

**OFFICE OF EDUCATIONAL ACCOUNTABILITY**  
**Summary of State Board of Education Agenda Items**  
**August 15-16, 2013**

**OFFICE OF ACCREDITATION**

16. Approval to allow up to two (2) of the three (3) required science units (excluding Biology I) to be earned by completing Agriculture and Natural Resources I & II  
(Has cleared the Administrative Procedures Act process without public comment)

On June 6, 2013, the Commission on School Accreditation approved the proposal from the Office of Career and Technical Education to allow up to two (2) of the three (3) required science units (excluding Biology I) to be earned by completing Agriculture and Natural Resources I & II. One (1) credit allowed shall be awarded for Biology II, and one-half (1/2) credit shall be awarded for Botany, and one-half (1/2) credit shall be awarded for Field Experiences in Science.

Recommendation: Approval

Back-up material attached



**Approved by the Commission on School Accreditation  
June 6, 2013**

**Item 16**

**Discussion of the Office of Career and Technical Education proposal to allow up to two (2) of the three required science units (excluding Biology I) to be earned by completing Agriculture and Natural Resources I & II (it is suggested that one credit allowed be awarded for Biology II, and ½ credit be awarded for Botany, and ½ credit be awarded for Field Experiences in Science)**

The Office of Career and Technical Education requests the Accreditation Commission to consider an addition to its document *Mississippi Public Schools Accountability Standards 2012*, Appendixes A-1, A-2, A-3, and B. The addition is to allow CTE courses in Agriculture and Natural Resources to satisfy science credits for graduation purposes.

At the present time students already are awarded two credits of science to satisfy sciences credits for graduation but the credits earned are at the discretion of each district. This change is to bring consistency to the awarding of science equivalent credits.

We are requesting approval of 4-Carnegie credits in Agriculture and Natural Resources I & II to satisfy up to 2 of the science credits required for graduation (excluding Biology I). We are asking that the note in these appendixes be stated:

**“<sup>3</sup> Up to 2 of the three required science units (excluding Biology I) may be earned by completing Agriculture and Natural Resources I & II (it is suggested that one credit allowed be awarded for Biology II, and ½ credit be awarded for Botany, and ½ credit be awarded for Field Experiences in Science).”**

Justification

- The MDE Office of Curriculum and Instruction appointed a team of academic science teachers to review the updated curriculum in Agriculture and Natural Resources I & II with the purpose of determining if the content of this 4-credit sequence of courses included content that is comparable to up to 2 credits in science. Facilitated by the RCU at MSU and utilizing a crosswalk of content that compared Secondary Sciences (Academic) to Secondary Agriculture and Natural Resources (CTE), the team studied the content and judged it to be equivalent academic credit and recommended credit equivalent to Biology II, Botany, and Field Experiences in Science.
- Attachments: A: Equivalent Credit Process  
B: Reports of Committee Findings  
C: Curriculum Crosswalk

Office of Career and Technical Education

Equivalent Credit Process Form

Process:

1. Upon completion of the CTE curriculum development the RCU and MDE personnel will work with academic committees to evaluate the equivalent academic credit for the specific pathway.
2. The RCU will provide a crosswalk of the pathway curriculum showing alignment to the academic course competencies.
3. Academic committees will document and sign off via fax or email if the course content is aligned to the academic credit trying to be attained.
4. Committee members must be in agreement of awarding the equivalent credit to the CTE pathway.
5. The committee members have 2 working weeks to approve or disapprove the crosswalk.
6. Upon disapproval RCU and MDE personnel will work with the committee to revise the curriculum as needed.

Date of beginning process: 1/9/13 (OKS)

Date of initial webinar: 2/1/2013 @ 12 noon (OKS) → rescheduled to 3/1/13 (OKS)

Materials supplied to the committee from the RCU personnel: ANR crosswalk

Date of approval: \_\_\_\_\_ " curriculum

\*\*See attached for signatures and letters of approval.

Definitions:

Committee members: 2 secondary and 2 postsecondary academic instructors.

Pathway: A career and technical education sequence of courses.

RCU personnel: Instructional Design Specialist of the pathway.

MDE personnel: The CTE program supervisor of the pathway.

