection by the environment of those offspring better able to survive and leave offspring.

**Natural Selection**
- Natural selection scientifically explains the fossil record
- Natural selection explains molecular similarity of diverse species
- Natural selection is a mechanism for evolution leading to organism diversity

Natural selection and its evolutionary consequences provide a scientific explanation for the fossil record of ancient life forms, as well as for the striking molecular similarities observed among the diverse species of living organisms. The great diversity of organisms is the result of more than 3.5 billion years of evolution that has filled every available niche with life forms.

**Relations to common ancestor**
- Current diverse species are related by descent from common ancestors

The millions of different species of plants, animals, and microorganisms that live on earth today are related by descent from common ancestors.

**Biological classification**
- Biological classification is based on evolutionary relationships
- Species is the most fundamental classification unit

Biological classifications are based on how organisms are related. Organisms are classified into a hierarchy of groups and subgroups based on similarities in development and DNA sequences which reflect their evolutionary relationships. Species is the most fundamental unit of classification.

2. **Understand and apply knowledge of the inter-dependence of organisms.**

**Principles that underlie the concept and/or skill include but are not limited to:**

**Materials cycling**
- Atoms and molecules cycle (examples: carbon, nitrogen, oxygen cycles)

The atoms and molecules on the earth cycle among the living and nonliving components of the biosphere.

**Energy flow**
- Energy transformation from producers through levels of consumer and decomposers

Energy flows through ecosystems in one direction, from photosynthetic organisms to herbivores to carnivores and decomposers. These tropic levels can be illustrated by food chains and food webs.

**Organism interrelationships**
- Cooperation and competition within ecosystems
- Interrelationships and interdependency lead to long term stable systems
Organisms both cooperate and compete in ecosystems. The interrelationships and interdependencies of these organisms may generate ecosystems that are stable for hundreds or thousands of years.

**Humans modify ecosystems**
- Human modification of ecosystems
- Habitat destruction threatens global stability

Human beings live within the world's ecosystems. Increasingly, humans modify ecosystems as a result of population growth, technology, and consumption. Human destruction of habitats through direct harvesting, pollution, atmospheric changes, and other factors is threatening current global stability, and if not addressed, ecosystems will be irreversibly affected.

**DMPS Graduate Ends Statements:**

*Graduates demonstrate strategies for lifelong learning*
- They exhibit competent thinking
- They exhibit intuitive thinking
- They understand systems and processes, including the understanding of underlying structures
- They exhibit creative and innovative thinking
- They anticipate future trends
- They demonstrate critical thinking and problem solving abilities

*Graduates demonstrate knowledge and understanding of a rigorous curriculum integrated into all content areas*
- They demonstrate proficiency in science, including life, earth and physical science

*Graduates possess technological and information literacy*
- They can access and evaluate information from a variety of sources to continue their learning
- They understand, manage and create oral, written and multimedia communication
- They utilize appropriate technology to apply or analyze information
National Core Science Literacy Standards

Reading In Science

Key Ideas and Details

1. Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

2. Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

3. Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Craft and Structure

4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

5. Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

6. Analyze the author’s purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

Integration of Knowledge and Ideas

7. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

8. Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

9. Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
Range of Reading and Level of Text Complexity

10. By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.

Writing in Science

Text Types and Purposes

1. Write arguments focused on discipline-specific content.
   - Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.
   - Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience’s knowledge level, concerns, values, and possible biases.
   - Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
   - Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
   - Provide a concluding statement or section that follows from or supports the argument presented.

