STRATFORD PUBLIC SCHOOLS
Stratford, Connecticut

"Tantum eruditi sunt liberi"
Only the Educated Are Free

Environmental Science
Grades 11 - 12

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Adopted by the Board of Education on June 27, 2011

Irene Cornish	Elaine Watson
Superintendent of Schools	**Assistant Superintendent**

DISTRICT MISSION

The mission of the Stratford Public Schools is to develop a community of learners in which students acquire the knowledge, skills and confidence to meet the challenges of a changing and increasingly diverse 21st century society.

DISTRICT CORE VALUES

Students will acquire content knowledge, strengthen higher-order thinking, and develop character in order to address 21st century challenges.

BUNNELL HIGH SCHOOL BELIEFS

We believe teachers must work collaboratively in support of student learning and to model collaboration as a social skill with students. We believe that a rigorous curriculum for all students, an acceptance of diversity, and a culture that actively welcomes all learners will contribute to a more knowledgeable community and society. We believe in the value of a strong education as a means of preparing students for work and life in the remainder of the 21st century.

STRATFORD HIGH SCHOOL BELIEFS

- a safe, positive school climate that embraces diversity is essential to ensure respect and opportunity for each individual

- students should understand the world beyond their community in order to contribute to a global society

- parents and students must share responsibility and work in partnership with the school in order to improve academic performance and to develop lifelong learners

- students should use technology effectively to acquire, process, and deliver information

BUNNELL HIGH SCHOOL and STRATFORD HIGH SCHOOL
LEARNING EXPECTATIONS

All students will…

- use real-world digital and other research tools to access, evaluate and effectively apply information appropriate for authentic tasks. (Academic)

- work independently and collaboratively to solve problems and accomplish goals. (Civic-Social)

- communicate information clearly and effectively using a variety of tools/media in varied contexts for a variety of purposes. (Academic)

- demonstrate innovation, flexibility and adaptability in thinking patterns, work habits and working/learning conditions. (Academic)

- effectively apply the analysis, synthesis and evaluation processes that enable productive problem solving. (Academic)

- value and demonstrate personal responsibility, character, cultural understanding and ethical behavior. (Civic-Social)

- show competence in all core academic subjects and other fields of interest, including the ability to clearly and effectively communicate content information in multiple formats. (Academic)

Stratford Information Literacy and Technology Standards

Standard 1: Information Strategies

Students determine their need for information and apply strategies to select, locate, and access information resources.

Essential Understanding:

Intelligent decision-making is based on recognizing the need and applying appropriate strategies for accessing information.

Standard 2: Information Use

Students evaluate, analyze, and synthesize information and data to solve problems, conduct research, and pursue personal interests.

Essential Understanding:

All information is not equal.

Standard 3: Information and Technology Application

Students use appropriate technologies to create written, visual, oral and multimedia products that communicate ideas and information.

Essential Understanding:

The effective communication of ideas and information is influenced by the use of appropriate formats.

Standard 4: Literacy and Literary Appreciation

Students extract meaning from fiction and non-fiction resources in a variety of formats. They demonstrate an enjoyment of reading, including an appreciation of literature and other creative expressions.

Essential Understanding:

Reading provides a variety of benefits and advantages.

Standard 5: Personal Management

Students display evidence of ethical, legal, and social responsibility in regard to information resources and project and self-management.

Essential Understanding:

Successful learning requires self-evaluation and discipline

21st Century Skills

1. Use real-world digital and other research tools to access, evaluate, and effectively apply information appropriate for authentic tasks.
2. Work independently and collaboratively to solve problems and accomplish goals.
3. Communicate information clearly and effectively using a variety of tools/media in varied contexts for a variety of purposes.
4. Demonstrate innovation, flexibility, and adaptability in thinking patterns, work habits, and working/learning conditions.
5. Effectively apply the analysis, synthesis, and evaluative processes that enable productive problem solving.
6. Value and demonstrate personal responsibility, character, cultural understanding, and ethical behavior.

Stratford Public Schools
Standards for Science
"What an exiting senior should be able to do in science."

Inquiry

1. Demonstrate an understanding and apply basic scientific concepts, principles and theories in biology, chemistry, physics and earth/space sciences relative to the science program completed by the student.

