

Unit Overview

Content Area: Science

Course Title: Basic Environmental/Marine Science

Grade Level: 11/12

Unit Plan 1

Human/Environment Interface

Unit Plan 2

Ecological Interactions

Unit Plan 3

Natural Resources

Unit Plan 4

Human Impact

Unit Plan 5

Energy on Earth

Date Created:

Board Approved on:

Content Area: Basic Environmental Science	
Unit Title: Human/Environmental Interface	
Target Course/Grade Level: 11/12 (ICS)	
<p>Unit Summary: Give students an overview of how Environmental Scientists interface with the environment, and how they use a vast array of tools in which to study environments. The goal in mind is to get students gather data in various ways such as long term field data, historical data, remote data, and graphical data to begin the process of analysis. This unit will serve as a lasting thread throughout remaining units of the course.</p> <p>Primary interdisciplinary connections: Infused in the unit are connections to the 2009 NJCCCS for Mathematics, Language Arts Literacy and Technology</p> <p>21st century themes: For further clarification refer to NJ Class Standard Introductions @ www.njccs.org</p>	
Learning Targets	
Content Standards	
CPI #	Cumulative Progress Indicator (CPI)
5.1.12 A-C	Science Practices 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 Practices strands encompass the knowledge and reasoning skills that students must acquire to be proficient in science.
5.4.12.G.4	Compare over time the impact of human activity on the cycling of matter and energy through ecosystems.
5.4.12.G.5	Assess (using maps, local planning documents, and historical records) how the natural environment has changed since humans have inhabited the region.
5.1.12.D.3	Demonstrate how to use scientific tools and instruments and knowledge of how to handle animals with respect for their safety and welfare.
<p>Unit Essential Questions</p> <ul style="list-style-type: none"> • How can we use the past to help understand the present state of the environment? • What vast array of environmental sampling tools would best fit what data 	<p>Unit Enduring Understandings <i>Students will understand that...</i></p> <ul style="list-style-type: none"> • Technology is a major underlying factor in all research. • Change on earth can be slow and best measured over long period studies • Choosing and using the correct measurement tool that achieves the correct data and goal

<p>is needed?</p> <ul style="list-style-type: none"> • What is the difference between subjective and objective data? • Why is where you are and where you are going on earth so important? 	<ul style="list-style-type: none"> • How to extrapolate data from unmeasured data • Maps/charts/remote sensing are all tools at an environmental scientists disposal • Tag and release studies are key to understanding many aspects of organisms • An overview of how use of ocean resources has remained relatively unchanged.
<p>Unit Objectives <i>Students will know...</i></p> <ul style="list-style-type: none"> • Tagging/research techniques • Mapping/bathymetry and orienteering • GPS technology • Tank maintenance • Salinity/density relationship • Lab safety procedures • Proper use /choice of measurement tools • Various map projections • Graph interpolation • Human use of ocean over time 	<p>Unit Objectives <i>Students will be able to...</i></p> <ul style="list-style-type: none"> • Tag/recapture data collections (real/simulated) • Operate GPS units for location/traveling to research sites. • Daily/weekly/monthly water quality monitoring and remediation. • Salinity and density measurement and maintenance. • Lab and lab specimen safety • Record and analyze data from short and long term observational data. • Creating/analyzing/interpolating graphical data • Id various map/charts • Analyzing remote sensing data to id patterns. • Create and interpret time lines • Planning and facilitating a long term observational experiment

Formative Assessments

- Observations
- Homework
- Class participation
- Lab journal
- Writing assignments
- Data organization
- Notebooks
- Lab reports
- Graph/ graph reading
- Quizzes

Summative Assessments

- Unit projects
- Chapter and unit tests
- Practical tests
- Quarterly exams
- Presentations

Modifications (ELLs, Special Education, Gifted and Talented)

- **Extra help**
- **Peer tutoring**
- **Modified assignment**
- **Enrichment opportunities**
- **Native language to English Dictionary**
- **Differentiated Instruction**
- **Follow all IEP modifications/504 plan**

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

**Texts : Addison Wesley Environmental Science third edition
Data Stream Ocean (AMS) summer 08 investigations**

<http://www.ametsoc.org/amsedu/DS-Ocean/home.html>

Signals of spring (ACES)

