

# ***Course of Study***

## *Environmental Science*

**Warren County Career Center**

**3525 North State Route 48  
Lebanon, Ohio 45036**

**Adopted 6-15-06**

*This document is for the use of the staff at Warren County Career Center.  
Credit is given the designer of the template, Upper Valley JVS, Piqua, Ohio.*

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# *Acknowledgements*

## **Environmental Science Warren County Career Center**

We would like to take this opportunity to express our gratitude to the following people for their guidance and support in the preparation of this course of study:

Warren County Career Center Administrative Team  
Warren County Educational Service Center  
Mr. Karl Flem  
Mr. Jeff Little  
Mrs. Adrienne Schmidt  
Ms. Toni Welles  
Mrs. Charla Cornwell  
Mrs. Sandra Monti

***Warren County Career Center  
Resolution Of School Board Approval***

WHEREAS, representatives of the Science Department of the Warren County Career Center have reviewed the Course of Study; and

WHEREAS, this Course of Study is based upon Academic Content Standards adopted by the State of Ohio for the Environmental Science program; and

WHEREAS, the Science Department have reviewed and added competencies as needed to address local labor market needs and trends in the industry;

NOW, THEREFORE, BE IT RESOLVED, in accordance with the Superintendent's recommendation, that the Warren County Career Center adopt the Environmental Science Course of Study.

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District Superintendent

Date

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President, Board of Education

Date

## *Statement of Recommendation*

The Science Department at Warren County Career Center has reviewed this course of study and recommends it for use as the foundation for instruction in the Environmental Science class.

The developers of this course of study have considered local labor market needs and the school's ability to offer specialized programs. The competencies have been reviewed and accepted as being congruent with our school's vision, mission, and strategic goals. When appropriate, additional competencies related to the program area have been incorporated into this course of study.

Achievement of technical competencies, utilizing proper attitudes, and demonstrating appropriate values are critical for successful employment and for furthering educational opportunities within a student's chosen field. We believe that this course of study adequately and correctly focuses upon student development.

This course of study is recommended on: 6-15-06

## ***Warren County Career Center Vision Statement***

WCCC is the valued partner of choice within the educational and economic systems of our communities, by providing quality academic and career technical education.

We pave the way for a future of opportunities unique to each of our learners.

## ***Warren County Career Center Mission Statement***

To prepare youths and adults to make informed career choices and to successfully enter, compete, and advance in a changing work world.

## ***Warren County Career Values***

- Communicating openly and honestly
- Taking ownership of personal actions and being held accountable for results
- Upholding and demonstrating high ethical, educational and fiscal standards
- Exhibiting high levels of professionalism
- Providing high quality instruction and highly qualified staff to ensure success for all learners
- Making quality customer service a high priority
- Promoting partnerships and a team environment
- Celebrating team and individual achievements
- Using data to drive planning, decision making and actions

## *Course Design*

Courses are designed to reflect career-focused education, which combines high-level academics with real-life technical skills. The intent is to maximize a student's present and future academic and career success.

Career-focused education enhances the integration of academic and technical skills, designs programs that prepare students with transferable skills and promotes each student's career opportunities.

## *Course Philosophy*

We believe that the philosophy for our science courses to be:

- Prepare students to use appropriate scientific processes and principles to make personal decisions;
- Enable students to engage in intelligent public discourse about matters of scientific and technological concern;
- Help students develop an understanding of themselves and the world in which they live;
- Foster an understanding of the nature of science, the development of science processes, the principles of science, and the connections between all the sciences;
- Increase their future economic productivity through the use of scientific knowledge, understanding, and skills in their careers.

## ***Course Goals***

The course goals for Environmental Science are to:

- Set high expectations and provide support for achievement by all students
- Provide balance among conceptual understanding, procedural knowledge and skills, and application and problem-solving
- Provide skills to allow them to be able to apply scientific knowledge and processes to individual and societal issues
- Incorporate the use of technology by all students and the interconnected nature of science and technology
- Understand chemical concepts and how their interactions are involved with technology and career paths

## ***Course Description***

Environmental Science contains a challenging study in the study of our environment. Connection between science, technology, and society are related to the study with the use of environmental issues. Students will become more informed on the global issues regarding our environment, thereby allowing them to become better decision makers.

