

# **DARIEN PUBLIC SCHOOLS**

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## **CURRICULUM GUIDE**

### **7<sup>th</sup> Grade Science**

# **DARIEN PUBLIC SCHOOLS**

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## **SECTION I - Course Information**

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## **STATEMENT OF PHILOSOPHY**

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### MMS Science Department Philosophy:

Our middle school science program is based on a framework of scientific inquiry, exploration, and application of learned content. Using state standards as a guide, students across all grades will be expected to conduct hands-on experiments, collect and analyze data, and use correct scientific language in formulating conclusions. Learning will be enhanced by readings, current events, writing, class discussions, proper note-taking, use of technology, and special projects.

## PROGRAM GOALS

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In alignment with the **Core Science Curriculum Framework**, students will “develop basic *explanations* for natural phenomena, and the ability to ask good questions and apply experimental procedures to collect and analyze data.” In addition, with the consideration of all learning needs, our students will continue to develop as scientifically literate individuals.

Scientific literacy “requires that a person have an essential understanding of key science ideas, along with a fluency in the language and terms used to describe them. Scientific literacy requires the ability to apply critical thinking skills when dealing with science-related issues. A scientifically literate person is able to transfer knowledge of the academic theories and principles of science to practical applications in the real world” (State of Connecticut Science Curriculum Framework).

## **OVERVIEW**

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This program is designed to meet all the needs of the students enrolled at MMS. The aim is to promote and integrate scientific inquiry, literacy, and numeracy throughout the middle school experience.

### 6<sup>th</sup> Grade:

- Introduction to Scientific Method
- Structure and Function of Organisms
- Heredity and Evolution
- Science & Technology: Technology used to Improve Food Production and Preservation
- Properties of Matter

### 7<sup>th</sup> Grade:

- The Changing Earth: Earthquakes, Volcanoes, Glaciation, Weathering, and Erosion
- Abiotic Factors Influencing Long Island Sound: Temperature, Wind and Water
- Biotic Factors Influencing Long Island Sound: Food Webs and Photosynthesis
- Science & Technology: Human Impact on Long Island Sound

### 8<sup>th</sup> Grade:

- Motion, Forces and Energy
- Earth in the Solar System
- Electricity and Magnetism
- Science Exhibition Project
- Science & Technology: Space Exploration and Bridge Technology

## **ESSENTIAL QUESTIONS**

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Guiding Question: How is Earth influenced by biotic and abiotic factors?

How do external and internal sources of energy affect the Earth's systems?

- How do external and internal sources of energy affect Earth's landforms?
- How do external and internal sources of energy affect the local, regional and seasonal weather?

How do matter and energy flow through ecosystems?

How does the density of materials affect their interaction?

- How does the density of the Earth's crust result in past, present and future land formations?
- How does the density of air masses affect weather?
- How does the density of different types of water affect the Long Island Sound estuary

How does science and technology affect the quality of our lives?

- How does human activity in Connecticut affect the Long Island Sound's environment?

## **PROCESS SKILLS**

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All of the following skills will help continue to develop a scientifically literate individual:

- Reading (Comprehending)
- Reading (Analyzing)
- Writing and Language Mechanics
- Speaking
- Listening
- Viewing
- Using Maps and Globes
- Studying
- Reasoning and Reflecting
- Using Learning Resources and Technology
- Working Independently and Collaboratively
- Inventing
- Designing
- Creating
- Debating
- Performing
- Quantifying
- Understanding Number Operations
- Using Formulas
- Problem Solving
- Graphing
- Data Analysis
- Applying Probability and Statistics
- Applying Scientific Method

## **STUDENT PERFORMANCE SUMMARY**

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- ◆ Narrative, Expository or Persuasive Essay/Short Answer, Letter or Article
- ◆ Research Report
- ◆ Lab Report
- ◆ Demonstration
- ◆ Oral Presentation with Visuals (story board, overhead transparencies, PowerPoint, whiteboard, LCD projector, Internet site, etc.)
- ◆ Notebook
- ◆ Model with Written Explanation
- ◆ Debate
- ◆ Exhibition
- ◆ Cooperative Learning
- ◆ Computer-Based Lab Work
- ◆ Foldable (graphic organizers)

## **GRADING GUIDELINES**

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Grades are determined based on the number of points earned divided by the possible points. The number of test, quizzes or projects varies each quarter. Each grade has a numerical value, which is averaged at the end of the quarter. Listed below are typical point values for each type of assessment:

<b>Type of Assessment</b>	<b>Point Value</b>	<b>Assessment Definition</b>
Written Work	5-20 points	Class activities & homework
Notebook	5-30 points	Maintaining & organizing all written work
Labs	25–75 points	Based on Lab Format Sheet
Tests	100 points	Various formats
Quizzes	10-50 points	Various formats
Projects	10-200 points	Various formats
Final Assessment	100-200 points	Performance tasks, written responses and selected responses

**Class Participation:** There is not a separate participation grade. Participation is reflected in the successful completion of tasks, labs and activities during class time. Students that do not finish labs or activities in class should promptly ask for an appointment outside of class time. The lab set-up will be disassembled within a few days. It is essential that students complete the labs, as these skills cannot be acquired through homework. The lab and activity grades can include participation, proper use of the facilities, equipment and clean up.

**Extra Credit:** Extra Credit is not available.

## **SECTION II – UNITS OF STUDY**

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## **SUMMARY OF UNITS**

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<b><u>Unit Title</u></b>	<b><u>Duration (Weeks)</u></b>
Unit 1: The Changing Earth	16 weeks
Unit 2: Abiotic Factors Influencing Long Island Sound: Temperature, Wind and Water	8 weeks
Unit 3: Biotic Factors Influencing Long Island Sound: Food Webs and Photosynthesis	6 weeks
Unit 4: Human Impact on Long Island Sound	8 weeks

**UNIT 1: THE CHANGING EARTH**

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## **UNIT 1: THE CHANGING EARTH**

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### **ESSENTIAL QUESTIONS**

Guiding Question: How is Earth influenced by biotic and abiotic factors?

How do external and internal sources of energy affect the Earth's systems?

- How do external and internal sources of energy affect Earth's landforms?

How does the density of materials affect their interaction?

- How does the density of the Earth's crust result in past, present and future land formations?