2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
   - Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
   - Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic.
   - Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
   - Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
   - Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).
Production and Distribution of Writing

4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Research to Build and Present Knowledge

7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

9. Draw evidence from informational texts to support analysis, reflection, and research.

Range of Writing

10. Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
## Unit 1: Ecology

**Approximate Timeline:** 6 weeks

<table>
<thead>
<tr>
<th>Content Standards</th>
<th>Content Objectives</th>
<th>Iowa Core Statements</th>
<th>Common Student-Centered Learning Targets</th>
<th>Common Assessments</th>
<th>Graduate Ends</th>
</tr>
</thead>
<tbody>
<tr>
<td>Everything is connected.</td>
<td>• Explain the components of an ecosystem</td>
<td>Understand and apply knowledge of the interdependence of organisms.</td>
<td><strong>Skills and Concepts:</strong></td>
<td>At 6 Weeks October 1-5 Q#1</td>
<td>• Graduates demonstrate strategies for lifelong learning</td>
</tr>
<tr>
<td></td>
<td>• Understand the importance of individual species</td>
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<td>1A. I can identify an organism, population and community.</td>
<td>Q#2</td>
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<tr>
<td></td>
<td>• Explain how human actions have impacted food chains</td>
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<td>1B. I can distinguish between biotic and abiotic factors.</td>
<td>Q#3,4</td>
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<td></td>
<td>• Describe the carbon cycle</td>
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<td>1C. I can sketch a food web and label its trophic levels.</td>
<td>Q#5</td>
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<td></td>
<td>• Identify interactions among species</td>
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<td>1D. I can illustrate the path of the carbon cycle in an ecosystem.</td>
<td>Q#6</td>
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<td></td>
<td>• Consider how ecosystems change over time</td>
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<td>1E. I can interpret an energy pyramid and calculate energy transfer between trophic levels.</td>
<td>Q# 7, 8</td>
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<td></td>
<td>• Biodiversity ✓ Genetic ✓ Habitati ✓ Species ✓</td>
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<td>1F. I can analyze an ecological case study and discuss the unintended consequences of a well-intentioned ecological management system.</td>
<td>Q#9</td>
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<td></td>
<td>✓ loss of and benefits of ✓ Ecosystem services</td>
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<td>1G. I can compare/contrast primary and secondary succession.</td>
<td>Q#10</td>
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</tr>
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<td></td>
<td>• Endangerment Extinction</td>
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<td>1H. I can differentiate between genetic, habitat and species biodiversity.</td>
<td>Q# 11</td>
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<td></td>
<td>• Conservation</td>
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<td>1I. I can debate the importance of conservation of biodiversity.</td>
<td>Q# 12</td>
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<td>1J. I can explain how a species becomes extinct and the impact on an ecosystem.</td>
<td>Q# 13,14</td>
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<td>1K. I can identify human practices of species conservation.</td>
<td>Q# 15,16</td>
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<td>1L. I can describe the various life relationships between species.</td>
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</tbody>
</table>

**Suggested Resources:** Holt, Environmental Science chapters 4-7, [www.dmpsscience.wikispaces.com](http://www.dmpsscience.wikispaces.com), The Day They Parachuted Cats on Borneo (play by Charlotte Pomerantz)
## Unit 2: Populations

