

**SOUTHERN REGIONAL SCHOOL DISTRICT SCIENCE SEMINAR I CURRICULUM**

**9-10**

Aligned to the 2009 New Jersey Core Curriculum Content Standards

**EXCELLENCE IN EDUCATION**

**Content Area: Science**

**Course Title: Science Seminar I**

**Grade Level: 9-10**

**Unit Plan 1**

**Weather Systems**

**Unit Plan 2**

**Earth Systems**

**Unit Plan 3**

**Atomic Structure**

**Unit Plan 4**

**Cellular Processes**

**Unit Plan 5**

**Ecology**

**Date Created: May 26, 2011**

**Board Approved on:**

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### Unit Overview

**Content Area: Science Seminar I**

**Unit Title:** Weather systems

**Target Course/Grade Level: 9-10**

**Unit Summary:** This unit is designed to give students an understanding of the composition of the Earth relating to weather.

**Primary interdisciplinary connections:** Infused within the unit are connection to the 2009 NJCCCS for Mathematics, language Arts Literacy, and Technology.

**21<sup>st</sup> century themes:** The unit will integrate the 21<sup>st</sup> Century life and Career stand 9.1 strands A-D. these strands include: Critical thinking and problem solving, creativity and innovation, collaboration, teamwork and leadership, and cross cultural understanding and interpersonal communication.

**Technology connections:**

For further clarification refer to NJ Class Standard introductions at [www.njcccs.org](http://www.njcccs.org).

### Learning Targets

#### Content Standards

This unit will assimilate three strands of Science Practices Standard 5.1, Science Practices. These strands include;

- A. Understand Scientific Explanations
- B. Generate Scientific Evidence Through Active Investigations
- C. Reflect on Scientific Knowledge

and the strands of Science Practices Standard 5.4, Earth Systems Science. This strand includes;

- F. Climate and Weather

**CONTENT STANDARDS LINK:** [www.njcccs.org](http://www.njcccs.org)

CPI #	Cumulative Progress Indicator (CPI)
5.1.12.A.1-3	All students will understand that science is both a body of knowledge and an evidence-based, model-building enterprise that continually extends, refines, and revises knowledge. The Four Science Practice Strands encompass the knowledge and reasoning skills that students must acquire to be proficient in service.
5.1.12.B.1	Design investigations, collect evidence, analyze data, and evaluate evidence to determine measures of central tendencies, causal/correlational relationships, and anomalous data.
5.1.12.B.2	Build, refine, and represent evidence-based models using mathematical, physical, and computational tools.
5.1.12.B.3	Revise predictions and explanations using evidence, and connect

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	explanations/arguments to established scientific knowledge, models, and theories
5.1.12.C.1	Reflect on and revise understandings a new evidence emerges
5.1.12.C.2	Use data representations and new models to revise predictions and explanations
5.1.12.C.3	Consider alternative theories to interpret and evaluate evidence-based arguments
5.4.12.F.1	Explain that it is warmer in summer and colder in winter for people in New Jersey because the intensity of sunlight is greater and the days are longer in summer than in winter. Connect these seasonal changes in sunlight to the tilt of Earth's axis with respect to the plane of its orbit around the Sun.
5.4.12.F.2	Explain how the climate in regions throughout the world is affected by seasonal weather patterns, as well as other factors, such as the addition of greenhouse gases to the atmosphere and proximity to mountain ranges and to the ocean.
5.4.12.F.3	Explain variations in the global energy budget and hydrologic cycle at the local, regional, and global scales.
<p><b>Unit Essential Questions</b></p> <ul style="list-style-type: none"> <li>• How is climate affected by seasonal weather patterns?</li> <li>• How can meteorologists predict storm paths?</li> <li>• How are seasonal changes in sunlight connected to the tilt of the Earth's axis?</li> <li>• What universal communication language and symbols are used by meteorologists to share knowledge and impart information?</li> <li>• How is the hydrologic cycle related to the global energy budget?</li> <li>• How does the composition of the atmosphere vary with altitude?</li> <li>• What tools do scientists use to measure various atmospheric conditions?</li> </ul>	<p><b>Unit Enduring Understandings</b></p> <p><i>Students will understand that...</i></p> <ul style="list-style-type: none"> <li>• The earth operates as a set of complex, dynamic, and interconnected systems, and is part of the all-encompassing system of the universe</li> <li>• Earth's weather and climate systems are the result of complex interactions.</li> </ul>
<p><b>Unit Objectives</b></p> <p><i>Students will know...</i></p> <ul style="list-style-type: none"> <li>• Vocabulary and key Terms</li> <li>• Essential laboratory equipment.</li> <li>• The importance of a universal system of measurement.</li> </ul>	<p><b>Unit Objectives</b></p> <p><i>Students will be able to...</i></p> <ul style="list-style-type: none"> <li>• Interpret and construct tables and graphs that illustrate scientific findings</li> <li>• Apply graphing skills in order to predict storms</li> <li>• Understand, evaluate and practice safe procedures for</li> </ul>

