

Title 7: Education K-12

Part 120: Agriculture Food and Natural Resources (REPEAL 11/2013)

~~2006 Mississippi Curriculum Framework~~

~~Secondary Forestry~~

~~(Program CIP: 03.0511—Forestry Technology/Technician)~~

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Standards in this document are based on information from the following organizations:

Proposed Standards for Mississippi Agriculture Education Programs

~~Adapted from the publication, *Career Cluster Resources for Agriculture, Food, and Natural Resources*, National Association of State Directors of Career and Technical Education~~

Academic Standards

~~Mississippi Department of Education Subject Area Testing Program~~

Workplace Skills for the 21st Century

~~Secretary's Commission on Achieving Necessary Skills~~

National Educational Technology Standards for Students

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Foreword

Secondary vocational technical education programs in Mississippi are faced with many challenges resulting from sweeping educational reforms at the national and state levels. Schools and teachers are increasingly being held accountable for providing true learning activities to every student in the classroom. This accountability is measured through increased requirements for mastery and attainment of competency as documented through both formative and summative assessments.

The courses in this document reflect the statutory requirements as found in Section 37-3-49, Mississippi Code of 1972, as amended (Section 37-3-46). In addition, this curriculum reflects guidelines imposed by federal and state mandates (Laws, 1988, ch. 487, §14; Laws, 1991, ch. 423, §1; Laws, 1992, ch. 519, §4 eff. from and after July 1, 1992; Carl D. Perkins Vocational Education Act III, 1998; and No Child Left Behind Act of 2001).

Each secondary vocational technical course consists of a series of instructional units which focus on a common theme. All units have been written using a common format which includes the following components:

- Unit Number and Title
- Suggested Time on Task—An estimated number of clock hours of instruction that should be required to teach the competencies and objectives of the unit. A minimum of 140 hours of instruction is required for each Carnegie unit credit. The curriculum framework should account for approximately 75-80 percent of the time in the course.
- Competencies and Suggested Objectives
 - A competency represents a general concept or performance that students are expected to master as a requirement for satisfactorily completing a unit. Students will be expected to receive instruction on all competencies.
 - The suggested objectives represent the enabling and supporting knowledge and performances that will indicate mastery of the competency at the course level.
- Suggested Teaching Strategies—This section of each unit indicates strategies that can be used to enable students to master each competency. Emphasis has been placed on strategies which reflect active learning methodologies. Teachers should feel free to modify or enhance these suggestions based on needs of their students and resources available in order to provide optimum learning experiences for their students.
- Suggested Assessment Strategies—This section indicates strategies that can be used to measure student mastery. Examples of suggested strategies could include rubrics, class participation, reflection, and journaling. Again, teachers should feel free to modify or enhance these suggested assessment strategies based on local needs and resources.

- Integrated Academic Topics, Workplace Skills, Technology Standards, and Occupational Standards—This section identifies related academic topics as required in the Subject Area Assessment Program (SATP) in Algebra I, Biology I, English II, and U. S. History from 1877, which are integrated into the content of the unit. It also identifies the general workplace skills as identified in the Secretary's Commission on Achieving Necessary Skills (SCANS) report as being critical for all workers in the 21st Century. In addition, national technology standards and occupational skills standards associated with the competencies and suggested objectives for the unit are also identified.
- References—A list of suggested references is provided for each unit. The list includes some of the primary instructional resources that may be used to teach the competencies and suggested objectives. Again, these resources are suggested and the list may be modified or enhanced based on needs and abilities of students and on available resources.

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Program Description

Forestry is an instructional program designed to prepare students to enter occupations related to the field of forestry. The first year topics include Exploring the World of Forestry; Leadership/FFA Activities; Forest Safety; Tree Growth and Stand Development; Dendrology; Forest Surveying and Mapping; Legal Land Descriptions; Tree and Log Measurements; and Introduction to Timber Cruising. The second year instruction focuses on Identifying Forests and Forest Products; Employability Skills/FFA Activities; Forest Management Practices; Advanced Timber Cruising; Timber Marketing; Timber Harvesting; Reforestation; Forest Fire Management; and Forest Insects and Diseases. Graduates may become employed at the entry level or pursue careers in Forestry, Agriculture, Agribusiness, or Natural Resources Education in postsecondary or higher education.

Industry standards are adapted from the publication *Career Cluster Resources for Agriculture, Food, and Natural Resources*, developed by the National Association of State Directors of Career and Technical Education.

Course Outline

Forestry I

Course CIP Code: 03.0401

Course Description: Forestry I is designed to introduce the student to the forest industry and forestry careers in Mississippi. The course provides instruction on forest careers and leadership, forest safety, tree growth and development, dendrology, surveying and mapping, and tree and log measurements. Emphasis is placed on the scientific and technical principles of modern forest management. (2 2½ Carnegie units depending on time spent in course.)

Unit	Title	Hours
1	Exploring the World of Forestry	7.5
2	Leadership/FFA Activities	7.5
3	Forest Safety	15
4	Tree Growth and Stand Development	7.5
5	Dendrology	30
6	Forest Surveying and Mapping	37.5
7	Legal Land Descriptions	30
8	Tree and Log Measurements	37.5
9	Introduction to Timber Cruising	45

Forestry II

Course CIP Code: 03.0490

Course Description: Forestry II is a continuation of Forestry I with additional emphasis on forest management, timber cruising, marketing and harvesting methods, reforestation, fire management, and forest pests. Emphasis is placed on scientific and technical principles. (2 2½ Carnegie units depending on time spent in course)

Unit	Title	Hours
1	Identifying Forests and Forest Products	7.5
2	Employability Skills/FFA Activities	7.5
3	Forest Management Practices	45
4	Advanced Timber Cruising	52.5
5	Timber Marketing	15
6	Timber Harvesting	15
7	Reforestation	22.5
8	Forest Fire Management	22.5
9	Forest Insects and Diseases	22.5

Forestry I

Unit 1: Exploring the World of Forestry

(7.5 hours)

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Explain the importance of forestry.</p> <ul style="list-style-type: none">a. Describe the elements of a forest community, including trees, plants, shrubs, soil, water, and animal life.b. Describe the importance of trees and forests, including products, employment, climate, air quality, erosion, and recreation.c. Describe the amount of forested land worldwide and in the United States, including acres of forest land and acres of commercial land within the local county or regional area.d. Describe the history of forestry, including the importance of forestry to the South and to Mississippi.e. Describe the importance of forests in the South, including growing season, timber inventory, and economic impact.f. Describe resources considered in multiple-use forest management, including timber, soil, wildlife, recreation, and water.	<p>Teaching:</p> <ul style="list-style-type: none">• Using PowerPoint presentations, posters, and videos, discuss and describe the importance of forestry.• Have students prepare a poster illustrating the importance of trees and forests. Discuss the history of forestry and its importance to the South and to Mississippi in particular.• Divide students into groups and assign one component of the forest community to each group to research, summarize, and prepare a fact sheet to be provided to the class. <p>Assessment:</p> <ul style="list-style-type: none">• Give a written test on the importance of forestry.• Use a rubric to evaluate the poster on importance of forestry. (See Sample Poster Rubric in Appendix E.)• Use a rubric to evaluate the fact sheet. (See Sample Fact Sheet Rubric in Appendix E.)
<p>2. Explain careers in the field of forestry.</p> <ul style="list-style-type: none">a. Identify the careers available in the field of forestry.b. Describe educational requirements, job opportunities, duties, and responsibilities for professional, technical, and forestry workers.	<p>Teaching:</p> <ul style="list-style-type: none">• Invite a guest speaker from the forest industry to speak on careers in forestry.• Have students investigate and compare educational requirements, job opportunities, and duties and responsibilities for professionals, technicians, and forest laborers. <p>Assessment:</p> <ul style="list-style-type: none">• Give a written test on careers and educational programs in forestry.

Competencies and Suggested Objectives	Suggested Strategies for Competencies
3. Explain the impact of federal and state regulations on forestry operations. a. Examine the impact of federal regulations on forest operations. b. Examine the impact of state regulations on forest operations.	Teaching: • Have a representative of the forest industry speak to the class on state and federal regulations and their impact on forestry operations. Assessment: • Give a written test on the impact of state and federal regulations.

STANDARDS

Proposed Standards for Mississippi Agriculture Education Programs

The following standards were adapted from the publication, *Career Cluster Resources for Agriculture, Food, and Natural Resources*. The complete text of this document can be found at <http://www.careerclusters.org/ClusterDocuments/agdocuments/AGFinal.pdf>.

- NRS1—Recognize importance of resource and human interrelations to conduct management activities in natural habitats.
- NRS2—Use effective venues to communicate natural phenomena to the public.
- NRS3—Apply scientific principles to natural resource management activities.
- NRS4—Employ knowledge of natural resource industries to describe production practices and processing procedures.
- NRS5—Practice responsible conduct to protect natural resources.
- ENV2—Identify public policies and regulations impacting environmental services to determine their effect on facility operations.
- ENV3—Apply scientific principles to environmental services.

Academic Standards

- B7—Investigate the interdependence and interactions that occur within an ecosystem.
- E1—Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
- E2—Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3—Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4—Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E5—Complete oral and written presentations which exhibit interaction and consensus within a group.
- E10—Use language and critical thinking strategies to serve as tools for learning.

- H1— Explain how geography, economics, and politics have influenced the historical development of the United States in the global community.
- H2— Describe the impact of science and technology on the historical development of the United States in the global community.
- H3— Describe the relationship of people, places, and environments through time.

Workplace Skills for the 21st Century

- WP1— Allocates resources (time, money, materials and facilities, and human resources).
- WP2— Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP3— Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
- WP4— Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.
- WP5— Selects, applies, and maintains/troubleshoots technology.
- WP6— Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7— Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8— Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

National Educational Technology Standards for Students

- T1— Basic operations and concepts
- T2— Social, ethical, and human issues
- T3— Technology productivity tools
- T4— Technology communications tools
- T5— Technology research tools
- T6— Technology problem solving and decision making tools

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Computer Software

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Forestry I

Unit 2: Leadership/FFA Activities

(7.5 hours)

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Explain the benefits of FFA participation.</p> <ol style="list-style-type: none"> Identify FFA organizational activities that promote and recognize achievements in forestry, including career development events, personal development seminars, leadership conferences, national and international exchange programs, education experience with industry, and personal and community development programs. Identify the benefits of FFA participation to an individual and to the forestry industry, including personal growth and development, exposure to the forestry industry environment, and multicultural experiences. Identify opportunities for members in the FFA organization, including personal development, personal recognition, career exploration, and self-expression. 	<p>Teaching:</p> <ul style="list-style-type: none"> Use a PowerPoint presentation to identify FFA activities that promote and recognize achievements. Invite a guest speaker to explain benefits of FFA participation. Divide students into groups to identify and compile a list of benefits of FFA from Internet sources and the <i>FFA Student Handbook</i>. <p>Assessment:</p> <ul style="list-style-type: none"> Give a written test on the benefits of FFA participation. Use a rubric to evaluate the compilation of research findings. (See Sample Rubric on Written Report in Appendix E.)
<p>2. Demonstrate group leadership skills.</p> <ol style="list-style-type: none"> Develop and present a 3-5 minute speech on a forestry topic, including guidelines for preparing a successful speech, speech outlining, resource development, writing skills, and presentation skills. Describe the purposes and functions of parliamentary procedure, including the ability to conduct a meeting, methods of voting, motions and their handling, and officer positions and functions. 	<p>Teaching:</p> <ul style="list-style-type: none"> Use PowerPoint presentations on group leadership skills pertaining to writing/delivering speeches and parliamentary procedure. Have students prepare and present a 3-5 minute speech. Divide students into groups to practice parliamentary procedure skills. <p>Assessment:</p> <ul style="list-style-type: none"> Give a written test on group leadership skills. Use the FFA scorecard to evaluate the speech. (See FFA Prepared Public Speaking Scorecard in Appendix E.) Use a scorecard to evaluate the demonstration of parliamentary procedure skills. (See Sample Scorecard for Parliamentary Procedure Demonstration in Appendix E.)

STANDARDS

Agriculture, Food and Natural Resources Standards

The following standards were adapted from the publication, *Career Cluster Resources for Agriculture, Food, and Natural Resources*. The complete text of this document can be found at <http://www.careerclusters.org/ClusterDocuments/agdocuments/AGFinal.pdf>.

- LEA1—Use leadership skills in collaborating with others to accomplish organizational goals and objectives
- LEA2—Use personal growth skills in collaborating with others to accomplish organizational goals and objectives
- ELR1—Know and understand the importance of professional ethics and legal responsibilities.
- ELR2—Demonstrate workplace ethics specific to Agriculture, Food, and Natural Resources (AFNR) occupations.
- NRS2—Use effective venues to communicate natural phenomena to the public.
- NRS4—Employ knowledge of natural resource industries to describe production practices and processing procedures.
- ABS1—Employ leadership skills to accomplish goals and objectives in the AFNR business environment.

Academic Standards

- E1—Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
- E2—Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3—Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4—Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E5—Complete oral and written presentations which exhibit interaction and consensus within a group.
- E8—Read, discuss, analyze, and evaluate literature from various genres and other written material.
- E9—Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
- E10—Use language and critical thinking strategies to serve as tools for learning.

Workplace Skills for the 21st Century

- WP1—Allocates resources (time, money, materials and facilities, and human resources).
- WP2—Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.

- WP3—Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
- WP5—Selects, applies, and maintains/troubleshoots technology.
- WP6—Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7—Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8—Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

National Educational Technology Standards for Students

- T1—Basic operations and concepts
- T2—Social, ethical, and human issues
- T4—Technology communications tools
- T5—Technology research tools
- T6—Technology problem solving and decision making tools

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National FFA Organization. (2003). *Career development events handbook 2001-2005*. Retrieved June 20, 2005, from http://www.ffa.org/programs/cde/documents/cde_handbook.pdf

Forestry I**Unit 3: Forest Safety****(15 hours)**

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Explain forest safety practices.</p> <ul style="list-style-type: none">a. Describe first aid and first aid equipment used in forestry work.b. Describe job site safety practices, including the hazards, carelessness, safety equipment, safety regulations, and prevention of accidents.c. Explain the impact of federal and state safety regulations (such as OSHA) on forestry operations.	<p>Teaching:</p> <ul style="list-style-type: none">• Discuss, describe, and demonstrate first aid and first aid equipment and job site safety practices used in forestry work.• Integrate activities with other vocational courses, e.g., Allied Health.• Assist students with researching the impacts of federal and state safety regulations (such as OSHA) on forestry operations using computer technology.• Invite guest speakers from the Extension Service, MFC, or utility companies, e.g., Farm Bureau and Mississippi Power Company.• Monitor students throughout the year for adherence to safety practices. <p>Assessment:</p> <ul style="list-style-type: none">• Use a checklist to monitor job site safety practices used in forestry. (See Sample Checklist for Forestry Safety in Appendix E.)• Give a written test on forest safety practices.
<p>2. Describe forest environmental hazards, including heat, cold, plants, insects, wildlife, and topographical hazards.</p> <ul style="list-style-type: none">a. Identify characteristics of forest insects and wildlife.b. Explain signs and symptoms of exposure to insects and wildlife.	<p>Teaching:</p> <ul style="list-style-type: none">• Show a PowerPoint or other visual presentation to identify characteristics of hazardous forest plants, insects, and wildlife.• Discuss, describe, and show signs and symptoms of exposure to hazards. <p>Assessment:</p> <ul style="list-style-type: none">• Give a written test on forest environmental hazards.

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>3. Demonstrate forest safety practices.</p> <p>a. Apply safety practices to environmental, wildlife, and topographical hazards.</p> <p>b. Apply job-site safety practices.</p> <p>c. Discuss types and frequency of forest accidents.</p>	<p>Teaching:</p> <ul style="list-style-type: none"> Identify forest hazards on field trips. Identify and demonstrate job safety practices. Safety practices will be continually monitored on all field trips and laboratory activities. Have students prepare a written or oral report dealing with different types and frequency of forest accidents. <p>Assessment:</p> <ul style="list-style-type: none"> Give a written test on identifying hazards and applying job-site safety practices. Use a safety checklist for forestry operations. (See Sample Checklist for Forest Safety in Appendix E.) Use a rubric to evaluate types and frequency of forest accidents. (See Sample Rubric for Oral Report/Speech in Appendix E.)

STANDARDS

Agriculture, Food and Natural Resources Standards

The following standards were adapted from the publication, *Career Cluster Resources for Agriculture, Food, and Natural Resources*. The complete text of this document can be found at <http://www.careerclusters.org/ClusterDocuments/agdocuments/AGFinal.pdf>.

TET1—Use tools, equipment, machinery, and technology to work in areas related to AFNR.

PWR2—Apply principles of operation and maintenance to mechanical equipment, structures, biological systems, land treatment, power utilization, and technology.

PWR3—Apply principles of service and repair to mechanical equipment, structures, biological systems, land treatment, power utilization, and technology.

TEC1—Use a variety of tools available in computer systems to accomplish fast, accurate production in the workplace.

NRS5—Practice responsible conduct to protect natural resources.

ENV2—Identify public policies and regulations impacting environmental services to determine their effect on facility operations.

ENV5—Use tools, equipment, machinery, and technology to accomplish tasks in environmental services.

Academic Standards

A1—Recognize, classify, and use real numbers and their properties.

- E2—Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3—Read, evaluate, and use print, non print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4—Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E5—Complete oral and written presentations which exhibit interaction and consensus within a group.
- E9—Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
- E10—Use language and critical thinking strategies to serve as tools for learning.
- H4—Demonstrate the ability to use social studies tools (e.g., timelines, maps, globes, resources, graphs, a compass, technology, etc.).