2. Identify and solve problems through scientific investigation, including: identification of the problem, student design of experiments, collection of relevant evidence or data, use of logical reasoning, appropriately analyzing quantitative and qualitative data from experiments, drawing conclusions and identifying the validity of an experiment.

3. Demonstrate various scientific inquiry skills including: formulating predictions, differentiating between observations and inferences, making generalizations from observations, relating an effect to its cause, identifying patterns or relationships, distinguishing between quantitative and qualitative observations, comparing, sorting and/or classifying objects or events.

4. Select and use appropriate technology, laboratory equipment and materials, including sensing devices to measure, calculate, organize and communicate data.

5. Demonstrate the ability to work independently and collaboratively in an organized fashion to complete a task.

Communication

6. Demonstrate the abilities associated with accurate and effective communication. These include writing, following written procedures, summarizing data, using language appropriately, developing diagrams and charts, explaining statistical analysis, constructing a reasoned argument, and responding to critical comments.

7. Demonstrate the ability to create and/or interpret scientific information provided in graphs, tables, charts and illustrations.

STS – Science, Technology & Society

8. Distinguish between the role of science striving to understand the natural world and technology seeking solutions to human problems.

9. Analyze the possibilities and limits of science and technology in order to make and defend decisions about societal issues.

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Safety In The Science Laboratory

Students and teachers must be aware of the potential for safety problems in the science classrooms and laboratories. Schools should review available safety resources and develop safety training for their teachers and students as well as safety rules for the classroom.

Teachers must choose safe labs that cover important concepts. Thought must be given to the chemicals purchased by schools. Which chemicals are the safest for the proposed labs, how much is needed, where will the chemicals be stored and in what arrangement? Are the storage areas locked and well ventilated?

General Lab Safety Recommendations

1. Always perform an experiment or demonstration prior to allowing students to replicate the activity. Look for possible hazards. Alert students to potential dangers.

2. Safety instructions should be given orally and be posted each time an experiment is begun.
3. Constant surveillance and supervision of student activities are essential.
4. Never eat or drink in the laboratory or from laboratory equipment. Keep personal items off the lab tables.
5. Never use mouth suction in filling pipettes with chemical reagents. Use a suction bulb.

General Science Safety Checklist

The following is a suggested checklist of safety concerns in K-12 science laboratories.

1. Appropriate protective equipment for the science laboratory
2. Enforcement of safety procedures
3. All students and teachers know the location of all protective equipment
4. All students read and sign a lab safety contract.
5. Sufficient, accessible lab stations per number of students in each laboratory
6. All students must wear proper safety goggles whenever chemicals, glassware, or heat are used

No food products should be consumed by staff or students as part of a lesson, unit or related course work.

Stratford Public Schools
Unit Plan for High School Science
Environmental Science Unit # 1

Unit 1: **Introduction to Environmental Science**	Est. # of Weeks: 3 weeks
Synopsis: This unit will describe the field of environmental science and discuss students' personal impact on the environment by means of an ecological footprint.	

STUDENT LEARNING GOALS	
Content-Specific Powered Standards *CT Frameworks Core Science Standards for High School Science* **9.9** - Some materials can be recycled, but others accumulate in the environment and may affect the balance of the Earth systems. **10.6**- Living organisms have the capability of producing populations of unlimited size, but the environment can support only a limited number of individuals from each species.	**Interdisciplinary Standards (Technology Integration)** **Standard 1: Information Strategies** Students determine their need for information and apply strategies to select, locate, and access information resources. **Standard 2: Information Use** Students evaluate, analyze, and synthesize information and data to solve problems, conduct research, and pursue personal interests. **Standard 5: Personal Management** Students display evidence of ethical, legal, and social responsibility in regard to information resources and project and self-management.

CT Frameworks Core Science Standards for High School Science **Ecology-**Stability in an ecosystem is a balance between competing effects.	-- **Key Vocabulary** Environmental science Ecology Agriculture Natural resource Pollution Biodiversity Ecological footprint Sustainability
21st Century Skills **1. Use real-world digital and other research tools to access, evaluate, and effectively apply information appropriate for authentic tasks.** **2. Work independently and collaboratively to solve problems and accomplish goals.** **4. Demonstrate innovation, flexibility, and adaptability in thinking patterns, work habits, and working/learning conditions.** **5. Effectively apply the analysis, synthesis, and evaluative processes that enable productive problem solving.** **6. Value and demonstrate personal responsibility, character, cultural understanding, and ethical behavior.**	

Enduring Understandings	**Essential Questions**
- Changes in an ecosystem can result from changes in climate, human activity, introduction of nonnative species, or changes in population size. - New technologies and changes in lifestyle can have positive and/or negative effects on the environment. - Human populations grow due to advances in agriculture, medicine, construction and the use of energy. - Humans modify ecosystems as a result of rapid population growth, use of technology and consumption of resources.	What amount of renewable and nonrenewable resources are used by you as an individual? As a nation? As a planet?