**Agriculture and Natural Resources Academic Credit Review**

**Report of Committee Findings**

The Mississippi Department of Education through its Office of Career and Technical Education authorized the Research and Curriculum Unit (RCU) of Mississippi State University to conduct a study of the content of the 4-credit curriculum in Agriculture and Natural Resources (ANR) to determine if that content is sufficient in rigor and relevance to be considered equivalent to academic course(s) in science. Specific attention is to be given to whether ANR content is sufficient to award science credit toward graduation for 260142 Biology II and 269998 Field Experiences in Science Courses. The RCU established a committee of five science teachers to participate in this study.

Each committee member was provided a complete curriculum for ANR and a "crosswalk" of that content to academic standards found in science courses. Following their study, each committee member was asked to execute the following evaluation form (including signature) and return the form to the RCU.

A. Mark one:

  C  

I have reviewed the materials and determined that the content found in the ANR curriculum is equivalent to 260142 Biology II, and I recommend students completing the ANR curriculum be awarded Biology II credit for graduation purposes.

\_\_\_\_\_

I have reviewed the materials and determined that the content found in the ANR curriculum is not equivalent to 260142 Biology II, and I do not recommend students completing the ANR curriculum be awarded 260142 Biology II credit for graduation purposes.

B. Mark one:

  C  

I have reviewed the materials and agree that the content found in the ANR curriculum is equivalent to 269998 Field Experiences in Science Courses, and I recommend students completing the ANR curriculum be awarded Field Experiences in Science Courses credit for graduation purposes.

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I have reviewed the materials and determined that the content found in the ANR curriculum is not equivalent to 269998 Field Experiences in Science Courses, and I do not recommend students completing the ANR curriculum be awarded Field Experiences in Science Courses credit for graduation purposes.

C. Mark one:

  C  

I have reviewed the materials and determined that the content found in the ANR curriculum is equivalent to 260311 Botany, and I recommend students completing the ANR curriculum be awarded Botany credit for graduation purposes.

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I have reviewed the materials and determined that the content found in the ANR curriculum is not equivalent to 260311 Botany, and I do not recommend students completing the ANR curriculum be awarded 260311 Botany credit for graduation purposes.



Signature of Committee Member

**Agriculture and Natural Resources Academic Credit Review**

**Report of Committee Findings**

The Mississippi Department of Education through its Office of Career and Technical Education authorized the Research and Curriculum Unit (RCU) of Mississippi State University to conduct a study of the content of the 4-credit curriculum in Agriculture and Natural Resources (ANR) to determine if that content is sufficient in rigor and relevance to be considered equivalent to academic course(s) in science. Specific attention is to be given to whether ANR content is sufficient to award science credit toward graduation for 260142 Biology II and 269998 Field Experiences in Science Courses. The RCU established a committee of five science teachers to participate in this study.

Each committee member was provided a complete curriculum for ANR and a "crosswalk" of that content to academic standards found in science courses. Following their study, each committee member was asked to execute the following evaluation form (including signature) and return the form to the RCU.

A. Mark one:

I have reviewed the materials and determined that the content found in the ANR curriculum is equivalent to 260142 Biology II, and I recommend students completing the ANR curriculum be awarded Biology II credit for graduation purposes.

I have reviewed the materials and determined that the content found in the ANR curriculum is not equivalent to 260142 Biology II, and I do not recommend students completing the ANR curriculum be awarded 260142 Biology II credit for graduation purposes.

B. Mark one:

I have reviewed the materials and agree that the content found in the ANR curriculum is equivalent to 269998 Field Experiences in Science Courses, and I recommend students completing the ANR curriculum be awarded Field Experiences in Science Courses credit for graduation purposes.

I have reviewed the materials and determined that the content found in the ANR curriculum is not equivalent to 269998 Field Experiences in Science Courses, and I do not recommend students completing the ANR curriculum be awarded Field Experiences in Science Courses credit for graduation purposes.

C. Mark one:

I have reviewed the materials and determined that the content found in the ANR curriculum is equivalent to 260311 Botany, and I recommend students completing the ANR curriculum be awarded Botany credit for graduation purposes.

I have reviewed the materials and determined that the content found in the ANR curriculum is not equivalent to 260311 Botany, and I do not recommend students completing the ANR curriculum be awarded 260311 Botany credit for graduation purposes.

