

NATURAL/ENVIRONMENTAL SCIENCE

LENGTH OF TIME: 90 minutes daily for one semester

GRADE LEVEL: 10 - 12

COURSE STANDARDS:

The student will:

1. Compare and contrast the structure and function of representative aquatic and terrestrial ecosystems. PA Std 3.1, 3.3, 4.1, 4.6
2. Define species, communities and populations and describe their interactions. PA Std 4.6
3. Discuss threats to our air, water, and other natural resources and summarize methods that might be taken to conserve them. PA Std 4.3, 4.2
4. Describe man's traditional sources of energy and research alternatives. PA Std 4.8
5. Outline the current hypothesis for the origin of life on earth and describe the mechanisms of organic variation. PA Std 4.6
6. Correctly identify representative specimens of local flora and fauna. PA Std 4.6, 4.7

RELATED PA ACADEMIC STANDARDS FOR SCIENCE AND TECHNOLOGY

- 3.1 Unifying Themes
 - B. Models
 - C. Patterns
 - D. Scale
 - E. Change
- 3.3 Biological Sciences
 - A. Living Forms
 - B. Structure and Function
 - D. Evolution

RELATED PA ACADEMIC STANDARDS FOR ENVIRONMENT AND ECOLOGY

- 4.1 Watersheds and Wetlands
 - A. Cycles
 - B. Role of watersheds
 - C. Physical Factors
 - D. Characteristics and functions of wetlands
 - E. Impacts of watersheds and wetlands
- 4.2 Renewable and Nonrenewable Resources
 - A. Uses
 - B. Availability
 - C. Management
 - D. Influential Factors
- 4.3 Environmental Health

- A. Environmental Health Issues
- B. Human Actions
- C. Biological Diversity
- 4.4 Agriculture and Society
 - A. Society's needs
 - B. Agricultural science
 - C. Agricultural systems
 - D. Technology
- 4.5 Integrated Pest Management
 - A. Effects, Benefits and Impacts
 - B. Health Risks
 - C. Management Practices
- 4.6 Ecosystems and their Interactions
 - A. Living and Nonliving Components
 - B. Cycles
 - C. Change over Time
- 4.7 Threatened, Endangered and Extinct Species
 - A. Diversity
 - B. Adaptation
 - C. Management Strategies
- 4.8 Humans and the Environment
 - A. Societal Needs
 - B. Sustainability
 - C. Human Impacts
 - D. Supply and Demand
- 4.9 Environmental Laws and Regulations
 - A. Environmental Laws and their Impact

PERFORMANCE ASSESSMENTS:

Students will demonstrate achievement of the standards by:

1. Diagram food webs and food chains and explain the transfer of nutrients and materials. (Course Standard 1,2) PA Std 4.6
2. Construct cognitive maps to depict and analyze biogeochemical cycles. (Course Standard 1) Pa Std 3.1, 4.1, 4.6
3. Carry out computer simulations of populations that incorporate the factors that affect their dynamics. (Course Standard 2) PA Std 4.3, 4.6, 4.8
4. Write a research report about an endangered species. (Course Standard 2,3) PA Std 4.7
5. Outline the steps involved in terrestrial and aquatic succession in local ecosystems. (Course Standard 1,2) PA Std 4.6
6. Measure levels of dissolved oxygen, carbon dioxide, and pH in samples of water, taken from local lentic and lotic sources, and discuss their implications. (Course Standards 1,2,3) PA Std 4.1, 4.6
7. Research, design, and produce an informational poster on a pollutant. (Course Standard 3) PA Std 4.3

8. Debate the hypothetical disposal of solid and toxic wastes in the area that comprises the school district. (Course Standard 3) Pa Std 4.3
9. Draw an editorial cartoon focused on an environmental problem. (Course Standard 3) PA Std 4.8
10. Students will write and perform a radio play describing a particular ecosystem. PA Std 4.6
11. Create a comic book or board game that incorporates the information discussed in class concerning traditional and alternative sources of energy. (Course Standard 4) PA Std 4.2, 4.8
12. Devise an energy plan for a future home and lifestyle, based on present day energy costs. (Course Standard 4) PA Std 4.8
13. Correctly identify 20 local birds by their calls. (Course Standard 6) PA Std 4.6
14. Create identification keys to use in the sight identification of representative birds, insects, trees, and wild flowers from our locality. (Course Standard 6) PA Std 4.6
15. Correctly identify 20 local organisms by their tracks or signs. (Course Standard 6) PA Std 4.6
16. Take rubbings of 12 local trees and use taxonomic keys to identify them. (Course Standard 6) PA Std 4.6
17. Research, design, and produce an informational pamphlet on a species of Pennsylvania wildlife. (Course Standard 6) PA Std 4.6
18. Visit a local meadow, forest, lentic, and lotic ecosystem to measure selected abiotic factors, answer questions regarding the structure and function of each, and identify flora and fauna. (Course Standard 6) PA Std 4.6
19. Submit a project that may consist of, but is not limited to, a collection, a model, a journal, a research project, or an in-depth study of an aspect of natural or environmental science discussed in the course. (Course Standard 6) PA Std 4.1-4.9