Workplace Skills for the 21st Century

- WP2—Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP3—Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
- WP6—Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7—Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8—Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

National Educational Technology Standards for Students

- T1—Basic operations and concepts
- T5—Technology research tools

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Forestry I

Unit 4: Tree Growth and Stand Development

(7.5 hours)

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Explain tree physiology.</p> <ol style="list-style-type: none"> Describe the main parts of a tree, including trunk, crown, and roots along with their functions. Describe tree respiration and photosynthesis, including respiration, transfer of water, minerals, nutrients, and production of food. Describe environmental and biological factors that affect tree growth, including temperature, moisture, light, air, soil, tolerance, and hardiness. Describe the methods of tree reproduction, including sprouts, seeds, and suckers. Identify characteristics of tree growth, including height and diameter growth. 	<p>Teaching:</p> <ul style="list-style-type: none"> Use presentation media to present tree physiology to students. Use a field trip or trees on the school campus to identify the factors that affect tree growth, methods of tree reproduction, and characteristics of tree growth. <p>Assessment:</p> <ul style="list-style-type: none"> Give a written test on tree physiology. Use a rubric to evaluate field trip participation. (See Sample Checklist for Field Trip Participation in Appendix E.)
<p>2. Explain forest stand development.</p> <ol style="list-style-type: none"> Identify stands according to classifications, including age, size, and composition. Identify trees according to crown classes. 	<p>Teaching:</p> <ul style="list-style-type: none"> Use a media presentation to discuss factors associated with forest stand development. Use a field trip to have students identify forest stand classifications and crown classes. <p>Assessment:</p> <ul style="list-style-type: none"> Give a written test on forest stand development. Use a rubric to evaluate field trip participation. (See Sample Checklist for Field Trip Participation in Appendix E.)
<p>3. Explain applications of tissue culture, cloning, and other advances in biotechnology to forestry.</p> <ol style="list-style-type: none"> Describe applications of tissue culture, cloning, and other advances in biotechnology to forestry. 	<p>Teaching:</p> <ul style="list-style-type: none"> Use a media presentation to provide a basic understanding of biotechnology applications in forestry. Divide students into groups and have them research an application of biotechnology in forestry and summarize their findings for presentation to the class. <p>Assessment:</p> <ul style="list-style-type: none"> Give a written test on biotechnology in forestry.

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| | <ul style="list-style-type: none"> • Use a rubric to evaluate summaries on biotechnology. (See Sample Rubric on Written Report in Appendix E.) |
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STANDARDS

Agriculture, Food and Natural Resources Standards

The following standards were adapted from the publication, *Career Cluster Resources for Agriculture, Food, and Natural Resources*. The complete text of this document can be found at <http://www.careerclusters.org/ClusterDocuments/agdocuments/AGFinal.pdf>.

- LEA1 — Use leadership skills in collaborating with others to accomplish organizational goals and objectives
- LEA2 — Use personal growth skills in collaborating with others to accomplish organizational goals and objectives
- PLT1 — Apply principles of anatomy and physiology to produce and manage plants in both a domesticated and a natural environment.
- PLT2 — Address taxonomic or other classifications to explain basic plant anatomy and physiology.
- PLT3 — Apply fundamentals of production and harvesting to produce plants.
- PLT4 — Exercise elements of design to enhance an environment (e.g., floral, forest, landscape, and farm).
- NRS1 — Recognize importance of resource and human interrelations to conduct management activities in natural habitats.
- NRS2 — Use effective venues to communicate natural phenomena to the public.
- NRS3 — Apply scientific principles to natural resource management activities.
- NRS4 — Employ knowledge of natural resource industries to describe production practices and processing procedures.
- NRS5 — Practice responsible conduct to protect natural resources.
- ENV1 — Use analysis procedures to plan and evaluate environmental service impacts.
- ENV3 — Apply scientific principles to environmental services.
- ENV5 — Use tools, equipment, machinery, and technology to accomplish tasks in environmental services.
- ABS1 — Employ leadership skills to accomplish goals and objectives in the AFNR business environment.

Academic Standards

- A1 — Recognize, classify, and use real numbers and their properties.
- A2 — Recognize, create, extend, and apply patterns, relations, and functions and their applications.
- B2 — Investigate the biochemical basis of life.
- B3 — Investigate cell structures, functions, and methods of reproduction.
- B4 — Investigate the transfer of energy from the sun to living systems.

- B5— Investigate the principles, mechanisms, and methodology of classical and molecular genetics.
- B6— Investigate concepts of natural selection as they relate to diversity of life.
- B7— Investigate the interdependence and interactions that occur within an ecosystem.
- E1— Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
- E2— Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3— Read, evaluate, and use print, non print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4— Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E5— Complete oral and written presentations which exhibit interaction and consensus within a group.

Workplace Skills for the 21st Century

- WP1— Allocates resources (time, money, materials and facilities, and human resources).
- WP2— Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP3— Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
- WP4— Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.
- WP6— Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7— Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.

National Educational Technology Standards for Students

- T1— Basic operations and concepts
- T2— Social, ethical, and human issues
- T3— Technology productivity tools
- T5— Technology research tools
- T6— Technology problem solving and decision making tools

SUGGESTED REFERENCES

Textbooks and Other Publications

Burton, L. D. (2000). *Introduction to forestry science*. Albany, NY: Delmar.

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Forestry I**Unit 5: Dendrology****(30 hours)**

Competencies and Suggested Objectives	Suggested Strategies for Competencies
1. Explain the tree classification system. <ul style="list-style-type: none"> a. Identify nomenclature and taxonomy terms. b. Identify common name and/or binomial name of trees. 	Teaching: <ul style="list-style-type: none"> • Use a PowerPoint presentation to provide basic information on the classification of trees. • Have students research selected trees to identify their binomial classification. Assessment: <ul style="list-style-type: none"> • Give a written test on tree classification. • Evaluate assignment to identify binomial classification of selected trees.
2. Identify trees by characteristics. <ul style="list-style-type: none"> a. Describe identifying characteristics of trees, including fruit, leaves, twigs, bark, and tree form. b. Collect leaves and/or bark samples of species found locally. 	Teaching: <ul style="list-style-type: none"> • Use a PowerPoint presentation to present basic information on identifying characteristics of trees. • Have students collect, preserve, and display leaves and bark of a minimum of 40 local species. All specimens are to be identified by common and scientific name. Assessment: <ul style="list-style-type: none"> • Give a written test on identifying characteristics of trees. • Evaluate student leaf and bark collection.

STANDARDS*Agriculture, Food and Natural Resources Standards*

The following standards were adapted from the publication, *Career Cluster Resources for Agriculture, Food, and Natural Resources*. The complete text of this document can be found at <http://www.careerclusters.org/ClusterDocuments/agdocuments/AGFinal.pdf>.

PLT2—Address taxonomic or other classifications to explain basic plant anatomy and physiology.

NRS1—Recognize importance of resource and human interrelations to conduct management activities in natural habitats.

NRS2—Use effective venues to communicate natural phenomena to the public.

NRS3—Apply scientific principles to natural resource management activities.

NRS5—Practice responsible conduct to protect natural resources.

ENV5—Use tools, equipment, machinery, and technology to accomplish tasks in environmental services.

Academic Standards

- B1 — Utilize critical thinking and scientific problem solving in designing and performing biological research and experimentation.
- B3 — Investigate cell structures, functions, and methods of reproduction.
- B4 — Investigate the transfer of energy from the sun to living systems.
- B5 — Investigate the principles, mechanisms, and methodology of classical and molecular genetics.
- B6 — Investigate concepts of natural selection as they relate to diversity of life.
- B7 — Investigate the interdependence and interactions that occur within an ecosystem.
- E1 — Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
- E2 — Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3 — Read, evaluate, and use print, non print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4 — Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E5 — Complete oral and written presentations which exhibit interaction and consensus within a group.
- E6 — Explore cultural contributions to the history of the English language and its literature.
- H1 — Explain how geography, economics, and politics have influenced the historical development of the United States in the global community.
- H2 — Describe the impact of science and technology on the historical development of the United States in the global community.
- H3 — Describe the relationship of people, places, and environments through time.

Workplace Skills for the 21st Century

- WP2 — Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP3 — Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.

National Educational Technology Standards for Students

- T4 — Technology communications tools
- T5 — Technology research tools
- T6 — Technology problem-solving and decision-making tools

SUGGESTED REFERENCES

Textbooks and Other Publications

Curriculum & Instructional Materials Center. (1999). *Forestry*. Stillwater, OK: Department of Vocational and Technical Education.

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Forestry I**Unit 6: Forest Surveying and Mapping****(37.5 hours)**

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Explain concepts of forest surveying.</p> <ul style="list-style-type: none">a. Define terms, including bearings, acre, azimuths, chaining, boundary lines, angles, surveying, traversing, latitude, and longitude.b. Describe the importance of surveying to forestry, including timber sales, land measurement, boundary marking, and mapping.c. Identify characteristics of a forest survey, including use of compass, measuring distances, and mapping.d. Identify surveying tools, including compass, chain, plumb bob, and range pole.e. Label parts of a compass, including magnetic needle, pivot point, housing graduated degrees, and sighting mirror.f. Identify and calculate compass measurements and symbols, including azimuths, bearings, and degrees.	<p>Teaching:</p> <ul style="list-style-type: none">• Utilize text and other publications to discuss and explain terms and importance of surveying in forestry.• Use media applications to identify characteristics of a forest survey.• Demonstrate and discuss tools used in forest surveying. Have students demonstrate use of these tools.• Explain and show the parts and use of a compass.• Make group assignments on use of compass. <p>Assessment:</p> <ul style="list-style-type: none">• Give a written test on terms and importance of surveying in forestry.• Grade assignments on using a compass.• Evaluate use of tools used in surveying. (See Sample Rubric on Use of Surveying Tools in Appendix E.)
<p>2. Perform forestry surveying and mapping techniques.</p> <ul style="list-style-type: none">a. Determine the number of paces per chain using common pacing techniques.b. Perform compass, pacing, and chaining skills, including completing a traverse of a selected area.c. Utilize new technologies for forest surveying and mapping to include GPS and GIS and remote sensing.	<p>Teaching:</p> <ul style="list-style-type: none">• Demonstrate the proper techniques for pacing, chaining and traversing. Make small group assignment on pacing and chaining.• Invite guest speaker to demonstrate GPS and GIS technology.• Demonstrate use of GPS.• Divide students into small groups and issue assignments on GPS, GIS, and remote sensing. <p>Assessment:</p> <ul style="list-style-type: none">• Give a written test on forest surveying and mapping techniques.• Grade assignment on proper techniques for pacing, chaining, and traversing.• Grade assignment on GPS, GIS, and remote sensing.

Competencies and Suggested Objectives	Suggested Strategies for Competencies
3. Calculate acreage of forest tracts. a. Determine acres from remote sensing. b. Determine acres from a traverse.	Teaching: • Demonstrate proper techniques used in calculating acres from remote sensing and traversing. • Give an individual assignment to calculate acreage from remote sensing and a traverse. Assessment: • Grade assignment on calculating acres from remote sensing and traversing.

STANDARDS

Agriculture, Food and Natural Resources Standards

The following standards were adapted from the publication, *Career Cluster Resources for Agriculture, Food, and Natural Resources*. The complete text of this document can be found at <http://www.careerclusters.org/ClusterDocuments/agdocuments/AGFinal.pdf>.

- ELR1—Know and understand the importance of professional ethics and legal responsibilities.
- ELR2—Demonstrate workplace ethics specific to Agriculture, Food, and Natural Resources (AFNR) occupations.
- TET1—Use tools, equipment, machinery, and technology to work in areas related to AFNR.
- TEC1—Use a variety of tools available in computer systems to accomplish fast, accurate production in the workplace.
- TEC3—Explain geospatial technology to demonstrate its applications.
- NRS1—Recognize importance of resource and human interrelations to conduct management activities in natural habitats.
- NRS2—Use effective venues to communicate natural phenomena to the public.
- NRS3—Apply scientific principles to natural resource management activities.
- NRS4—Employ knowledge of natural resource industries to describe production practices and processing procedures.
- NRS5—Practice responsible conduct to protect natural resources.
- ABS2—Practice good recordkeeping to accomplish AFNR business objectives.
- ABS5—Utilize technology to accomplish AFNR business objectives.

Academic Standards

- A1—Recognize, classify, and use real numbers and their properties.
- A2—Recognize, create, extend, and apply patterns, relations, and functions and their applications.
- A3—Simplify algebraic expressions, solve and graph equations, inequalities and systems in one and two variables.
- A5—Utilize various formulas in problem solving situations.

- E2—Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3—Read, evaluate, and use print, non print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4—Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E10—Use language and critical thinking strategies to serve as tools for learning.
- H4—Demonstrate the ability to use social studies tools (e.g., timelines, maps, globes, resources, graphs, a compass, technology, etc.).

Workplace Skills for the 21st Century

- WP1—Allocates resources (time, money, materials and facilities, and human resources).
- WP2—Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP3—Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
- WP5—Selects, applies, and maintains/troubleshoots technology.
- WP6—Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7—Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8—Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

National Educational Technology Standards for Students

- T1—Basic operations and concepts
- T2—Social, ethical, and human issues
- T3—Technology productivity tools
- T4—Technology communications tools
- T5—Technology research tools
- T6—Technology problem solving and decision making tools

SUGGESTED REFERENCES

Textbooks and Other Publications

Curriculum & Instructional Materials Center. (1999). *Forestry*. Stillwater, OK: Department of Vocational and Technical Education.

Eugene, T., & Byrkhart, H. (2002). *Forest measurements*. New York: McGraw Hill.

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Mississippi Automated Data Retrieval System. (2005). *Welcome to MARIS*. Retrieved September 14, 2005, from <http://www.maris.state.ms.us/>

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The Compass Store. (2005). *Find your declination adjustment value*. Retrieved September 14, 2005, from <http://www.thecompassstore.com/deevar.html>

Forestry I**Unit 7: Legal Land Descriptions****(30 hours)**

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Describe the United States Public Land Survey System.</p> <p>a. Explain and identify the principal meridians, baselines, and initial points used in Mississippi, including location of these lines on a map.</p> <p>b. Define legal land description terms, including bearing, blaze, contour, elevation, legend, plot, sea level, topographic map and corner markers.</p> <p>c. Explain reasons and importance for land location in forestry, including retrace, location, and layout of boundaries.</p>	<p>Teaching:</p> <ul style="list-style-type: none">• Discuss, show, and explain principal meridians, baselines, and initial points used in Mississippi.• Discuss terms associated with legal land description.• Discuss and analyze reasons for land location in forestry.• Have students complete an assignment to label the principal meridians, baselines, and initial points on a map of Mississippi. <p>Assessment:</p> <ul style="list-style-type: none">• Give a written test to define legal land description terms and reasons for land location in forestry.• Evaluate assignment to label a map of Mississippi.
<p>2. Identify information found on maps.</p> <p>a. Interpret information from and demonstrate use of ownership maps.</p> <p>b. Interpret information from and demonstrate use of topographic maps.</p>	<p>Teaching:</p> <ul style="list-style-type: none">• Explain, discuss, and demonstrate how to use ownership and topographic maps.• Have students complete assignments to demonstrate map reading and interpretation skills. <p>Assessment:</p> <ul style="list-style-type: none">• Evaluate assignments to demonstrate map reading and interpretation skills.
<p>3. Apply principles of legal land description.</p> <p>a. Write, read, and locate parcels of land using legal land descriptions.</p> <p>b. Observe the records of timber and land deeds.</p>	<p>Teaching:</p> <ul style="list-style-type: none">• Explain, discuss, and demonstrate how to write, read, and locate parcels of land using legal land descriptions.• Have students complete assignment sheets dealing with legal land descriptions.• Invite an attorney to speak to the class on deeds, titles, and transfer of land and timber.• Take students on a field trip to county tax collectors/assessors and chancery records building. <p>Assessment:</p> <ul style="list-style-type: none">• Give a written test on principles of legal

	<p>land description.</p> <ul style="list-style-type: none"> • Evaluate assignments on legal land descriptions. • Evaluate field trip participation using a checklist. (See Sample Checklist for Field Trip Participation in Appendix E.)
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STANDARDS

Agriculture, Food and Natural Resources Standards

The following standards were adapted from the publication, *Career Cluster Resources for Agriculture, Food, and Natural Resources*. The complete text of this document can be found at <http://www.careerclusters.org/ClusterDocuments/agdocuments/AGFinal.pdf>.

- ELR1 — Know and understand the importance of professional ethics and legal responsibilities.
- ELR2 — Demonstrate workplace ethics specific to Agriculture, Food, and Natural Resources (AFNR) occupations.
- NRS2 — Use effective venues to communicate natural phenomena to the public.
- ENV5 — Use tools, equipment, machinery, and technology to accomplish tasks in environmental services.

Academic Standards

- A1 — Recognize, classify, and use real numbers and their properties.
- A2 — Recognize, create, extend, and apply patterns, relations, and functions and their applications.
- E1 — Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
- E4 — Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.

Workplace Skills for the 21st Century

- WP2 — Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP6 — Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7 — Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.

National Educational Technology Standards for Students

- T1 — Basic operations and concepts

SUGGESTED REFERENCES

Textbooks and Other Publications

Curriculum & Instructional Materials Center. (1999). *Forestry*. Stillwater, OK: Department of Vocational and Technical Education.

Eugene, T., & Byrkhart, H. (2002). *Forest measurements*. New York: McGraw Hill.