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<ul style="list-style-type: none"><li>• The effect of seasonal weather patterns.</li><li>• How to track and predict storms.</li><li>• The effect of revolution, rotation and tilt.</li><li>• Basic Lab Safety</li></ul>	<p>conducting science investigations</p> <ul style="list-style-type: none"><li>• Evaluate the effects of global climate changes, through both human and natural causes</li><li>• Explain the role of greenhouse gases on the atmosphere</li><li>• Compare the effects of rotation and revolution on the length of day and season</li><li>• Use Meteorological devices to record and analyze weather data</li><li>• Use and identify the appropriate symbols to forecast and predict weather patterns</li></ul>
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### Formative Assessments

For additional ideas please refer to NJ State DOE classroom application documents:

<http://njcccs.org/CADDownload.aspx>

- Observation
- Homework
- Class participation
- Venn Diagrams/Graphic Organizers
- DO-NOW
- Laboratories/Lab Reports
- Notebook
- Writing Assignments

### Summative Assessments

For additional ideas please refer to NJ State DOE Professional Education Port (PEP):

<http://www.state.nj.us/education/njpep/index.html>

- Chapter/Unit Test
- Writing Assignments
- Presentations
- Laboratory Reports
- Unit Projects
- Quarterly Exams

### Modifications (ELLs, Special Education, Gifted and Talented)

- Teacher tutoring
- Cooperative learning groups
- Modified assignments
- Differentiated instruction
- Native language texts and native language to English dictionary
- Follow all IEP modifications/504 plan

### Curriculum development Resources/Instructional Materials/Equipment Needed Teacher Resources:

- *Laboratory manuals and equipment*
- *Science Websites*
  - [www.pearsonsuccessnet.com](http://www.pearsonsuccessnet.com)
  - [www.biology.com](http://www.biology.com)
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### Unit Overview

**Content Area: Science**

**Unit Title:** Earth Systems

**Target Course/Grade Level: 9-10**

**Unit Summary**

This Unit is designed to give students an understanding of the composition of the Earth relating to atmosphere and forces that physically shape and alter its structure.

**Primary interdisciplinary connections:**

Infused within the unit are connection to the 2009 NJCCCS for Mathematics, Language Arts Literacy and Technology.

**21<sup>st</sup> century themes:**

The unit will integrate the 21<sup>st</sup> Century Life and Career stand 9.1 strands A-D. These strands include: Critical thinking and problem solving, creativity and innovation, collaboration, teamwork and leadership, and cross cultural understanding and interpersonal communication.

**Technology connections:**

For further clarification refer to NJ Class Standard Introductions at [www.njcccs.org](http://www.njcccs.org).

### Learning Targets

**Content Standards**

This unit will assimilate three strands of Science Practices Standard 5.1, Science Practices. These strands include;

- A. Understand Scientific Explanations
- B. Generate Scientific Evidence Through Active Investigations
- C. Reflect on Scientific Knowledge

and two strands of Science Practices Standard 5.4, Earth Systems Science. These strands include;