### **RELATED GOALS AND STANDARDS**

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#### **Connecticut State Science Content Standards addressed:**

##### **7.3 Landforms are the result of the interaction of constructive and destructive forces over time.**

Volcanic activity and the folding and faulting of rock layers during the shifting of the Earth's crust affect the formation of mountains, ridges and valleys.

#### **Connecticut State Science Expected Performances addressed:**

- C.18** Describe how folded and faulted rock layers provide evidence of the gradual up and down motion of the Earth's crust.
- C.20** Explain how the boundaries of tectonic plates can be inferred from the location of earthquakes and volcanoes.

#### **National Science Standards addressed:**

##### **NS.5-8.4: Earth and Space Science**

##### ***STRUCTURE OF THE EARTH SYSTEM***

- The solid Earth is layered with a lithosphere; hot, convecting mantle; and dense, metallic core.
- Lithospheric plates on the scales of continents and oceans constantly move at rates of centimeters per year in response to movements in the mantle. Major geological events, such as earthquakes, volcanic eruptions, and mountain building, result from these plate motions.
- Land forms are the result of a combination of constructive and destructive forces. Constructive forces include crustal deformation, volcanic eruption, and deposition of sediment, while destructive forces include weathering and erosion.

##### ***EARTH'S HISTORY***

- The Earth processes we see today, including erosion, movement of lithospheric plates, and changes in atmospheric composition, are similar to those that occurred in the past.

## CONTENT KNOWLEDGE OBJECTIVES

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### Initial Understanding

Students will be able to **distinguish** between various geologic processes.

### Developing an Interpretation

Students will be able to **demonstrate** the geologic processes needed to create specific landforms or geologic events.

### Making Connections

Students will be able to **explain** the process of the formation of landforms on the continents and in the oceans.

### Taking a Critical Stance

Students will be able to **apply** their knowledge of plate movements to areas of the world that exhibit specific geologic events.

## VOCABULARY

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Aftershock	Fold	Plate Tectonic Theory
Anticline	Foot wall	Plateau
Compression	Gas	Pressure
Conduction	Geology	Radiation
Constructive force	Hanging wall	Reverse fault
Continental crust	Hotspot	Richter scale
Continental Drift Theory	Inner core	Seafloor spreading
Convection	Latitude	Seismic waves
Convection currents	Liquid	Shearing
Converging	Longitude	Solid
Crust	Magma/Lava	Stress
Deformation	Mantle	Strike-slip fault
Density	Mass	Subduction zone
Destructive force	Mid Ocean Ridge	Syncline
Diverging	Molten	Tension
Earthquake	Moment Magnitude Scale	Thrust fault
Energy	Normal fault	Transform boundary
Epicenter	Oceanic crust	Tsunami
Fault	Outer core	Uplift zone
Fault block mountain	Pangaea	Volcano
Focus	Plate	Volume

## **ACTIVITIES**

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This list will be modified on a regular basis.

\* Denotes common experience for all students.

**C.18 Describe how folded and faulted rock layers provide evidence of the gradual up and down motion of the Earth's crust.**

**\*Lab activity:** Faults and folds

**Lab Activity:** Seismic waves

**C.20 Explain how the boundaries of tectonic plates can be inferred from the location of earthquakes and volcanoes.**

**\*Research Activity:** Famous earthquakes and volcanoes

**\*Lab Activity:** Density

**\*Lab Activity:** Volcanic Eruptions

**\*Map Activity:** Plate boundaries puzzle

## **PERFORMANCE ASSESSMENT**

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Projects

Group Lab Work

Lab Reports

Written Work

Lab practical exam

Model

## **CAREER AWARENESS**

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Geologist, Real Estate Investor, Insurance Agent, Structural Engineer, Civil Engineer, City Planner, Park Ranger

## **CORE TEXT FOR STUDENTS**

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Vogel, Carole Garbuny. Science Explorer: Inside Earth. Upper Saddle River, NJ: Prentice Hall, Inc., 2002. (ISBN: 0-13-434489-8)

## **ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS**

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This list will be modified on a regular basis.

Earthquakes:

<http://earthquake.usgs.gov/4kids/>

[http://nisee.berkeley.edu/eqiis\\_earthquakes.html](http://nisee.berkeley.edu/eqiis_earthquakes.html)

<http://www.geo.ed.ac.uk/quakes/quakes.html>

<http://quake.wr.usgs.gov/>

<http://wwwneic.cr.usgs.gov/>

<http://sci2k.net/eatwt.htm>

Volcanoes:

<http://volcano.und.nodak.edu/vw.html>

<http://vulcan.wr.usgs.gov/Volcanoes/framework.html>

<http://volcano.und.nodak.edu/vwdocs/vwlessons/lessons/Pangea/Pangea1.html>

## **MATERIALS AND SUPPLIES**

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Blank World Maps

Clay

Beakers

Cooking Oil

Triple Beam Balances

Displacement Canisters

Colored Pencils

Slinkies

Graduated Cylinders

Pancake Syrup

Different Density Foam Pieces

Demonstration Model of Faults

Plate Map Puzzle

Hot Plates

Food Coloring

Various Solid Objects

## **INTEGRATED TECHNOLOGY**

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Students will use Excel to chart collected data on volcanoes and earthquakes.

Students will use the internet to research and make observations on geologic events.

**UNIT 2: ABIOTIC FACTORS INFLUENCING LONG ISLAND  
SOUND: TEMPERATURE, WIND and WATER**

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## **UNIT 2: ABIOTIC FACTORS INFLUENCING LONG ISLAND SOUND: TEMPERATURE, WIND and WATER**

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### **ESSENTIAL QUESTIONS**

Guiding Question: How is Earth influenced by biotic and abiotic factors?

How do external and internal sources of energy affect the Earth's systems?

- How do external and internal sources of energy affect Earth's landforms?
- How do external and internal sources of energy affect the local and regional weather?

How does the density of materials affect their interaction?

- How does the density of air masses affect weather?

### **RELATED GOALS AND STANDARDS**

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#### **Connecticut State Science Content Standards addressed:**

##### **6.3 Variations in the amount of the sun's energy hitting the Earth's surface affect daily and seasonal weather patterns.**

Local and regional weather are affected by the amount of solar energy these areas receive and by their proximity to a large body of water.