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Forestry I**Unit 8: Tree and Log Measurements****(37.5 hours)**

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Explain tree measurement techniques:</p> <ul style="list-style-type: none"> a. Define terms, including board feet, basal area, cord, diameter at breast height (DBH), diameter, diameter inside bark (DIB), diameter outside bark (DOB), form class, one thousand board feet (MBF), merchantable height, sawlog, sawtimber, and sticks. b. Identify tools used in taking tree measurements and associate them with uses, including D-tape, tree stick, tree calipers, wedge prism, clinometer, and increment borer. c. Classify DBH measurements into the correct diameter classes, including one and two inch classes. d. Demonstrate the correct location of DBH measurements, including trees on level ground, slopes, leaning, forking, and deformed. e. Identify merchantable height, including heights for sawtimber, pulpwood, and specialty products. f. Distinguish among the major log rules, including Doyle, Scribner, and International log rules. g. Draw tally symbols, including dot tally method. 	<p>Teaching:</p> <ul style="list-style-type: none"> • Discuss terms, including board feet, basal area, cord, diameter at breast height (DBH), diameter, diameter inside bark (DIB), diameter outside bark (DOB), form class, one thousand board feet (MBF), merchantable height, sawlog, sawtimber, and sticks. • Identify and demonstrate the use of tools used in taking tree measurements, including D-tape, tree stick, tree calipers, wedge prism, clinometer, and increment borer. • Have students classify DBH measurements into the correct diameter classes, including one and two inch classes. • Demonstrate how to determine the correct location of DBH measurements, including trees on level ground, slopes, leaning, forking, and deformed. • Differentiate among the merchantable heights, and estimate for sawtimber, pulpwood, and specialty products. • Discuss the major log rules and their characteristics, including Doyle, Scribner, and International log rules. • Demonstrate how to draw tally symbols, using the dot tally method. • Have students measure and tally 10 pulpwood and 10 sawlog trees. <p>Assessment:</p> <ul style="list-style-type: none"> • Give a written test on tree measurement techniques. • Evaluate activity using a rubric on identifying and using tools for tree measurement, including tree scale stick, D-tape, tree calipers, wedge prism, clinometer, and increment borer. (See Sample Rubric for Tree Measurement Tool Identification and Use in Appendix E.)

	<ul style="list-style-type: none"> • Evaluate student performance on assignment to measure and tally standing timber.
<p>2. Perform volume measurement of standing timber and sawlogs.</p> <p>a. Determine the volume of standing timber, including volume computation from DBH and height measurements and basal area.</p> <p>b. Calculate the net volume of logs, including measuring length and DIB at small end of log to obtain volume and weight scaling of logs for volume.</p> <p>c. Calculate the volume of standing timber using traditional methods and computer software.</p>	<p>Teaching:</p> <ul style="list-style-type: none"> • Demonstrate how to determine the volume of standing timber, including volume computation from DBH and height measurements and basal area. • Demonstrate how to calculate the net volume of logs, including measuring length and DIB at small end of log to obtain volume and weight scaling of logs for volume. • Demonstrate the volume of standing timber using traditional methods and computer software. • Using the data collected in the assignment for objective 2a, have students calculate the total volume of saw timber and pulpwood using traditional and computer methods. <p>Assessment:</p> <ul style="list-style-type: none"> • Give a written test on volume measurement of standing timber and sawlogs. • Evaluate student assignment to calculate volume of standing timber.

STANDARDS

Agriculture, Food and Natural Resources Standards

The following standards were adapted from the publication, *Career Cluster Resources for Agriculture, Food, and Natural Resources*. The complete text of this document can be found at <http://www.careerclusters.org/ClusterDocuments/agdocuments/AGFinal.pdf>.

- ELR1—Know and understand the importance of professional ethics and legal responsibilities.
- ELR2—Demonstrate workplace ethics specific to Agriculture, Food, and Natural Resources (AFNR) occupations.
- PLT1—Apply principles of anatomy and physiology to produce and manage plants in both a domesticated and a natural environment.
- TET1—Use tools, equipment, machinery, and technology to work in areas related to AFNR.
- PWR2—Apply principles of operation and maintenance to mechanical equipment, structures, biological systems, land treatment, power utilization, and technology.
- PWR3—Apply principles of service and repair to mechanical equipment, structures, biological systems, land treatment, power utilization, and technology.

- NRS4—Employ knowledge of natural resource industries to describe production practices and processing procedures.
- ENV5—Use tools, equipment, machinery, and technology to accomplish tasks in environmental services.
- ABS2—Practice good recordkeeping to accomplish AFNR business objectives.
- ABS4—Employ AFNR industry concepts and practices to manage inventory.
- ABS5—Utilize technology to accomplish AFNR business objectives.
- ABS6—Use marketing and sales principles to accomplish an AFNR business objective.

Academic Standards

- A1—Recognize, classify, and use real numbers and their properties.
- E2—Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3—Read, evaluate, and use print, non print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4—Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.

Workplace Skills for the 21st Century

- WP2—Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP3—Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
- WP5—Selects, applies, and maintains/troubleshoots technology.
- WP6—Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7—Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8—Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

National Educational Technology Standards for Students

- T1—Basic operations and concepts
- T3—Technology productivity tools
- T6—Technology problem solving and decision making tools

SUGGESTED REFERENCES

Textbooks and Other Publications

- Curriculum & Instructional Materials Center. (1999). *Forestry*. Stillwater, OK: Department of Vocational and Technical Education.
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- Holland, I. I., & Rolfe, G. L. (2003). *Forests and forestry* (6th ed.). Upper Saddle River, NJ: Prentice Hall.

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- Mississippi State University Cooperative Extension Service. (2004). *Pine timber volume to weight conversions*. Retrieved September 15, 2005, from <http://msucares.com/pubs/publications/p2244.htm>
- Science Made Simple. (2005). *Online metric converter*. Retrieved September 15, 2005, from <http://www.scienceadesimple.com/conversions.html>
- The Timber Buyers Network. (2005). *What are log rules?* Retrieved September 15, 2005, from <http://www.timberbuyer.net/topics/logrules.htm>

Forestry I**Unit 9: Introduction to Timber Cruising****(45 hours)**

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<ol style="list-style-type: none"> 1. Describe procedures for cruising timber. <ol style="list-style-type: none"> a. Discuss terms associated with cruising, including basal area, board foot, bole, circumference, cord, cull, cunit, diameter at breast height (DBH), dendrometer, diameter, DIB, DOB, form class, hypsometer, MBF, merchantable height, sawlog, sawtimber, sticks, taper, and whorl. b. Describe reasons for conducting a cruise, including management and procurement. c. Describe factors that determine cruise intensity, including acreage, species, timber density, value, and purpose of cruise. 	<p>Teaching:</p> <ul style="list-style-type: none"> • Discuss and describe procedures for timber cruising. • Conduct an outdoor lab demonstrating the use of timber cruising tools. • Discuss and describe cruise intensity. <p>Assessment:</p> <ul style="list-style-type: none"> • Give a written test on timber cruising procedures.
<ol style="list-style-type: none"> 2. Perform timber cruising. <ol style="list-style-type: none"> a. Describe cruising techniques. b. Perform a cruise and volume calculation using traditional methods and computer software. 	<p>Teaching:</p> <ul style="list-style-type: none"> • Lead a group discussion on timber cruising techniques, including the different types of cruises and their characteristics. • Make a field assignment to cruise a given tract of timber. <p>Assessment:</p> <ul style="list-style-type: none"> • Give a written test on timber cruising techniques. • Use a rubric to evaluate performance in conducting a timber cruise. (See Sample Rubric for Conducting a Timber Cruise in Appendix E.)

STANDARDS*Agriculture, Food and Natural Resources Standards*

The following standards were adapted from the publication, *Career Cluster Resources for Agriculture, Food, and Natural Resources*. The complete text of this document can be found at <http://www.careerclusters.org/ClusterDocuments/agdocuments/AGFinal.pdf>.

TEC1—Use a variety of tools available in computer systems to accomplish fast, accurate production in the workplace.

NRS2—Use effective venues to communicate natural phenomena to the public.

NRS3—Apply scientific principles to natural resource management activities.

Academic Standards

- A1—Recognize, classify, and use real numbers and their properties.
- A2—Recognize, create, extend, and apply patterns, relations, and functions and their applications.
- A3—Simplify algebraic expressions, solve and graph equations, inequalities and systems in one and two variables.
- A4—Explore and communicate the characteristics and operations of polynomials.
- A5—Utilize various formulas in problem-solving situations.
- B1—Utilize critical thinking and scientific problem solving in designing and performing biological research and experimentation.
- E4—Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.

Workplace Skills for the 21st Century

- WP1—Allocates resources (time, money, materials and facilities, and human resources).
- WP2—Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP3—Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
- WP4—Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.
- WP5—Selects, applies, and maintains/troubleshoots technology.
- WP6—Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7—Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8—Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

National Educational Technology Standards for Students

- T1—Basic operations and concepts
- T3—Technology productivity tools
- T4—Technology communications tools
- T5—Technology research tools
- T6—Technology problem solving and decision making tools

SUGGESTED REFERENCES

Textbooks and Other Publications

Burton, L. D. (2000). *Introduction to forestry science*. Albany, NY: Delmar.

Curriculum & Instructional Materials Center. (1999). *Forestry*. Stillwater, OK: Department of Vocational and Technical Education.

Eugene, T., & Byrkhart, H. (2002). *Forest measurements*. New York: McGraw Hill.

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Forestry II

Unit 1: Identifying Forests and Forest Products

(7.5 hours)

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Apply procedures to identify forest types.</p> <ul style="list-style-type: none"> a. Define terms associated with forest types. b. Distinguish between softwoods and hardwoods, including all characteristics of hardwoods and softwoods. c. Identify forest regions of the United States on a map, including Pacific Coast, Rocky Mountains, Northern, Central Hardwood, Southern, and Tropical. d. Identify the principal species associated with the forest regions of Mississippi, including oak pine, oak gum cypress, oak hickory, loblolly-shortleaf, and longleaf slash. 	<p>Teaching:</p> <ul style="list-style-type: none"> • Using PowerPoint presentations, posters, and/or videos, identify different forest types and discuss their characteristics. • Divide the students into small groups and assign one forest region per group to research and summarize and report back to class. • Have students prepare a poster comparing softwood and hardwood tree species. <p>Assessment:</p> <ul style="list-style-type: none"> • Give a written test to identify forest and forest products. • Use a rubric to evaluate the forest regions report. (See Sample Rubric on Written Report in Appendix E.) • Use a rubric to assess performance on tree poster. (See Sample Poster Rubric in Appendix E.)
<p>2. Apply procedures to identify the physical properties of wood.</p> <ul style="list-style-type: none"> a. Identify the physical properties of wood according to wood uses, including specific gravity, grain, strength, stiffness, bending, hardness, toughness, ability to be stained, and chemical properties. b. Describe Mississippi wood products according to their importance to the state and local economy, including sawlogs, pulpwood products, poles and posts, veneer, furniture products, miscellaneous, and by products. c. Describe the role of recycling in the forest products industry, including impact on forest management and harvesting practices. 	<p>Teaching:</p> <ul style="list-style-type: none"> • Discuss the physical properties of wood and analyze tree species specimen. • Conduct field trip(s) to local forest industries to view wood and forest products. Have students record their observations in their journal/notebook. • Invite a guest speaker from the forest industry to speak on recycling. Have students summarize the presentation in their journal/notebook. <p>Assessment:</p> <ul style="list-style-type: none"> • Give a written test on the physical properties of wood. • Use a checklist to evaluate the field trip summary. (See Sample Checklist for Field Trip Participation in Appendix E.)

STANDARDS

Agriculture, Food and Natural Resources Standards

The following standards were adapted from the publication, *Career Cluster Resources for Agriculture, Food, and Natural Resources*. The complete text of this document can be found at <http://www.careerclusters.org/ClusterDocuments/agdocuments/AGFinal.pdf>.

- LEA1 — Use leadership skills in collaborating with others to accomplish organizational goals and objectives
- LEA2 — Use personal growth skills in collaborating with others to accomplish organizational goals and objectives
- PLT2 — Address taxonomic or other classifications to explain basic plant anatomy and physiology.
- PLT3 — Apply fundamentals of production and harvesting to produce plants.
- PWR1 — Apply physical science principles to engineering applications with mechanical equipment, structures, biological systems, land treatment, power utilization, and technology.
- NRS3 — Apply scientific principles to natural resource management activities.
- NRS4 — Employ knowledge of natural resource industries to describe production practices and processing procedures.
- ENV1 — Use analysis procedures to plan and evaluate environmental service impacts.
- ENV2 — Identify public policies and regulations impacting environmental services to determine their effect on facility operations.
- ENV4 — Operate environmental service systems (e.g., pollution control, water treatment, wastewater treatment, solid waste management, and energy) to manage a facility environment.

Academic Standards

- A1 — Recognize, classify, and use real numbers and their properties.
- A2 — Recognize, create, extend, and apply patterns, relations, and functions and their applications.
- A8 — Analyze data and apply concepts of probability.
- B1 — Utilize critical thinking and scientific problem solving in designing and performing biological research and experimentation.
- B7 — Investigate the interdependence and interactions that occur within an ecosystem.
- E1 — Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
- E2 — Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3 — Read, evaluate, and use print, non print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4 — Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.

- E5—Complete oral and written presentations which exhibit interaction and consensus within a group.
- E9—Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
- E10—Use language and critical thinking strategies to serve as tools for learning.

Workplace Skills for the 21st Century

- WP2—Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP3—Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
- WP6—Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7—Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8—Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

National Educational Technology Standards for Students

- T1—Basic operations and concepts
- T2—Social, ethical, and human issues
- T3—Technology productivity tools
- T4—Technology communications tools
- T5—Technology research tools
- T6—Technology problem-solving and decision-making tools

SUGGESTED REFERENCES

Textbooks and Other Publications

- Burton, L. D. (2000). *Introduction to forestry science*. Albany, NY: Delmar.
- Brown, C. (1996). *Mississippi trees*. Jackson, MS: Mississippi Forestry Commission.
- Curriculum & Instructional Materials Center. (1999). *Forestry*. Stillwater, OK: Department of Vocational and Technical Education.
- Holland, I. I., & Rolfe, G. L. (2003). *Forests and forestry* (6th ed.). Upper Saddle River, NJ: Prentice Hall.

Web Sites

Society of American Foresters. (2005). *About forestry*. Retrieved September 15, 2005, from <http://www.safnet.org/aboutforestry/index.cfm>

Forestry II

Unit 2: Employability Skills/FFA Activities

(7.5 hours)

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Develop employability skills.</p> <ul style="list-style-type: none"> a. Discuss employability traits. b. Prepare a computerized resume containing essential information including personal information, education, and employment experience using correct grammar, spelling, and punctuation. c. Complete job application forms including correct grammar, spelling, and punctuation. d. Explain procedures for job interviews using correct job etiquette. e. Demonstrate the role of an applicant in a job interview using correct interview procedures. f. Explore job opportunities using a computerized database. 	<p>Teaching:</p> <ul style="list-style-type: none"> • Give a PowerPoint presentation on employability skills. • Have students prepare a personal resume. • Have students fill out a job application form. • Have students write a report on a forestry related occupation that they are interested in and present their findings to the class. Information may be found from the Internet, the <i>Occupational Outlook Handbook</i>, or other appropriate resource. <p>Assessment:</p> <ul style="list-style-type: none"> • Give a written test on employability skills. • Use a rubric to evaluate the resume. • Use a rubric to evaluate the job application. • Use a rubric to evaluate the report and presentation. (See Sample Rubric on Written Report in Appendix E.)
<p>2. Identify FFA leadership activities associated with forestry.</p> <ul style="list-style-type: none"> a. Identify FFA organizational activities that promote and recognize achievements in forestry, including personal development activities, seminars, leadership conferences, national and international exchange programs, education experience with industry, and personal and community development programs. b. Identify the benefits of FFA participation to an individual and to the forestry industry, including personal growth and development, exposure to the forestry industry environment, and multicultural experiences. c. Identify opportunities for members in the FFA organization, including personal development, personal 	<p>Teaching:</p> <ul style="list-style-type: none"> • Use a PowerPoint presentation to explain the benefits of FFA participation. • Invite a guest speaker to explain benefits of FFA participation. • Divide students into groups to research benefits of FFA from Internet sources and the <i>FFA Student Handbook</i>. <p>Assessment:</p> <ul style="list-style-type: none"> • Give a written test on the benefits of FFA participation.

recognition, travel, association with persons from other parts of the United States and abroad, career exploration, and self expression.	
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STANDARDS

Agriculture, Food and Natural Resources Standards

The following standards were adapted from the publication, *Career Cluster Resources for Agriculture, Food, and Natural Resources*. The complete text of this document can be found at <http://www.careerclusters.org/ClusterDocuments/agdocuments/AGFinal.pdf>.

- LEA1—Use leadership skills in collaborating with others to accomplish organizational goals and objectives
- LEA2—Use personal growth skills in collaborating with others to accomplish organizational goals and objectives
- TET1—Use tools, equipment, machinery, and technology to work in areas related to AFNR.
- TEC1—Use a variety of tools available in computer systems to accomplish fast, accurate production in the workplace.
- NRS2—Use effective venues to communicate natural phenomena to the public.
- ABS1—Employ leadership skills to accomplish goals and objectives in the AFNR business environment.
- ABS2—Practice good recordkeeping to accomplish AFNR business objectives.

Academic Standards

- E1—Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
- E2—Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3—Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4—Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E5—Complete oral and written presentations which exhibit interaction and consensus within a group.
- E8—Read, discuss, analyze, and evaluate literature from various genres and other written material.
- E9—Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
- E10—Use language and critical thinking strategies to serve as tools for learning.
- H4—Demonstrate the ability to use social studies tools (e.g., timelines, maps, globes, resources, graphs, a compass, technology, etc.).

Workplace Skills for the 21st Century

- WP1—Allocates resources (time, money, materials and facilities, and human resources).
WP2—Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
WP3—Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
WP6—Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
WP7—Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
WP8—Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

National Educational Technology Standards for Students

- T2—Social, ethical, and human issues
T4—Technology communications tools
T5—Technology research tools
T6—Technology problem solving and decision making tools

SUGGESTED REFERENCES

Textbooks and Other Publications

- Crookett, C., Stevens, S., and Stewart, B. (1990). *Core employment skills*. Columbia, MO: Instructional Materials Laboratory, University of Missouri.
- National FFA Organization. (2005). *FFA manual*. Indianapolis, IN: Author.
- National FFA Organization. (2005). *FFA student handbook*. Indianapolis, IN: Author.

