



GLOBAL WARMING

Subject: English | Current: 2010 | Grade: 9-12

Day: 1 of 2

1 Purpose ----- To examine the premise through literature that life on earth changes as a result of the climate.

2 Duration ----- 2 Lessons, 50-60 Minutes Each

3 Additional Topics ----- Species Extinction; Collapse of Civilizations

4 Objectives ----- Become familiar with the canon of sustainability by reading interdisciplinary works of non-fiction

5 Standards Addressed ----- **SOCIAL STUDIES**

WORLD HISTORY AND CIVILIZATION

Students will analyze and explain trends and events of global significance, such as world wars and international controversies and challenges, and cross-cultural changes that have connected once-separated regions into an incipient global community.

WH.8

GEOGRAPHY AND HISTORY OF THE WORLD

Students will examine the human causes of change to the environment on a global scale along with the impact of these changes on the lives of humans.

GHW.12

Analyze global climate change (sometimes called “global warming”) and assess the validity of this idea, the variable climate changes it forecasts for different parts of Earth, and the implications of these changes for humans (political, economic, and health and welfare).

GHW.12.1



SCIENCE

EARTH AND SPACE SCIENCE I

Students investigate, through laboratory and fieldwork, the universe, the Earth, and the processes that shape the Earth. They understand that the Earth operates as a collection of interconnected systems that may be changing or may be in equilibrium. Students connect the concepts of energy, matter, conservation, and gravitation to the Earth, solar system, and universe. Students utilize knowledge of the materials and processes of the Earth, planets, and stars in the context of the scales of time and size.

ES.1

Recognize and explain that the concept of conservation of energy is at the heart of advances in fields as diverse as the study of nuclear particles and the study of the origin of the universe.

ES.1.9

Recognize and describe that the earth sciences address planet-wide interacting systems, including the oceans, the air, the solid Earth, and life on Earth, as well as interactions with the Solar System. (Core Standard)

ES.1.10

Examine the structure, composition, and function of the Earth's atmosphere. Include the role of living organisms in the cycling of atmospheric gases. (Core Standard)

ES.1.11

Describe the role of photosynthetic plants in changing the Earth's atmosphere. (Core Standard)

ES.1.12

Explain the importance of heat transfer between and within the atmosphere, land masses, and oceans. (Core Standard)

ES.1.13

Understand and explain the role of differential heating and the role of the Earth's rotation on the movement of air around the planet. (Core Standard)

ES.1.14

Understand and describe the origin, life cycle, behavior, and prediction of weather systems. (Core Standard)

ES.1.15

Investigate the causes of severe weather and propose appropriate safety measures that can be taken in the event of severe weather. (Core Standard)

ES.1.16

Describe the development and dynamics of climatic changes over time, such as the cycles of glaciation.

ES.1.17

Demonstrate the possible effects of atmospheric changes brought on by things such as acid rain, smoke, volcanic dust, greenhouse effect, and ozone depletion. (Core Standard)

ES.1.18

Identify and discuss the effects of gravity on the waters of the Earth. Include both the flow of streams and the movements of tides. (Core Standard)

ES.1.19



Describe the relationship among ground water, surface water, and glacial systems. (Core Standard)

ES.1.20

Discuss geologic evidence, including fossils and radioactive dating, in relation to the Earth's past. (Core Standard)

ES.1.28

Recognize and explain that in geologic change, the present arises from the materials of the past in ways that can be explained according to the same physical and chemical laws. (Core Standard)

ES.1.29

BIOLOGY

Students work with the concepts, principles, and theories that enable them to understand the living environment. They recognize that living organisms are made of cells or cell products that consist of the same components as all other matter, involve the same kinds of transformation of energy, and move using the same kinds of basic forces. Students investigate, through laboratories and fieldwork, how living things function and how they interact with one another and their environment.