[http://www.signalsofspring.net/aces/](http://www.signalsofpring.net/aces/)

Teacher made labs/projects

M² Lab (see teacher for write up)

Remote sensing sites (various web resources)

Teacher Notes

Unit Overview

Content Area: Basic Environmental

Unit Title: Ecological Interactions

Target Course/Grade Level: 11/12 (ICS)

Unit Summary: The unit's purpose is to lay the foundation of ecological study for students. The unit will encompass the interdependencies and interrelationship of all organisms and how those interactions carry through all aspects of environmental science. The unit also lays out the terminology that is used in the environmental science world's language. Finally the unit lays the framework for understanding and tracking energy and matter in ecosystems and how that relates to the organism.

Primary interdisciplinary connections:

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

21st century themes: The unit will integrate the 21st 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.

Learning Targets

Content Standards

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.
5.3.12.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.2	Use mathematical formulas to justify the concept of an efficient diet.
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) between photosynthesis and cellular respiration.
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>Unit Essential Questions</p> <ul style="list-style-type: none"> • How do Earth's living (biotic) and nonliving (abiotic) parts interact and affect the survival of organisms and shape ecosystems? • How have human activities shaped local and global ecology • What factors contribute to changes in populations? • How is an ecosystem like a game of “jenga”? 	<p>Unit Enduring Understandings <i>Students will understand that...</i></p> <ul style="list-style-type: none"> • Students will understand that a balance exists between living and nonliving, predators and their prey in an ecosystem • Students will become aware that the nitrogen cycle is an important part of a balanced tank ecosystem. • 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. • The survival of organisms is affected by interactions with each other and their environment, and can be altered by human manipulation.
<p>Unit Objectives <i>Students will know...</i></p> <ul style="list-style-type: none"> • Vocabulary and key terms. • The Interactions and relationships between living things in biological communities • The differences between food chains and food webs. • How a species adapts to its niche. How to relate evolution and to the concept of niche. • The factors that limit population size. • The characteristics of Earth’s major biomes. • The stages of primary and secondary succession. 	<p>Unit Objectives <i>Students will be able to...</i></p> <ul style="list-style-type: none"> • Identify the roles of producers, consumers and decomposers. • Explain the concept of the trophic level. • Describe the concept of the niche. • Examine how interactions between a species and its environment define the species niche. • Explain the relationship between the population sizes of predator and prey. • Define symbiosis and describe several symbiotic relationships. • Describe the factors that limit the growth of a population.

Formative Assessments

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Summative Assessments

- Unit projects
- Chapter and unit test
- Quarterly exams
- Presentations

Modifications (ELLs, Special Education, Gifted and Talented)

- Extra help
- Peer tutoring
- Modified assignments
- Enrichment opportunities
- Native language to English dictionary
- Differentiated instruction
- Follow all IEP modifications/504 plan

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

Addison Wesley Environmental Science third edition
DataStreme Ocean (AMS) Ocean Studies
Signals of Spring (ACES)
Teacher made labs

Teacher Notes:

Unit Overview

Content Area: Basic Environmental Science

Unit Title: Natural Resources

Target Course/Grade Level: 11/12 (ICS)

Unit Summary:

Students will begin to explore the cycles of nature, and how they related to the limited natural resources on earth. These limits are further complicated by human and the principal of “the tragedy of the commons”. This principal will be a common thread as students explore the major resources humans need to survive on the planet, and give students a chance to explore how they can play a role in helping the sustainability of those resources.

Primary interdisciplinary connections:

Infused in the unit are connections to the 2009 NJCCCS for Mathematics, Language Arts Literacy and Technology

21st century themes:

For further clarification refer to NJ Class Standard Introductions @ www.njccs.org

Learning Targets

Content Standards

CPI #	Cumulative Progress Indicator (CPI)
5.1.8.B.3	Use qualitative and quantitative evidence to develop evidence-based arguments.
5.1.12.D.1	Engage in multiple forms of discussion in order to process, make sense of, and learn from others’ ideas, observations, and experiences.
5.1.12.D.2	Represent ideas using literal representations, such as graphs, tables, journals, concept maps, and diagrams.
5.1.12.C.3	Consider alternative theories to interpret and evaluate evidence-based arguments.
5.4.12.G.2	Explain the unintended consequences of harvesting natural resources from an ecosystem.
5.4.12.G.4	Compare over time the impact of human activity on the cycling of matter and energy through ecosystems.
5.4.12.G.7	Relate information to detailed models of the hydrologic, carbon, nitrogen, phosphorus, sulfur, and oxygen cycles, identifying major sources, sinks, fluxes, and residence times.