- C. Properties of Earth Materials
- D. Tectonics

**CONTENT STANDARDS LINK:** [www.njcccs.org](http://www.njcccs.org)

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<b>CPI #</b>	<b>Cumulative Progress Indicator (CPI)</b>
5.1.12.A.1-3	All students will understand that science is both a body of knowledge and an evidence-based, model-building enterprise that continually extends, refines, and revises knowledge. The Four Science Practice Strands encompass the knowledge and reasoning skills that students must acquire to be proficient in service.
5.1.12.B.1	Design investigations, collect evidence, analyze data, and evaluate evidence to determine measures of central tendencies, causal/correlational relationships, and anomalous data.
5.1.12.B.2	Build, refine, and represent evidence-based models using mathematical, physical, and computational tools.
5.1.12.B.3	Revise predictions and explanations using evidence, and connect explanations/arguments to established scientific knowledge, models, and theories.
5.1.12.C.1	Reflect on and revise understandings as new evidence emerges
5.1.12.C.2	Use data representations and new models to revise predictions and explanations.
5.1.12.C.3	Consider alternative theories to interpret and evaluate evidence-based arguments.
5.4.12.C.2	Analyze the vertical structure of Earth’s atmosphere, and account for the global, regional, and local variations of these characteristics and their impact on life.
5.4.12.D.1	Explain the mechanisms for plate motions using earthquake data, mathematics, and conceptual models.
<p><b>Unit Essential Questions</b></p> <ul style="list-style-type: none"> <li>• How does the composition of the atmosphere vary with altitude?</li> <li>• What scientific evidence supports the changing topography of the Earth?</li> </ul>	<p><b>Unit Enduring Understandings</b> <i>Students will understand that...</i></p> <ul style="list-style-type: none"> <li>• The earth operates as a set of complex, dynamic, and interconnected systems, and is part of the all-encompassing system of the universe</li> <li>• Earth’s composition is unique, is related to the origin of our solar system, and provides us with raw resources needed to sustain life</li> <li>• The theory of plate tectonics provides us with a framework for understanding the dynamic processes within our earth.</li> </ul>
<p><b>Unit Objectives</b> <i>Students will know...</i></p> <ul style="list-style-type: none"> <li>• Vocabulary and key Terms</li> <li>• Essential laboratory equipment.</li> <li>• The importance of a universal system of measurement.</li> <li>• Tectonic plate movement.</li> </ul>	<p><b>Unit Objectives</b> <i>Students will be able to...</i></p> <ul style="list-style-type: none"> <li>• Interpret and construct tables and graphs that illustrate scientific findings</li> <li>• Apply graphing skills in order to predict storms</li> <li>• Understand, evaluate and practice safe procedures for conducting science investigations</li> </ul>

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<ul style="list-style-type: none"><li>• The effect of revolution, rotation and tilt</li><li>• The layers of the atmosphere</li></ul>	<ul style="list-style-type: none"><li>• Evaluate the effects of global climate changes, through both human and natural causes</li><li>• Explain the evidence that supports the Theory of Plate Tectonics</li></ul>
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### Formative Assessments

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- Observation
- Homework
- Class participation
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### Unit Overview

**Content Area: Science**

**Unit Title:** Atomic Structure

**Target Course/Grade Level: 9-10**

**Unit Summary**

Students will understand and evaluate central atomic theory concepts and structure, as well as investigate how scientists classify elements using the periodic table.

**Primary interdisciplinary connections:**

Infused within the unit are connection to the 2009 NJCCCS for Mathematics, Language Arts Literacy and Technology.

**21<sup>st</sup> century themes:**

The unit will integrate the 21<sup>st</sup> Century Life and Career stand 9.1 strands A-D. These strands include: Critical thinking and problem solving, creativity and innovation, collaboration, teamwork and leadership, and cross cultural understanding and interpersonal communication.

**Technology connections:**

For further clarification refer to NJ Class Standard Introductions at [www.njcccs.org](http://www.njcccs.org).

### Learning Targets

**Content Standards**

This unit will assimilate two strands of Science Practices Standard 5.1, Science Practices. These strands include;

- A. Understand Scientific Explanations
- B. Generate Scientific Evidence Through Active Investigations

and assimilate two strands of Science Practices Standard 5.2, Physical Science. This strand is;