B.1

Trace the relationship between environmental changes and changes in the gene pool, such as genetic drift and isolation of sub-populations. (Core Standard)

B.1.36

Explain that the amount of life any environment can support is limited by the available energy, water, oxygen, and minerals, and by the ability of ecosystems to recycle the residue of dead organic materials. Recognize, therefore, that human activities and technology can change the flow and reduce the fertility of the land. (Core Standard)

B.1.37

Describe how ecosystems can be reasonably stable over hundreds or thousands of years. Understand that if a disaster such as flood or fire occurs, the damaged ecosystem is likely to recover in stages that eventually result in a system similar to the original one. (Core Standard)

B.1.39

Understand and explain that like many complex systems, ecosystems tend to have cyclic fluctuations around a state of rough equilibrium. However, also understand that ecosystems can always change with climate changes or when one or more new species appear as a result of migration or local evolution. (Core Standard)

B.1.40

Recognize that and describe how human beings are part of the Earth's ecosystems. Note that human activities can, deliberately or inadvertently, alter the equilibrium in ecosystems. (Core Standard)

Describe the flow of matter, nutrients, and energy within ecosystems. (Core Standard)

B.1.41



Recognize that and describe how the physical or chemical environment may influence the rate, extent, and nature of the way organisms develop within ecosystems. (Core Standard)

B.1.45

INTEGRATED CHEMISTRY-PHYSICS

Understand and give examples to show that an enormous variety of biological, chemical, and physical phenomena can be explained by changes in the arrangement and motion of atoms and molecules.

CP.1.11

PHYSICS I

Students recognize the nature and scope of physics, including its relationship to other sciences and its ability to describe the natural world. Students learn how physics describes the natural world, using quantities such as velocity, acceleration, force, energy, momentum, and charge. Through experimentation and analysis, students develop skills that enable them to understand the physical environment. They learn to make predictions about natural phenomena by using physical laws to calculate or estimate these quantities. Students learn that this description of nature can be applied to diverse phenomena at scales ranging from the subatomic to the structure of the universe and include every day events. Students learn how the ideas they study in physics can be used in concert with the ideas of the other sciences. They also learn how physics can help to promote new technologies. Students will be able to communicate what they have learned orally, mathematically, using diagrams, and in writing.

P.1

ADVANCED ENVIRONMENTAL SCIENCE

Students investigate, through laboratory and fieldwork, the concepts of environmental systems, populations, natural resources, and environmental hazards.

ENV.1

Know and describe how ecosystems can be reasonably stable over hundreds or thousands of years. Consider as an example the ecosystem of the Great Plains prior to the advent of the horse in Native American Plains societies, from then until the advent of agriculture, and well into the present.

ENV.1.1

Understand and describe that if a disaster, such as flood or fire occurs, the damaged ecosystem is likely to recover in stages that eventually result in a system similar to the original one.

ENV.1.2

Understand and explain that ecosystems have cyclic fluctuations, such as seasonal changes or changes in population, as a result of migrations.

ENV.1.3

Understand and explain that human beings are part of the Earth's ecosystems, and give examples of how human activities can, deliberately or inadvertently, alter ecosystems.

ENV.1.4



Identify and measure biological, chemical, and physical factors within an ecosystem.

ENV.1.10

Locate, identify, and explain the role of the major earth biomes and discuss how the abiotic and biotic factors interact within these ecosystems.

ENV.1.11

Explain the process of succession, both primary and secondary, in terrestrial and aquatic ecosystems.

ENV.1.12

Recognize and explain that the amount of life any environment can support is limited by the available energy, water, oxygen, and minerals, and by the ability of ecosystems to recycle organic materials from the remains of dead organisms.

ENV.1.14

Illustrate the flow of energy through various trophic levels of food chains and food webs within an ecosystem. Describe how each link in a food web stores some energy in newly made structures and how much of the energy is dissipated into the environment as heat. Understand that a continual input of energy from sunlight is needed to keep the process going.