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- National FFA Organization. (2003). *Career development events handbook 2001-2005*. Retrieved June 20, 2005, from <http://www.ffa.org/programs/cde/documents/cde-handbook.pdf>
- United States Department of Labor. (2005). *Occupational outlook handbook*. Retrieved September 15, 2005, from <http://www.bls.gov/oco/>

Forestry II

Unit 3: Forest Management Practices

(45 hours)

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Explain forest management practices.</p> <ul style="list-style-type: none">a. Define terms associated with forest management practices, including BMPs and SMZs, age classifications, forest management, improvement cutting, selection cutting, timber stand improvement, stand types, and wildlife management.b. Identify the role of forest management, including forest crops, management of stands, measurement of stands, goals and objectives of the landowner, and voluntary best management practices.c. Describe forest management practices, including silviculture, reproduction, harvest cuttings, fertilization, and herbicide application.d. Discuss BMPs and SMZs.	<p>Teaching:</p> <ul style="list-style-type: none">• Use a PowerPoint and/or video to describe and examine forest management practices.• Conduct a field trip to evaluate forest management practices including BMPs and SMZs. Have students record their observations in their journal/notebook. <p>Assessment:</p> <ul style="list-style-type: none">• Give a written test on forest management practices.• Use a checklist to evaluate participation in the field trip. (See Sample Checklist for Field Trip Participation in Appendix E.)
<p>2. Apply forest management practices.</p> <ul style="list-style-type: none">a. Describe the purposes of intermediate cutting in forest management, including maximizing growth, control spacing, and removal of undesirable trees.b. Determine the type of intermediate cut, including pre-commercial, pulpwood, release, and salvage.c. Classify timber stand improvement needs, including thin overstocked stands, prescribed burning, fertilization, herbicide use, and salvage cuts.	<p>Teaching:</p> <ul style="list-style-type: none">• Divide students into groups and assign a tract to each group to formulate a forest management plan and present the plan to the class.• Take students on a field trip to examine and analyze forest management practices. <p>Assessment:</p> <ul style="list-style-type: none">• Use a rubric to evaluate the presentation of the forest management plan.• Give a written test on forest management practices.• Evaluate the presentation for content and delivery.• Use a checklist to evaluate field trip participation. (See Sample Checklist for Field Trip Participation in Appendix E.)

STANDARDS

Agriculture, Food and Natural Resources Standards

The following standards were adapted from the publication, *Career Cluster Resources for Agriculture, Food, and Natural Resources*. The complete text of this document can be found at <http://www.careerclusters.org/ClusterDocuments/agdocuments/AGFinal.pdf>.

- LEA1 — Use leadership skills in collaborating with others to accomplish organizational goals and objectives
- LEA2 — Use personal growth skills in collaborating with others to accomplish organizational goals and objectives
- ELR1 — Know and understand the importance of professional ethics and legal responsibilities.
- ELR2 — Demonstrate workplace ethics specific to Agriculture, Food, and Natural Resources (AFNR) occupations.
- PLT1 — Apply principles of anatomy and physiology to produce and manage plants in both a domesticated and a natural environment.
- PLT2 — Address taxonomic or other classifications to explain basic plant anatomy and physiology.
- PLT3 — Apply fundamentals of production and harvesting to produce plants.
- TET1 — Use tools, equipment, machinery, and technology to work in areas related to AFNR.
- TEC1 — Use a variety of tools available in computer systems to accomplish fast, accurate production in the workplace.
- NRS1 — Recognize importance of resource and human interrelations to conduct management activities in natural habitats.
- NRS2 — Use effective venues to communicate natural phenomena to the public.
- NRS3 — Apply scientific principles to natural resource management activities.
- NRS4 — Employ knowledge of natural resource industries to describe production practices and processing procedures.
- NRS5 — Practice responsible conduct to protect natural resources.
- ENV1 — Use analysis procedures to plan and evaluate environmental service impacts.
- ENV2 — Identify public policies and regulations impacting environmental services to determine their effect on facility operations.
- ENV3 — Apply scientific principles to environmental services.
- ENV4 — Operate environmental service systems (e.g., pollution control, water treatment, wastewater treatment, solid waste management, and energy) to manage a facility environment.
- ENV5 — Use tools, equipment, machinery, and technology to accomplish tasks in environmental services.

Academic Standards

- B1 — Utilize critical thinking and scientific problem solving in designing and performing biological research and experimentation.
- B4 — Investigate the transfer of energy from the sun to living systems.
- B6 — Investigate concepts of natural selection as they relate to diversity of life.

- B7— Investigate the interdependence and interactions that occur within an ecosystem.
- E1— Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
- E3— Read, evaluate, and use print, non print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4— Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E5— Complete oral and written presentations which exhibit interaction and consensus within a group.
- E9— Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
- E10— Use language and critical thinking strategies to serve as tools for learning.

Workplace Skills for the 21st Century

- WP1— Allocates resources (time, money, materials and facilities, and human resources).
- WP2— Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP3— Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
- WP6— Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7— Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8— Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

National Educational Technology Standards for Students

- T1— Basic operations and concepts
- T2— Social, ethical, and human issues
- T3— Technology productivity tools
- T4— Technology communications tools
- T5— Technology research tools
- T6— Technology problem solving and decision making tools

SUGGESTED REFERENCES

Textbooks and Other Publications

- Burton, L. D. (2000). *Introduction to forestry science*. Albany, NY: Delmar.
- Camp, W. G., & Daugherty, T. B. (2002). *Managing our natural resources* (4th ed.). Albany, NY: Delmar.

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Mississippi Forestry Commission. (2000). *Best management practices*. (3rd ed.). Retrieved September 15, 2005, from <http://www.mfc.state.ms.us/pdf/bmp2000.pdf>

Mississippi Forestry Commission. (2004). *The forest owner and water quality*. Retrieved September 15, 2005, from <http://www.mfc.state.ms.us/pdf/mfc104.htm>

Society of American Foresters. (2005). *About forestry*. Retrieved July 7, 2005, from <http://www.safnet.org/aboutforestry/index.cfm>

United States Forest Service. (2001). *Water quality protection measures in the U.S. Forest Service*. Retrieved September 15, 2005, from http://www.fs.fed.us/publications/policy_analysis/water_quality_protection_measures.pdf

Forestry II

Unit 4: Advanced Timber Cruising

(52.5 hours)

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<ol style="list-style-type: none">1. Plan and conduct a timber cruise.<ol style="list-style-type: none">a. Prepare cruise layouts, including drawing of a diagram describing a 10% sample systematic grid.b. Conduct timber cruises and determine tract volume and values, including 10%, 20%, and 100% samples.c. Discuss point sampling.	<p>Teaching:</p> <ul style="list-style-type: none">• Discuss and describe preparing cruise layouts and cruises.• Invite a local timber buyer to discuss cruising techniques.• Conduct a field exercise to participate in timber cruising. Divide students into groups and have each group conduct a cruise of a given tract of timber. Have each group calculate the board footage on the tract and compare their findings to the groups.• Discuss and describe point sampling. <p>Assessment:</p> <ul style="list-style-type: none">• Give a written test on planning and conducting a timber cruise.• Use a rubric to evaluate the students on performing a timber cruise. (See Rubric for Conducting a Timber Cruise in Appendix E.)

STANDARDS

Agriculture, Food and Natural Resources Standards

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TET1—Use tools, equipment, machinery, and technology to work in areas related to AFNR.

TEC1—Use a variety of tools available in computer systems to accomplish fast, accurate production in the workplace.

NRS2—Use effective venues to communicate natural phenomena to the public.

NRS3—Apply scientific principles to natural resource management activities.

NRS4—Employ knowledge of natural resource industries to describe production practices and processing procedures.

NRS5—Practice responsible conduct to protect natural resources.

Academic Standards

A1—Recognize, classify, and use real numbers and their properties.

- A2—Recognize, create, extend, and apply patterns, relations, and functions and their applications.
- A3—Simplify algebraic expressions, solve and graph equations, inequalities and systems in one and two variables.
- A5—Utilize various formulas in problem-solving situations.
- B1—Utilize critical thinking and scientific problem solving in designing and performing biological research and experimentation.

Workplace Skills for the 21st Century

- WP1—Allocates resources (time, money, materials and facilities, and human resources).
- WP2—Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP3—Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
- WP7—Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8—Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

National Educational Technology Standards for Students

- T1—Basic operations and concepts
- T3—Technology productivity tools
- T5—Technology research tools
- T6—Technology problem solving and decision making tools

SUGGESTED REFERENCES

Textbooks and Other Publications

- Burton, L. D. (2000). *Introduction to forestry science*. Albany, NY: Delmar.
- Curriculum & Instructional Materials Center. (1999). *Forestry*. Stillwater, OK: Department of Vocational and Technical Education.
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Computer Software

- Resource Consulting International, Ltd. Crustali VB (Version 4.05) [Computer software]. Starkville, MS: Author.

Web Sites

USDA Forest Service. (2005). *National cruise program (NATCRS)*. Retrieved September 15, 2005, from <http://www.fs.fed.us/fmnc/measure/cruising/natcrs/index.php>

Forestry II**Unit 5: Timber Marketing****(15 hours)**

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Explain timber marketing procedures.</p> <ul style="list-style-type: none">a. Define terms associated with timber marketing, including compliance, management prescriptions, offeree, and offeror.b. Describe marketing practices for selling at the highest return, including marking, estimating timber, determining the value of timber, and selling the timber for the highest price.c. Identify potential markets, including pulp paper mills, post mill, sawmill, specialty markets, export markets, firewood sales, and distance to these markets.d. Describe how to determine the highest value of a timber stand, including preparing a prospectus and a timber sale contract.	<p>Teaching:</p> <ul style="list-style-type: none">• Discuss terms associated with timber marketing, including compliance, management prescriptions, offeree, and offeror.• Discuss marketing practices for selling at the highest return, including marking, estimating timber, determining the value of timber, and selling the timber for the highest price.• Invite a representative of the forest industry to speak on markets for local forest products. Have students summarize the presentation in a journal/notebook.• Make a student assignment to determine the highest value of a stand and prepare a simple prospectus and contract. <p>Assessment:</p> <ul style="list-style-type: none">• Give a written test on timber marketing practices.• Use a checklist to evaluate the student notebook/journal.• Use a rubric on preparing a prospectus and a timber sale contract to evaluate this activity. (See samples in Appendix E.)
<p>2. Describe conditions of sale and harvesting of timber.</p> <ul style="list-style-type: none">a. Describe legal documents used in the sale and harvesting of timber, including the prospectus, timber sale contract, timber deed, and harvesting contract.b. Describe desirable post harvest land conditions which may be specified in a harvesting contract.c. Describe logistics of transporting timber to markets, including the effect upon the price received by the producer.	<p>Teaching:</p> <ul style="list-style-type: none">• Discuss and show examples of legal documents used in the sale and harvesting of timber, including the prospectus, timber sale contract, timber deed, and harvesting contract.• Describe desirable post harvest land conditions which may be specified in a harvesting contract.• Describe logistics of transporting timber to markets, including the effect upon the price received by the producer.• Have students complete an assignment to evaluate conditions for sale and harvesting of a timber tract. <p>Assessment:</p> <ul style="list-style-type: none">• Give a written test on conditions of sale

	and harvesting of timber. • Evaluate student assignment.
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STANDARDS

Agriculture, Food and Natural Resources Standards

The following standards were adapted from the publication, *Career Cluster Resources for Agriculture, Food, and Natural Resources*. The complete text of this document can be found at <http://www.careerclusters.org/ClusterDocuments/agdocuments/AGFinal.pdf>.

- LEA1 — Use leadership skills in collaborating with others to accomplish organizational goals and objectives
- LEA2 — Use personal growth skills in collaborating with others to accomplish organizational goals and objectives
- ELR1 — Know and understand the importance of professional ethics and legal responsibilities.
- ELR2 — Demonstrate workplace ethics specific to Agriculture, Food, and Natural Resources (AFNR) occupations.
- PLT3 — Apply fundamentals of production and harvesting to produce plants.
- TET1 — Use tools, equipment, machinery, and technology to work in areas related to AFNR.
- TEC1 — Use a variety of tools available in computer systems to accomplish fast, accurate production in the workplace.
- NRS1 — Recognize importance of resource and human interrelations to conduct management activities in natural habitats.
- NRS2 — Use effective venues to communicate natural phenomena to the public.
- NRS3 — Apply scientific principles to natural resource management activities.
- NRS4 — Employ knowledge of natural resource industries to describe production practices and processing procedures.
- NRS5 — Practice responsible conduct to protect natural resources.
- ENV1 — Use analysis procedures to plan and evaluate environmental service impacts.
- ENV2 — Identify public policies and regulations impacting environmental services to determine their effect on facility operations.
- ENV3 — Apply scientific principles to environmental services.
- ABS1 — Employ leadership skills to accomplish goals and objectives in the AFNR business environment.
- ABS2 — Practice good recordkeeping to accomplish AFNR business objectives.
- ABS5 — Utilize technology to accomplish AFNR business objectives.
- ABS6 — Use marketing and sales principles to accomplish an AFNR business objective.

Academic Standards

- A1 — Recognize, classify, and use real numbers and their properties.
- A2 — Recognize, create, extend, and apply patterns, relations, and functions and their applications.
- B7 — Investigate the interdependence and interactions that occur within an ecosystem.

- E1—Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
- E2—Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3—Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4—Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E5—Complete oral and written presentations which exhibit interaction and consensus within a group.
- E9—Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
- E10—Use language and critical thinking strategies to serve as tools for learning.
- H1—Explain how geography, economics, and politics have influenced the historical development of the United States in the global community.
- H2—Describe the impact of science and technology on the historical development of the United States in the global community.
- H3—Describe the relationship of people, places, and environments through time.
- H4—Demonstrate the ability to use social studies tools (e.g., timelines, maps, globes, resources, graphs, a compass, technology, etc.).

Workplace Skills for the 21st Century

- WP1—Allocates resources (time, money, materials and facilities, and human resources).
- WP2—Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP3—Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
- WP5—Selects, applies, and maintains/troubleshoots technology.
- WP6—Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7—Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8—Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

National Educational Technology Standards for Students

- T1—Basic operations and concepts
- T2—Social, ethical, and human issues
- T3—Technology productivity tools
- T4—Technology communications tools
- T5—Technology research tools
- T6—Technology problem solving and decision making tools

SUGGESTED REFERENCES

Textbooks and Other Publications

- Burton, L. D. (2000). *Introduction to forestry science*. Albany, NY: Delmar.
- Curriculum & Instructional Materials Center. (1999). *Forestry*. Stillwater, OK: Department of Vocational and Technical Education.
- Holland, I. I., & Rolfe, G. L. (2003). *Forests and forestry* (6th ed.). Upper Saddle River, NJ: Prentice Hall.

Web Sites

- Fall Line Timber Sales Consultants. (2005). *Sample timber sales contract*. Retrieved September 15, 2005, from <http://home.flash.net/~falline/tsalecont.htm>
- Mississippi State University Extension Service. (2004). *Marketing your timber the timber sales agreement*. Retrieved September 15, 2005, from <http://msucare.com/pubs/publications/p1855.htm>
- Riffe Lake Timber Company. (2004). *Timber deed and sale agreement*. Retrieved September 15, 2005, from <http://www.riffelaketimber.com/samples/saleagreement.html>
- University of Nebraska Extension Service. *Marketing your timber*. Retrieved September 15, 2005, from <http://ianrpubs.unl.edu/forestry/g383.htm>
- University of Wisconsin Extension Service. (2004). *Standing timber for sale*. Retrieved September 15, 2005, from <http://basineducation.uwex.edu/woodland/timber.htm>

Forestry II**Unit 6: Timber Harvesting****(15 hours)**

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Explain timber harvesting procedures.</p> <ul style="list-style-type: none">a. Define terms associated with timber harvesting, including harvesting layout, BMPs and SMZs, felling, topping, bunching, skidding, merchandising, loading, and hauling.b. Describe the methods of harvesting timber, including selection, seed tree, shelterwood, clear-cut, and mechanical.c. Identify the products of harvesting, including pulpwood, sawlogs, and specialty wood products.	<p>Teaching:</p> <ul style="list-style-type: none">• Discuss terms associated with timber harvesting, including harvesting layout, BMPs and SMZs, felling, topping, bunching, skidding, merchandising, loading, and hauling.• Have students research and prepare a report on methods of harvesting timber, including selection, seed tree, shelterwood, clear-cut, and mechanical.• Identify and describe the products of harvesting, including pulpwood, sawlogs, and specialty wood products. <p>Assessment:</p> <ul style="list-style-type: none">• Give a written test on timber harvesting procedures.• Use a rubric to evaluate the student report describing the methods of harvesting timber. (See Sample Rubric on Written Report in Appendix E.)
<p>2. Develop a timber harvesting plan.</p> <ul style="list-style-type: none">a. Identify types of harvesting equipment, including saws, fellerbunchers, pre haulers, skidders, whole tree chippers, loaders, and hauling vehicles.b. Observe timber harvesting operations, including forest management practices of pulpwood and sawlogs.c. Describe desirable post harvesting land conditions, including disposition of non-merchantable timber, dead trees, tree tops, soil cover, and damage caused by logging equipment.d. Develop a simple harvesting plan for a given tract of timber.	<p>Teaching:</p> <ul style="list-style-type: none">• Use a PowerPoint or videotape to identify types of harvesting equipment, including saws, fellerbunchers, pre haulers, skidders, whole tree chippers, loaders, and hauling vehicles.• Conduct a field trip to observe timber harvesting operations and equipment, including forest management practices of pulpwood and sawlogs. Provide students with a list of questions to be answered from their observations.• Describe desirable post harvesting land conditions, including disposition of nonmerchantable timber, dead trees, tree tops, soil cover, and damage caused by logging equipment.• Describe the components of a timber harvesting plan. Have students complete an assignment to develop a simple harvesting plan for a given tract of timber.