*Cynthia Alawara*

Signature of Committee Member

Agriculture and Natural Resources Academic Credit Review

Report of Committee Findings

The Mississippi Department of Education through its Office of Career and Technical Education authorized the Research and Curriculum Unit (RCU) of Mississippi State University to conduct a study of the content of the 4-credit curriculum in Agriculture and Natural Resources (ANR) to determine if that content is sufficient in rigor and relevance to be considered equivalent to academic course(s) in science. Specific attention is to be given to whether ANR content is sufficient to award science credit toward graduation for 260142 Biology II and 269998 Field Experiences in Science Courses. The RCU established a committee of five science teachers to participate in this study.

Each committee member was provided a complete curriculum for ANR and a "crosswalk" of that content to academic standards found in science courses. Following their study, each committee member was asked to execute the following evaluation form (including signature) and return the form to the RCU.

A. Mark one:

I have reviewed the materials and determined that the content found in the ANR curriculum is equivalent to 260142 Biology II, and I recommend students completing the ANR curriculum be awarded Biology II credit for graduation purposes.

I have reviewed the materials and determined that the content found in the ANR curriculum is not equivalent to 260142 Biology II, and I do not recommend students completing the ANR curriculum be awarded 260142 Biology II credit for graduation purposes.

B. Mark one:

I have reviewed the materials and agree that the content found in the ANR curriculum is equivalent to 269998 Field Experiences in Science Courses, and I recommend students completing the ANR curriculum be awarded Field Experiences in Science Courses credit for graduation purposes.

I have reviewed the materials and determined that the content found in the ANR curriculum is not equivalent to 269998 Field Experiences in Science Courses, and I do not recommend students completing the ANR curriculum be awarded Field Experiences in Science Courses credit for graduation purposes.

C. Mark one:

I have reviewed the materials and determined that the content found in the ANR curriculum is equivalent to 260311 Botany, and I recommend students completing the ANR curriculum be awarded Botany credit for graduation purposes.

I have reviewed the materials and determined that the content found in the ANR curriculum is not equivalent to 260311 Botany, and I do not recommend students completing the ANR curriculum be awarded 260311 Botany credit for graduation purposes.

  
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Signature of Committee Member

**Agricultural and Natural Resources (ANR) 2012**

**Program CIP: 01.0003**

The following chart shows the crosswalk between Agricultural and Natural Resources (ANR) 2012 and 2010 Science Framework. ANR curriculum aligns with BIOLOGY II and also aligns with Field Experiences. It is requested that a student successfully completing ANR receive 1 credit for BIOLOGY II and ½ credit for Field Experiences.

ANR Curriculum	Academic Standards
<p>Unit 1: Introduction to ANR</p> <p>Competency 1: Examine the nature of the agriculture and natural resources industry.</p> <p>a. Investigate the scope of the agricultural and natural resources industry.</p> <p>b. Trace the development of agricultural sciences and technologies in the United States.</p> <p>c. Associate the major areas of agriculture and natural resources with their products and practices.</p> <p>d. Investigate education and training opportunities in agriculture and natural resources.</p> <p>e. Examine the scope of the agricultural and natural resources industry from a global perspective.</p> <p>Competency 2: Examine the relationships between the pure sciences, agriculture, and agriscience.</p> <p>a. Associate the pure sciences with agriculture and agriscience areas.</p> <p>b. Develop a plan for conducting an experiment using the scientific method.</p> <p>Competency 3: Apply standard agricultural and natural resources safety practices.</p> <p>a. Apply safety standards in the workplace.</p> <p>b. Apply safety standards in the agricultural classroom and laboratory.</p> <p>c. Interpret information on a material safety data sheet (MSDS).</p> <p>d. Describe the use of general safety using hand equipment and indicators to include safety color codes, fire extinguishers, first aid kits, emergency exits, and so forth.</p> <p>e. Apply safety precautions related to dress and personal- protection devices and select procedures for dealing with the different classes of fires.</p>	<p>AQ 1 Apply inquiry-based and problem-solving processes and skills to scientific investigations.</p> <p>BIOI 1 Apply inquiry-based and problem-solving processes and skills to scientific investigations.</p> <p>BIOI 2 Describe the biochemical basis of life and explain how energy flows within and between the living systems.</p> <p>BO 1 Apply inquiry-based and problem-solving processes and skills to scientific investigations.</p> <p>ES 1 Apply inquiry-based and problem-solving processes and skills to scientific investigations.</p> <p>G 1 Apply inquiry-based and problem-solving processes and skills to scientific investigations.</p> <p>PS 1 Apply inquiry-based and problem-solving processes and skills to scientific investigations.</p> <p>ZO 1 Apply inquiry-based and problem-solving processes and skills to scientific investigations.</p>
<p>Unit 4: Science of Animals</p> <p>Competency 1: Explore the animal agriculture industry and enterprises.</p> <p>a. Associate the different classes of domestic animals with ways that each benefits humanity (beef and dairy cattle, horse, swine, poultry, goats, and sheep).</p> <p>b. Explore the production, processing, and marketing of major animal enterprises (beef and dairy cattle, horse, swine, poultry, goats, and sheep).</p>	<p>BIOI 2 Describe the biochemical basis of life and explain how energy flows within and between the living systems.</p> <p>BIOI 3 Investigate and evaluate the interaction between living organisms and their environment.</p> <p>BIOI 4 Analyze and explain the structures and function of the levels of biological organization.</p> <p>BIOI 5 Demonstrate an understanding of the molecular basis of heredity.</p> <p>BIOII 2 Describe and contrast the structures, functions, and chemical processes of the cell.</p>