##### **7.3 Landforms are the result of the interaction of constructive and destructive forces over time.**

Glaciation, weathering and erosion change the Earth's surface by moving earth materials from place to place.

#### **Connecticut State Science Expected Performances addressed:**

- C.7** Describe the effect of heating on the movement of molecules in solids, liquids and gases.
- C.8** Explain how local weather conditions are related to the temperature, pressure and water content of the atmosphere and the proximity to a large body of water.
- C.9** Explain how the uneven heating of the Earth's surface causes winds.
- C.19** Explain how glaciation, weathering and erosion create and shape valleys and floodplains.

#### **National Science Standards addressed:**

**NS.5-8.4:** Earth and Space Science

##### ***STRUCTURE OF THE EARTH SYSTEM***

- Land forms are the result of a combination of constructive and destructive forces. Constructive forces include crustal deformation, volcanic eruption, and deposition of

- sediment, while destructive forces include weathering and erosion.
- Water, which covers the majority of the Earth's surface, circulates through the crust, oceans, and atmosphere in what is known as the "water cycle." Water evaporates from the Earth's surface, rises and cools as it moves to higher elevations, condenses as rain or snow, and falls to the surface where it collects in lakes, oceans, soil, and in rocks underground.
  - The atmosphere is a mixture of nitrogen, oxygen, and trace gases that include water vapor. The atmosphere has different properties at different elevations.
  - Clouds, formed by the condensation of water vapor, affect weather and climate.
  - Global patterns of atmospheric movement influence local weather. Oceans have a major effect on climate, because water in the oceans holds a large amount of heat.

### ***EARTH IN THE SOLAR SYSTEM***

- The sun is the major source of energy for phenomena on the Earth's surface, such as growth of plants, winds, ocean currents, and the water cycle. Seasons result from variations in the amount of the sun's energy hitting the surface, due to the tilt of the Earth's rotation on its axis and the length of the day.

## **CONTENT KNOWLEDGE OBJECTIVES**

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### **Initial Understanding**

Students will be able to **distinguish** between various weather events.

Students will be able to **recognize** the effects of weathering on landforms.

### **Developing an Interpretation**

Students will be able to **compare** national and regional weather to local conditions.

Students will be able to **analyze** how weathering affects landforms.

### **Making Connections**

Students will be able to **explain** the relationship between local weather conditions and local geographic features.

Students will be able to **relate** local weather to evidence of erosion in the area.

### **Taking a Critical Stance**

Students will be able to **evaluate** three locations to determine which location would have the best local weather conditions for certain activities.

Students will be able to **describe** the human influence on erosion.

## VOCABULARY

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Abiotic	Fronts	Precipitation
Abrasion	Frost action	Radiation
Air pressure	Glacial lake	Runoff
Alluvial fan	Glacial till	Sand dune
Altitude	Glacier	Sea breeze
Atmosphere	Greenhouse effect	Seasons
Barometer	Humidity	Stationary front
Carbonation	Hurricane	Storm
Chemical weathering	Ice Age	Temperature
Climate	Infrared radiation	Thermal energy
Cloud formation	Kettle lake	Thermometer
Cold front	Land breeze	Thunder
Condensation	Landslide	Tornado
Conduction	Levees	Tributary
Convection	Lightning	Ultraviolet radiation
Delta	Load	Visible light
Deposition	Loess	Warm front
Dew point	Low energy shoreline	Water vapor
Drainage basin	Mass wasting	Waves
Electromagnetic waves	Mechanical weathering	Weather
El nino	Meltwater	Weathering
Energy	Moraine	Wind
Erosion	Occluded front	Wind chill factor
Evaporation	Outwash plain	Wind erosion
Flood plains	Oxbow lake	

## ACTIVITIES

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This list will be modified on a regular basis.

**C.7 Describe the effect of heating on the movement of molecules in solids, liquids and gases.**

**Lab Activity:** Earth's atmosphere

**Lab Activity:** Temperature and density of air

**C.8 Explain how local weather conditions are related to the temperature, pressure and water content of the atmosphere and the proximity to a large body of water.**

**Research Activity:** Weather at different locations

**Lab Activity:** Water in the atmosphere

**Lab Activity:** Heating sand and water

**C.9 Explain how the uneven heating of the Earth’s surface causes winds.**

**Lab Activity:** Winds

**C.19 Explain how glaciation, weathering and erosion create and shape valleys and floodplains.**

**Lab Activity:** Soil erosion

**Lab Activity:** Ice cube glaciers

## **PERFORMANCE ASSESSMENT**

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Projects  
Group Lab Work  
Lab Reports  
Written Work

## **CAREER AWARENESS**

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Geologist, Meteorologist, Real Estate Investor, Insurance Agent, Structural Engineer, Civil Engineer, City Planner, Park Ranger, Landscaper

## **CORE TEXT FOR STUDENTS**

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Densman, Linda, et al. Dynamic Earth. Upper Saddle River, NJ: Prentice Hall, Inc., 1997.

Simons, Barbara Brooks. Science Explorer: Weather and Climate. Upper Saddle River, NJ: Prentice Hall, Inc., 2000. (ISBN: 0-13-434494-4)

## **ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS**

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This list will be modified on a regular basis.

[www.weather.com](http://www.weather.com)

<http://www.nws.noaa.gov/>

<http://www.usatoday.com/weather/resources/basics/wworks0.htm>

## **MATERIALS AND SUPPLIES**

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Sand	Clay	Water
Ice cube trays	Freezer	Large and small pans
Buckets	Dew Point Kit	Extra Paper Towels
Dust Pan and Broom	Snapple Bottles and Caps	Candles
Balloons	Empty Water Bottles	Hot Plates
Large Beakers	Thermometers	Heat Lamps
Sheets of thick cardboard	Aquarium	Ice Packs
Plexiglass Sheet		
Plastic Dome (clear 2L soda bottles)		

## **INTEGRATED TECHNOLOGY**

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Students will be using Excel to chart collected weather data.

Students will use the internet to research and make observations on weather and weathering.

Students will use the Middlesex Middle School weather station to analyze trends in local weather.