Learning Objectives / Grade Level Expectations

Students will:

- Define environmental science and compare environmental science with ecology
- Classify environmental problems into major categories
- Express differences between developed and developing countries by means of en ecological footprint
- Express what sustainability is, and describe why it is a goal of environmental science
- Explain how land development, transportation options and consumption of resources may affect the environment.
- Describe human efforts to reduce the consumption of raw materials and improve air and water quality.
- Describe the factors that affect the carrying capacity of the environment.
- Explain how technological advances have affected the size and growth rate of human populations throughout history.

ASSESSMENT PLAN	
Summative Assessment(s)/Performance Based Assessments including 21st Century Learning	**Formative and Diagnostic Assessment(s)** Homework

Connecticut Efficiency and Climate Change Ecological Footprint	Quiz

LEARNING PLAN COMPONENTS
Textbook Resource- Environmental Science- Holt- Chapter 1

Stratford Public Schools
Unit Plan for High School Science
Environmental Science Unit # 2

Unit 2: Biodiversity	**Est. # of Weeks: 3 weeks**

Synopsis: The diverse life on Earth provides humans with a variety of crops, medicines, and recreational experiences. Human activities threaten many species with extinction, but people are also working to protect biodiversity. Connecticut has its own biodiversity & wildlife.

STUDENT LEARNING GOALS	
Content-Specific Powered Standards	**Interdisciplinary Standards (Technology Integration)**
CT Frameworks Enrichment Content Standards for High School Science	**Standard 1: Information Strategies**
Ecology-Stability in an ecosystem is a balance between competing effects.	Students determine their need for information and apply strategies to select, locate, and access information resources.
	Standard 2: Information Use
	Students evaluate, analyze, and synthesize information and data to solve problems, conduct research, and pursue personal interests.
21st Century Skills	**Standard 3: Information and Technology Application**
1. Use real-world digital and other research tools to access, evaluate, and effectively apply information appropriate for authentic tasks.	Students use appropriate technologies to create written, visual, oral and multimedia products that communicate ideas and information.
2. Work independently and	**Standard 4: Literacy and Literary Appreciation**
	Students extract meaning from fiction and non-fiction resources in a variety of

collaboratively to solve problems and accomplish goals.
3. Communicate information clearly and effectively using a variety of tools/media in varied contexts for a variety of purposes.
4. Demonstrate innovation, flexibility, and adaptability in thinking patterns, work habits, and working/learning conditions.
5. Effectively apply the analysis, synthesis, and evaluative processes that enable productive problem solving.
6. Value and demonstrate personal responsibility, character, cultural understanding, and ethical behavior.

formats. They demonstrate an enjoyment of reading, including an appreciation of literature and other creative expressions.

Standard 5: Personal Management

Students display evidence of ethical, legal, and social responsibility in regard to information resources and project and self-management.

Key Vocabulary
Biodiversity
Keystone species
Ecotourism
Endangered species
Threatened species
Exotic/alien species
Endemic /native species

Enduring Understandings	Essential Questions
▪ Biodiversity is the sum total of different kinds of organisms and is affected by alterations of habitats.	

Learning Objectives / Grade Level Expectations
Students will:
- Describe the diversity of species on Earth
- List & describe three levels of biodiversity
- Explain ways in which biodiversity is important to ecosystems and humans
- Analyze the potential value of a single species
- Define and give examples of endangered and threatened species
- Describe ways that species are being threatened with extinction

ASSESSMENT PLAN	
Summative Assessment(s)/Performance Based Assessments including 21st Century Learning Biome Research Project	**Formative and Diagnostic Assessment(s)**

LEARNING PLAN COMPONENTS
Textbook resource: Environmental Science- Holt- Chapter 10

Stratford Public Schools
Unit Plan for High School Science
Environmental Science Unit # 3

Unit 3: Population Dynamics	Est. # of Weeks: 2 weeks

Synopsis: Concepts of human demography are presented. Predicting and managing human population growth has grown more challenging in recent countries. Some patterns can be seen in the economic and political development of different countries.