**Approximate Timeline:** 4 weeks

<table>
<thead>
<tr>
<th>Content Standards</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Population growth</td>
<td>• Describe how population has changed in the last 500 years</td>
<td>Understand and apply knowledge of the interdependence of organisms.</td>
<td><strong>Skills and Concepts:</strong></td>
<td>At 10 Weeks Oct. 29-Nov. 2</td>
<td>• Graduates demonstrate strategies for lifelong learning</td>
</tr>
<tr>
<td>significantly impacts the environment.</td>
<td>• Analyze the impact of population growth</td>
<td></td>
<td>2A. I can differentiate between developing and developed country and their environmental impact.</td>
<td>Q#1</td>
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</tr>
<tr>
<td></td>
<td>• Compare ecological footprints of various nations</td>
<td></td>
<td>2B. I can graph how the population has changed over the past 500 years.</td>
<td>Q#4</td>
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</tr>
<tr>
<td></td>
<td>• Identify the regions that are exhibiting the greatest population increase and decline</td>
<td></td>
<td>2C. I can explain why population change has accelerated in the last 200 years.</td>
<td>Q#5,6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Interpret and create a population pyramid</td>
<td></td>
<td>2D. I can create and interpret a population pyramid given demographic data.</td>
<td>Q#2,3</td>
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</tr>
<tr>
<td></td>
<td>• Population properties in nature are size, density and pattern of dispersion</td>
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<td>2E. I can predict how population growth will affect my life.</td>
<td>Q#7</td>
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<tr>
<td></td>
<td>• Carrying capacity is the maximum population a habitat can support over a long period of time</td>
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<td>2F. I can explain why some nations have smaller ecological footprints despite their population growth.</td>
<td>Q#8</td>
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<tr>
<td></td>
<td>• invasive species and environmental impact</td>
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<td>2G. I can identify the regions that are exhibiting the greatest population change.</td>
<td>Q#9</td>
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<td>2H. I can explain why populations increase or decrease</td>
<td>Q#10,11</td>
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<td>2I. I can explain the properties of a population and carrying capacity.</td>
<td>Q#12,13,14</td>
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<tr>
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<td></td>
<td>2J. I can describe how invasive species are distributed and how they impact native species populations.</td>
<td>Q#15,16</td>
<td></td>
</tr>
</tbody>
</table>

### National Standard:

Students should develop an understanding of:

- Population growth
- Natural resources
- Environmental quality
- Natural and human-induced hazards
- Science and technology in local, national and global challenges

### Skills and Concepts:

- 2A. I can differentiate between developing and developed country and their environmental impact.
- 2B. I can graph how the population has changed over the past 500 years.
- 2C. I can explain why population change has accelerated in the last 200 years.
- 2D. I can create and interpret a population pyramid given demographic data.
- 2E. I can predict how population growth will affect my life.
- 2F. I can explain why some nations have smaller ecological footprints despite their population growth.
- 2G. I can identify the regions that are exhibiting the greatest population change.
- 2H. I can explain why populations increase or decrease.
- 2I. I can explain the properties of a population and carrying capacity.
- 2J. I can describe how invasive species are distributed and how they impact native species populations.

### At 10 Weeks Oct. 29-Nov. 2

- Q#1
- Q#4
- Q#5,6
- Q#2,3
- Q#7
- Q#8
- Q#9
- Q#10,11
- Q#12,13,14
- Q#15,16
### Unit 3: Energy

**Approximate Timeline:** 8 weeks

<table>
<thead>
<tr>
<th>Content Standards</th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Energy plays a central role in human existence.</strong></td>
<td>Mining and Minerals • Resources • How we use minerals • Means of extraction • Coal • Impacts of mining • Types of mining</td>
<td><strong>National Standard:</strong> Students should develop an understanding of: • Population growth • Natural resources • Environmental quality • Natural and human-induced hazards • Science and technology in local, national and global challenges</td>
<td>Skills and Concepts: 3A. I can compare cost, safety and environmental impacts of various mining techniques. 3B. I can explain the role coal plays in our energy dependent society. 3C. I can explain the importance of oil and minerals in our consumer products. 3D. I can describe how turbines generate electricity. 3E. I can compare energy usage in different parts of the world. 3F. I can compare and contrast various renewable and nonrenewable energy resources. 3G. I can debate the future of nuclear power. 3H. I can conduct an energy audit and assess energy efficiencies in my daily life. 3I. I can make recommendations to reduce energy usage through product choice and lifestyle.</td>
<td>At 18 Weeks Jan. 7-11 Q#1,2 Q#3,4 Q#5,6 Q#7 Q#8 Q#9, 10, 11, 12 Q#13 Q#14 Q#15, 16</td>
<td>• Graduates demonstrate strategies for lifelong learning • Graduates demonstrate knowledge and understanding of a rigorous curriculum integrated into all content areas • Graduates demonstrate proficiency in science, including life, earth and physical science • Graduates possess technological and information literacy</td>
</tr>
<tr>
<td>Non-renewable energy</td>
<td>Oil • Uses of crude oil • Coal • Natural gas • World energy use • Electricity production • Fossil fuel reserves • Cost/benefit analysis • Energy efficiency and conservation</td>
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<tr>
<td>Renewable/Alternatives energy</td>
<td>Wind, water, solar, geothermal, biomass, hydrogen, tidal • Nuclear energy • Cost/benefit analysis • Biorenewables</td>
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</tbody>
</table>