<p>c. Compare the concepts of animal rights and animal welfare as related to agricultural animal enterprises.</p> <p>Competency 2: Investigate the anatomy and physiology of animals.</p> <p>a. Diagram the major components of an animal cell and list their functions.</p> <p>b. Explain animal growth and reproduction by cell mitosis and meiosis.</p> <p>c. Identify the basic anatomical and physiological features of cows, sheep, swine, goats, horse, and poultry including respiration, digestion, and reproductive processes.</p> <p>d. Compare the reproduction process in cows, sheep, swine, goats, horse, and poultry.</p> <p>Competency 3: Describe important elements of digestion and nutrition in animals.</p> <p>a. Compare and contrast the digestive systems and processes in cows and sheep, horse, swine, and poultry.</p> <p>b. Associate each of the six major classes of nutrients with their roles and functions.</p> <p>c. Classify and discuss the use of feedstuffs as roughages, concentrates, and processed feeds.</p> <p>Roughage Examples: Hay, cottonseed hulls, and silage</p> <p>Concentrate Examples: Corn, soybeans, and oats</p> <p>Competency 4: Examine the role of genetics and breeding in animal production.</p> <p>a. Explain basic concepts of heredity and genetics.</p> <p>b. Describe the processes of selective breeding including artificial insemination and embryo transfer.</p>	<p>BIOII 3 Investigate and discuss the molecular basis of heredity.</p> <p>G 1 Apply inquiry-based and problem-solving processes and skills to scientific investigations.</p> <p>G 2 Analyze the structure and function of the cell and cellular organelles.</p> <p>G 3 Apply the principles of heredity to demonstrate genetic understandings.</p> <p>ZO 1 Apply inquiry-based and problem-solving processes and skills to scientific investigations.</p> <p>ZO 2 Develop an understanding of levels of organization and animal classification.</p> <p>ZO 3 Differentiate among animal life cycles, behaviors, adaptations, and relationships.</p>
<p>Unit 5: Science of Plants</p> <p>Competency 1: Explore the anatomy and physiology of a plant.</p> <p>a. Draw a diagram of a flowering plant and label and describe the major parts (roots, stems, leaves, and flowers).</p> <p>b. Compare the process of respiration, photosynthesis, and transpiration.</p> <p>c. Examine the process of plant growth to include cell division, cell elongation, and cell differentiation.</p> <p>Competency 2: Investigate common methods of plant reproduction.</p>	<p>BIOI 1 Apply inquiry-based and problem-solving processes and skills to scientific investigations.</p> <p>BIOI 2 Describe the biochemical basis of life and explain how energy flows within and between the living systems.</p> <p>BIOI 4 Analyze and explain the structures and function of the levels of biological organization.</p> <p>BIOI 6 Demonstrate an understanding of principles that explain the diversity of life and biological evolution.</p> <p>BIOII 4 Demonstrate an understanding of the factors that contribute to evolutionary theory and</p>