**UNIT 3: BIOTIC FACTORS INFLUENCING LONG ISLAND  
SOUND: FOOD WEBS and PHOTOSYNTHESIS**

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## **UNIT 3: BIOTIC FACTORS INFLUENCING LONG ISLAND SOUND: FOOD WEBS and PHOTOSYNTHESIS**

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### **ESSENTIAL QUESTIONS**

Guiding Question: How is Earth influenced by biotic and abiotic factors?

How do matter and energy flow through ecosystems?

How does the addition or removal of a species affect the ecosystem?

How do different factors affect photosynthesis?

### **RELATED GOALS and STANDARDS**

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#### **Connecticut State Science Standards addressed:**

- 6.2 An ecosystem is composed of all the populations that are living in a certain space and the physical factors with which they interact.**

Populations in ecosystems are affected by biotic factors, such as other populations, and abiotic factors, such as soil and water supply.

Populations in ecosystems can be categorized as producers, consumers and decomposers of organic matter.

#### **Connecticut State Science Expected Performances**

- C.4** Describe how abiotic factors, such as temperature, water and sunlight, affect the ability of plants to create their own food through photosynthesis.
- C.5** Explain how populations are affected by predator-prey relationships.
- C.6** Describe common food webs in different Connecticut ecosystems.

#### **National Science Standards addressed:**

##### **NS.5-8.3: Life Science**

##### ***POPULATIONS AND ECOSYSTEMS***

- A population consists of all individuals of a species that occur together at a given place and time. All populations living together and the physical factors with which they interact compose an ecosystem.
- Populations of organisms can be categorized by the function they serve in an ecosystem. Plants and some micro-organisms are producers--they make their own food. All animals, including humans, are consumers, which obtain food by eating other organisms. Decomposers, primarily bacteria and fungi, are consumers that use waste materials and dead organisms for food. Food webs identify the relationships among producers, consumers, and decomposers in an ecosystem.
- For ecosystems, the major source of energy is sunlight. Energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis. That energy then passes from organism to organism in food webs.

- The number of organisms an ecosystem can support depends on the resources available and abiotic factors, such as quantity of light and water, range of temperatures, and soil composition. Given adequate biotic and abiotic resources and no disease or predators, populations (including humans) increase at rapid rates. Lack of resources and other factors, such as predation and climate, limit the growth of populations in specific niches in the ecosystem.

## **CONTENT KNOWLEDGE OBJECTIVES**

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### **Initial Understanding**

Students will be able to **distinguish** between producers and consumers in the Long Island Sound food web.

Students will be able to **diagram** the process of photosynthesis.

### **Developing an Interpretation**

Students will be able to **analyze** the effects of changes to the Long Island Sound food web.

Students will be able to **analyze** the results of growing plants in various conditions.

### **Making Connections**

Students will be able to **create** a food web using knowledge of the organisms in Long Island Sound.

Students will be able to **describe** the impact of sunlight and water on photosynthesis.

### **Taking a Critical Stance**

Students will be able to **apply** their knowledge of the Long Island Sound food web to invasive predator-prey relationships.

Students will be able to **apply** the importance of photosynthesis to the Long Island Sound food web.

## VOCABULARY

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Adaptation	Filter feeders	Prey
Benthos	Food web	Primary consumer
Biotic	Glucose	Producers
Brackish water	Habitat	Salinity
Carnivore	Herbivore	Salt Marsh
Chlorophyll	Intertidal zone	Secondary consumer
Chloroplast	Keystone species	Sessile
Consumers	Niche	Species
Decomposer	Omnivore	Stomata
Ecosystem	Photosynthesis	The Race
Endangered	Phytoplankton	Tidal flats
Estuary	Plankton	Wetland
Extinct	Predator	Zooplankton

## ACTIVITIES

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This list will be modified on a regular basis.

\* Denotes a common experience for all students.

**C.4 Describe how abiotic factors, such as temperature, water and sunlight, affect the ability of plants to create their own food through photosynthesis.**

**\*Lab Activity:** Plant growth and germination

**\*Microscope Activity:** Leaf parts

**C.5 Explain how populations are affected by predator-prey relationships.**

**\*Lab Activity:** Predator-prey

**C.6 Describe common food webs in different Connecticut ecosystems.**

**Research and Map Activity:** Long Island Sound organisms

**\*Lab Activity:** Identifying Long Island Sound intertidal zone organisms

## PERFORMANCE ASSESSMENT

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Projects  
Group Lab Work  
Lab Reports  
Written Work

## **CAREER AWARENESS**

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Botanist, Zoologist, Marine Biologist, Conservationist, Environmentalist, Park Ranger, Farmer, Florist, Microbiologist, Ecologist

## **CORE TEXT FOR STUDENTS**

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Atkin, John, et al. The Sound Book. Norwalk, CT: The Long Island Soundkeeper Fund, Inc.

Holtzclaw, Fred, Linda Cronin Jones and Steve Miller. Science Explorer: Environmental Science. Upper Saddle River, NJ: Prentice Hall, Inc., 2000. (ISBN: 0-13-434486-3)

## **ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS**

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This list will be modified on a regular basis.

Wahle, Lisa and Nancy Balcom. Living Treasures: The Plants and Animals of Long Island Sound. Groton, CT. Connecticut Sea Grant College Program, 2002.

Beachcombers: Guide to the North Atlantic Seashore. Lincoln, MA. Massachusetts Audubon Society, 1993.

<http://www.longislandsoundstudy.net/>

<http://camel2.conncoll.edu/ccrec/greennet/arbo/publications/34/MAIN.HTM>

<http://www.epa.gov/owow/>

## **MATERIALS AND SUPPLIES**

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Colored Pencils

Mung Beans

Prepared slides

Handheld PDAs with probes

Snapple Bottles

Microscopes

Organisms found in Long Island Sound

Candles

Soil

## **INTEGRATED TECHNOLOGY**

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Students will use Excel to graph plant growth.

Students will use handheld PDAs to measure abiotic factors affecting plant growth.

Students will use the internet to research and make observations on the living organisms in Long Island Sound.

## **UNIT 4: HUMAN IMPACT ON LONG ISLAND SOUND**

## **UNIT 4: HUMAN IMPACT ON LONG ISLAND SOUND**

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### **ESSENTIAL QUESTIONS**

Guiding Question: How is Earth influenced by biotic and abiotic factors?