10 Revised 2012
## Unit 4: Air
### Approximate Timeline: 4 weeks

<table>
<thead>
<tr>
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</tr>
</thead>
</table>
| Natural and human induced hazards affect air quality and climate regulation. | Effects of Pollution  
- Global climate change  
- Greenhouse effect  
- Greenhouse gasses  
- Evidence of climate history  
- Weather impacts  
- Predicting effects of climate change  
- Human impact on the carbon cycle | National Standard: Students should develop an understanding of:  
- Environmental quality  
- Natural and human-induced hazards  
- Science and technology in local, national and global challenges | Skills and Concepts  
4A. I can explain the greenhouse effect.  
4B. I can relate greenhouse gasses to global climate change.  
4C. I can predict how climate change will affect weather.  
4D. I can recognize and evaluate evidence of historic climate change.  
4E. I can describe which human actions effect the carbon cycle.  
4F. I can describe various types, sources and effects of air pollutants.  
4G. I can differentiate between primary and secondary sources of air pollution.  
4H. I can explain the significance of the ozone layer and the effects of ground level ozone.  
4I. I can explain government regulations related to air quality.  
4J. I can suggest and implement ideas for innovative air pollution management practices. | At week 22 February 4-8  
Q#1  
Q#2  
Q#3  
Q#4  
Q#5  
Q#6,7  
Q#8,9  
Q#10  
Q#11  
Q#12 | • Graduates demonstrate strategies for lifelong learning  
• Graduates demonstrate knowledge and understanding of a rigorous curriculum integrated into all content areas  
• Graduates demonstrate proficiency in science, including life, earth and physical science  
• Graduates possess technological and information literacy |
| Nature of air pollution  
- Types of pollutants  
- Sources (natural and man-made)  
- Scope of effects | Detection and monitoring of pollution  
- Air  
- Light  
- Noise  
- Government regulations  
  ✓ Clean Air Act  
  ✓ Montreal Protocol  
  ✓ Kyoto Protocol  
- Personal responsibility to mitigate air pollution | | | | |
# Unit 5: Land and Agriculture

## Approximate Timeline: 9 weeks

<table>
<thead>
<tr>
<th>Content Standards</th>
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<th>Graduate Ends</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land (2 weeks)</td>
<td>Uses, Sustainable management, Conservation, Land degradation, Urban development, Parks/public lands, Forestry, Soils</td>
<td>National Standard: Students should develop an understanding of: Natural resources, Environmental quality, Natural and human-induced hazards, Science and technology in local, national and global challenges</td>
<td>Skills and Concepts: 5A. I can describe the main categories of land usage. 5B. I can identify and defend a land management or conservation practice. 5C. I can relate forestry management practices to their impact on the environment. 5D. I can explain the local and global impact of deforestation. 5E. I can explain the basic properties of soils. 5F. I can differentiate sustainable and non-sustainable farming methods. 5G. I can explain ways to prevent land erosion and its effect on air and water. 5H. I can predict the economic, ecological and health impacts of genetically modified organisms. 5I. I can describe the advantages and disadvantages to various farming techniques used worldwide. 5J. I can illustrate the path of the nitrogen and phosphorus through an ecosystem. 5K. I can describe human’s impact on the nitrogen and phosphorus cycles. 5L. I can compare/contrast waste management techniques (landfills, compost piles, incinerators). 5M. I can understand my role in recycling and its impact on waste management. 5N. I can assess the environmental impact of various materials. 5O. I can explain how a compost pile works. 5P. I can explain how hazardous waste is generated and managed.</td>
<td>At Week 31 April 15-19</td>
<td>• Graduates demonstrate strategies for lifelong learning • Graduates demonstrate knowledge and understanding of a rigorous curriculum integrated into all content areas • Graduates demonstrate proficiency in science, including life, earth and physical science • Graduates possess technological and information literacy</td>
</tr>
<tr>
<td>Agriculture (4 weeks)</td>
<td>History of Ag, Sustainable farming methods, Genetically altered crops, Pesticides/chemicals, Worldwide farming methods, Phosphorus and nitrogen cycle, green revolution</td>
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<td>Q#1,2</td>
<td>Q#3</td>
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<tr>
<td>Waste and waste management (3 weeks)</td>
<td>waste management techniques, hazardous waste management, Recycling, Materials comparison (paper/plastic), Composting</td>
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<td>Q#4</td>
<td>Q#5</td>
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<td>Q#6</td>
<td>Q#7</td>
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<td>Q#8,9</td>
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<td>Q#10</td>
<td>Q#11,12</td>
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<td>TBA</td>
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<td>Q#13</td>
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<td>Q#14,16</td>
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<td>Q#15</td>
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<td>Q#17</td>
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<td>Q#18</td>
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<td>Q#19,20</td>
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</table>
### Unit 6: Water