STUDENT LEARNING GOALS	

Content-Specific Powered Standards
CT Frameworks Core Science Standards for High School Science
10.6 - Living organisms have the capability of producing populations of unlimited size, but the environment can support only a limited number of individuals from each species.
 	
CT Frameworks Enrichment Content Standards for High School Science
      Ecology-Stability in an ecosystem is a balance between competing effects.
	Interdisciplinary Standards (Technology Integration)
	Standard 1: Information Strategies
	    Students determine their need for information and apply strategies to select, locate, and access information resources.
	
	Standard 2: Information Use
	    Students evaluate, analyze, and synthesize information and data to solve problems, conduct research, and pursue personal interests.
	
	Standard 3: Information and Technology Application
	    Students use appropriate technologies to create written, visual, oral and multimedia products that communicate ideas and information.
	
	Standard 4: Literacy and Literary Appreciation
	    Students extract meaning from fiction and non-fiction resources in a variety of

21st Century Skills
1. **Use real-world digital and other research tools to access, evaluate, and effectively apply information appropriate for authentic tasks.**
2. **Work independently and collaboratively to solve problems and accomplish goals.**
3. **Communicate information clearly and effectively using a variety of tools/media in varied contexts for a variety of purposes.**
4. **Demonstrate innovation, flexibility, and adaptability in thinking patterns, work habits, and working/learning conditions.**
5. **Effectively apply the analysis, synthesis, and evaluative processes that enable productive problem solving.**
6. **Value and demonstrate personal responsibility, character, cultural understanding, and ethical behavior.**

formats. They demonstrate an enjoyment of reading, including an appreciation of literature and other creative expressions.

Standard 5: Personal Management

Students display evidence of ethical, legal, and social responsibility in regard to information resources and project and self-management.

Key Vocabulary

Population
Density
Dispersion
Growth rate
Reproductive potential
Exponential growth
Carrying capacity
Demography
Age structure
Fertility rate
Migration
Life expectancy

Enduring Understandings
- Human populations grow due to advances in agriculture, medicine, construction and the use of energy.
- Humans modify ecosystems as a result of rapid population growth, use of technology and consumption of resources.
- Fluctuations in population size in an ecosystem are determined by the relative rates of birth, immigration, emigration and death.

Essential Questions

How can we predict and manage population growth? What patterns can be seen in the development of different countries?

Learning Objectives / Grade Level Expectations
Students will:
- Describe the factors that affect the carrying capacity of the environment.
- Explain how change in population density is affected by emigration, immigration, birth rate and death rate, and relate these factors to the exponential growth of human populations.
- Explain how technological advances have affected the size and growth rate of human populations throughout history.

ASSESSMENT PLAN

Summative Assessment(s)/Performance Based Assessments including 21st Century Learning	**Formative and Diagnostic Assessment(s)**
Population Growth Project- CIESE (Center for Innovation in Engineering and Science Education)	Homework Quizzes- How Populations Change in Size, Studying Human Populations & Changing Population Trends Population Dynamics Unit Test

LEARNING PLAN COMPONENTS

Population Ecology Virtual Lab: How does competition affect population growth?
Textbook Resources- Environmental Science- Holt- Chapters 8 & 9

Unit 4: Energy Resources	Est. # of Weeks: 2 weeks

Synopsis: Energy consumption patterns produce great demand for fuels. Our choice of fuels and our dependence on them has economic, environmental, and political consequences. Renewable & alternative energy resources play an increasingly important role in reducing our dependency on nonrenewable energy sources.

STUDENT LEARNING GOALS	

Content-Specific Powered Standards
CT Frameworks Core Science Standards
for High School Science
       9.3 - Various sources of energy
       are used by humans and all have
       advantages and disadvantages.
 	
21ˢᵗ Century Skills
1. Use real-world digital and other
research tools to access, evaluate, and
effectively apply information
appropriate for authentic tasks.
2. Work independently and
	<u>**Interdisciplinary Standards (Technology Integration**)</u>
	Standard 1: Information Strategies
	    Students determine their need for information and apply strategies to select,
	    locate, and access information resources.
	