ENV.1.18

Indiana Department of Education. (n.d.). Indiana Standards and Resources: Social Studies: World History and Civilization, and Geography of the World; Science: Earth and Space Science, Biology, Physics, Advanced Environmental Science, and Integrated Chemistry. Retrieved from <http://dc.doe.in.gov/Standards/AcademicStandards/StandardSearch.aspx>

6 Vocabulary

----- These terms are included in the lesson plan:

- **Permafrost:** Ground remaining frozen for two years
- **Global Warming:** Increase in the average temperature of the Earth's near- surface air and oceans
- **Natural Greenhouse Effect:** A process that keeps the earth warm and habitable
- **Kyoto Protocol:** Policy to limit the emission of greenhouse gases

7 Materials

----- Materials to aide the lesson plan include:

- Excerpts from reports, reflections, field notes of scientists who have studied earth changes.
- Access to a science lab within the school.
- http://www.ridge2000.org/seas/for_students/data/field_notes_05.html
- http://www.yourdailygreen.com/Technology/Henry_David_Thoreau_as_Climatologist_Scientists_Use_Field_Notes_Taken_in_1851_to_Track_Plant_Species_Loss
- http://www.exploratorium.edu/origins/antarctica/fieldnotes/12_31senses.html



8 Additional Resources

----- Additional Resources include:

- School Library
- Meteorologist

9 Methods & Procedures

----- The lesson plan's course is as follows:

A. Introduction

Teacher will introduce the concept of “field notes,” whereby students will record observations of phenomena assigned by the teacher. Students will then read their notes to other students without elaboration, to check for clarity of description.

B. Development

Students will read excerpts from Field Notes From a Catastrophe and consider the process of change as it occurs in nature (butterflies, frogs, flowers, trees, insects, etc). Students will then brainstorm the effects of change caused by fire, flood, erosion, drought, rain, wind, and other “natural” phenomena. Students must pick one environmental change and one change affecting humankind, such as starvation.

C. Practice

Group project: students construct a mini- ecosystem (tropical forest, savanna, desert, etc) and list the threats to the stability of the ecosystem. The project will include the food chain, animals and plants, human interaction and cycles for an ecosystem.

-URL at end of lesson plan

D. Independent Practice

Students attend a meeting of an environmental action group, take field notes, and share with the class.

E. Accommodations (Differentiated Instruction)

For those students that may not be able to take notes, provide voice-activated recorders. For students who may need scaffolding, provide a good example of appropriate field notes.

F. Checking for understanding

Students will write a journal entry discussing the effects of environmental change on their community. Prompt: What would happen if there were no trees?



G. Closure

Careers in the Science and Technology Directorate of the Department of Homeland Security

-URL at the end of lesson plan

Instructional Systems Specialist: URL at end of lesson plan

10 Evaluation

----- A rubric will be used to assess the mini-ecosystem project. -URL at end of lesson plan

Rubric is found at: -URL at end of lesson plan

11 Teacher Reflection

----- The teacher will complete this after teaching the lesson.

12 Resources & Media

----- Websites and Video provided throughout lesson plan:

- Carson, Rachel. 1962. Silent Spring. Boston: Houghton-Mifflin
- Darwin, Charles. 1839. The Voyage of the Beagle.
- Sacks, Oliver. 1998. The Island of the Color Blind. New York: Vintage.
- Cunningham, Davis (dir.). 2006. An Inconvenient Truth (DVD).
- http://www.ridge2000.org/seas/for_students/data/field_notes_05.html
- http://www.yourdailygreen.com/Technology/Henry_David_Thoreau_as_Climatologist_Scientists_Use_Field_Notes_Taken_in_1851_to_Track_Plant_Species_Loss
- http://www.exploratorium.edu/origins/antarctica/fieldnotes/12_31senses.html
- <http://www.mysciencebox.org/ecoplan>
- www.rcampus.com/rubricshowc.cfm?code=Q32X3A
- http://www.dhs.gov/xabout/structure/gc_1244558032819.shtm
- www.indeed.com/q-Instructional-Systems-Specialist-l-Fairfax,-VA-jobs.html



The Federal documents used in this lesson plan are works of the U.S. Government and are not subject to copyright protection in the United States. (17 USC § 105).

This work is being released under creative commons license, CC-BY-SA. Text of license is available at <http://creativecommons.org/licenses/by-sa/3.0/>