<p>a. Analyze the process of seed formation to include pollination and fertilization.</p> <p>b. Identify the parts of a seed and associate each part with its function.</p> <p>c. Describe and apply factors essential to seed germination.</p> <p>d. Observe and record data related to plant growth and reproduction.</p> <p>e. Identify the five methods of asexual reproduction.</p> <p>Competency 3: Apply classification methods to plants.</p> <p>a. Classify plants based on life cycle.</p> <p>b. Examine the use of the binomial nomenclature (genus and species) classification system in horticulture.</p> <p>Competency 4: Apply principles of plant nutrition.</p> <p>a. Differentiate between the major plant nutrients (macronutrients) and the minor nutrients (micronutrients).</p> <p>b. Identify the chemical symbols of the 16 essential plant nutrients.</p> <p>Competency 5: Explore basic concepts of pest management to include insect damage, weed damage, and diseases.</p> <p>a. Identify the different types of plant pests and discuss how each class causes damage or loss to a crop.</p> <p>b. Compare the different types of pest control measures.</p>	<p>natural selection.</p> <p>BI0II 5 Develop an understanding of organism classification.</p> <p>BO 1 Apply inquiry-based and problem-solving processes and skills to scientific investigations.</p> <p>BO 2 Distinguish among the characteristics of botanical organization, structure, and function.</p> <p>BO 3 Demonstrate an understanding of plant reproduction.</p> <p>BO 4 Draw conclusions about the factors that affect the adaptation and survival of plants.</p> <p>BO 5 Relate an understanding of plant genetics to its uses in modern living.</p> <p>CHI 1 Apply inquiry-based and problem-solving processes and skills to scientific investigations.</p> <p>CHI 4 Analyze the relationship between microscopic and macroscopic models of matter.</p> <p>ZO 2 Develop an understanding of levels of organization and animal classification.</p> <p>ZO 3 Differentiate among animal life cycles, behaviors, adaptations, and relationships.</p> <p>ZO 4 Demonstrate an understanding of the principles of animal genetic diversity and evolution.</p>
<p>Unit 6: Soil Science</p> <p>Competency 1: Demonstrate an understanding of the impact of soil as a natural resource.</p> <p>a. Associate the definition of soil with its importance.</p> <p>b. Describe the process of soil formation including the effects of chemical and physical weathering.</p> <p>c. Classify the texture of a soil.</p> <p>d. Identify the different layers of a typical soil profile and describe their importance.</p> <p>Competency 2: Investigate the use of the land capability classification system.</p> <p>a. Describe the concepts of land classification and highest productive use.</p> <p>b. Identify and describe factors that contribute to land capability.</p> <p>Competency 3: Investigate the chemical properties</p>	<p>CHI 1 Apply inquiry-based and problem-solving processes and skills to scientific investigations.</p> <p>CHI 5 Compare factors associated with acid/base and oxidation/reduction reactions.</p> <p>E3 Discuss factors that are used to explain the geological history of earth.</p> <p>E4 Demonstrate an understanding of earth systems relating to weather and climate.</p> <p>E5 Apply an understanding of ecological factors to explain relationships between earth systems.</p> <p>ES 3 Discuss the impact of human activities on the environment, conservation activities, and efforts to maintain and restore ecosystems.</p> <p>G 1 Apply inquiry-based and problem-solving processes and skills to scientific investigations.</p> <p>G 2 Analyze the structure and function of the</p>