	Standard 2: Information Use
	    Students evaluate, analyze, and synthesize information and data to solve
	    problems, conduct research, and pursue personal interests.
	
	Standard 3: Information and Technology Application
	    Students use appropriate technologies to create written, visual, oral and
	    multimedia products that communicate ideas and information.
	
	Standard 4: Literacy and Literary Appreciation

collaboratively to solve problems and accomplish goals.
3. Communicate information clearly and effectively using a variety of tools/media in varied contexts for a variety of purposes.
4. Demonstrate innovation, flexibility, and adaptability in thinking patterns, work habits, and working/learning conditions.
5. Effectively apply the analysis, synthesis, and evaluative processes that enable productive problem solving.
6. Value and demonstrate personal responsibility, character, cultural understanding, and ethical behavior.

Students extract meaning from fiction and non-fiction resources in a variety of formats. They demonstrate an enjoyment of reading, including an appreciation of literature and other creative expressions.

Standard 5: Personal Management

Students display evidence of ethical, legal, and social responsibility in regard to information resources and project and self-management.

Key Vocabulary

Fossil fuels
Petroleum
Oil reserves
Nuclear energy
Renewable energy
Solar heating
Biomass fuel
Hydroelectric energy
Geothermal energy
Alternative energy
Energy efficiency
Energy conservation

Enduring Understandings
- During the burning of fossil fuels, stored chemical energy is converted to electrical energy through heat transfer processes.
- In nuclear fission, matter is transformed directly into energy in a process that is several million times as energetic as chemical burning.
- Alternative energy sources are being explored and used to address the disadvantages of using fossil and nuclear fuels.

Essential Questions

What are the advantages and disadvantages of the various methods of energy production?

Learning Objectives / Grade Level Expectations
Students will:
- Describe the availability, current uses and environmental issues related to the use of fossil and nuclear fuels to produce electricity.
- Describe the availability, current uses and environmental issues related to the use of hydrogen fuel cells, wind and solar energy to produce electricity.
- Explain how fuels are used to generate electricity in an electric power plant
- Identify patterns of energy consumption & production in the world and in the US
- Explain how fossil fuels form and how they are used
- Describe how a nuclear power plant works
- List advantages & disadvantages of fossil fuel, nuclear energy, forms of renewable energy, etc.

ASSESSMENT PLAN	
Summative Assessment(s)/Performance Based Assessments including 21st Century Learning	**Formative and Diagnostic Assessment(s)**
Nonrenewable Energy Current Events	Homework
Alternative Energy Possibilities Near You	Quizzes- Nonrenewable Energy, Renewable Energy
	Energy Resources Unit Test

LEARNING PLAN COMPONENTS
Global Fossil Fuel Distribution

Your Household Energy Consumption
Textbook Resource- Environmental Science- Holt- Chapters 17 & 18

Stratford Public Schools
Unit Plan for High School Science
Environmental Science Unit # 5

Unit 5: Land Use - Management / Waste and Recycling	Est. # of Weeks: 2 weeks

Synopsis: Land use management development and land conservation greatly impact the quality of life for all members of a community. As landfill options decrease communities and cities need to address the issues of waste management and recycling of materials.

STUDENT LEARNING GOALS	
Content-Specific Powered Standards Land management and conservation greatly impact the quality of life in rural suburban and urban environments. The use of resources by human populations may affect the quality of the environment . Some materials can be recycled, but others accumulate in the environment and may affect the balance of the Earth systems	**Interdisciplinary Standards (Technology Integration)** **Standard 1: Information Strategies** Students determine their need for information and apply strategies to select, locate, and access information resources. **Standard 2: Information Use** Students evaluate, analyze, and synthesize information and data to solve problems, conduct research, and pursue personal interests. **Standard 3: Information and Technology Application** Students use appropriate technologies to create written, visual, oral and

21st Century Skills

1. Use real-world digital and other research tools to access, evaluate, and effectively apply information appropriate for authentic tasks.

2. Work independently and collaboratively to solve problems and accomplish goals.

3. Communicate information clearly and effectively using a variety of tools/media in varied contexts for a variety of purposes.