How does science and technology affect the quality of our lives?

- How does human activity affect the Long Island Sound environment?

How does the density of materials affect their interaction?

- How does the density of different types of water affect the Long Island Sound estuary?

### **RELATED GOALS and STANDARDS**

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#### **CT State Science Standards addressed:**

**6.4 Water moving across and through Earth materials carries with it the products of human activities.**

- Most precipitation that falls on Connecticut eventually reaches Long Island Sound.

**9.9 The use of resources by human populations may affect the quality of the environment. Some materials can be recycled, but other accumulate in environments and may affect the balance of the Earth systems.**

- Accumulations of metal and non-metal ions used to increase agricultural productivity are a major source of water pollution. New technologies and changes in lifestyles can have positive and/or negative effects on the environment.

#### **Connecticut State Science Expected Performances addressed:**

**C.10** Explain the role of septic and sewage systems on the quality of surface and ground water.

**C.11** Explain how human activity may impact water resources in Connecticut, such as ponds, rivers and the Long Island Sound ecosystem.

#### **National Science Standards addressed:**

**NS.5-8.6** Personal and Social Perspectives

#### **NATURAL HAZARDS**

- Human activities also can induce hazards through resource acquisition, urban growth, land-use decisions, and waste disposal. Such activities can accelerate many natural changes.

## NS.5-8.4 Earth and Space Science

### ***STRUCTURE OF THE EARTH SYSTEM***

- Water is a solvent. As it passes through the water cycle it dissolves minerals and gases and carries them to the oceans.

## **CONTENT KNOWLEDGE OBJECTIVES**

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### **Initial Understanding**

Students will be able to **distinguish** between the different types of pollution.

### **Developing an Interpretation**

Students will be able to **compare** the impact of pollution on organisms in or around Long Island Sound

### **Making Connections**

Students will be able to **explain** the importance of watershed preservation.

### **Taking a Critical Stance**

Students will be able to **apply** their knowledge of pollution to ways of preserving Long Island Sound for future generations.

## **VOCABULARY**

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Acid Rain	Insoluble	Runoff
Advanced sewage treatment	Leachfield	Sanitary sewers
Airborne pollutants	Mixture	Secondary sewage treatment
Chlorofluorocarbons (CFCs)	Nonpoint source	Septic system
Coliform	Nutrients	Sewage
Combined sewer overflow	Organic substances	Sewer system
Concentrate	Oxidation	Smog
Dilute	Ozone	Soluble
Dissolve	Pathogens	Solute
Floatables	Pesticides	Solution
Global warming	Point source	Solvent
Greenhouse effect	Pollutant	Storm sewers
Heavy metals	Primary sewage treatment	Watershed
Hypoxia		

## **ACTIVITIES**

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This list will be modified on a regular basis.

\* Denotes a common experience for all students.

### **C.10 Explain the role of septic and sewage systems on the quality of surface and ground water.**

**Lab Activity:** Water solubility

**\*Lab Activity:** Pycnoclines

**Lab Activity:** Water filtration

### **C.11 Explain how human activity may impact water resources in Connecticut such as ponds, rivers and the Long Island Sound ecosystem.**

**Lab Activity:** Bioaccumulation

**Debate:** Land use

**Field Activity:** Long Island Sound data and organism collection

**\*Lab Activity:** Watershed

**Lab Activity:** Acid rain

**Lab Activity:** Greenhouse effect

## **PERFORMANCE ASSESSMENT**

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Projects

Group Lab Work

Lab Reports

Written Work

## **CAREER AWARENESS**

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Biologist, Chemist, Water Purification/Septic System Designer and Maintenance Professional, Fisheries Industry Professional, City Planner, Environmentalist.

## **CORE TEXT FOR STUDENTS**

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Atkin, John, et al. The Sound Book. Norwalk, CT: The Long Island Soundkeeper Fund, Inc.

Holtzclaw, Fred, Linda Cronin Jones and Steve Miller. Science Explorer: Environmental Science. Upper Saddle River, NJ: Prentice Hall, Inc., 2000. (ISBN: 0-13-434486-3)

## **ADDITIONAL TEXTS/ RESOURCES FOR USE BY STUDENTS**

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This list will be modified on a regular basis.

<http://www.lisrc.uconn.edu/lisrc/index.asp>

<http://www.savethesound.org>

<http://dep.state.ct.us/>

<http://www.epa.gov/owow/>

## **MATERIALS AND SUPPLIES**

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Plastic Cups	Plastic Spoons	Metric Measuring Spoons
Baking Soda	Salt	Water
Sugar	Plastic Chips	Plastic Bags
Water Quality Test Kit	Steel Wool	Rain Water
Vinegar	Lemon Juice	Thermometers
Food Coloring	Soil/Sand	Large Plastic Tubs
Handheld PDAs with probes		

## **INTEGRATED TECHNOLOGY**

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Students will use handheld PDAs with water quality probes.

Students will use Excel to record and analyze data from lab activities.

Students will use the internet to research and make observations on the human impact on Long Island Sound.

## **SECTION III - GOALS and STANDARDS**

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RELATED GOALS and STANDARDS



# **Core Science Curriculum Framework**

An Invitation for Students and Teachers  
to Explore Science and Its Role in Society

# **Content Standards and Expected Performances**

## **Core Science for Grades 6-8**



**THE STANDARDS FOR SCIENTIFIC INQUIRY, LITERACY AND NUMERACY ARE INTEGRAL PARTS OF THE CONTENT STANDARDS FOR EACH GRADE LEVEL IN THIS CLUSTER.**