The Environmental Science course provides an applied science using observations and experimentation. Students will learn to solve environmental problems relating to resource depletion, pollution, and extinction. These issues will explore developing and developed countries, giving the students a global prospective on several environmental concerns.

This study of will help students develop the skills necessary for development of critical thinking in the work force and real life situations.

There are no prerequisites for Environmental Science which will allow students from all career pathways to obtain their required science credits.

## ***Academic and Technical Integration***

Expectations of curriculum must be aligned with what is written, taught, assessed, and reported. Student expectations focus on active, project-centered learning—an approach to learning that emphasizes a connection between ideas in a discipline and the outside world. Educational programming and course content will clearly connect career and post-secondary opportunities. At the Warren County Career Center, the main goal is to design courses and projects that use strategies for authentic instruction. These characteristics of instruction focus on deep understanding, established opportunities for concept connections, provide anticipatory and abstract thinking, and emphasize genuine application.

The academic courses at the WCCC follow the state model curricula. They are designed to meet both associate school and state requirements. These standards respond to the need to improve student achievement, quality of curriculum and instruction, and strengthen school and community relationships.

## ***Technology***

The Warren County Career Center board and staff believe that technology skills are essential for all students to achieve in the 21<sup>st</sup> century. It is the goal of this district to infuse technology into all facets of education:

- Instruction
- Assessment
- Administration
- Career planning
- Course design
- Professional development

Strategies to incorporate technology into all facets of education are a priority of the district and there is commitment to a continual process to provide updated hardware, software, and professional development for staff members for the purpose of providing a high quality education, with the integration of technology, for all students.

## *Students Served*

The population served by this program are juniors and seniors at the Warren County Career Center.

# *Scope and Sequence*

## Environmental Science

### *Competency 1 Environmental Science: A Global Prospective*

- 1.1 Understanding Our Environment
  - 1.1.1 Describe the three categories into which most environmental problems fall
  - 1.1.2 Explain how the population crisis and the consumption crisis contribute to environmental problems
  - 1.1.3 Distinguish between renewable and non-renewable resources
- 1.2 Using Science to Solve Environmental Problems
  - 1.2.1 Distinguish between pure and applied science
  - 1.2.2 Describe scientific method
  - 1.2.3 Explain the uses of tables, line graphs, bar graphs, and pie charts
- 1.3 Making Environmental Decision
  - 1.3.1 Use a decision-making model to make a decision about an environmental issue
  - 1.3.2 Name values that are important in making decisions about the environment

### *Competency 2 Living Things in Ecosystems*

- 2.1 Connections In The Ecosystem
  - 2.1.1 Distinguish between the biotic and abiotic factors in an ecosystem
  - 2.1.2 Explain the terms populations and community
  - 2.1.3 Distinguish between habitat and niche
- 2.2 How Species Interact With Each Other
  - 2.2.1 Explain the five major types of species interactions
  - 2.2.2 List examples of each of the five major types of species interactions
- 2.3 Adapting To The Environment
  - 2.3.1 Explain the process of evolution by natural selection
  - 2.3.2 Explain the concept of adaptation
  - 2.3.3 Explain the concept of coevolution
  - 2.3.4 Define the term extinction

### *Competency 3 How Ecosystem Work*

- 3.1 Explain The Energy Flow Within The Ecosystem
  - 3.1.1 Describe the roles of producers and consumers
  - 3.1.2 Trace the transfer of energy from the sun to producers and from producers to consumers
  - 3.1.3 Draw a food chain and a food web
  - 3.1.4 Explain why an energy pyramid is a good representation of trophic levels
- 3.2 The Cycling of Materials
  - 3.2.1 Describe the water, carbon, and nitrogen cycles
  - 3.2.2 Explain how humans are affecting the carbon cycle
  - 3.2.3 Explain the importance of the nitrogen cycle and nitrogen-fixing bacteria

- 3.3 How Ecosystems Change
  - 3.3.1 Describe secondary and primary succession
  - 3.3.2 Explain the importance of pioneer species
  - 3.3.3 Explain how soil is formed