4. Demonstrate innovation, flexibility, and adaptability in thinking patterns, work habits, and working/learning conditions.

5. Effectively apply the analysis, synthesis, and evaluative processes that enable productive problem solving.

6. Value and demonstrate personal responsibility, character, cultural understanding, and ethical behavior.

Standard 4: Literacy and Literary Appreciation

Students extract meaning from fiction and non-fiction resources in a variety of formats. They demonstrate an enjoyment of reading, including an appreciation of literature and other creative expressions.

Standard 5: Personal Management

Students display evidence of ethical, legal, and social responsibility in regard to information resources and project and self-management.

Key Vocabulary
Urban
Rural
Suburban
Ecosystem services
Deforestation
Reforestation
Wilderness
Farmland
Sustainability
Recycling materials
Reduce materials
Reuse materials
Landfill
Resource recovery (Trash to energy)

Enduring Understandings

　　Land use includes many purposes, including agriculture, forest, urban and suburban development, parks and recreation, and industrial development. Land resources are limited and use for landfills must be monitored.
Recycling of materials can greatly reduce pressure on Landfills.

Essential Questions
What are the consequences of unregulated landfill use?
What is the importance of maintaining open space in towns and cities?
What are the advantages of recycling of waste materials?
What is meant by the term Food Sustainability?
On a global level what is the adverse impact of deforestation?

Learning Objectives / Grade Level Expectations
Students will:
Distinguish between urban and rural land.
Describe three ways in which humans use land.
Explain the concept of ecosystem services
Explain benefits of preserving farmland (Food sustainability)
Describe the effects of deforestation
Describe how the Town of Stratford addresses issues of open space and recycling of materials

ASSESSMENT PLAN	
Summative Assessment(s)/Performance Based Assessments including 21st Century Learning Pirhala Farm Food sustainability Project (optional) Gardens may be developed within school courtyards Chapter test Quizzes	**Formative and Diagnostic Assessment(s)**

LEARNING PLAN COMPONENTS

Stratford Public Schools
Unit Plan for High School Science
Environmental Science Unit # 6

Unit 6: Water Resources / Pollution	Est. # of Weeks: 2 weeks

Synopsis: Water is important in our environment. Although there is abundant water on Earth, only a small percentage is fresh, usable water. Pollution has caused fresh water to become a threatened resource. Students will study water quality, watersheds, CT Waterways, & Long Island Sound.

STUDENT LEARNING GOALS	

Content-Specific Powered Standards
CT Frameworks Core Science Standards for High School Science
9.7 - Elements on Earth move among reservoirs in the solid earth, oceans, atmosphere and organisms as part of biogeochemical cycles.
9.8 - The use of resources by human populations may affect the quality of the environment.
	Interdisciplinary Standards (Technology Integration)
	Standard 1: Information Strategies
	    Students determine their need for information and apply strategies to select, locate, and access information resources.
	
	Standard 2: Information Use
	    Students evaluate, analyze, and synthesize information and data to solve problems, conduct research, and pursue personal interests.
	
	Standard 3: Information and Technology Application
	    Students use appropriate technologies to create written, visual, oral and

21st Century Skills
1. **Use real-world digital and other research tools to access, evaluate, and effectively apply information appropriate for authentic tasks.**
2. **Work independently and collaboratively to solve problems and accomplish goals.**
3. **Communicate information clearly and effectively using a variety of tools/media in varied contexts for a variety of purposes.**
4. **Demonstrate innovation, flexibility, and adaptability in thinking patterns, work habits, and working/learning conditions.**
5. **Effectively apply the analysis, synthesis, and evaluative processes that enable productive problem solving.**
6. **Value and demonstrate personal responsibility, character, cultural understanding, and ethical behavior.**

multimedia products that communicate ideas and information.

Standard 4: Literacy and Literary Appreciation
Students extract meaning from fiction and non-fiction resources in a variety of formats. They demonstrate an enjoyment of reading, including an appreciation of literature and other creative expressions.

Standard 5: Personal Management

Students display evidence of ethical, legal, and social responsibility in regard to information resources and project and self-management.