<b>Grades 6-8 Core Scientific Inquiry, Literacy and Numeracy</b> <i>How is scientific knowledge created and communicated?</i>	
Content Standards	Expected Performances
<p><b>SCIENTIFIC INQUIRY</b></p> <ul style="list-style-type: none"> <li>◆ Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena.</li> <li>◆ Scientific inquiry progresses through a continuous process of questioning, data collection, analysis and interpretation.</li> <li>◆ Scientific inquiry requires the sharing of findings and ideas for critical review by colleagues and other scientists.</li> </ul> <p><b>SCIENTIFIC LITERACY</b></p> <ul style="list-style-type: none"> <li>◆ Scientific literacy includes speaking, listening, presenting, interpreting, reading and writing about science.</li> <li>◆ Scientific literacy also includes the ability to search for and assess the relevance and credibility of scientific information found in various print and electronic media.</li> </ul> <p><b>SCIENTIFIC NUMERACY</b></p> <ul style="list-style-type: none"> <li>◆ Scientific numeracy includes the ability to use mathematical operations and procedures to calculate, analyze and present scientific data and ideas.</li> </ul>	<p><b>C INQ.1</b> Identify questions that can be answered through scientific investigation.</p> <p><b>C INQ.2</b> Read, interpret and examine the credibility of scientific claims in different sources of information.</p> <p><b>C INQ.3</b> Design and conduct appropriate types of scientific investigations to answer different questions.</p> <p><b>C INQ.4</b> Identify independent and dependent variables, and those variables that are kept constant, when designing an experiment.</p> <p><b>C INQ.5</b> Use appropriate tools and techniques to make observations and gather data.</p> <p><b>C INQ.6</b> Use mathematical operations to analyze and interpret data.</p> <p><b>C INQ.7</b> Identify and present relationships between variables in appropriate graphs.</p> <p><b>C INQ.8</b> Draw conclusions and identify sources of error.</p> <p><b>C INQ.9</b> Provide explanations to investigated problems or questions.</p> <p><b>C INQ.10</b> Communicate about science in different formats, using relevant science vocabulary, supporting evidence and clear logic.</p>

## Grade 6

Content Standards	Expected Performances
<p><i>Structure and Function – How are organisms structured to ensure efficiency and survival?</i></p> <p><b>7.2 Many organisms, including humans, have specialized organ systems that interact with each other to maintain dynamic internal balance.</b></p> <ul style="list-style-type: none"> <li>◆ All organisms are made up of one or more cells; each functions more or less independently.</li> <li>◆ Multicellular organisms need specialized structures and systems to perform basic life functions.</li> </ul>	<p><b>MMS: ***Introduction to Scientific Method***</b></p> <p><b>C 15.</b> Describe the basic structures of an animal cell, including nucleus, cytoplasm, mitochondria and cell membrane, and how they function to support life.</p> <p><b>C 16.</b> Describe the structures of the human digestive, respiratory, and circulatory systems, and explain how they function to bring oxygen and nutrients to the cells and expel waste materials.</p> <p><b>C 17.</b> Explain how the human muscular/skeletal system supports the body and allows movement.</p>
<p><i>Heredity and Evolution – What are the processes responsible for life’s unity and diversity?</i></p> <p><b>8.2 Reproduction is a characteristic of living systems and it is essential for the continuation of every species.</b></p> <ul style="list-style-type: none"> <li>◆ Heredity is the passage of instructions specifying traits from one generation to another.</li> <li>◆ Some characteristics of an organism are inherited and some result from interactions w/ environment.</li> </ul>	<p><b>C 25.</b> Explain the similarities and differences in cell division in somatic and germ cells.</p> <p><b>C 26.</b> Describe the structure and function of the male and female human reproduction system, including the process of egg and sperm production.</p> <p><b>C 27.</b> Describe how genetic information is organized in genes on chromosomes, and explain sex determination in humans.</p>
<p><i>Science and Technology in Society – How do science and technology affect the quality of our lives?</i></p> <p><b>7.4 Technology allows us to improve food production and preservation, thus improving our ability to meet the nutritional needs of growing populations.</b></p> <ul style="list-style-type: none"> <li>◆ Methods have been developed to prevent food spoilage caused by bacteria.</li> </ul>	<p><b>C 21.</b> Describe how freezing, dehydration, pickling and irradiation prevent food spoilage caused by bacteria.</p>
<p><i>Properties of Matter - How does the structure of matter affect the properties and uses of materials?</i></p> <p><b>6.1 Materials can be classified as pure substances or mixtures, depending on their chemical and physical properties.</b></p> <ul style="list-style-type: none"> <li>◆ Mixtures are made of combinations of elements and/or compounds, and they can be separated using a variety of physical means.</li> <li>◆ Pure substances can be either elements or compounds, and they cannot be broken down by physical means.</li> </ul>	<p><b>C 1.</b> Describe the properties of common elements such as oxygen, hydrogen, carbon, iron and aluminum.</p> <p><b>C 2.</b> Describe how the properties of simple compounds, such as water and table salt, are different from the properties of the elements of which they are made.</p> <p><b>C 3.</b> Explain how mixtures can be separated by using the properties of the substances from which they are made, such as particle size, density, solubility and boiling point.</p>