*Competency 4 Kings of Ecosystems*

- 4.1 Forests
  - 4.1.1 Define biome
  - 4.1.2 Compare and contrast the world's forest biomes
  - 4.1.3 Describe plant and animal adaptations in each kind of forest
- 4.2 Grasslands, Chaparral, Deserts, and Tundra
  - 4.2.1 Describe the factors that shape and characterize grassland, chaparral, desert, and tundra ecosystems
  - 4.2.2 Explain how the adaptations of plants and animals in each ecosystem help them to survive
- 4.3 Freshwater Ecosystems
  - 4.3.1 Describe the characteristics of the different freshwater ecosystems
  - 4.3.2 Compare survival adaptations of organisms in moving and standing freshwater ecosystems
- 4.4 Marine Ecosystems
  - 4.4.1 Describe the characteristics of estuaries, coral reefs, oceans, and polar ecosystems
  - 4.4.2 Describe the organisms' adaptations to different marine environments

*Competency 5 Water*

- 5.1 Our Water Resources
  - 5.1.1 Explain why fresh water is a precious resource
  - 5.1.2 Describe our main sources of fresh water
  - 5.1.3 Explain why fresh water is often in short supply
- 5.2 Freshwater Pollution
  - 5.2.1 Explain why groundwater pollution is hard to clean
  - 5.2.2 Define and compare point and non-point pollution
  - 5.2.3 Classify the kinds of water pollutants
  - 5.2.4 Describe the impact of water pollution on people and on the environment
- 5.3 Ocean Pollution
  - 5.3.1 Explain how and why the oceans are polluted and describe the effects of pollution on marine life
  - 5.3.2 Discuss the effects of polluted oceans on humans
  - 5.3.3 Explain how individuals can prevent ocean pollution

*Competency 6 Air*

- 6.1 What Causes Air Pollution?
  - 6.1.1 Name the major sources of air pollution
  - 6.1.2 Distinguish between primary and secondary pollutants
  - 6.1.3 Explain how we could reduce air pollution
  - 6.1.4 Explain how a thermal inversion can make air pollution worse
- 6.2 Effects On Human Health
  - 6.2.1 Describe some possible health effects of air pollution
  - 6.2.2 Explain what causes indoor air pollution and how it can be prevented
- 6.3 Acid Precipitation

- 6.3.1 Explain what causes acid precipitation
- 6.3.2 Explain how acid precipitation affects ecosystems
- 6.3.3 Describe ways that countries are working together to solve the problem of acid precipitation

*Competency 7 Atmosphere and Climate*

- 7.1 The Atmosphere
  - 7.1.1 Explain how the atmosphere makes life possible on Earth
  - 7.1.2 Explain how photosynthesis and respiration keep the amount of carbon dioxide in the air nearly constant
  - 7.1.3 Describe how the atmosphere is structured in layers
- 7.2 Climate
  - 7.2.1 Explain why different parts of the world have different climates
  - 7.2.2 Explain what causes the seasons
- 7.3 Greenhouse Earth
  - 7.3.1 Explain why the Earth and its atmosphere are like a greenhouse
  - 7.3.2 Explain why carbon dioxide levels in the atmosphere are rising
  - 7.3.3 Explain why many scientists think that the Earth's climate will get warmer
  - 7.3.4 Describe what a warmer Earth might be like
- 7.4 The Ozone Shield
  - 7.4.1 Explain how the ozone layer shields the Earth from much of the sun's harmful radiation
  - 7.4.2 Explain how CFC's are damaging the ozone layer
  - 7.4.3 Describe the damaging effects of excessive ultraviolet light

*Competency 8 Land*

- 8.1 The City
  - 8.1.1 Define suburban sprawl and explain why it is considered a problem
  - 8.1.2 Describe the urban crisis and explain what city planners are doing to relieve it
- 8.2 How We Use Land
  - 8.2.1 Describe how humans use non-urban lands as natural resources
  - 8.2.2 Explain how logging, ranching, and mining activities affect the land
  - 8.2.3 Explain how lands can be logged, grazed, and mined sustainably
- 8.3 Public Land In The United States
  - 8.3.1 Explain how public land is used in the United States
  - 8.3.2 Discuss the benefits and disadvantages of using public land for multiple uses