Key Vocabulary

Surface water
River system
Watershed
Groundwater
Aquifer
Recharge zone
Water Pollution
Point-source pollution
Nonpoint-source pollution
Wastewater
Eutrophication
Thermal pollution
Biomagnification

Enduring Understandings
- Elements on Earth exist in essentially fixed amounts and are located in various chemical reservoirs.
- The cyclical movement of matter between reservoirs is driven by the Earth's internal and external sources of energy.
- Accumulation of metal and non-metal ions used to increase agricultural productivity is a major source of water pollution.

Essential Questions

How important is water to our environment? How has pollution threatened water as a resource? How are humans contaminating our water resource and what can be done about it?

Learning Objectives / Grade Level Expectations
Students will:
- Describe the distribution of Earth's water resources and explain why fresh water is one of the Earth's limited resources.
- Explain how solar energy causes water to cycle through the major earth reservoirs.
- Describe the relationship between groundwater and surface water in a watershed.
- Explain how the accumulation of mercury, phosphates and nitrates affects the quality of water and the organisms that live in rivers, lakes and oceans.

ASSESSMENT PLAN	
Summative Assessment(s)/Performance Based Assessments including 21st Century Learning	**Formative and Diagnostic Assessment(s)**
Profiling Local Water Resources pamphlet Stratford Coastal Ecosystem Project	Homework Quizzes- Water Resources, Water Use, Water Pollution Test- Water Pollution Unit

LEARNING PLAN COMPONENTS
How Wet Is Our Planet? Demonstration Water Cycle online animation

What Is Groundwater?
Delineating a Watershed
"The Price is Right" Project WET Water Treatment Activity
A Groundwater Pollution Mystery- Project WET "A Grave Mistake"
Measuring Dissolved Oxygen Lab
Toxic Waters- NY Times Series- video clips and articles
Textbook Resources- Environmental Science- Holt- Chapter 11

Stratford Public Schools
Unit Plan for High School Science
Environmental Science Unit # 7

Unit 7: Air Quality	Est. # of Weeks: 2 weeks

Synopsis: There are different kinds of pollution that affect air quality. Air pollution is produced in different ways and can be reduced. Air pollution has short and long term health effects.

STUDENT LEARNING GOALS	
Content-Specific Powered Standards	**Interdisciplinary Standards (Technology Integration)**
	Standard 1: Information Strategies
CT Frameworks Core Science Standards for High School Science	Students determine their need for information and apply strategies to select, locate, and access information resources.
9.8 - The use of resources by human populations may affect the quality of the environment.	**Standard 2: Information Use**
	Students evaluate, analyze, and synthesize information and data to solve problems, conduct research, and pursue personal interests.
CT Frameworks Enrichment Content Standards for High School Science	**Standard 3: Information and Technology Application**
Structure and Composition of	Students use appropriate technologies to create written, visual, oral and

the Atmosphere- Life has changed Earth's atmosphere, and changes in the atmosphere affect conditions for life.

multimedia products that communicate ideas and information.

Standard 5: Personal Management

Students display evidence of ethical, legal, and social responsibility in regard to information resources and project and self-management.

21st Century Skills
1. Use real-world digital and other research tools to access, evaluate, and effectively apply information appropriate for authentic tasks.
2. Work independently and collaboratively to solve problems and accomplish goals.
3. Communicate information clearly and effectively using a variety of tools/media in varied contexts for a variety of purposes.
4. Demonstrate innovation, flexibility, and adaptability in thinking patterns, work habits, and working/learning conditions.
5. Effectively apply the analysis, synthesis, and evaluative processes that enable productive problem solving.
6. Value and demonstrate personal responsibility, character, cultural understanding, and ethical behavior.

Key Vocabulary

Air pollution
Primary pollutant
Secondary pollutant
Carbon monoxide
Nitrogen oxides
Sulfur dioxide
Volatile organic compounds (VOC's)
Particulate matter
Smog
Acid precipitation
pH
Acid shock

Enduring Understandings
- Emission of combustion by-products, such as SO_2, CO_2 and NOx by industries and vehicles is a major source of air pollution.
- The atmosphere has specific thermal structure and chemical composition.
- The ozone layer in the upper atmosphere absorbs ultraviolet radiation. This layer varies both naturally and in response to human activities.

Essential Questions

What is air pollution? Where does air pollution come from? How can air pollution harm me? What do I do to contribute to the problem? How can I help?