	<p>Assessment:</p> <ul style="list-style-type: none"> • Give a written test on timber harvesting plans and procedures. • Use a rubric to evaluate participation in field trip to observe timber harvesting operations, including forest management practices of pulpwood and saw logs. (See Sample Checklist for Field Trip Participation in Appendix E.) • Evaluate student performance on the development of a simple harvesting plan.
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STANDARDS

Agriculture, Food and Natural Resources Standards

The following standards were adapted from the publication, *Career Cluster Resources for Agriculture, Food, and Natural Resources*. The complete text of this document can be found at <http://www.careerclusters.org/ClusterDocuments/agdocuments/AGFinal.pdf>.

- ELR1 — Know and understand the importance of professional ethics and legal responsibilities.
- ELR2 — Demonstrate workplace ethics specific to Agriculture, Food, and Natural Resources (AFNR) occupations.
- PLT1 — Apply principles of anatomy and physiology to produce and manage plants in both a domesticated and a natural environment.
- PLT2 — Address taxonomic or other classifications to explain basic plant anatomy and physiology.
- PLT3 — Apply fundamentals of production and harvesting to produce plants.
- PLT4 — Exercise elements of design to enhance an environment (e.g., floral, forest, landscape, and farm).
- TET1 — Use tools, equipment, machinery, and technology to work in areas related to AFNR.
- TEC1 — Use a variety of tools available in computer systems to accomplish fast, accurate production in the workplace.
- NRS1 — Recognize importance of resource and human interrelations to conduct management activities in natural habitats.
- NRS2 — Use effective venues to communicate natural phenomena to the public.
- NRS3 — Apply scientific principles to natural resource management activities.
- NRS4 — Employ knowledge of natural resource industries to describe production practices and processing procedures.
- NRS5 — Practice responsible conduct to protect natural resources.
- ENV1 — Use analysis procedures to plan and evaluate environmental service impacts.
- ENV2 — Identify public policies and regulations impacting environmental services to determine their effect on facility operations.
- ENV3 — Apply scientific principles to environmental services.
- ENV5 — Use tools, equipment, machinery, and technology to accomplish tasks in environmental services.

- ABS1—Employ leadership skills to accomplish goals and objectives in the AFNR business environment.
- ABS2—Practice good recordkeeping to accomplish AFNR business objectives.
- ABS4—Employ AFNR industry concepts and practices to manage inventory.
- ABS5—Utilize technology to accomplish AFNR business objectives.
- ABS6—Use marketing and sales principles to accomplish an AFNR business objective.

Academic Standards

- A1—Recognize, classify, and use real numbers and their properties.
- A2—Recognize, create, extend, and apply patterns, relations, and functions and their applications.
- E1—Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
- E2—Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3—Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4—Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E5—Complete oral and written presentations which exhibit interaction and consensus within a group.
- E9—Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
- E10—Use language and critical thinking strategies to serve as tools for learning.
- H3—Describe the relationship of people, places, and environments through time.
- H4—Demonstrate the ability to use social studies tools (e.g., timelines, maps, globes, resources, graphs, a compass, technology, etc.).

Workplace Skills for the 21st Century

- WP1—Allocates resources (time, money, materials and facilities, and human resources).
- WP2—Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP3—Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
- WP5—Selects, applies, and maintains/troubleshoots technology.
- WP6—Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7—Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8—Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

- T1——Basic operations and concepts
- T3——Technology productivity tools
- T4——Technology communications tools
- T5——Technology research tools
- T6——Technology problem-solving and decision-making tools

SUGGESTED REFERENCES

Textbooks and Other Publications

- Burton, L. D. (2000). *Introduction to forestry science*. Albany, NY: Delmar.
- Curriculum & Instructional Materials Center. (1999). *Forestry*. Stillwater, OK: Department of Vocational and Technical Education.
- Holland, I. I., & Rolfe, G. L. (2003). *Forests and forestry* (6th ed.). Upper Saddle River, NJ: Prentice Hall.

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- Auburn University. (2005). *Timber harvesting*. Retrieved September 15, 2005, from <http://www.pfmt.org/harvesting/default.htm>
- Deere and Company. (2005). *John Deere forestry equipment*. Retrieved September 15, 2005, from http://www.deere.com/en_US/cfd/forestry/deere_forestry/index.html
- National Timber Harvesting and Safety Foundation. (2005). *Logging and transportation safety*. Retrieved September 15, 2005, from <http://www.loggingsafety.com/>

Forestry II**Unit 7: Reforestation****(22.5 hours)**

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Explain reforestation practices.</p> <ul style="list-style-type: none">a. Define reforestation terms, including planting tools, methods of seeding, and site preparation.b. Identify the sources of tree seedlings, including private, state, and federal nurseries.c. Describe the methods of handling seedlings, including plant as soon as possible, heel in, and keep in cold storage.d. Describe the methods of planting, including direct seeding, hand planting, and machine planting.e. Describe the different types of site preparation, including roll chop, shearing, burning, chemical, piling, and bedding.f. Describe the types of reforestation, including artificial and natural means.g. Describe the economics of reforestation.h. Identify federal and state reforestation programs available locally.	<p>Teaching:</p> <ul style="list-style-type: none">• Use a PowerPoint presentation to examine and discuss reforestation practices.• Divide the class into groups and have them use the Internet or textbook to research reforestation practices. Have students summarize their findings into fact sheets and distribute to the class.• Conduct a field trip to a local or state tree nursery to observe seedling plantings and growth practices. Have students summarize their findings in their notebook/journal. <p>Assessment:</p> <ul style="list-style-type: none">• Give a written test on reforestation practices.• Use a rubric to evaluate student performance on reforestation fact sheet. (See Sample Fact Sheet Rubric in Appendix E.)
<p>2. Perform reforestation practices.</p> <ul style="list-style-type: none">a. Plant seedlings, including using all available methods.b. Perform a compliance check, including carrying out a standard Mississippi Forestry Commission compliance check.	<p>Teaching:</p> <ul style="list-style-type: none">• Have students demonstrate planting of seedlings using all available methods.• Demonstrate procedures for conducting a compliance check and have students perform a compliance check. <p>Assessment:</p> <ul style="list-style-type: none">• Give a written test on reforestation practices.• Evaluate compliance check exercise.

STANDARDS

Agriculture, Food and Natural Resources Standards

The following standards were adapted from the publication, *Career Cluster Resources for Agriculture, Food, and Natural Resources*. The complete text of this document can be found at <http://www.careerclusters.org/ClusterDocuments/agdocuments/AGFinal.pdf>.

- PLT1—Apply principles of anatomy and physiology to produce and manage plants in both a domesticated and a natural environment.
- PLT3—Apply fundamentals of production and harvesting to produce plants.
- PLT4—Exercise elements of design to enhance an environment (e.g., floral, forest, landscape, and farm).
- TEC1—Use a variety of tools available in computer systems to accomplish fast, accurate production in the workplace.
- NRS1—Recognize importance of resource and human interrelations to conduct management activities in natural habitats.
- NRS2—Use effective venues to communicate natural phenomena to the public.
- NRS3—Apply scientific principles to natural resource management activities.
- NRS4—Employ knowledge of natural resource industries to describe production practices and processing procedures.
- NRS5—Practice responsible conduct to protect natural resources.
- ENV3—Apply scientific principles to environmental services.
- ENV4—Operate environmental service systems (e.g., pollution control, water treatment, wastewater treatment, solid waste management, and energy) to manage a facility environment.
- ENV5—Use tools, equipment, machinery, and technology to accomplish tasks in environmental services.
- ABS1—Employ leadership skills to accomplish goals and objectives in the AFNR business environment.
- ABS2—Practice good recordkeeping to accomplish AFNR business objectives.
- ABS3—Apply generally accepted accounting principles and skills to manage budget, credit, and optimal application of AFNR business assets.
- ABS5—Utilize technology to accomplish AFNR business objectives.

Academic Standards

- A1—Recognize, classify, and use real numbers and their properties.
- A2—Recognize, create, extend, and apply patterns, relations, and functions and their applications.
- A3—Simplify algebraic expressions, solve and graph equations, inequalities and systems in one and two variables.
- A5—Utilize various formulas in problem-solving situations.
- A8—Analyze data and apply concepts of probability.
- B1—Utilize critical thinking and scientific problem solving in designing and performing biological research and experimentation.

- B2 — Investigate the biochemical basis of life.
- B3 — Investigate cell structures, functions, and methods of reproduction.
- B4 — Investigate the transfer of energy from the sun to living systems.
- B5 — Investigate the principles, mechanisms, and methodology of classical and molecular genetics.
- B6 — Investigate concepts of natural selection as they relate to diversity of life.
- B7 — Investigate the interdependence and interactions that occur within an ecosystem.
- E1 — Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
- E2 — Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.
- E3 — Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4 — Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E5 — Complete oral and written presentations which exhibit interaction and consensus within a group.
- E8 — Read, discuss, analyze, and evaluate literature from various genres and other written material.
- E9 — Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.
- E10 — Use language and critical thinking strategies to serve as tools for learning.

Workplace Skills for the 21st Century

- WP1 — Allocates resources (time, money, materials and facilities, and human resources).
- WP2 — Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP3 — Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
- WP5 — Selects, applies, and maintains/troubleshoots technology.
- WP6 — Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7 — Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.
- WP8 — Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

National Educational Technology Standards for Students

- T1 — Basic operations and concepts
- T2 — Social, ethical, and human issues
- T3 — Technology productivity tools
- T4 — Technology communications tools

T5——Technology research tools

T6——Technology problem-solving and decision-making tools

SUGGESTED REFERENCES

Textbooks and Other Publications

Burton, L. D. (2000). *Introduction to forestry science*. Albany, NY: Delmar.

Curriculum & Instructional Materials Center. (1999). *Forestry*. Stillwater, OK: Department of Vocational and Technical Education.

Holland, I. I., & Rolfe, G. L. (2003). *Forests and forestry* (6th ed.). Upper Saddle River, NJ: Prentice Hall.

Web Sites

Mississippi State University Extension Service. (2004). *Planting southern pines: A guide to species selection and planting techniques*. Retrieved September 15, 2005, from <http://msucare.com/pubs/publications/p1776.htm>

Forestry II

Unit 8: Forest Fire Management

(22.5 hours)

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Explain forest fire management practices.</p> <ul style="list-style-type: none">a. Define the terms associated with forest fires, including types of fires, behavior, fuels, controls, and weather conditions.b. Identify the elements of the fire triangle, including heat, fuel, and oxygen.c. Identify the classes of fires, including ground, surface, and crown.d. Identify the methods of attack, including direct and indirect.e. Identify firefighting tools according to their uses, including rakes, swatters, cutting tools, back pack sprayer, drip torch, and fire plows.	<p>Teaching:</p> <ul style="list-style-type: none">• Discuss and describe terms about forest fire management.• Conduct an outdoor lab to demonstrate the use of firefighting tools and procedures. <p>Assessment:</p> <ul style="list-style-type: none">• Give a written test on forest fire management practices.
<p>2. Apply forest fire management techniques.</p> <ul style="list-style-type: none">a. Develop a prescribed burning plan, including fire lanes, weather conditions, wind speed and direction, timber type, fuel conditions, manpower, and procedures for obtaining a burn permit.b. Develop a forest fire prevention plan, including fire lanes, section roads, prescribed burning, and emergency notification procedures.	<p>Teaching:</p> <ul style="list-style-type: none">• Discuss the common elements of a prescribed burn plan.• Develop a prescribed burning plan.• Complete a burn permit.• Invite an industry representative to speak on fire prevention plans and have students develop a fire prevention plan for a tract of timber. <p>Assessment:</p> <ul style="list-style-type: none">• Give a written test on fire management techniques.• Use a rubric to evaluate the burn plan. (See Sample Rubric—Develop a Prescribed Burning Plan in Appendix E.)• Evaluate completed burn permit.

STANDARDS

Agriculture, Food and Natural Resources Standards

The following standards were adapted from the publication, *Career Cluster Resources for Agriculture, Food, and Natural Resources*. The complete text of this document can be found at <http://www.careerclusters.org/ClusterDocuments/agdocuments/AGFinal.pdf>.

ELR1—Know and understand the importance of professional ethics and legal responsibilities.

- NRS3—Apply scientific principles to natural resource management activities.
- NRS4—Employ knowledge of natural resource industries to describe production practices and processing procedures.
- NRS5—Practice responsible conduct to protect natural resources.
- ENV1—Use analysis procedures to plan and evaluate environmental service impacts.
- ENV2—Identify public policies and regulations impacting environmental services to determine their effect on facility operations.
- ENV3—Apply scientific principles to environmental services.

Academic Standards

- B1—Utilize critical thinking and scientific problem solving in designing and performing biological research and experimentation.
- B7—Investigate the interdependence and interactions that occur within an ecosystem.
- E1—Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.
- E3—Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.

Workplace Skills for the 21st Century

- WP1—Allocates resources (time, money, materials and facilities, and human resources).
- WP2—Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP3—Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.
- WP8—Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.

National Educational Technology Standards for Students

- T2—Social, ethical, and human issues
- T3—Technology productivity tools
- T4—Technology communications tools

SUGGESTED REFERENCES

Textbooks and Other Publications

- Burton, L. D. (2000). *Introduction to forestry science*. Albany, NY: Delmar.
- Curriculum & Instructional Materials Center. (1999). *Forestry*. Stillwater, OK: Department of Vocational and Technical Education.

Holland, I. I., & Rolfe, G. L. (2003). *Forests and forestry* (6th ed.). Upper Saddle River, NJ: Prentice Hall.

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The Nature Conservancy. (2000). *The fire management process*. Retrieved October 27, 2005, from <http://www.tncfiremanual.org/overview.htm>.

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Forestry II

Unit 9: Forest Insects and Diseases

(22.5 hours)

Competencies and Suggested Objectives	Suggested Strategies for Competencies
<p>1. Identify and discuss forest insects and diseases.</p> <p>a. Define the terms associated with forest insects and diseases, including wood damage, leaf eaters, wood eaters, epidemic, predator, habitat, diseases, and signs of damage.</p> <p>b. Identify insect and disease damage, including comparing the damage observed to the insect that caused the damage.</p> <p>c. Identify the insect or disease with the symptoms of damage, including leaf eaters, wood eaters, sap eaters, phloem eaters, core borers, root feeders, and terminal feeders.</p>	<p>Teaching:</p> <ul style="list-style-type: none">• Use PowerPoint presentations, posters, and textbooks to discuss forest insect and disease identification.• Conduct a field trip to identify forest insect and disease damage.• Require students to complete a photo collection of various insects, diseases, and associated damage. <p>Assessment:</p> <ul style="list-style-type: none">• Give a written test on insects and diseases.• Evaluate photo collection.
<p>2. Discuss control methods of forest insects and diseases.</p> <p>a. Describe the various methods used to control insects and diseases, including direct control and indirect control.</p> <p>b. Identify the reasons for identifying insect and disease damage, including prevention of epidemics and loss of timber volume.</p> <p>c. Describe aerial forest detection procedures, including those for insect and disease problems.</p>	<p>Teaching:</p> <ul style="list-style-type: none">• Use a PowerPoint presentation to discuss methods of forest insect and disease control.• Conduct a field trip to assess control methods. <p>Assessment:</p> <ul style="list-style-type: none">• Give a written test on forest insect and disease control methods.• Use a checklist to evaluate participation in field trip. (See Sample Checklist for Field Trip Participation in Appendix E.)

STANDARDS

Agriculture, Food and Natural Resources Standards

The following standards were adapted from the publication, *Career Cluster Resources for Agriculture, Food, and Natural Resources*. The complete text of this document can be found at <http://www.careerclusters.org/ClusterDocuments/agdocuments/AGFinal.pdf>.

PLT1—Apply principles of anatomy and physiology to produce and manage plants in both a domesticated and a natural environment.

PLT2—Address taxonomic or other classifications to explain basic plant anatomy and physiology.

- PLT4—Exercise elements of design to enhance an environment (e.g., floral, forest, landscape, and farm).
- TET1—Use tools, equipment, machinery, and technology to work in areas related to AFNR.
- PWR1—Apply physical science principles to engineering applications with mechanical equipment, structures, biological systems, land treatment, power utilization, and technology.
- PWR2—Apply principles of operation and maintenance to mechanical equipment, structures, biological systems, land treatment, power utilization, and technology.
- PWR3—Apply principles of service and repair to mechanical equipment, structures, biological systems, land treatment, power utilization, and technology.
- NRS1—Recognize importance of resource and human interrelations to conduct management activities in natural habitats.
- NRS2—Use effective venues to communicate natural phenomena to the public.
- NRS3—Apply scientific principles to natural resource management activities.
- NRS4—Employ knowledge of natural resource industries to describe production practices and processing procedures.
- NRS5—Practice responsible conduct to protect natural resources.
- ENV1—Use analysis procedures to plan and evaluate environmental service impacts.
- ENV2—Identify public policies and regulations impacting environmental services to determine their effect on facility operations.
- ENV3—Apply scientific principles to environmental services.
- ENV4—Operate environmental service systems (e.g., pollution control, water treatment, wastewater treatment, solid waste management, and energy) to manage a facility environment.
- ENV5—Use tools, equipment, machinery, and technology to accomplish tasks in environmental services.
- ABS5—Utilize technology to accomplish AFNR business objectives.