*Competency 9 Food*

- 9.1 Feeding The People Of The World
  - 9.1.1 Explain why providing adequate food for all of the world's people is so difficult
  - 9.1.2 Describe the advantages and disadvantages of the green revolution
- 9.2 Agriculture and Soil
  - 9.2.1 Describe fertile soil
  - 9.2.2 Describe methods of preventing soil erosion
  - 9.2.3 Explain how irrigation can cause salinization
  - 9.2.4 Describe desertification and how it can be prevented
  - 9.2.5 Compare low-input and conventional farming
- 9.3 Pest Control
  - 9.3.1 Explain why pest control is often necessary

- 9.3.2 Explain how insects can become resistant to pesticides
- 9.3.3 Describe alternatives to pesticides

*Competency 10 Biodiversity*

- 10.1 Biodiversity At Risk
  - 10.1.1 Explain how humans are causing extinctions of other species
  - 10.1.2 Explain why it is important that we preserve biodiversity
- 10.2 Public Policy
  - 10.2.1 Describe the main provision of the Endangered Species Act
  - 10.2.2 Define *endangered species* and *threatened species*
  - 10.2.3 Discuss controversies about efforts to protect endangered species
  - 10.2.4 Describe worldwide efforts to prevent extinctions
- 10.3 The Future of Biodiversity
  - 10.3.1 Describe how captive breeding programs, botanical gardens, and germ-plasm banks help save species
  - 10.3.2 Explain the advantages of protecting entire ecosystems rather than individual species

*Competency 11 Energy*

- 11.1 Fossil Fuels to Electricity
  - 11.1.1 Explain how fossil fuels are used to produce electricity
  - 11.1.2 Distinguish between renewable and non-renewable resources
  - 11.1.3 Explain how our major sources of energy are dwindling
- 11.2 Nuclear Energy
  - 11.2.1 Define *nuclear fission*
  - 11.2.2 Describe the operation of a nuclear power plant
  - 11.2.3 Explain how a nuclear power plant is similar to a plant that burns fossil fuels
  - 11.2.4 Explain the advantages and disadvantages of nuclear energy
- 11.3 A Sustainable Energy Future
  - 11.3.1 Describe methods of conserving energy
  - 11.3.2 Describe several alternative energy sources

*Competency 12 Waste*

- 12.1 Solid Waste: The Throwaway Society
  - 12.1.1 Define *solid waste*
  - 12.1.2 Explain how most municipal solid waste is disposed of
- 12.2 Solid Waste: Options For the Future
  - 12.2.1 Describe three ways to reduce the amount of waste that goes to landfills and incinerators
- 12.3 Hazardous Waste
  - 12.3.1 Define *hazardous waste*
  - 12.3.2 Explain how most hazardous waste is disposed of in the United States
  - 12.3.3 Explain the two best ways to deal with the hazardous-waste problem

*Competency 13 Population Growth*

- 13.1 How Populations Change in Size
  - 13.1.1 Describe the factors that affect a population's size
  - 13.1.2 Explain why populations grow
  - 13.1.3 Explain what limits a population's growth
- 13.2 A growing Human Population
  - 13.2.1 Describe how the size of the human populations has changed

- 13.2.2 Identify the factors that led to changes in the human populations
- 13.2.3 Describe the stages of population growth
- 13.3 Problems Related to Population Growth
  - 13.3.1 Describe the problems stemming from population growth

*Competency 14    Toward A Sustainable Future*

- 14.1 International Cooperation
  - 14.1.1 Describe the results of the Earth Summit
  - 14.1.2 Describe international agreements relating to the environment
- 14.2 Environmental Policies in the United States
  - 14.2.1 Explain how environmental impact statements are prepared
  - 14.2.2 Describe the role of local government in environmental conservation
  - 14.2.3 Give examples of how citizens can influence environmental decisions at all levels of government

## *Source Documents for Scope and Sequence*

- \* National Science Education Standards
- \* Ohio Draft Science Content Standards

# ***TECHNOLOGY STANDARDS***

## **Standard 1: Nature of Technology**

**Students develop an understanding of technology, its characteristics, scope, core concepts\* and relationships between technologies and other fields.**

Benchmark A: Synthesize information, evaluate and make decisions about technologies.