**Approximate Timeline:** 5 weeks

<table>
<thead>
<tr>
<th>Content Standards</th>
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<th>Common Assessments</th>
<th>Graduate Ends</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water is a finite natural resources that is vital for human survival.</td>
<td>Water</td>
<td>National Standard: Students should develop an understanding of:</td>
<td>Skills and Concepts:</td>
<td>At Week 36 May 20-24</td>
<td>• Graduates demonstrate strategies for lifelong learning</td>
</tr>
<tr>
<td>• Hydrological cycle</td>
<td>• Uses</td>
<td>• Natural resources</td>
<td>6A. I can explain and illustrate how water cycles through the atmosphere and the Earth.</td>
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</tr>
<tr>
<td>• Management</td>
<td>• Quality</td>
<td>• Environmental quality</td>
<td>6B. I can explain how global water is distributed.</td>
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</tr>
<tr>
<td>• Conservation</td>
<td>• Sources</td>
<td>• Natural and human-induced hazards</td>
<td>6C. I can compare and contrast water conservation practices.</td>
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</tr>
<tr>
<td>• Quality</td>
<td>• Global Distribution Nature of pollution</td>
<td>• Science and technology in local, national and global challenges</td>
<td>6D. I can evaluate my direct and indirect water consumption, and propose methods for water conservation.</td>
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<tr>
<td>• Types of water pollutants</td>
<td>• Sources</td>
<td></td>
<td>6E. I can explain the difference between surface and ground water sources.</td>
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<td></td>
</tr>
<tr>
<td>• Scope of effects</td>
<td>• point source vs. non-point source</td>
<td></td>
<td>6F. I can analyze and interpret water quality data.</td>
<td></td>
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</tr>
<tr>
<td>• Techniques for monitoring water quality</td>
<td>Approaches to water pollution management</td>
<td></td>
<td>6G. I can describe various types, sources and effects of water pollutants.</td>
<td></td>
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</tr>
<tr>
<td>• Global methods</td>
<td>• Sustainable practices</td>
<td></td>
<td>6H. I can explain the role of government in water pollution regulation.</td>
<td></td>
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</tr>
<tr>
<td>• Government regulations ✓ Clean Water Act</td>
<td></td>
<td></td>
<td>6I. I can analyze the cost/benefits of dams.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**At Week 36 May 20-24**

- Q#1
- Q#2
- Q#3
- Q#4
- Q#5
- TBA
- Q#6,7,8,9,10
- Q#11
- Q#12

- • Graduates demonstrate knowledge and understanding of a rigorous curriculum integrated into all content areas
- • Graduates demonstrate proficiency in science, including life, earth and physical science
- • Graduates possess technological and information literacy