Academic Standards

- A2—Recognize, create, extend, and apply patterns, relations, and functions and their applications.
- A3—Simplify algebraic expressions, solve and graph equations, inequalities and systems in one and two variables.
- A5—Utilize various formulas in problem solving situations.
- A7—Interpret and apply slope as a rate of change.
- A8—Analyze data and apply concepts of probability.
- B1—Utilize critical thinking and scientific problem solving in designing and performing biological research and experimentation.
- B2—Investigate the biochemical basis of life.
- B3—Investigate cell structures, functions, and methods of reproduction.
- B5—Investigate the principles, mechanisms, and methodology of classical and molecular genetics.
- B6—Investigate concepts of natural selection as they relate to diversity of life.
- B7—Investigate the interdependence and interactions that occur within an ecosystem.

- E3—Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.
- E4—Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
- E5—Complete oral and written presentations which exhibit interaction and consensus within a group.

Workplace Skills for the 21st Century

- WP1—Allocates resources (time, money, materials and facilities, and human resources).
- WP2—Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.
- WP6—Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.
- WP7—Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.

National Educational Technology Standards for Students

- T1—Basic operations and concepts
- T2—Social, ethical, and human issues
- T3—Technology productivity tools
- T4—Technology communications tools
- T5—Technology research tools
- T6—Technology problem solving and decision making tools

SUGGESTED REFERENCES

Textbooks and Other Publications

- Burton, L. D. (2000). *Introduction to forestry science*. Albany, NY: Delmar.
- Camp, W. G., & Daugherty, T. B. (2002). *Managing our natural resources* (4th ed.). Albany, NY: Delmar.
- Curriculum & Instructional Materials Center. (1999). *Forestry*. Stillwater, OK: Department of Vocational and Technical Education.
- Holland, I. I., & Rolfe, G. L. (2003). *Forests and forestry* (6th ed.). Upper Saddle River, NJ: Prentice Hall.

Web Sites

- The University of Georgia, Warnell School of Forest Resources. (2005) *Forest pests of North America*. Retrieved September 16, 2005, from <http://www.forestpests.org/>

USDA Forest Service. (2003). *America's forests: 2003 health update*. Retrieved September 16, 2005, from http://www.fs.fed.us/publications/documents/forest_health_update2003.pdf

Worrel, J. (2005) *Forest and shade tree pathology*. Retrieved September 16, 2005, from <http://www.forestpathology.org/>

Recommended Tools and Equipment

CAPITALIZED ITEMS

1. ~~Distance Measuring Equipment (DME) (2)~~
2. ~~Global Positioning System (GPS) (10)~~
3. ~~Chainsaw (1)~~
4. ~~Computer with multimedia kit and modem (10)~~
5. ~~Transit (1)~~
6. ~~Level (1)~~
7. ~~Laser printer (networked) (1)~~
8. ~~Color inkjet printer (networked) (1)~~
9. ~~Notebook computer (1)~~

NON CAPITALIZED ITEMS

1. ~~Bag, tree planting (10)~~
2. ~~Bar, tree planting (10)~~
3. ~~Calculators (with trig functions) (20)~~
4. ~~Caliper, tree (10)~~
5. ~~Chainsaw chaps (1)~~
6. ~~Clinometer (Suunto) with case (15)~~
7. ~~Clipboard (20)~~
8. ~~Compass, land measuring (C thru) (20)~~
9. ~~Compass (Silva ranger type 15) with case, quadrant (15), and azimuth (15)~~
10. ~~Fire weather instrument kit (1)~~
11. ~~Fire rake (1)~~
12. ~~Fire swatter (1)~~
13. ~~First aid kit (1)~~
14. ~~Flammable materials cabinet (1)~~
15. ~~Glasses, safety (20)~~
16. ~~Haga altimeter (2)~~
17. ~~Hat, safety hard (20)~~
18. ~~Hat, safety hard with eye shield and ear muffs (2)~~
19. ~~Increment borer (10)~~
20. ~~Leggings, zip-up (20)~~
21. ~~Pole, range (4)~~
22. ~~Probe, soil (2)~~
23. ~~Telescoping power tree pruner (1)~~
24. ~~Pruning saw, hand (10)~~
25. ~~Rod, telescoping leveling (1)~~
26. ~~Rule, log (20)~~
27. ~~Scale, triangle engineer (20)~~
28. ~~Sheet holder/clip board (aluminum) (20)~~
29. ~~Sprayer, backpack (1)~~
30. ~~Stereoscope (10)~~

31. Tally book (10)
32. Tape, logger (10)
33. Tape (fiberglass), surveying (4)
34. Tape, diameter (20)
35. Torch, drip (2)
36. Tree scale stick (20)
37. Vest, cruiser (20)
38. Vertex hypsometer (2)
39. Variable pattern spot sprayer (25 gallon) (1)
40. Water cooler, 5 gal. with cup dispenser (1) (local obligation)
41. Wedge prism

RECOMMENDED INSTRUCTIONAL AIDS

Teachers should have access to:

1. Camcorder with tripod and carrying case (1)
2. Camera, 35mm with zoom lens (1)
3. Cart, AV (for TV VCR) (1)
4. Compass, demonstration (1)
5. Contour kit (1)
6. Digital camera
7. Internet connection for all computers
8. Slide projector (1)
9. TV VCR/DVD player (1)
10. LCD data projector
11. 31" television set with S-video input

Student Competency Profile for Secondary Forestry I

Student: _____

This record is intended to serve as a method of noting student achievement of the competencies in each unit. Noted in parentheses beside each unit is the cluster competency from the MS-CPAS. This form may be duplicated for each student and serve as a cumulative record of competencies achieved in the course.

As an alternative to the use of this form, you may note competency achievement by attaching a report showing comparable results for each student. Please indicate that you are using this alternative report by checking here. _____

Unit 1: Exploring the World of Forestry

- _____1. Explain the importance of forestry.
- _____2. Explain careers in the field of forestry.
- _____3. Explain the impact of federal and state regulations on forestry operations.

Unit 2: Leadership/FFA Activities

- _____1. Explain the benefits of FFA participation.
- _____2. Demonstrate group leadership skills.

Unit 3: Forest Safety

- _____1. Explain forest safety practices.
- _____2. Describe forest environmental hazards, including heat, cold, plants, insects, wildlife, and topographical hazards.
- _____3. Demonstrate forest safety practices.

Unit 4: Tree Growth and Stand Development

- _____1. Explain tree physiology.
- _____2. Explain forest stand development
- _____3. Explain applications of tissue culture, cloning, and other advances in biotechnology to forestry.

Unit 5: Dendrology

- _____1. Explain the tree classification system.
- _____2. Identify trees by characteristics.

Unit 6: Forest Surveying and Mapping

- _____1. Explain concepts of forest surveying.

- ~~_____2. Perform forestry surveying and mapping techniques.~~
- ~~_____3. Calculate acreage of forest tracts.~~

~~Unit 7: Legal Land Descriptions~~

- ~~_____1. Describe the United States Public Land Survey System.~~
- ~~_____2. Identify information found on maps.~~
- ~~_____3. Apply principles of legal land description.~~

~~Unit 8: Tree and Log Measurements~~

- ~~_____1. Explain tree measurement techniques.~~
- ~~_____2. Perform volume measurement of standing timber and sawlogs.~~

~~Unit 9: Introduction to Timber Cruising~~

- ~~_____1. Describe procedures for cruising timber.~~
- ~~_____2. Perform timber cruising.~~

Student Competency Profile for Secondary Forestry II

Student: _____

This record is intended to serve as a method of noting student achievement of the competencies in each unit. Noted in parentheses beside each unit is the cluster competency from the MS-CPAS. This form may be duplicated for each student and serve as a cumulative record of competencies achieved in the course.

As an alternative to the use of this form, you may note competency achievement by attaching a report showing comparable results for each student. Please indicate that you are using this alternative report by checking here. _____

Unit 1: Identifying Forests and Forest Products

- _____ 1. Apply procedures to identify forest types.
- _____ 2. Apply procedures to identify the physical properties of wood.

Unit 2: Employability Skills/FFA Activities

- _____ 1. Develop employability skills.
- _____ 2. Identify FFA leadership activities associated with forestry.

Unit 3: Forest Management Practices

- _____ 1. Explain forest management practices.
- _____ 2. Apply forest management practices.

Unit 4: Advanced Timber Cruising

- _____ 1. Plan and conduct a timber cruise.

Unit 5: Timber Marketing

- _____ 1. Explain timber marketing procedures.
- _____ 2. Describe conditions of sale and harvesting of timber.

Unit 6: Timber Harvesting

- _____ 1. Explain timber harvesting procedures.
- _____ 2. Develop a timber harvesting plan.

Unit 7: Reforestation

- _____ 1. Explain reforestation practices.
- _____ 2. Perform reforestation practices.

Unit 8: Forest Fire Management

- ~~_____1. Explain forest fire management practices.~~
- ~~_____2. Apply forest fire management techniques.~~

Unit 9: Forest Insects and Diseases

- ~~_____1. Identify and discuss forest insects and diseases.~~
- ~~_____2. Discuss control methods of forest insects and diseases.~~

Appendix A: Proposed Standards for Mississippi Agriculture Education Programs¹

The following standards were adapted from the publication, *Career Cluster Resources for Agriculture, Food, and Natural Resources*. Each standard represents a pathway knowledge and skill statement as listed in this document. Standards are clustered by career pathway. The complete text of this document can be found at <http://www.careerclusters.org/ClusterDocuments/agdocuments/AGFinal.pdf>.

LEADERSHIP (LEA)

- LEA1—Use leadership skills in collaborating with others to accomplish organizational goals and objectives.
- a. Embrace empowerment, risk, communication, focusing on results, decision making, problem solving, investment in individuals, and resource use and access to develop premier leadership.
 - b. Embrace compassion, service, listening, coaching, developing others, team development, and understanding and appreciating others to develop premier leadership.
 - c. Embrace enthusiasm, creativity, the future, conviction, mission, courage, concept, focus, principles, and change to develop premier leadership.
 - d. Embrace integrity, courage, values, ethics, humility, perseverance, self-discipline, and responsibility to develop premier leadership.
 - e. Include self, community, diversity, environment, global awareness, and knowledge to develop premier leadership.
 - f. Embrace innovation, intuition, adaptation, life-long learning, and coachability to develop premier leadership.
- LEA2—Use personal growth skills in collaborating with others to accomplish organizational goals and objectives.
- a. Embrace attitude, exercise, goal setting, planning, self-discipline, sense of balance, persistence, and respect to develop personal growth.
 - b. Embrace friendship, integrity, morals, values, etiquette, citizenship, cross-cultural awareness, acceptance/change, and respect for differences to develop personal growth.
 - c. Embrace goal setting, planning, decision making, principles, respect, attitude, dependability, loyalty, trustworthiness, and communication to develop personal growth.
 - d. Embrace learning, critical thinking, reasoning, creative thinking, attitude, dependability, decision making, and problem solving to develop personal growth.
 - e. Embrace attitude, self-discovery, coping, friendship, self-reliance, sense of balance, empathy, compassion, and integrity to develop personal growth.
 - f. Embrace ethics, coping, courage, attitude, self-image/worth, values, principles, and sense of balance to develop personal growth.

¹ *Career cluster resources for agriculture, food, and natural resources*. (n.d.). Retrieved November 16, 2005, from <http://www.careerclusters.org/ClusterDocuments/agdocuments/AGFinal.pdf>

ETHICS AND LEGAL RESPONSIBILITIES (ELR)

- ELR1—Know and understand the importance of professional ethics and legal responsibilities.
- a. Apply knowledge of professional and workplace ethics and legal responsibilities to organize guidelines for workplace conduct.
 - b. Apply ethical and legal reasoning to workplace situations.
 - c. Review appropriate resources to identify national and international rules associated with a desired career.
 - d. Identify what ethical issues and concerns affect a desired career field to assist in making career decisions.
- ELR2—Demonstrate workplace ethics specific to Agriculture, Food, and Natural Resources (AFNR) occupations.
- a. Evidence interest and concern to demonstrate natural resource stewardship and ethics.
 - b. Exercise personal habits and actions to demonstrate workplace ethics.

FOOD PRODUCTS AND PROCESSING SYSTEMS (FPP)

- FPP1—Apply principles of food processing to maintain equipment and facilities.
- a. Develop management plans to maintain equipment and facilities.
 - b. Interpret and follow, develop, and implement Hazardous Critical Control Point (HACCP) procedures to establish operating parameters.
- FPP2—Apply principles of food science to the food industry.
- a. Apply food science principles to enhance product development.
- FPP3—Plan, implement, manage, and/or provide services for the preservation and packaging of food and food products.
- a. Analyze product preparation options to prepare products for distribution.
 - b. Compare and select food preservation methods to develop food preservation programs.
- FPP4—Identify processing, handling, and storage factors to show how they impact product quality and safety.
- a. Develop a “quality factors program” to comply with local, national, and governmental, and international standards.
 - b. Develop slaughter/inspection techniques to process foods and analyze food product options.

PLANT SYSTEMS (PLT)

- PLT1—Apply principles of anatomy and physiology to produce and manage plants in both a domesticated and a natural environment.
- a. Analyze and evaluate nutritional requirements and environmental conditions to develop and implement a fertilization plan.
 - b. Test appropriate materials or examine data to evaluate and manage soil/media nutrients.
 - c. Explain and use basic methods for reproducing and propagating plants.
 - d. Develop and use a plan for integrated pest management.

- PLT2—Address taxonomic or other classifications to explain basic plant anatomy and physiology.
- a. Examine unique plant properties to identify/describe functional differences in plant structures including roots, stems, flowers, leaves, and fruit.
 - b. Classify plants on physiology for taxonomic or other classifications.
- PLT3—Apply fundamentals of production and harvesting to produce plants.
- a. Apply fundamentals of plant management to develop a production plan.
 - b. Apply fundamentals of plant management to harvest, handle, and store crops.
- PLT4—Exercise elements of design to enhance an environment (e.g., floral, forest, landscape, and farm).
- a. Apply basic design elements and principles to create a design using plants.

ANIMAL SYSTEMS (ANM)

- ANM1—Apply knowledge of anatomy and physiology to produce and/or manage animals in a domesticated or natural environment.
- a. Use classification systems to explain basic functions of animal anatomy and physiology.
 - b. Recognize the anatomy of animal species to understand how the body structures interact and affect animal health.
 - c. Analyze a subject animal to determine the nature of its health status.
- ANM2—Recognize animal behaviors to facilitate working with animals safely.
- a. Develop a safety plan for working with a specific animal.
- ANM3—Provide proper nutrition to maintain animal performance.
- a. Examine animal developmental stages to comprehend why nutrient requirements are different throughout an animal's life cycle.
 - b. Analyze a feed ration to determine whether or not it fulfills a given animal's nutrient requirements.
 - c. Record and compare feed variations to assess whether the nutritional requirements of an animal are being met.
- ANM4—Know the factors that influence an animal's reproductive cycle to explain species response.
- a. Analyze elements in the reproductive cycle to explain differences in the male and female reproductive systems.
 - b. Discuss reproductive cycles to show how they differ from species to species.
 - c. Evaluate an animal to determine its breeding soundness.
- ANM5—Identify environmental factors that affect an animal's performance.
- a. Recognize optimum performance for a given animal species.
 - b. Create a program to develop an animal to its highest potential performance.
 - c. Assess an animal to determine if it has reached its optimum performance level.
 - d. Develop efficient procedures to produce consistently high-quality animals, well-suited for their intended purposes.