<p>of soils.</p> <p>a. Develop a soil testing plan for a given field or area.</p> <p>b. Take a soil sample for testing purposes.</p> <p>c. Describe how soil pH affects productivity of a soil.</p> <p>d. Test a soil for pH and nutritional content and make recommendations on amendments and fertilizers to be applied.</p>	<p>cell and cellular organelles.</p> <p>GE1 Apply inquiry-based and problem-solving processes and skills to scientific investigations.</p> <p>GE2 Develop an understanding of plate tectonics and geochemical and ecological processes that affect earth.</p>
<p>Unit 7: Agricultural Lab Operations and Safety</p> <p>Competency 1: Identify safety procedures and safety devices for the agricultural workplace.</p> <p>a. Describe procedures for maintaining a clean and safe workplace environment and the use of all protective devices.</p> <p>b. Demonstrate rules for hand/power tools including basic operation, danger point, observer safety, and electrical safety.</p> <p>c. Explain the relationship between volts, amps, and watts. Demonstrate use of the voltmeter, amp meter, pliers, screwdriver, wire cutters, and wire strippers. Discuss the causes of electrical accidents including short circuits, overloads, improper insulation, and presence of moisture.</p> <p>d. Demonstrate procedures for preventing electrical accidents such as use of proper tools, proper working environment, and disconnecting of power when working on circuits (lockout-tagout), breakers, fuses, ground fault connector interrupters, control switches, proper grounding, and safety devices.</p> <p>Competency 2: Identify common equipment, tools, and safety procedures and perform the various welding processes.</p> <p>a. Identify major types of welders including the shield metal arc welding (SMAW), gas metal arc welding (GMAW), and gas tungsten arc welding (GTAW).</p> <p>b. Describe and identify different welding supplies used in welding: low hydrogen, mild steel and alloy welding electrodes and the types of gases involved in the SMAW process.</p> <p>c. Perform welding techniques including start, stop, and restart, pad construction, flat butt construction, beads, T, lap, corner, edge, and butt utilizing the appropriate welding process (SMAW, GMAW, and/or GTAW).</p>	<p>PS 2 Describe and explain how forces affect motion.</p> <p>PHY1 5 Apply an understanding of magnetism, electric fields, and electricity.</p>

<p>Competency 3: Apply safety procedures and perform tasks using oxyacetylene equipment.</p> <ul style="list-style-type: none"> <li>a. Identify, discuss, and demonstrate parts of the oxyacetylene welding and cutting equipment.</li> <li>b. Identify the different types of oxyacetylene flames and the applications of each to include neutral, oxidizing, and carburizing.</li> <li>c. Assemble and operate oxyacetylene welding and cutting equipment. Set up equipment for cutting operations to include selecting the proper tip and setting regulator pressures. Practice the "pushing the puddle" procedure for heat control in welding.</li> </ul> <p>Competency 4: Examine the major parts and function of a small engine.</p> <ul style="list-style-type: none"> <li>a. Identify the major systems of a small gasoline engine to include ignition, air intake, lubrication, power train, cooling, exhaust, and fuel systems. Identification will include the purpose or function of each component.</li> <li>b. Identify and demonstrate the use of hand tools and diagnostic instruments.</li> <li>c. Explore two- and four-cycle engines.</li> </ul>	
<p>Unit 9: Science of the Agricultural Environment</p> <p>Competency 1: Examine the relationship of the atmosphere to the earth's environment.</p> <ul style="list-style-type: none"> <li>a. Define atmosphere and describe its contents.</li> <li>b. Diagram and describe the structure of the atmosphere.</li> </ul> <p>Competency 2: Use weather and climate information in making decisions about the environment.</p> <ul style="list-style-type: none"> <li>a. Distinguish between weather and environment.</li> <li>b. Explore the relationship of latitude, longitude, and altitude to climate.</li> </ul> <p>Competency 3: Assess air quality and identify sources of air pollution.</p> <ul style="list-style-type: none"> <li>a. Define air quality and relate quality to pollution and air-quality standards.</li> <li>b. Explain the movement of air and global pollution.</li> <li>c. Describe the major kinds and sources of air pollution.</li> <li>d. Identify the effects of air pollution on the earth's environment.</li> </ul> <p>Competency 4: Explore concepts and practices related to wildlife conservation and management.</p> <ul style="list-style-type: none"> <li>a. Create a diagram illustrating the</li> </ul>	<p>CHI 4 Analyze the relationship between microscopic and macroscopic models of matter.</p> <p>ES 1 Apply inquiry-based and problem-solving processes and skills to scientific investigations.</p> <p>ES 2 Develop an understanding of the relationships of ecological factors that affect an ecosystem.</p> <p>ES 3 Discuss the impact of human activities on the environment, conservation activities, and efforts to maintain and restore ecosystems.</p>