Benchmark B: Apply technological knowledge in decision-making.

Benchmark C: Examine the synergy between and among technologies and other fields of study when solving technological problems.

## **Standard 2: Technology and Society Interaction**

**Students recognize interactions among society, the environment and technology, and understand technology's relationship with history. Consideration of these concepts forms a foundation for engaging in responsible and ethical use of technology.**

Benchmark A: Interpret and practice responsible citizenship relative to technology.

Benchmark B: Demonstrate the relationship among people, technology and the environment.

Benchmark C: Interpret and evaluate the influence of technology throughout history, and predict its impact on the future.

Benchmark D: Analyze ethical and legal technology issues and formulate solutions and strategies that foster responsible technology usage.

Benchmark E: Forecast the impact of technological products and systems.

## **Standard 3: Technology for Productivity Applications**

**Students learn the operations of technology through the usage of technology and productivity tools.**

Benchmark A: Integrate conceptual knowledge of technology systems in determining practical applications for learning and technical problem-solving.

Benchmark B: Identify, select and apply appropriate technology tools and resources to produce creative works and to construct technology-enhanced models.

#### **Standard 4: Technology and Communication Applications**

**Students use an array of technologies and apply design concepts to communicate with multiple audiences, acquire and disseminate information and enhance learning.**

Benchmark A: Apply appropriate communication design principles in published and presented projects.

Benchmark B: Create, publish and present information, utilizing formats appropriate to the content and audience.

Benchmark C: Identify communication needs, select appropriate communication tools and design collaborative interactive projects and activities to communicate with others, incorporating emerging technologies.

#### **Standard 5: Technology and Information Literacy**

**Students engage in information literacy strategies, use the Internet, technology tools and resources, and apply information-management skills to answer questions and expand knowledge.**

Benchmark A: Determine and apply an evaluative process to all information sources chosen for a project.

Benchmark B: Apply a research process model to conduct research and meet information needs.

Benchmark C: Formulate advanced search strategies, demonstrating an understanding of the strengths and limitations of the Internet, and evaluate the quality and appropriate use of Internet resources.

Benchmark D: Evaluate choices of electronic resources and determine their strengths and limitations.

#### **Standard 6: Design**

**Students apply a number of problem-solving strategies demonstrating the nature of design, the role of engineering and the role of assessment.**

Benchmark A: Identify and produce a product or system using a design process, evaluate the final solution and communicate the findings.

Benchmark B: Recognize the role of teamwork in engineering design and of prototyping in the design process.

Benchmark C: Understand and apply research, development and experimentation to problem-solving.

## **Standard 7: Designed World**

**Students understand how the physical, informational and bio-related technological systems of the designed world are brought about by the design process. Critical to this will be students' understanding of their role in the designed world: its processes, products, standards, services, history, future, issues and career connections.**

Benchmark A: Classify, demonstrate, examine, and appraise energy and power technologies.

Benchmark B: Classify, demonstrate, examine and appraise transportation technologies.

Benchmark C: Classify, demonstrate, examine and appraise manufacturing technologies.

Benchmark D: Classify, demonstrate, examine and appraise construction technologies.

Benchmark E: Classify, demonstrate, examine and appraise information and communication technologies

Benchmark F: Classify, demonstrate, examine and appraise medical technologies.

Benchmark G: Classify, demonstrate, examine and appraise agricultural and related biotechnologies.

# *Performance Measures/Student Assessment/Instructional Strategies*

## **Assessments/Evaluations**

- Observations
- Demonstrations
- Portfolios
- Standardized Tests
- Class Assignment
- Quizzes/Tests/Exams

## **Instructional Strategies**

- Teacher-Directed & Student-Centered Activities
- Case Study Problem Solving
- Cooperative Learning
- Project-Based Learning
- Career-Based Learning (Internships/Shadowing/Placement)
- Community-Based Learning (CTSOs and Other)
- Exploratory Learning
- Independent Research
- Team Teaching

## **Content Specific Strategies**