TOOLS, EQUIPMENT, TECHNOLOGY, AND SAFETY (TET)

- ~~TET1—Use tools, equipment, machinery, and technology to work in areas related to AFNR.~~
- ~~a. Select the appropriate tool to perform a given task.~~
 - ~~b. Keep tools in good working order for efficient work use.~~
 - ~~c. Wear protective equipment and handle natural resource tools and equipment with skill to demonstrate safe use of tools and equipment.~~

POWER SYSTEMS (PWR)

- ~~PWR1—Apply physical science principles to engineering applications with mechanical equipment, structures, biological systems, land treatment, power utilization, and technology.~~
- ~~a. Relate power generation to energy sources.~~
 - ~~b. Apply principles of lubricants to sort and classify lubricants.~~
- ~~PWR2—Apply principles of operation and maintenance to mechanical equipment, structures, biological systems, land treatment, power utilization, and technology.~~
- ~~a. Perform scheduled service routines to maintain machinery and equipment.~~
 - ~~b. Observe rules of the road to operate machinery and equipment.~~
- ~~PWR3—Apply principles of service and repair to mechanical equipment, structures, biological systems, land treatment, power utilization, and technology.~~
- ~~a. Troubleshoot problems and evaluate performance to service and repair components of internal combustion engines.~~
 - ~~b. Follow manufacturer's guidelines to service and repair power transmission systems.~~
 - ~~c. Evaluate performance and check maintenance manuals to service and repair hydraulic lines.~~
 - ~~d. Troubleshoot from schematics to service vehicle electrical systems.~~
 - ~~e. Use company diagrams and scenarios to service vehicle heating and air conditioning systems.~~
 - ~~f. Check performance parameters to service and repair steering, suspension, traction, and vehicle performance systems.~~
 - ~~g. Use tools in the workplace to demonstrate safe and proper skills with construction/fabrication hand tools.~~

STRUCTURAL SYSTEMS (STR)

- ~~STR1—Exercise basic skills in blueprint and design development to create sketches, drawings, and plans.~~
- ~~a. Use computer skills to develop simple sketches and plans.~~
- ~~STR2—Read and relate structural plans to specifications and building codes.~~
- ~~a. Examine blueprints and local codes to develop a logical construction plan.~~
- ~~STR3—Examine structural requirements to estimate project costs.~~
- ~~a. Use bids and billing information to develop a complete materials list and project cost estimate.~~

- ~~STR4—Develop skills required to use construction/fabrication equipment and tools.~~
~~a. Use tools in the workplace to demonstrate safe and proper skills with construction/fabrication hand tools.~~
- ~~STR5—Plan, implement, manage, and/or provide support services for facility design and construction; equipment design, manufacture, repair, and service; and agricultural technology.~~
~~a. Design machinery and equipment including vehicles, implements, buildings, and facilities (e.g., feeding, feed storage).~~
~~b. Follow architectural and mechanical plans to construct buildings and facilities.~~

~~TECHNICAL SYSTEMS (TEC)~~

- ~~TEC1—Use a variety of tools available in computer systems to accomplish fast, accurate production in the workplace.~~
~~a. Identify and explain the various types of hardware systems to show their applications and potentials.~~
- ~~TEC2—Use available power sources to plan and apply control systems.~~
~~a. Measure with selective instruments to demonstrate knowledge of basic electricity.~~
~~b. Reference electrical drawings to design, install, and troubleshoot control systems.~~
- ~~TEC3—Explain geospatial technology to demonstrate its applications.~~
~~a. Employ appropriate techniques to demonstrate application of GPS/GIS systems principles.~~
~~b. Use computer applications to produce maps that reflect surveying and mapping principles.~~
~~c. Select an area of personal expertise to demonstrate knowledge of end applications.~~

~~NATURAL RESOURCE SYSTEMS (NRS)~~

- ~~NRS1—Recognize importance of resource and human interrelations to conduct management activities in natural habitats.~~
~~a. Identify resource management components to establish relationships in natural resource systems.~~
~~b. Apply cartographic skills to natural resource activities.~~
~~c. Monitor natural resource status to obtain planning data.~~
~~d. Employ environmental and wildlife knowledge to demonstrate natural resource enhancement techniques.~~
~~e. Examine weather and other criteria to recognize dangers related to work in an outdoor environment.~~
~~f. Learn applicable rules or laws to demonstrate natural resource mitigation techniques.~~
- ~~NRS2—Use effective venues to communicate natural phenomena to the public.~~
~~a. Communicate natural resources information to the general public.~~
~~b. Personally interpret natural resource phenomena to natural resource users.~~
- ~~NRS3—Apply scientific principles to natural resource management activities.~~
~~a. Use science concepts, processes, and research techniques to examine natural resource topics.~~

- b. ~~Examine biological and physical characteristics to identify and classify natural resources.~~
- c. ~~Examine natural cycles and related phenomena to describe ecologic concepts and principles.~~
- NRS4 ~~Employ knowledge of natural resource industries to describe production practices and processing procedures.~~
 - a. ~~Prepare presentations to describe how natural resource products are produced, harvested, processed, and used.~~
- NRS5 ~~Practice responsible conduct to protect natural resources.~~
 - a. ~~Employ techniques and equipment needed to prevent wildfire.~~
 - b. ~~Use wildfire suppression techniques to demonstrate abilities in firefighting and control.~~
 - c. ~~Recognize symptoms of animal and plant diseases and use appropriate techniques to prevent their spread.~~
 - d. ~~Recognize insect types and available controls to prevent insect infestation.~~
 - e. ~~Use acceptable pesticides to treat insect infestation.~~
 - f. ~~Know law enforcement procedures to manage public gatherings and to gain entry into secure, closed, or restricted areas.~~

~~ENVIRONMENTAL SERVICE SYSTEMS (ENV)~~

- ENV1 ~~Use analysis procedures to plan and evaluate environmental service impacts.~~
 - a. ~~Use instrumentation to monitor samples.~~
 - b. ~~Calibrate and service instruments on a timely schedule to maintain environmental instrumentation.~~
 - c. ~~Apply statistics, charts, and scattergrams to measure and monitor operations.~~
- ENV2 ~~Identify public policies and regulations impacting environmental services to determine their effect on facility operations.~~
 - a. ~~Consult reliable resources or training to identify the major laws impacting environmental services.~~
- ENV3 ~~Apply scientific principles to environmental services.~~
 - a. ~~Apply meteorological knowledge to recognize weather systems and weather patterns.~~
 - b. ~~Describe soil composition and properties to demonstrate knowledge of soil science.~~
 - c. ~~Explain well design and groundwater supplies to demonstrate knowledge of hydrology.~~
 - d. ~~Discuss properties, classifications, and functions in order to understand wetland principles.~~
 - e. ~~Discuss properties, classifications, and functions in order to understand watershed principles.~~
 - f. ~~Use chemical analysis to conduct tests.~~
 - g. ~~Apply sampling techniques and other assessments to demonstrate background knowledge of microbiology.~~

- ~~ENV4—Operate environmental service systems (e.g., pollution control, water treatment, wastewater treatment, solid waste management, and energy) to manage a facility environment.~~
- ~~a. Use pollution control measures to maintain a safe facility environment.~~
 - ~~b. Apply principles of solid waste management (landfill) to manage safe disposal of all categories of waste.~~
 - ~~c. Apply drinking water treatment principles to assure safe drinking water at a facility.~~
 - ~~d. Apply wastewater treatment operations principles to manage wastewater disposal in keeping with rules and regulations.~~
 - ~~e. Apply hazardous materials management principles to assure a safe facility and to comply with applicable regulations.~~
 - ~~f. Explore conventional and alternative supplies to define energy sources.~~
- ~~ENV5—Use tools, equipment, machinery, and technology to accomplish tasks in environmental services.~~
- ~~a. Use technology tools to map land, facilities, and infrastructure.~~

~~AGRIBUSINESS SYSTEMS (ABS)~~

- ~~ABS1—Employ leadership skills to accomplish goals and objectives in the AFNR business environment.~~
- ~~a. Develop a mission statement to guide business activities effectively.~~
 - ~~b. Apply leadership skills to accomplish general business activities from production to public relations.~~
 - ~~c. Apply management skills to accomplish general business activities from production to public relations.~~
- ~~ABS2—Practice good recordkeeping to accomplish AFNR business objectives.~~
- ~~a. Prepare and maintain all files as needed to accomplish effective recordkeeping.~~
- ~~ABS3—Apply generally accepted accounting principles and skills to manage budget, credit, and optimal application of AFNR business assets.~~
- ~~a. Use key accounting fundamentals to accomplish dependable bookkeeping and associated files.~~
- ~~ABS4—Employ AFNR industry concepts and practices to manage inventory.~~
- ~~a. Monitor inventory levels to accomplish practical inventory control.~~
- ~~ABS5—Utilize technology to accomplish AFNR business objectives.~~
- ~~a. Use technology and information technology strategies for business improvement.~~
- ~~ABS6—Use marketing and sales principles to accomplish an AFNR business objective.~~
- ~~a. Conduct market research.~~
 - ~~b. Develop a marketing plan.~~
 - ~~c. Implement a marketing plan.~~
 - ~~d. Merchandise products and services.~~

Appendix B: Academic Standards

Algebra I²

Competencies and Suggested Objective(s)

- A1—Recognize, classify, and use real numbers and their properties.
- a.——Describe the real number system using a diagram to show the relationships of component sets of numbers that compose the set of real numbers.
 - b.——Model properties and equivalence relationships of real numbers.
 - c.——Demonstrate and apply properties of real numbers to algebraic expressions.
 - d.——Perform basic operations on square roots excluding rationalizing denominators.
- A2—Recognize, create, extend, and apply patterns, relations, and functions and their applications.
- a.——Analyze relationships between two variables, identify domain and range, and determine whether a relation is a function.
 - b.——Explain and illustrate how change in one variable may result in a change in another variable.
 - c.——Determine the rule that describes a pattern and determine the pattern given the rule.
 - d.——Apply patterns to graphs and use appropriate technology.
- A3—Simplify algebraic expressions, solve and graph equations, inequalities and systems in one and two variables.
- a.——Solve, check, and graph linear equations and inequalities in one variable, including rational coefficients.
 - b.——Graph and check linear equations and inequalities in two variables.
 - c.——Solve and graph absolute value equations and inequalities in one variable.
 - d.——Use algebraic and graphical methods to solve systems of linear equations and inequalities.
 - e.——Translate problem solving situations into algebraic sentences and determine solutions.
- A4—Explore and communicate the characteristics and operations of polynomials.
- a.——Classify polynomials and determine the degree.
 - b.——Add, subtract, multiply, and divide polynomial expressions.
 - c.——Factor polynomials using algebraic methods and geometric models.
 - d.——Investigate and apply real number solutions to quadratic equations algebraically and graphically.
 - e.——Use convincing arguments to justify unfactorable polynomials.
 - f.——Apply polynomial operations to problems involving perimeter and area.
- A5—Utilize various formulas in problem solving situations.
- a.——Evaluate and apply formulas (e.g., circumference, perimeter, area, volume, Pythagorean Theorem, interest, distance, rate, and time).

² Mississippi mathematics framework—Algebra I. (2003). Retrieved September 10, 2003, from http://marcopolo.mde.k12.ms.us/frameworks/mathematics/ma_algebra_i.html

- b. — Reinforce formulas experimentally to verify solutions.
- c. — Given a literal equation, solve for any variable of degree one.
- d. — Using the appropriate formula, determine the length, midpoint, and slope of a segment in a coordinate plane.
- e. — Use formulas (e.g., point-slope and slope-intercept) to write equations of lines.
- A6 — Communicate using the language of algebra.
 - a. — Recognize and demonstrate the appropriate use of terms, symbols, and notations.
 - b. — Distinguish between linear and non-linear equations.
 - c. — Translate between verbal expressions and algebraic expressions.
 - d. — Apply the operations of addition, subtraction, and scalar multiplication to matrices.
 - e. — Use scientific notation to solve problems.
 - f. — Use appropriate algebraic language to justify solutions and processes used in solving problems.
- A7 — Interpret and apply slope as a rate of change.
 - a. — Define slope as a rate of change using algebraic and geometric representations.
 - b. — Interpret and apply slope as a rate of change in problem-solving situations.
 - c. — Use ratio and proportion to solve problems including direct variation ($y=kx$).
 - d. — Apply the concept of slope to parallel and perpendicular lines.
- A8 — Analyze data and apply concepts of probability.
 - a. — Collect, organize, graph, and interpret data sets, draw conclusions, and make predictions from the analysis of data.
 - b. — Define event and sample spaces and apply to simple probability problems.
 - c. — Use counting techniques, permutations, and combinations to solve probability problems.

Biology-I³

Competencies and Suggested Objective(s)

- B1 — Utilize critical thinking and scientific problem-solving in designing and performing biological research and experimentation.
 - a. — Demonstrate the proper use and care for scientific equipment used in biology.
 - b. — Observe and practice safe procedures in the classroom and laboratory.
 - c. — Apply the components of scientific processes and methods in the classroom and laboratory investigations.
 - d. — Communicate results of scientific investigations in oral, written, and graphic form.
- B2 — Investigate the biochemical basis of life.
 - a. — Identify the characteristics of living things.
 - b. — Describe and differentiate between covalent and ionic bonds using examples of each.
 - c. — Describe the unique bonding and characteristics of water that makes it an essential component of living systems.

³ Mississippi science framework—Biology I. (2003). Retrieved September 10, 2003, from http://marcopolo.mde.k12.ms.us/frameworks/science/sci_biology_I.html

- d. — Classify solutions using the pH scale and relate the importance of pH to organism survival.
- e. — Compare the structure, properties and functions of carbohydrates, lipids, proteins and nucleic acids in living organisms.
- f. — Explain how enzymes work and identify factors that can affect enzyme action.
- B3 — Investigate cell structures, functions, and methods of reproduction.
 - a. — Differentiate between prokaryotic and eukaryotic cells.
 - b. — Distinguish between plant and animal (eukaryotic) cell structures.
 - c. — Identify and describe the structure and basic functions of the major eukaryotic organelles.
 - d. — Describe the way in which cells are organized in multicellular organisms.
 - e. — Relate cell membrane structure to its function in passive and active transport.
 - f. — Describe the main events in the cell cycle and cell mitosis including differences in plant and animal cell divisions.
 - g. — Relate the importance of meiosis to sexual reproduction and the maintenance of chromosome number.
 - h. — Identify and distinguish among forms of asexual and sexual reproduction.
- B4 — Investigate the transfer of energy from the sun to living systems.
 - a. — Describe the structure of ATP and its importance in life processes.
 - b. — Examine, compare, and contrast the basic processes of photosynthesis and cellular respiration.
 - c. — Compare and contrast aerobic and anaerobic respiration.
- B5 — Investigate the principles, mechanisms, and methodology of classical and molecular genetics.
 - a. — Compare and contrast the molecular structures of DNA and RNA as they relate to replication, transcription, and translation.
 - b. — Identify and illustrate how changes in DNA cause mutations and evaluate the significance of these changes.
 - c. — Analyze the applications of DNA technology (forensics, medicine, agriculture).
 - d. — Discuss the significant contributions of well-known scientists to the historical progression of classical and molecular genetics.
 - e. — Apply genetic principles to solve simple inheritance problems including monohybrid crosses, sex linkage, multiple alleles, incomplete dominance, and codominance.
 - f. — Examine inheritance patterns using current technology (gel electrophoresis, pedigrees, karyotypes).
- B6 — Investigate concepts of natural selection as they relate to diversity of life.
 - a. — Analyze how organisms are classified into a hierarchy of groups and subgroups based on similarities and differences.
 - b. — Identify characteristics of kingdoms including monerans, protists, fungi, plants and animals.
 - c. — Differentiate among major divisions of the plant and animal kingdoms (vascular/non-vascular; vertebrate/invertebrate).
 - d. — Compare the structures and functions of viruses and bacteria relating their impact on other living organisms.

- e. ~~Identify evidence of change in species using fossils, DNA sequences, anatomical and physiological similarities, and embryology.~~
- f. ~~Analyze the results of natural selection in speciation, diversity, adaptation, behavior and extinction.~~
- B7 ~~Investigate the interdependence and interactions that occur within an ecosystem.~~
 - a. ~~Analyze the flow of energy and matter through various cycles including carbon, oxygen, nitrogen and water cycles.~~
 - b. ~~Interpret interactions among organisms in an ecosystem (producer/consumer/decomposer, predator/prey, symbiotic relationships and competitive relationships).~~
 - c. ~~Compare variations, tolerances, and adaptations of plants and animals in major biomes.~~
 - d. ~~Investigate and explain the transfer of energy in an ecosystem including food chains, food webs, and food pyramids.~~
 - e. ~~Examine long and short term changes to the environment as a result of natural events and human actions.~~

English II⁴

Competencies and Suggested Objective(s)

- E1 ~~Produce writing which reflects increasing proficiency through planning, writing, revising, and editing and which is specific to audience and purpose.~~
 - a. ~~Produce individual and/or group compositions and/or projects to persuade, tell a story, describe, create an effect, explain or justify an action or event, inform, entertain, etc.~~
 - b. ~~Produce writing typically used in the workplace such as social, business, and technical correspondence; explanation of procedures; status reports; research findings; narratives for graphs; justification of decisions, actions, or expenses; etc.~~
 - c. ~~Write a response, reaction, interpretation, analysis, summary, etc., of literature, other reading matter, or orally presented material.~~
 - d. ~~Revise to ensure effective introductions, details, wording, topic sentences, and conclusions.~~
- E2 ~~Communicate ideas for a variety of school and other life situations through listening, speaking, and reading aloud.~~
 - a. ~~Listen to determine the main idea and supporting details, to distinguish fact from opinion, and to determine a speaker's purpose or bias.~~
 - b. ~~Speak with appropriate intonation, articulation, gestures, and facial expression.~~
 - c. ~~Speak effectively to explain and justify ideas to peers, to inform, to summarize, to persuade, to entertain, to describe, etc.~~
- E3 ~~Read, evaluate, and use print, non-print, and technological sources to research issues and problems, to present information, and to complete projects.~~
 - a. ~~Read, view, and listen to distinguish fact from opinions and to recognize persuasive and manipulative techniques.~~

⁴ *Mississippi language arts framework—English II.* (2003). Retrieved September 10, 2003, from http://marcopolo.mde.k12.ms.us/frameworks/language_arts/la_10.html

- b. — Access both print and non-print sources to produce an I-Search paper, research paper, or project.
- c. — Use computers and audio-visual technology to access and organize information for purposes such as resumes, career search projects, and analytical writings, etc.
- d. — Use reference sources, indices, electronic card catalog, and appropriate research procedures to gather and synthesize information.
- E4 — Work individually and as a member of a team to analyze and interpret information, to make decisions, to solve problems, and to reflect, using increasingly complex and abstract thinking.
 - a. — Interact with peers to examine real-world and literary issues and ideas.
 - b. — Show growth in critical thinking, leadership skills, consensus building, and self-confidence by assuming a role in a group, negotiating compromise, and reflecting on individual or group work.
- E5 — Complete oral and written presentations which exhibit interaction and consensus within a group.
 - a. — Share, critique, and evaluate works in progress and completed works through a process approach.
 - b. — Communicate effectively in a group to present completed projects and/or compositions.
 - c. — Edit oral and written presentations to reflect correct grammar, usage, and mechanics.
- E6 — Explore cultural contributions to the history of the English language and its literature.
 - a. — Explore a variety of works from various historical periods, geographical locations, and cultures, recognizing their influence on language and literature.
 - b. — Identify instances of dialectal differences which create stereotypes, perceptions, and identities.
 - c. — Recognize root words, prefixes, suffixes, and cognates.
 - d. — Relate how vocabulary and spelling have changed over time.
- E7 — Discover the power and effect of language by reading and listening to selections from various literary genres.
 - a. — Listen to and read aloud selected works to recognize and respond to the rhythm and power of language to convey a message.
 - b. — Read aloud with fluency and expression.
 - c. — Analyze the stylistic devices, such as alliteration, assonance, word order, rhyme, onomatopoeia, etc., that make a passage achieve a certain effect.
 - d. — Demonstrate how the use of language can confuse or inform, repel or persuade, or inspire or enrage.
 - e. — Analyze how grammatical structure or style helps to create a certain effect.
- E8 — Read, discuss, analyze, and evaluate literature from various genres and other written material.
 - a. — Read and explore increasingly complete works, both classic and contemporary, for oral discussion and written analysis.
 - b. — Read, discuss, and interpret literature to make connections to life.
 - c. — Read from a variety of genres to understand how the literary elements contribute to the overall quality of the work.