- A. Properties of Matter
- B. Changes in Matter

**CONTENT STANDARDS LINK:** [www.njcccs.org](http://www.njcccs.org)

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5.1.12.B.1	Design investigations, collect evidence, analyze data, and evaluate evidence to determine measures of central tendencies, causal/correlational relationships, and anomalous data.
5.1.12.B.2	Build, refine, and represent evidence-based models using mathematical, physical, and computational tools.
5.1.12.B.3	Revise predictions and explanations using evidence, and connect explanations/arguments to established scientific knowledge, models, and theories
5.2.12.A.1	Use atomic models to predict the behaviors of atoms in interactions.
5.2.12.A.2	Account for the differences in the physical properties of solids, liquids, and gases.
5.2.12.A.3	Predict the placement of unknown elements on the Periodic Table based on their physical and chemical properties.
5.2.12.A.4	Explain how the properties of isotopes and useful applications of isotopes.
<b>Unit Essential Questions</b> <ul style="list-style-type: none"> <li>• How do scientists name and identify elements?</li> <li>• How are electrons arranged within an atom?</li> <li>• How do atomic mass and atomic number differ?</li> <li>• How is the periodic table arranged?</li> </ul>	<b>Unit Enduring Understandings</b> <i>Students will understand that...</i> <ul style="list-style-type: none"> <li>• All objects and substances in the natural world are composed of matter.</li> <li>• Matter is conserved in chemical reactions</li> <li>• The periodic table can be used to predict properties of elements</li> </ul>
<b>Unit Objectives</b> <i>Students will know...</i> <ul style="list-style-type: none"> <li>• Information contained in the periodic table block</li> <li>• The difference between ion, isotope and atom.</li> <li>• How elements are arranged on the periodic table</li> <li>• How matter is classified</li> <li>• The difference between chemical and physical changes</li> <li>• The difference between physical and</li> </ul>	<b>Unit Objectives</b> <i>Students will be able to...</i> <ul style="list-style-type: none"> <li>• Identify elements and compounds</li> <li>• Classify matter</li> <li>• Identify substances using physical and chemical properties</li> <li>• Compare and contrast physical and chemical changes</li> <li>• Determine how the law of conservation of mass applies to chemical changes</li> <li>• Identify the names and symbols of common elements</li> <li>• Explain how electrons are arranged in an atom</li> <li>• Compute atomic mass and mass number of an atom.</li> </ul>

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<p>chemical properties</p> <ul style="list-style-type: none"><li>• The difference between elements and compounds.</li></ul>	<ul style="list-style-type: none"><li>• Identify isotopes of common elements</li><li>• Demonstrate knowledge of nuclear structure</li><li>• Use the periodic table to obtain information</li><li>• Discuss the organization of the periodic table</li></ul>
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### Formative Assessments

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### Unit Overview

**Content Area: Science**

**Unit Title:** Cellular Processes

**Target Course/Grade Level: 9-10**

#### Unit Summary

Cells, the most basic unit of life, are complex and dynamic. Their structures are specifically adapted to their function, and have an overall goal of maintaining homeostasis. In multicellular organisms, cells become specialized to carry out a particular function. Organisms and the cells within them have to grow and develop, move materials around, build new molecules, reproduce new cells, and respond to environmental changes. In order for an organism to perform these necessary functions they must be able to obtain and utilize energy.

Students will learn the discovery, structure and function of prokaryotic and eukaryotic cells. Students will also learn the similarities and differences between plant and animal cells and their organelles.

#### Primary interdisciplinary connections:

Infused within the unit are connection to the 2009 NJCCCS for Mathematics, Language Arts Literacy and Technology.

#### 21<sup>st</sup> century themes:

The unit will integrate the 21<sup>st</sup> Century Life and Career stand 9.1 strands A-D. These strands include: Critical thinking and problem solving, creativity and innovation, collaboration, teamwork and leadership, and cross cultural understanding and interpersonal communication.

#### Technology connections:

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### Learning Targets

#### Content Standards

This unit will assimilate one strand of Science Practices Standard 5.1, Science Practices. These strand is;

A. Understand Scientific Explanations

and two strands of Science Practices Standard 5.3, Life Science. These strands include;