Learning Objectives / Grade Level Expectations
Students will:
- Explain how the release of sulfur dioxide (SO_2) into the atmosphere can form acid rain, and how acid rain affects water sources, organisms and human-made structures.
- Name five primary air pollutants and give sources for each.
- Describe the way in which smog forms.
- Explain the causes of acid precipitation.
- Explain how acid precipitation affects humans, plants, soils, & aquatic ecosystems.

ASSESSMENT PLAN

Summative Assessment(s)/Performance Based Assessments including 21st Century Learning	**Formative and Diagnostic Assessment(s)**
Air Pollution: What's the Solution (CIESE- Center for Innovation in Engineering and Science Education)	Homework Quizzes Air Quality Unit Test

LEARNING PLAN COMPONENTS

Textbook Resource- Environmental Science- Holt- Chapter 12

Stratford Public Schools
Unit Plan for High School Science
Environmental Science Unit # 8

Unit 8: Climate Change	Est. # of Weeks: 2 weeks

Synopsis: Human activities may be causing climate change. Two issues are the hole in the ozone layer and global warming, the rise in average global temperature.

STUDENT LEARNING GOALS	
Content-Specific Powered Standards *CT Frameworks Core Science Standards for High School Science* **9.7** - Elements on Earth move among reservoirs in the solid earth, oceans, atmosphere and organisms as part of biogeochemical cycles. **9.8** - The use of resources by human populations may affect the quality of the environment.	**Interdisciplinary Standards (Technology Integration)** **Standard 1: Information Strategies** Students determine their need for information and apply strategies to select, locate, and access information resources. **Standard 2: Information Use** Students evaluate, analyze, and synthesize information and data to solve problems, conduct research, and pursue personal interests. **Standard 3: Information and Technology Application**

CT Frameworks Enrichment Content Standards for High School Science **Energy in the Earth System** • Energy enters the Earth system primarily as solar radiation and eventually escapes as heat. • Climate is the long-term average of a region's weather and depends on many factors.	Students use appropriate technologies to create written, visual, oral and multimedia products that communicate ideas and information. **Standard 4: Literacy and Literary Appreciation** Students extract meaning from fiction and non-fiction resources in a variety of formats. They demonstrate an enjoyment of reading, including an appreciation of literature and other creative expressions. **Standard 5: Personal Management** Students display evidence of ethical, legal, and social responsibility in regard to information resources and project and self-management.
21st Century Skills **1. Use real-world digital and other research tools to access, evaluate, and effectively apply information appropriate for authentic tasks.** **2. Work independently and collaboratively to solve problems and accomplish goals.** **3. Communicate information clearly and effectively using a variety of tools/media in varied contexts for a variety of purposes.** **4. Demonstrate innovation, flexibility, and adaptability in thinking patterns, work habits, and working/learning conditions.** **5. Effectively apply the analysis, synthesis, and evaluative processes that enable productive problem solving.** **6. Value and demonstrate personal responsibility, character, cultural understanding, and ethical behavior.**	-- **Key Vocabulary**

Enduring Understandings	**Essential Questions**
• Elements on Earth exist in essentially fixed amounts and are located in various chemical reservoirs. • The cyclical movement of matter between reservoirs is driven by the Earth's internal and external sources of energy. • The sun is a major source of energy for Earth and other planets. • Some of the solar radiation is reflected back into the atmosphere and some is absorbed by matter and photosynthetic processes. • Different atmospheric gases absorb the Earth's thermal radiation. • The greenhouse effect may cause climatic changes. • Earth's climate has changed over time, corresponding to changes in Earth's geography, atmospheric composition and other factors, such as solar radiation and plate movement. • Emission of combustion by-products, such as SO_2, CO_2 and NO_x by industries and vehicles is a major source of air pollution.	

Learning Objectives / Grade Level Expectations
Students will:
- Explain how chemical and physical processes cause carbon to cycle through the major earth reservoirs.
- Explain how the accumulation of carbon dioxide (CO_2) in the atmosphere increases Earth's "greenhouse" effect and may cause climate changes.

ASSESSMENT PLAN	
Summative Assessment(s)/Performance Based Assessments including 21st Century Learning	**Formative and Diagnostic Assessment(s)** Homework Quizzes- Climate & Climate Change, Ozone Shield, Global Warming Climate Change Unit Test

LEARNING PLAN COMPONENTS
Textbook Resource- Environmental Science- Holt- Chapter 13