## Grade 7

Content Standards	Expected Performances
<p><i>Energy in the Earth's Systems – How do external and internal sources of energy affect the Earth's systems?</i></p> <p><b>7.3 Landforms are the result of the interaction of constructive and destructive forces over time.</b></p> <ul style="list-style-type: none"> <li>◆ Volcanic activity and the folding and faulting of rock layers during the shifting of Earth's crust affect the formation of mountains, ridges and valleys.</li> <li>◆ Glaciation, weathering and erosion change the Earth's surface by moving materials from place to place.</li> </ul>	<p><b>C 18.</b> Describe how folded and faulted rock layers provide evidence of the gradual up and down motion of the Earth's crust.</p> <p><b>C 19.</b> Explain how glaciation, weathering and erosion create and shape valleys and floodplains.</p> <p><b>C 20.</b> Explain how the boundaries of tectonic plates can be inferred from the location of earthquakes and volcanoes.</p>
<p><i>Matter and Energy in Ecosystems – How do matter and energy flow through ecosystems?</i></p> <p><b>6.2 An ecosystem is composed of all the populations that are living in a certain space and the physical factors with which they interact.</b></p> <ul style="list-style-type: none"> <li>◆ Populations in ecosystems are affected by biotic factors such as other populations and abiotic factors such as soil and water supply.</li> <li>◆ Populations in ecosystems can be categorized as producers/consumers/decomposers of organic material.</li> </ul>	<p><b>C 4.</b> Describe how abiotic factors such as temperature, water and sunlight affect plants' ability to create their own food through photosynthesis.</p> <p><b>C 5.</b> Explain how populations are affected by predator-prey relationships.</p> <p><b>C 6.</b> Describe common food webs in different Connecticut ecosystems.</p>
<p><i>Energy in the Earth's Systems – How do external and internal sources of energy affect the Earth's systems?</i></p> <p><b>6.3 Variation in the amount of the sun's energy hitting the Earth's surface affects daily and seasonal weather patterns.</b></p> <ul style="list-style-type: none"> <li>◆ Local and regional weather are affected by the amount of solar energy the area receives and proximity to a large body of water.</li> </ul>	<p><b>C 7.</b> Describe the effect of heating on the movement of molecules in solids, liquids and gases.</p> <p><b>C 8.</b> Explain how local weather conditions are related to the temperature, pressure and water content of the atmosphere and the proximity to a large body of water.</p> <p><b>C 9.</b> Explain how the uneven heating of the Earth's surface causes winds and affects the seasons.</p>
<p><i>Science and Technology in Society – How do science and technology affect the quality of our lives?</i></p> <p><b>6.4 Water moving across and through earth materials carries with it the products of human activities.</b></p> <ul style="list-style-type: none"> <li>◆ Most precipitation that falls on Connecticut eventually reaches Long Island Sound.</li> </ul>	<p><b>C 10.</b> Explain the role of septic and sewage systems on the quality of surface and ground water sources.</p> <p><b>C 11.</b> Explain how human activity may impact water resources in Connecticut such as local ponds, rivers and the Long Island Sound ecosystem.</p>
<p><i>Grade 9: Science and Technology in Society – How do science and technology affect the quality of our lives?</i></p> <p><b>9.8 The use of resources by human populations may affect the quality of the environment. Some materials can be recycled, but others accumulate in environments and may affect the balance of the Earth systems.</b></p> <ul style="list-style-type: none"> <li>◆ Accumulations of metal and non-metal ions used to increase agricultural productivity is a major source of water pollution.</li> <li>◆ New technologies and changes in lifestyles can have positive and/or negative effects on the environment.</li> </ul>	<p><b>D 25.</b> Explain how land development, transportation options, and consumption of resources may affect the environment.</p> <p><b>D 26.</b> Describe human efforts to reduce the consumption of raw materials and improve air and water quality. Explain the short and long term impacts of landfill and incineration of waste materials on the quality of the environment.</p>

## Grade 8

Content Standards	Expected Performances
<p><i>Forces and Motion – What makes objects move the way they do?</i></p> <p><b>8.1 An object’s inertia causes it to continue moving the way it is moving unless it is acted upon by a force to change its motion.</b></p> <ul style="list-style-type: none"> <li>◆ The motion of an object can be described by its position, direction of motion and its speed.</li> <li>◆ An unbalanced force acting on an object changes its speed or direction of motion, or both.</li> <li>◆ Objects moving in circles must experience force acting toward the center.</li> </ul>	<p><b>C 22.</b> Calculate average speed of a moving object and illustrate the motion of objects in graphs of distance over time.</p> <p><b>C 23.</b> Describe the qualitative relationships among force, mass and changes in motion.</p> <p><b>C 24.</b> Describe the forces acting on an object moving in a circular path.</p>
<p><i>Energy Transfer and Transformations – What is the role of energy in our world?</i></p> <p><b>7.1 Energy provides the ability to do work and it can exist in many forms.</b></p> <ul style="list-style-type: none"> <li>◆ Work is the process of making objects move through the application of force.</li> <li>◆ Energy can be stored in many forms and can be transformed into the energy of motion.</li> </ul>	<p><b>C 12.</b> Explain relationship between force, distance and work; use the relationship (<math>W=F \times D</math>) to calculate work done in lifting heavy objects.</p> <p><b>C 13.</b> Explain how simple machines such as inclined planes, pulleys and levers are used to create mechanical advantage.</p> <p><b>C 14.</b> Describe how different types of stored (potential) energy are used to move objects.</p>
<p><i>Science and Technology in Society – How do science and technology affect the quality of our lives?</i></p> <p><b>8.4 In the design of structures there is a need to consider factors such as function, materials, safety, cost and appearance.</b></p> <ul style="list-style-type: none"> <li>◆ Bridges can be designed in different ways to withstand certain loads and potentially destructive forces.</li> </ul>	<p><b>C 30.</b> Explain how beam, truss and suspension bridges are designed to withstand the forces that act on them.</p>
<p><i>Earth in the Solar System – How does the position of Earth in the solar system affect the conditions on our planet?</i></p> <p><b>8.3 The solar system is composed of planets and other objects that orbit the sun.</b></p> <ul style="list-style-type: none"> <li>◆ Gravity is the force that governs the motions of objects in the solar system.</li> <li>◆ The motion of the Earth and Moon relative to the sun causes daily, monthly and yearly cycles on Earth.</li> </ul>	<p><b>C 28.</b> Explain the effect of gravity on the orbital movement of planets in the solar system.</p> <p><b>C 29.</b> Explain how the regular motion of the Sun, Earth and Moon explains the seasons, phases of the moon and eclipses.</p> <p><b>MMS:</b> Explain the latest technology and discoveries made in the field of Space Exploration.</p>
<p><i>Grades 9: Energy transfer and transformations – What is the role of energy in our world?</i></p> <p><b>9.2 The electrical force is a universal force that exists between any two charged objects.</b></p> <ul style="list-style-type: none"> <li>◆ Moving electrical charges produce magnetic forces, and moving magnets can produce electrical force.</li> <li>◆ Electrical current can be transformed into light through the excitation of electrons.</li> </ul>	<p><b>D 4.</b> Explain the relationship among voltage, current, and resistance in a simple series circuit.</p> <p><b>D 5.</b> Explain how electricity is used to produce heat and light in incandescent bulbs and heating elements.</p> <p><b>D 6.</b> Describe the relationship between current and magnetism.</p> <p><b>D 7.</b> Explain how heat is used to generate electricity.</p>

## **National Science Standards**

### **NS.5-8.3: Life Science**

#### ***POPULATIONS AND ECOSYSTEMS***

- A population consists of all individuals of a species that occur together at a given place and time. All populations living together and the physical factors with which they interact compose an ecosystem.
- Populations of organisms can be categorized by the function they serve in an ecosystem. Plants and some micro-organisms are producers--they make their own food. All animals, including humans, are consumers, which obtain food by eating other organisms. Decomposers, primarily bacteria and fungi, are consumers that use waste materials and dead organisms for food. Food webs identify the relationships among producers, consumers, and decomposers in an ecosystem.
- For ecosystems, the major source of energy is sunlight. Energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis. That energy then passes from organism to organism in food webs.
- The number of organisms an ecosystem can support depends on the resources available and abiotic factors, such as quantity of light and water, range of temperatures, and soil composition. Given adequate biotic and abiotic resources and no disease or predators, populations (including humans) increase at rapid rates. Lack of resources and other factors, such as predation and climate, limit the growth of populations in specific niches in the ecosystem.