Unit Essential Questions

- Resources are required by humans, how can we limit their abuse?

Unit Enduring Understandings

Students will understand that...

- Sustainable resources can be managed properly
- If resources are abused they can effect multiple levels of

<ul style="list-style-type: none"> • Why in its current state are Sustainable resources not infinitely usable? • What is the “tragedy of the commons” and how does it relate to natural resources? • What are the roadblocks to responsible resource use? 	<p>the environment that may seem unrelated.</p> <ul style="list-style-type: none"> • Cycles in nature are ways of tracking a resource • All resources are integral parts of human existence and should be used and not abused • Pollution of Resources can further limit the resource. • All resources on earth have limits.
<p>Unit Objectives <i>Students will know...</i></p> <ul style="list-style-type: none"> • Cycles in nature • Resource Management • Resource use and policy making • Soils resource usage • Land resource usage • Water resource usage • Air resource usage • Pollution as it relates to resources • All resources have finite limits 	<p>Unit Objectives <i>Students will be able to...</i></p> <ul style="list-style-type: none"> • Create/follow and map the main cycles of water, nitrogen and carbon in ecosystems • Model the main cycles in ecosystems • Identify Maximum sustainable yield based on graphical data of a natural resource. • Create a management policy that governs a resource. • Evaluate if the policy is effective over time • Identify resource use issues • Propose viable solutions to basic resource issues

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Summative Assessments

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- Presentations

Modifications (ELLs, Special Education, Gifted and Talented)

- **Extra help**
- **Peer tutoring**
- **Modified assignment**
- **Enrichment opportunities**
- **Native language to English Dictionary**
- **Differentiated Instruction**
- **Follow all IEP modifications/504 plan**

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

Texts : Addison Wesley Environmental Science third edition (Unit 6 chapters 18-22)

Simulations: Fishbanks

Teacher made labs/projects

Teacher Notes

Unit Overview

Content Area: Basic Environmental

Unit Title: Human Impact

Target Course/Grade Level: 11/12 (ICS)

Unit Summary: This unit focuses on the influence humans have on the earth. Human impact on the earth can be mitigated when students see that decisions they make in their neighborhood can positively or negatively affect the environment. A goal of this unit is to guide students to identify what impact their choices have, so as to lessen their impact on the local ecosystems. This includes students delving into how climate variability and climate change will be an integral part the next generation's life.

Primary interdisciplinary connections:

21st century themes:

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

The unit will integrate the 21st 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.

Learning Targets

Content Standards

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.
5.4.12.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.G.1	Analyze and explain the sources and impact of a specific industry on a large body of water (e.g., Delaware or Chesapeake Bay).
5.4.12.G.2	Explain the unintended consequences of harvesting natural resources from an ecosystem.
5.4.12.G.4	Compare over time the impact of human activity on the cycling of matter and energy through ecosystems.

<p>Unit Essential Questions</p> <ul style="list-style-type: none"> • How have human activities shaped local and global ecology? • How can the needs for water alter or destroy the ecology of an area? • How and why does the climate change and how does the ocean participate in and respond to climate change? • How does the process of eutrophication effect an aquatic ecosystem? 	<p>Unit Enduring Understandings <i>Students will understand that...</i></p> <ul style="list-style-type: none"> • A relationship exists between the environment, human behavior, and human values. • Environmental protection policies may be more effective at the local level.
<p>Unit Objectives <i>Students will know...</i></p> <ul style="list-style-type: none"> • Vocabulary and key terms. • Past and present methods for the disposal of solid and hazardous wastes. • How water is used in an ecosystem. • Water is not potable in all parts of the world. • That water pollution is linked to human disease. • Nitrate and phosphate affect the growth of algae. • The global effects of air pollution. • Green house effect on global warming and climate variability. • How a species becomes threatened and how the endangered species is applied. • Materials that are currently recycled. 	<p>Unit Objectives <i>Students will be able to...</i></p> <ul style="list-style-type: none"> • Identify the major types of water pollutants and their sources. • List examples of solid and hazardous wastes. • Explain methods for reducing the volume of solid wastes. • Define conservation, explaining why resources such as water and biodiversity need to be conserved. • State and describe the ways that biodiversity benefits humans. • Explain habitat destruction and the loss of biodiversity. • Describe ways of conserving energy. • Identify the benefits of recycling.