<p>interrelationships among the soil, plants, animals, and humans.</p> <p>b. Discuss the concept of a food web.</p> <p>c. Identify and discuss conservation and management of wildlife.</p> <p>d. Research a given species of wildlife to determine habitat and management practices.</p>	
<p><b>Unit 10: Water Quality Management</b></p> <p><b>Competency 1: Explore concepts of water usage and quality.</b></p> <p>a. Describe the nature and states of water.</p> <p>b. Compare the classifications of water.</p> <p>c. Identify important uses of water.</p> <p>d. Identify sources of water.</p> <p><b>Competency 2: Describe important water management practices.</b></p> <p>a. Diagram and describe the water cycle.</p> <p>b. Compare natural water bodies of flowing and non-flowing sources.</p> <p>c. Identify common causes of water pollution and distinguish between point and nonpoint sources of pollution.</p> <p>d. Monitor the water quality in a selected body of flowing water.</p> <p>e. Describe and analyze the qualities of potable water.</p> <p><b>Competency 3: Describe how wastewater is treated to maintain water quality.</b></p> <p>a. Identify and describe the sources and types of wastewater.</p> <p>b. Identify and describe hazards that may be present in water.</p> <p>c. Describe methods and processes in wastewater treatment.</p>	<p><b>AQ 1</b> Apply inquiry-based and problem-solving processes and skills to scientific investigations.</p> <p><b>AQ 2</b> Develop an understanding of physical and chemical properties of water and aquatic environments.</p> <p><b>AQ 3</b> Apply an understanding of the diverse organisms found in aquatic environments.</p> <p><b>AQ 4</b> Draw conclusions about the relationships between human activity and aquatic organisms.</p> <p><b>ES 1</b> Apply inquiry-based and problem-solving processes and skills to scientific investigations.</p> <p><b>ES 2</b> Develop an understanding of the relationships of ecological factors that affect an ecosystem.</p> <p><b>ES 3</b> Discuss the impact of human activities on the environment, conservation activities, and efforts to maintain and restore ecosystems.</p>
<p><b>Unit 11: Science of Forestry and the Environment</b></p> <p><b>Competency 1: Examine basic principles of forest dendrology and mensuration.</b></p> <p>a. Examine the layered structure of forests and how these layers protect and enhance the ecosystem.</p> <p>b. Identify locally important tree species by common name, type, physical characteristics, and use.</p> <p>c. Analyze the growth rate and age of trees by examining the annual rings and accounting for variations in growth rate due to environmental</p>	<p><b>BIOI 3</b> Investigate and evaluate the interaction between living organisms and their environment.</p> <p><b>BIOII 4</b> Demonstrate an understanding of the factors that contribute to evolutionary theory and natural selection.</p> <p><b>BIOII 5</b> Develop an understanding of organism classification.</p> <p><b>BO 1</b> Apply inquiry-based and problem-solving processes and skills to scientific investigations.</p> <p><b>BO 2</b> Distinguish among the characteristics of botanical organization, structure, and function.</p> <p><b>ES 1</b> Apply inquiry-based and problem-solving</p>