A. Organization and Development

B. Matter and Energy Transformation

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<b>CONTENT STANDARDS LINK:</b> <a href="http://www.njcccs.org">www.njcccs.org</a>	
<b>CPI #</b>	<b>Cumulative Progress Indicator (CPI)</b>
5.1.12.A.1-3	All students will understand that science is both a body of knowledge and an evidence-based, model-building enterprise that continually extends, refines, and revises knowledge. The Four Science Practice Strands encompass the knowledge and reasoning skills that students must acquire to be proficient in service.
5.3.12.A.1	Represent and explain the relationship between the structure and function of each class of complex molecules using a variety of models.
5.3.12.A.2	Demonstrate the properties and functions of enzymes by designing and carrying out an experiment.
5.3.12.A.3	Predict a cell's response in a given set of environmental conditions.
5.3.12.B.4	Explain how environmental factors (such as temperature, light intensity, and the amount of water available) can affect photosynthesis as an energy storing process.
<b>Unit Essential Questions</b> <ul style="list-style-type: none"> <li>• How does structure relate to function in living systems from the organismal to the cellular level?</li> <li>• How do cell structures enable cells to carry out life processes?</li> </ul>	<b>Unit Enduring Understandings</b> <i>Students will understand that...</i> <ul style="list-style-type: none"> <li>• Living systems, at the cellular level, demonstrate the complementary nature of structure and function.</li> <li>• The difference between the major cell structures in the plant and animal cell</li> </ul>
<b>Unit Objectives</b> <i>Students will know...</i> <ul style="list-style-type: none"> <li>• Vocabulary and key terms.</li> <li>• Cells are made of complex molecules that consist mostly of a few elements.</li> <li>• There is a relationship between the organization of cells into tissues and the organization of tissues into organs.</li> <li>• The function of major cell structure</li> </ul>	<b>Unit Objectives</b> <i>Students will be able to...</i> <ul style="list-style-type: none"> <li>• Explain how the fundamental life processes of organisms depend on a variety of chemical reactions that occur in specialized areas of the organism's cells</li> <li>• Model how cells are enclosed within semi-permeable membranes that regulate their interaction with their surroundings, including the transport of materials into and out of the cell</li> <li>• Explain how the breakdown of some food molecules enables the cell to store energy in specific molecules that are used to carry out the many functions of the cell</li> </ul>

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### Formative Assessments

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### Unit Overview

**Content Area: Science**

**Unit Title:** Ecology

**Target Course/Grade Level: 9-10**

#### **Unit Summary**

Earth is a living planet in which all living things are linked to each other and to land, water, and air. Through these links, energy flows and matter cycles in ways that support life. These patterns are changing due to human activity on both the local and global levels. Our goal is to study the impact of our activity on the biosphere and make changes for a healthier future. The primary purpose of this unit is to develop the understanding that the existence of life on earth depends on interactions between organisms and between organisms and their environment. Various community interactions and dynamics will be explored that shape ecosystems. This unit also is designed to make students aware that the human society is part of the biosphere and is the most powerful force for change.

#### **Primary interdisciplinary connections:**

Infused within the unit are connection to the 2009 NJCCCS for Mathematics, Language Arts Literacy and Technology.

#### **21<sup>st</sup> century themes:**

The unit will integrate the 21<sup>st</sup> Century Life and Career stand 9.1 strands A-D. These strands include: Critical thinking and problem solving, creativity and innovation, collaboration, teamwork and leadership, and cross cultural understanding and interpersonal communication.

#### **Technology connections:**

For further clarification refer to NJ Class Standard Introductions at [www.njcccs.org](http://www.njcccs.org).

### Learning Targets

#### **Content Standards**

This unit will assimilate one strand of Science Practices Standard 5.1, Science Practices. These strand is;

A. Understand Scientific Explanations

and two strands of Science Practices Standard 5.3, Life Science. These strands include;