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

Addison Wesley Environmental Science third edition

American Meteorological Societies Earth's Climate System (ECS)

located at: <http://www.ametsoc.org/amsedu/ECS/home.html>

Teacher made labs

Teacher Notes:

Unit Overview

Content Area: Basic Environmental Science

Unit Title: Energy on Earth

Target Course/Grade Level: 11/12 (ICS)

Unit Summary:

All humans rely on some type of energy in order to live. There are many ways in which the students use energy in their everyday life. However if as a species if we continue to use the same energy in the same way we have, at the same rates that we have, we will deplete the planets sources in a very short time. This unit will not only focus on the ways we use energy, but how we can conserve it. In addition it will relate how we can involve other types of energy such as nuclear energy, and various types of alternative energy sources. Spread throughout will be the underlying theme of how every energy source has pros and cons to its use, and moving students in the direction of exploring their own opinions as to which sources would best fit their own ideals.

Primary interdisciplinary connections:

Infused in the unit are connections to the 2009 NJCCCS for Mathematics, Language Arts Literacy and Technology

21st century themes:

For further clarification refer to NJ Class Standard Introductions @ www.njccs.org

9.1.F 21st-Century Life & Career Skills All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.

Learning Targets

Content Standards

CPI #	Cumulative Progress Indicator (CPI)
5.4.12.E.1	Model and explain the physical science principles that account for the global energy budget
5.4.12.E.2	Predict what the impact on biogeochemical systems would be if there were an increase or decrease in internal and external energy.
5.4.12.G.5	Assess (using maps, local planning documents, and historical records) how the natural environment has changed since humans have inhabited the region.
5.1.12.D.3	Demonstrate how to use scientific tools and instruments and knowledge of how to handle animals with respect for their safety and welfare.
5.3.12.B.6	Explain how the process of cellular respiration is similar to the burning of fossil fuels.
5.1.12.C.3	Consider alternative theories to interpret and evaluate evidence-based arguments.

<p>Unit Essential Questions</p> <ul style="list-style-type: none"> • How can humans collectively reduce their dependence on energy? • How can you weigh the pros and cons of and energy source and come to a conclusion? • Changing fuel sources is a matter of changing how society acts, how can we change the societal norms? • Each energy source has its own stigmas attached, how would you present an energy form to overcome that stigma? 	<p>Unit Enduring Understandings <i>Students will understand that...</i></p> <ul style="list-style-type: none"> • Humans have a need for energy and our dependence on it • Energy from organic sources can be both positive and negative • How we get energy form nuclear sources • The need for alternative Energy sources • Understand the need to reduce our reliance on fossil fuels.
<p>Unit Objectives <i>Students will know...</i></p> <ul style="list-style-type: none"> • Where our major sources of energy come from • Sources of petroleum energy products • Sources and properties of nuclear energy • Explore various types of alternative energy sources and their pros and cons. 	<p>Unit Objectives <i>Students will be able to...</i></p> <ul style="list-style-type: none"> • Compare and contrast how various organic fuels are consumed to create viable energy • Identify how various forms of energy are used in their environment and the impacts of the use of that energy • Track the waste of fossil fuel use and how that impacts the environment. • Identify how nuclear fission reactors harness the power of atoms and convert it into usable energy • Identify various forms of alternative energy. • Compare and contrast various types of alternative energy sources • Explain how Biological fuels are an up and coming energy source • Id various types of methods of obtaining fossil fuels • Explore their own ethics on nuclear waste disposal methods • Identify the many ways that they can make an impact on conserving energy.

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Modifications (ELLs, Special Education, Gifted and Talented)

- Extra help
- Peer tutoring
- Modified assignment
- Enrichment opportunities
- Native language to English Dictionary
- Differentiated Instruction
- Follow all IEP modifications/504 plan

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

Texts : Addison Wesley Environmental Science third edition

Teacher made labs/projects

Remote sensing sites (various web resources)

Case studies and analysis

Teacher Notes