<p>factors.</p> <p>d. Demonstrate proper procedures for planting trees.</p> <p>Competency 2: Discuss the relationship of forestry to environmental quality and economic development.</p> <p>a. Identify consumer goods derived from forest locally.</p> <p>b. Describe the relationships between biodiversity and forests.</p> <p>c. Investigate methods for forest fire prevention.</p> <p>d. Discuss the different damages caused by forest fires.</p> <p>e. Discuss the methods and importance of reforestation.</p>	<p>processes and skills to scientific investigations.</p> <p>ES 2 Develop an understanding of the relationships of ecological factors that affect an ecosystem.</p> <p>ES 3 Discuss the impact of human activities on the environment, conservation activities, and efforts to maintain and restore ecosystems.</p>
<p>Unit 12: Wildlife and the Environment</p> <p>Competency 1: Examine the relationships of wildlife well-being and environmental quality.</p> <p>a. Identify the wildlife species found in the local area, and classify each as terrestrial or aquatic.</p> <p>b. Assess local wildlife habitat.</p> <p>c. Investigate the importance of wildlife to the environment and human well-being.</p> <p>d. Recommend procedures for improving habitat for wildlife.</p> <p>Competency 2: Investigate approaches in protecting and managing wildlife species.</p> <p>a. Discuss the need for wildlife protection and conservation policies and how species are lost from the earth.</p> <p>b. Classify wildlife species based on threats to their continued existence.</p> <p>c. Describe practices in conservation, protection, and management of wildlife.</p>	<p>AQ 3 Apply an understanding of the diverse organisms found in aquatic environments.</p> <p>AQ 4 Draw conclusions about the relationships between human activity and aquatic organisms.</p> <p>BIOI 3 Investigate and evaluate the interaction between living organisms and their environment.</p> <p>ES 2 Develop an understanding of the relationships of ecological factors that affect an ecosystem.</p> <p>ES 3 Discuss the impact of human activities on the environment, conservation activities, and efforts to maintain and restore ecosystems.</p> <p>ZO 2 Develop an understanding of levels of organization and animal classification.</p> <p>ZO 3 Differentiate among animal life cycles, behaviors, adaptations, and relationships.</p>
<p>Unit 13: Environmental Stewardship</p> <p>Competency 1: Discuss concepts of sustainable agriculture.</p> <p>a. Describe the nature and importance of sustainable agriculture (renewable/nonrenewable resources).</p> <p>b. Identify and select practices that promote sustainability in agriculture, forestry, and natural resources.</p> <p>Competency 2: Explore the services of agencies and organizations that protect and maintain the environment.</p>	<p>ES 2 Develop an understanding of the relationships of ecological factors that affect an ecosystem.</p> <p>ES 3 Discuss the impact of human activities on the environment, conservation activities, and efforts to maintain and restore ecosystems.</p> <p>SP 2 Develop an understanding of geographic information systems.</p>

<p>a. Identify and describe the role of government and other agencies concerned with environmental quality and natural resource conservation.</p> <p>b. Investigate public laws and policies related to environmental quality and natural resource conservation.</p> <p>Competency 3: Use appropriate procedures for management and disposal of solid waste.</p> <p>a. Identify sources of solid waste.</p> <p>b. Identify common hazards associated with improperly managed wastes.</p> <p>c. Explain how solid waste materials should be managed and disposed.</p> <p>d. Develop a plan for recycling.</p> <p>e. Explain the use of residential, agricultural, and industrial composting.</p> <p>Competency 4: Select appropriate procedures for managing hazardous waste materials.</p> <p>a. Explore the meaning of hazardous waste.</p> <p>b. Classify hazardous waste materials.</p> <p>c. Discover information about hazardous materials.</p>	
<p>Unit 14: Construction/Agriculture Equipment Operation and Maintenance</p> <p>Competency 1: Inspect, maintain, and repair agricultural equipment</p> <p>a. Describe procedures for inspecting coolant, engine oil, tire pressure, hydraulic fluid, gear oil, and air filters.</p> <p>b. Perform operation and maintenance checks on agricultural equipment according to manufacturer's specifications.</p> <p>c. Assess parts to repair or replace parts based on manufacturer's specifications and observation.</p> <p>d. Perform maintenance for required parts, reassemble, adjust, and test.</p> <p>Competency 2: Perform reconditioning of agricultural machinery and equipment.</p> <p>a. Recondition agricultural machinery and equipment.</p> <p>b. Paint agricultural machinery and equipment.</p> <p>Competency 3: Perform welds with shielded metal arc welding (SMAW) equipment.</p> <p>a. Fabricate a single v-groove butt welding in the horizontal position.</p> <p>b. Fabricate a single v-groove butt weld in the vertical up position.</p> <p>Competency 4: Perform welds with gas metal arc</p>	<p>PHYI 3 Develop an understanding of concepts related to work and energy.</p>

welding (GMAW) equipment.

a. Fabricate a single v-groove butt weld in the horizontal position.

b. Fabricate a single v-groove butt weld in the vertical up position.

Competency 5: Cut metal with plasma arc cutter.

a. Identify safety rules and practices associated with a plasma arc cutter.

b. Plasma cutter operation and usage.

Competency 6: Select and demonstrate proper equipment for a specific construction job and develop a bill of materials for a specific job.

a. Assess tool usage and material estimating for a specific task.