### **NS.5-8.4: Earth and Space Science**

#### ***STRUCTURE OF THE EARTH SYSTEM***

- The solid earth is layered with a lithosphere; hot, convecting mantle; and dense, metallic core.
- Lithospheric plates on the scales of continents and oceans constantly move at rates of centimeters per year in response to movements in the mantle. Major geological events, such as earthquakes, volcanic eruptions, and mountain building, result from these plate motions.
- Land forms are the result of a combination of constructive and destructive forces. Constructive forces include crustal deformation, volcanic eruption, and deposition of sediment, while destructive forces include weathering and erosion.
- Water, which covers the majority of the earth's surface, circulates through the crust, oceans, and atmosphere in what is known as the "water cycle." Water evaporates from the earth's surface, rises and cools as it moves to higher elevations, condenses as rain or snow, and falls to the surface where it collects in lakes, oceans, soil, and in rocks underground.
- Water is a solvent. As it passes through the water cycle it dissolves minerals and gases and carries them to the oceans.
- The atmosphere is a mixture of nitrogen, oxygen, and trace gases that include water vapor. The atmosphere has different properties at different elevations.
- Clouds, formed by the condensation of water vapor, affect weather and climate.
- Global patterns of atmospheric movement influence local weather. Oceans have a major effect on climate, because water in the oceans holds a large amount of heat.

### ***EARTH'S HISTORY***

- The earth processes we see today, including erosion, movement of lithospheric plates, and changes in atmospheric composition, are similar to those that occurred in the past.

### ***EARTH IN THE SOLAR SYSTEM***

- The sun is the major source of energy for phenomena on the earth's surface, such as growth of plants, winds, ocean currents, and the water cycle. Seasons result from variations in the amount of the sun's energy hitting the surface, due to the tilt of the earth's rotation on its axis and the length of the day

## **NS.5-8.6 Personal and Social Perspectives**

### ***NATURAL HAZARDS***

- Human activities also can induce hazards through resource acquisition, urban growth, land-use decisions, and waste disposal. Such activities can accelerate many natural changes.

## **SECTION IV – Learning Resources**

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## **SUPPLEMENTAL RESOURCES**

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This list will be modified on a regular basis.

“One Degree Factor.” Narr: Edward Norton. National Geographic’s Strange Days on Planet Earth. PBS. Vulcan Productions and National Geographic Television and Film. 2005.

“Troubled Waters.” Narr: Edward Norton. National Geographic’s Strange Days on Planet Earth. PBS. Vulcan Productions and National Geographic Television and Film. 2005.

“Predators.” Narr: Edward Norton. National Geographic’s Strange Days on Planet Earth. PBS. Vulcan Productions and National Geographic Television and Film. 2005.

[http://www.pbs.org/strangedays/educators/ag\\_toc.html](http://www.pbs.org/strangedays/educators/ag_toc.html)

Volcanoes of the Deep Sea. Dir. Steven Low. Produced by James Cameron. Volcanic Ocean Films, Inc., 2003 .

Cascadia: The Hidden Fire. Dir. Michael Lienau. Global Net Productions, 2004.

*The Weather*. Narr. Donald McIntyre. BBC Video, 2003.

“Mystery of the Megaflood” NOVA. PBS. 2005.

<http://www.pbs.org/wgbh/nova/megaflood/>

Volcano. Narr: John Flynn. National Geographic Video, 1989.

Volcano: Nature’s Inferno. Narr: Stacy Keach. National Geographic Video, 1997.

Earthquakes: The terrifying Truth. ABC World of Discovery. Kane Productions International, Inc., 1994.

### **Special Education Resources:**

Instruction for inclusion of special education students is planned to the specific needs of the individual as established by the Individual Education Plan (IEP).

# Lab Format Sheet

Independent Variable (IV)	What you are changing/testing in the experiment (only 1 thing changes!!)
Dependent Variable (DV)	What is being measured – this changes based on the independent variable.

## Problem

- The question your experiment will answer

## Hypothesis

- What do you expect to happen in the experiment
- If Independent Variable then Dependent Variable, because...
- Written in a Statement Form

## Introduction

- Background information you have obtained from literature research (Paragraph Form)

## Experimental Plan

- List of Materials
- List Procedure in numbered steps – Do not use I, we – write in 3<sup>rd</sup> person

## Discussion = Table, Charts & Results

**Title:** The effect of the IV on the DV. (All tables & charts need a title!)

### Table:

Table with one Trial

IV (units)	DV (units)

Table with repeated Trials

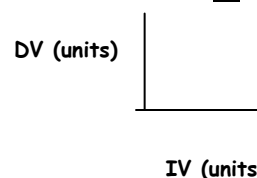
IV (units)	DV (units)			Average DV (units)
	1	2	3	

### Chart:

- Title Chart & Axis
- IV on x-Axis
- DV on y-Axis



The effect of the IV on the DV.



**Results:** A paragraph discussing the results - state information on Table(s) and Chart(s) & discuss trends/patterns of the data

## Conclusion

- Write in complete sentences & in paragraph form
- Do Not use I, me, we – write in the 3<sup>rd</sup> person
- Rephrase the problem as a statement that answers the question
- Explain Hypothesis – data supported or data did not support
- Analyze Results – using scientific concepts from class/research, explain how and why?
- Explain any unavoidable/experimental error - effects of it, and ways to reduce it
- Explain any real-life applications – who would care about the results & why
- Explain how this experiment relates to the topic you are studying in science class

## Further Investigations

- Based on this experiment what questions do you now have about this topic.
- List at least 2 questions/problems that you would like to run an experiment on now!