B. Matter and Energy Transformation

C. Interdependence

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<b>CPI #</b>	<b>Cumulative Progress Indicator (CPI)</b>
5.1.12.A.1-3	All students will understand that science is both a body of knowledge and an evidence-based, model-building enterprise that continually extends, refines, and revises knowledge. The Four Science Practice Strands encompass the knowledge and reasoning skills that students must acquire to be proficient in service.
5.3.12.B.1	Cite evidence that the transfer and transformation of matter and energy links organisms to one another and to their physical setting.
5.3.12.B.3	Predict what would happen to an ecosystem if an energy source was removed.
5.3.12.B.5	Investigate and describe the complementary relationship (cycling of matter and flow of energy) in the water, carbon, and nitrogen cycles.
5.3.12.C.1	Analyze the interrelationships and interdependencies among different organisms, and explain how these relationships contribute to the stability of the ecosystem.
5.3.12.C.2	Model how natural and human-made changes in the environment will affect individual organisms and the dynamics of populations.
<p><b>Unit Essential Questions</b></p> <ul style="list-style-type: none"> <li>• How do Earth's living (biotic) and nonliving (abiotic) parts interact and affect the survival of organisms and shape ecosystems?</li> <li>• What factors contribute to changes in populations?</li> <li>• How have human activities shaped local and global ecology?</li> </ul>	<p><b>Unit Enduring Understandings</b></p> <p><i>Students will understand that...</i></p> <ul style="list-style-type: none"> <li>• Measurement and observation tools are used to categorize, represent and interpret the natural world.</li> <li>• Evidence is used for building, refining, and/or critiquing scientific explanations.</li> <li>• All organisms transfer matter and convert energy from one form to another. Both matter and energy are necessary to build and maintain structures within the organism.</li> <li>• The survival of organisms is affected by interactions with each other and their environment, and can be altered by human manipulation.</li> <li>• The human society is part of the biosphere and is the most powerful force for change.</li> </ul>
<p><b>Unit Objectives</b></p> <p><i>Students will know...</i></p> <ul style="list-style-type: none"> <li>• Vocabulary and key terms.</li> <li>• Trophic levels within an ecosystem</li> <li>• The differences between food chains and food webs.</li> <li>• The biogeochemical cycles</li> <li>• The factors that limit population size.</li> <li>• Biological community interactions and symbiotic relationships</li> <li>• The differences between renewable and non-renewable resources.</li> <li>• Characteristics of sustainable</li> </ul>	<p><b>Unit Objectives</b></p> <p><i>Students will be able to...</i></p> <ul style="list-style-type: none"> <li>• Explain that the process of science attempts to find explanations using evidence for events in the natural world, and to use those explanations to make useful predictions.</li> <li>• Identify the levels of organization that ecologists study and describe the methods used to study ecology.</li> <li>• Trace the flow of energy through living systems and evaluate the efficiency of energy transfer among organisms in an ecosystem.</li> <li>• Explain how biotic and abiotic factors influence an ecosystem and describe how matter cycles among these factors.</li> <li>• Describe how the availability of nutrients affects the</li> </ul>

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<p>development.</p> <ul style="list-style-type: none"><li>• Benefits of biodiversity.</li><li>• Factors that influence our ecological footprint</li></ul>	<p>productivity of ecosystems.</p> <ul style="list-style-type: none"><li>• Identify and describe that interactions that shape communities.</li><li>• List the characteristics used to describe a population and identify factors that affect population size.</li><li>• Describe human activities that affect the biosphere and how ecosystems recover from a disturbance.</li><li>• Explain how environmental resources are classified and identify the characteristics of sustainable development.</li></ul>
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#### Formative Assessments

For additional ideas please refer to NJ State DOE classroom application documents:

<http://njcccs.org/CADDownload.aspx>

- Observation
- Homework
- Class participation
- Venn Diagrams/Graphic Organizers
- DO-NOW
- Laboratories/Lab Reports
- Notebook
- Writing Assignments

#### Summative Assessments

For additional ideas please refer to NJ State DOE Professional Education Port (PEP):

<http://www.state.nj.us/education/njpep/index.html>

- Chapter/Unit Test
- Writing Assignments
- Presentations
- Laboratory Reports
- Unit Projects focused on local ecological dynamics
- Quarterly Exams

#### Modifications (ELLs, Special Education, Gifted and Talented)

- Teacher tutoring
- Cooperative learning groups
- Modified assignments
- Differentiated instruction
- Native language texts and native language to English dictionary
- Follow all IEP modifications/504 plan

#### Curriculum development Resources/Instructional Materials/Equipment Needed Teacher Resources: Curriculum Development Resources/Instructional Materials/Equipment Needed Teacher Resources:

- Textbook
- Laboratory manuals and equipment
- Science Websites
  - <http://www.sciencenetlinks.com>
  - [www.biology.com](http://www.biology.com)
  - [www.phschools.com](http://www.phschools.com)

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