DESCRIPTION OF COURSE:

The objective of Natural and Environmental Science is to help students develop a greater understanding and appreciation for the interdependence of plant and animal life and those forces in nature which affect them. Activities may include field trips, various outdoor activities, and laboratory exercises that demonstrate ecological relationships and the concept of change in nature. Global, regional, and local environmental problems will be studied.

TITLES OF UNITS:

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| 1. Ecological Principles and Their Application | 1 ½ weeks |
| 2. Interactions of Organisms and the Environment | 1 week |
| 3. Types of Ecosystems and Communities | 1 ½ weeks |
| 4. Change in Ecosystems | 2 weeks |
| 5. Water Issues | 3 weeks |
| 6. Air Pollution and Climate Change | 3 weeks |
| 7. Land Use Issues | 2 weeks |
| 8. Traditional and Alternative Sources of Energy | 2 weeks |
| 9. Human Impact on Resources and Ecosystems | 3 weeks |

10. Natural History of the Palisades Area

ongoing

SAMPLE INSTRUCTIONAL STRATEGIES:

1. Cooperative learning groups
2. Problem solving activities
3. Small group activities
4. Individual explorations
5. Recitation
6. Process writing
7. Oral presentations
8. Lecture and discussion
9. Audio-visual presentations
10. Simulations
11. Model construction
12. Independent reading
13. Laboratory activities
14. Technology assisted learning
15. Computer simulations
16. Research activities
17. Cognitive mapping
18. Student created charts, posters, graphs, comic books, board games, cartoons, and brochures
19. Collections
20. Time lines

MATERIALS:

1. Text – Holt Environmental Science; Karen Arms; Holt, Reinhart, Winston; 2000
2. Computers and appropriate software
3. Selected audio visual materials
4. Field guides
5. Instruments: thermometers, microscopes, compasses, and psychrometers
6. Art supplies
7. HACH water testing kits
8. Aquatic sampling supplies
9. Appropriate miscellaneous lab ware

METHODS OF ASSISTANCE AND ENRICHMENT:

1. Opportunities for retesting
2. Tutorial opportunities
3. Pretests and test previews
4. Extra credit opportunities
5. Study guides/work sheets
6. Collaborative assessment opportunities
7. Alternative modes of assessment
8. Strategies developed with the Instructional Support Team

9. Resource room

PORTFOLIO DEVELOPMENT:

In order to document achievement and show evidence of improvement in science, students may include in their portfolios selections from the following:

1. Lab reports
2. Science writing
3. Projects/presentations
4. Tests/quizzes
5. Demonstration of scientific method
6. Drawings/models
7. Graphic organizers
8. Collections
9. Evidence of extended learning
10. Science awards

METHODS OF EVALUATION:

1. Tests and quizzes
2. Homework
3. Oral presentations
4. Laboratory reports
5. Research reports
6. Group and individual projects
7. Field final

INTEGRATED ACTIVITIES:

1. Concepts
 - understand and describe the components of ecological systems and their functions
 - analyze the effects of social systems, behaviors, and technologies on ecological systems and environmental quality
 - evaluate the implications of finite natural resources and the need for conservation, sustainable agricultural development and stewardship of the environment
 - correctly identify native trees, wildflowers, insects, and birds
2. Communication
 - read and use a variety of methods to make sense of texts
 - respond orally and in writing to information and ideas gained by reading, and use information and ideas to make decisions and solve problems
 - write for a variety of purposes
 - exchange information orally, ask and answer questions appropriately and promote effective group communication
 - compose and make oral presentations
3. Thinking/Problem Solving
 - use effective research and information management skills

- compute, measure, and estimate to solve theoretical and practical problems
- evaluate, infer, and draw appropriate conclusions from charts, tables, and graphs
- construct and evaluate models of scientific systems
- develop and apply skills of observation, data collection, analysis, pattern recognition, and scientific reasoning in designing and conducting experiments
- think critically and generate potential solutions to environmental issues

4. Application of Knowledge

- use laboratory instruments
- traditional library and computer aided research
- demonstrate knowledge of basic concepts and principles of natural and environmental science through traditional and alternate forms of assessment

5. Interpersonal Skills

- demonstrate skills of communicating, negotiating, and cooperating with others
- demonstrate that they can work effectively with others
- demonstrate the ability to work cooperatively in group situations