- d. ~~Identify qualities in increasingly complex literature that have produced a lasting impact on society.~~
- e. ~~Read for enjoyment, appreciation, and comprehension of plot, style, vocabulary, etc.~~
- E9 ~~Sustain progress toward fluent control of grammar, mechanics, and usage of standard English in the context of writing and speaking.~~
 - a. ~~Infuse the study of grammar and vocabulary into written and oral communication.~~
 - b. ~~Demonstrate, in the context of their own writing, proficient use of the conventions of standard English, including, but not limited to, the following: complete sentences, subject-verb agreement, plurals, spellings, homophones, possessives, verb forms, punctuation, capitalization, pronouns, pronoun-antecedent agreement, parallel structure, and dangling and misplaced modifiers.~~
 - c. ~~Give oral presentations to reinforce the use of standard English.~~
 - d. ~~Employ increasingly proficient editing skills to identify and solve problems in grammar, usage, and structure.~~
- E10 ~~Use language and critical thinking strategies to serve as tools for learning.~~
 - a. ~~Use language to facilitate continuous learning, to record observations, to clarify thought, to synthesize information, and to analyze and evaluate language.~~
 - b. ~~Interpret visual material orally and in writing.~~

U. S. History from 1877⁵

Competencies and Suggested Objective(s)

- H1 ~~Explain how geography, economics, and politics have influenced the historical development of the United States in the global community.~~
 - a. ~~Apply economic concepts and reasoning when evaluating historical and contemporary social developments and issues (e.g., gold standard, free coinage of silver, tariff issue, laissez faire, deficit spending, etc.).~~
 - b. ~~Explain the emergence of modern America from a domestic perspective (e.g., frontier experience, Industrial Revolution and organized labor, reform movements of Populism and Progressivism, Women's Movement, Civil Rights Movement, the New Deal, etc.).~~
 - c. ~~Explain the changing role of the United States in world affairs since 1877 through wars, conflicts, and foreign policy (e.g., Spanish American War, Korean conflict, containment policy, etc.).~~
 - d. ~~Trace the expansion of the United States and its acquisition of territory from 1877 (e.g., expansionism and imperialism).~~
- H2 ~~Describe the impact of science and technology on the historical development of the United States in the global community.~~
 - a. ~~Analyze the impact of inventions on the United States (e.g., telephone, light bulb, etc.).~~
 - b. ~~Examine the continuing impact of the Industrial Revolution on the development of our nation (e.g., mass production, computer operations, etc.).~~

⁵ *Mississippi social studies framework—U.S. History from 1877.* (2003). Retrieved September 10, 2003, from http://marcopolo.mde.k12.ms.us/frameworks/social_studies/ss_us_history.html

- e. — Describe the effects of transportation and communication advances since 1877.
- H3 — Describe the relationship of people, places, and environments through time.
 - a. — Analyze human migration patterns since 1877 (e.g., rural to urban, the Great Migration, etc.).
 - b. — Analyze how changing human, physical, geographic characteristics can alter a regional landscape (e.g., urbanization, Dust Bowl, etc.).
- H4 — Demonstrate the ability to use social studies tools (e.g., timelines, maps, globes, resources, graphs, a compass, technology, etc.).
 - a. — Interpret special purpose maps, primary/secondary sources, and political cartoons.
 - b. — Analyze technological information on graphs, charts, and timelines.
 - c. — Locate areas of international conflict (e.g., Caribbean, Southeast Asia, Europe, etc.).
- H5 — Analyze the contributions of Americans to the ongoing democratic process to include civic responsibilities.
 - a. — Examine various reform movements (e.g., Civil Rights, Women's Movement, etc.).
 - b. — Examine the government's role in various movements (e.g., arbitration, 26th Amendment, etc.).
 - c. — Examine the role of government in the preservation of citizens' rights (e.g., 19th Amendment, Civil Rights Act of 1964).
 - d. — Examine individuals' duties and responsibilities in a democratic society (e.g., voting, volunteerism, etc.).

Appendix C: Workplace Skills for the 21st Century⁶

- ~~WP1—Allocates resources (time, money, materials and facilities, and human resources).~~
- ~~WP2—Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.~~
- ~~WP3—Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.~~
- ~~WP4—Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.~~
- ~~WP5—Selects, applies, and maintains/troubleshoots technology.~~
- ~~WP6—Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.~~
- ~~WP7—Basic Skills: Employs basic academic skills including reading, writing, arithmetic and mathematics, speaking, and listening.~~
- ~~WP8—Personal Qualities: Practices work ethics related to individual responsibility, integrity, honesty, and personal management.~~

⁶ *Secretary's commission on achieving necessary skills*. Retrieved July 13, 2004, from <http://wdr.doleta.gov/SCANS/>

Appendix D: National Educational Technology Standards for Students⁷

- T1—Basic operations and concepts
 - Students demonstrate a sound understanding of the nature and operation of technology systems.
 - Students are proficient in the use of technology.
- T2—Social, ethical, and human issues
 - Students understand the ethical, cultural, and societal issues related to technology.
 - Students practice responsible use of technology systems, information, and software.
 - Students develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.
- T3—Technology productivity tools
 - Students use technology tools to enhance learning, increase productivity, and promote creativity.
 - Students use productivity tools to collaborate in constructing technology-enhanced models, prepare publications, and produce other creative works.
- T4—Technology communications tools
 - Students use telecommunications to collaborate, publish, and interact with peers, experts, and other audiences.
 - Students use a variety of media and formats to communicate information and ideas effectively to multiple audiences.
- T5—Technology research tools
 - Students use technology to locate, evaluate, and collect information from a variety of sources.
 - Students use technology tools to process data and report results.
 - Students evaluate and select new information resources and technological innovations based on the appropriateness for specific tasks.
- T6—Technology problem solving and decision making tools
 - Students use technology resources for solving problems and making informed decisions.
 - Students employ technology in the development of strategies for solving problems in the real world.

⁷ International Society for Technology in Education. (2000). *National educational technology standards for students (NETS)*. Retrieved July 13, 2004, from <http://www.iste.org/>

Appendix E: Sample Rubrics and Checklists for Assessment Activities

Sample Poster Rubric

CATEGORY	4-Exceptional	3-Admirable	2-Acceptable	1-Amateur	SCORE:
Required Elements	The poster includes all required elements as well as additional information.	All required elements are included on the poster.	All but 1 of the required elements are included on the poster.	Several required elements were missing.	
Labels	All items of importance on the poster are clearly labeled with labels that can be read from at least three ft. away.	Almost all items of importance on the poster are clearly labeled with labels that can be read from at least three ft. away.	Many items of importance on the poster are clearly labeled with labels that can be read from at least three ft. away.	Labels are too small to view OR no important items were labeled.	
Graphics – Relevance	All graphics are related to the topic and make it easier to understand. All borrowed graphics have a source citation.	All graphics are related to the topic and most make it easier to understand. Some borrowed graphics have a source citation.	All graphics relate to the topic. One or two borrowed graphics have a source citation.	Graphics do not relate to the topic OR several borrowed graphics do not have a source citation.	
Attractiveness	The poster is exceptionally attractive in terms of design, layout, and neatness.	The poster is attractive in terms of design, layout and neatness.	The poster is acceptably attractive though it may be a bit messy.	The poster is distractingly messy or very poorly designed. It is not attractive.	
Grammar	There are no grammatical/mechanical mistakes on the poster.	There are 1-2 grammatical/mechanical mistakes on the poster.	There are 3-4 grammatical/mechanical mistakes on the poster.	There are more than 4 grammatical/mechanical mistakes on the poster.	
Total Score:					

Sample Fact Sheet Rubric

CATEGORY	4-Exceptional	3-Admirable	2-Acceptable	1-Amateur	SCORE
Organization	Content is extremely well organized in a logical format that is easy to follow and flows smoothly from one idea to another enhancing the effectiveness of the project	Content is presented in a thoughtful organized manner and most transitions were easy to follow. Only a few ideas were unclear	While content was somewhat organized; ideas were not presented coherently and transitions were not always smooth.	The content was choppy and confusing. It was difficult to follow; transitions were abrupt and seriously distracted the audience	
Content Accuracy	All content was completely accurate; all facts were precise and explicit	Content was mostly accurate; with only a few inconsistencies or errors in information	Content was somewhat accurate; but there were more than a few inconsistencies or errors in information	Content was grossly inaccurate to the point that the facts in this project were misleading to the audience	
Research	Research on the project went above and beyond expectations. The student solicited material in addition to what was provided; brought in personal ideas and information to enhance project; and utilized more than six types of resources to make project effective	The student did a very good job of researching; using materials provided to their full potential; and used more than four types of research to enhance project. At least one source came from information outside of the school.	The student used the at least three references provided by the school in an acceptable manner; but did not consult any additional resources	The student did not use provided resources effectively and did little or no fact gathering on the topic	
Creativity	The fact sheet demonstrated exceptional creativity and originality on the part of the student.	The fact sheet was cleverly presented at times in a thoughtful and interesting manner.	The student did add a few creative touches to enhance the fact sheet but mostly reported the information as provided.	The fact sheet showed little creativity or originality."	

Sample Rubric on Written Report

CATEGORY	4-Exceptional	3-Admirable	2-Acceptable	1-Amateur	SCORE
Organization	Content is extremely well organized in a logical format that is easy to follow and flows smoothly from one idea to another enhancing the effectiveness of the project	Content is presented in a thoughtful organized manner and most transitions were easy to follow. Only a few ideas were unclear	While content was somewhat organized; ideas were not presented coherently and transitions were not always smooth.	The content was choppy and confusing. It was difficult to follow; transitions were abrupt and seriously distracted the audience	
Content Accuracy	All content was completely accurate; all facts were precise and explicit	Content was mostly accurate; with only a few inconsistencies or errors in information	Content was somewhat accurate; but there were more than a few inconsistencies or errors in information	Content was grossly inaccurate to the point that the facts in this project were misleading to the audience	
Research	Research on the project went above and beyond expectations. The student solicited material in addition to what was provided; brought in personal ideas and information to enhance project; and utilized more than six types of resources to make project effective	The student did a very good job of researching; using materials provided to their full potential; and used more than four types of research to enhance project. At least one source came from information outside of the school.	The student used the at least three references provided by the school in an acceptable manner; but did not consult any additional resources	The student did not use provided resources effectively and did little or no fact gathering on the topic	
Creativity	The report demonstrated exceptional creativity and originality on the part of the student.	The report was cleverly presented at times in a thoughtful and interesting manner.	The student did add a few creative touches to enhance the report but mostly reported the information as provided.	The report showed little creativity or originality.	

FFA Prepared Public Speaking Scorecard

	Max. Points	One	Two	Three	Four	Five	Six
Content of Manuscript	200						
<ul style="list-style-type: none"> • Importance and appropriateness of subject • Suitability of material used • Accuracy of statements • Evidence of purpose • Completeness and accuracy of bibliography 							
Manuscript Composition	100						
<ul style="list-style-type: none"> • Organization of contents • Unity of thought • Logical development • Language used • Sentence structure • Accomplishment of purpose-conclusion 							
Voice	100						
<ul style="list-style-type: none"> • Quality, pitch • Articulation • Pronunciation • Force 							
Stage Presence	100						
<ul style="list-style-type: none"> • Personal appearance • Poise and body posture • Attitude, confidence, and personality • Ease before audience 							
Power of Expression	100						
<ul style="list-style-type: none"> • Communicative ability including fluency, emphasis, directness, and sincerity • Conveyance of thought and meaning 							
Response to Questions	300						
<ul style="list-style-type: none"> • Ability to answer questions on the speech which are asked by the judges, indicating originality, familiarity with subject, and ability to think quickly 							
General Effect	100						
<ul style="list-style-type: none"> • Extent to which the speech was interesting, understandable, convincing, pleasing, and held attention. 							
Gross Total Points							
Less Time Deduction							
Net Total Points							

Sample Scorecard for Parliamentary Procedure Demonstration

	Points
Required motion	5
Discussion (max. of 5 debates @ 2 pts. each)	10
Additional motion (including main or alternate main motion)	5
Chair	10
Ability to preside	5
Leadership	10
Team's general effect	15
Conclusions reached by team	10
(Team's use of motions and discussion support disposal of the main motion)	
Team effect	10
(Degree to which discussion was convincing, logical, realistic, orderly, and efficient)	
Team's voice, poise, expression, and appearance	5
Completeness and accuracy	5
Format	5
Grammar, style, legibility	5
SUBTOTAL	100
Deductions	
Deductions for parliamentary mistakes	5-20 pts/minor mistake
Deductions for omitting assigned motion	10
TOTAL	<hr/>

(Adapted from *FFA CDE Handbook*)

Sample Checklist for Forest Safety

Place a check by each criterion which the student successfully employed while in the laboratory or field.

- ☐ 1. Stayed alert to possible hazards.
- ☐ 2. Conducted himself/herself in a safe responsible manner no horseplay.
- ☐ 3. Actively looked for potential hazards.
- ☐ 4. Was aware of other people working in the area.
- ☐ 5. Followed all established policies and procedures at all times.
- ☐ 6. Knew the location of fire extinguishers, first aid kits, and other safety equipment/devices.
- ☐ 7. Used proper tools for a given job and followed all safety precautions for using these tools.
- ☐ 8. Stayed at least 200 feet away from operating equipment unless assignment or duties required.
- ☐ 9. Reported all defective tools, equipment, and supplies to instructor or immediate supervisor before using.
- ☐ 10. Reported all accidents to instructor or supervisor, regardless of the nature or severity.
- ☐ 11. Wore proper protective clothing and equipment while on the job to include hard hat, clothing, safety glasses or goggles, shoes or boots, chaps, ear protection, gloves, etc. as health and safety regulations provide.

Sample Rubric on Use of Surveying Tools

	4—Skilled	3—Moderately Skilled	2—Limited Skill	1—Unskilled	SCORE
Compass	Uses the compass following accepted procedures. Accuracy and proficiency in use is that of experienced workers. No further training or practice is needed	Uses the compass safely and correctly. Some additional training or practice is needed to become proficient.	Is familiar with the safe and correct use of the compass. Additional training will be required to become proficient.	The student does not use the compass safely or correctly. Accuracy and proficiency are not within acceptable tolerances.	
Surveyor's Chain	Uses the surveyor's chain following accepted procedures. Accuracy and proficiency in use is that of experienced workers. No further training or practice is needed	Uses the surveyor's chain safely and correctly. Some additional training or practice is needed to become proficient.	Is familiar with the safe and correct use of the surveyor's chain. Additional training will be required to become proficient.	The student does not use the surveyor's chain safely or correctly. Accuracy and proficiency are not within acceptable tolerances.	
Plumb Bob	Uses the plumb bob following accepted procedures. Accuracy and proficiency in use is that of experienced workers. No further training or practice is needed	Uses the plumb bob safely and correctly. Some additional training or practice is needed to become proficient.	Is familiar with the safe and correct use of the plumb bob. Additional training will be required to become proficient.	The student does not use the plumb bob safely or correctly. Accuracy and proficiency are not within acceptable tolerances.	
Range Pole	Uses the range pole following accepted procedures. Accuracy and proficiency in use is that of experienced workers. No further training or practice is needed	Uses the range pole safely and correctly. Some additional training or practice is needed to become proficient.	Is familiar with the safe and correct use of the range pole. Additional training will be required to become proficient.	The student does not use the range pole safely or correctly. Accuracy and proficiency are not within acceptable tolerances.	

~~Sample Checklist for Field Trip Participation~~

- ~~_____1. The student arrived at the designated meeting place on time with all materials and supplies required for the field trip.~~
- ~~_____2. The student observed all safety rules and policies while traveling to and participating in the field trip.~~
- ~~_____3. The student demonstrated interest in the content of the field trip by paying attention to the exhibits and speakers, asking pertinent questions, and taking notes.~~
- ~~_____4. The student exhibited a positive attitude toward the events and activities of the field trip.~~
- ~~_____5. The student remained on task throughout the field trip.~~
- ~~_____6. The student exhibited cooperative workplace skills with other students throughout the field trip.~~

Sample Rubric for Tree Measurement Tool Identification and Use

	4—Skilled	3—Moderately Skilled	2—Limited Skill	1—Unskilled	SCORE
Diameter Tape	Uses the diameter tape with accuracy and proficiency of an experienced worker. No further training or practice is required.	Uses the diameter tape with accuracy but some further training or practice may be required to become as proficient as an experienced worker.	Uses the diameter tape correctly but further practice or training is needed to become proficient.	Does not use the diameter tape safely or correctly. Accuracy and proficiency are not within acceptable tolerances.	
Tree Scale Stick	Uses the tree scale stick with accuracy and proficiency of an experienced worker. No further training or practice is required.	Uses the tree scale stick with accuracy but some further training or practice may be required to become as proficient as an experienced worker.	Uses the tree scale stick correctly but further practice or training is needed to become proficient.	Does not use the tree scale stick safely or correctly. Accuracy and proficiency are not within acceptable tolerances.	
Tree Caliper	Uses the tree caliper with accuracy and proficiency of an experienced worker. No further training or practice is required.	Uses the tree caliper with accuracy but some further training or practice may be required to become as proficient as an experienced worker.	Uses the tree caliper correctly but further practice or training is needed to become proficient.	Does not use the tree caliper safely or correctly. Accuracy and proficiency are not within acceptable tolerances.	
Clinometer	Uses the clinometer with accuracy and proficiency of an experienced worker. No further training or practice is required.	Uses the clinometer with accuracy but some further training or practice may be required to become as proficient as an experienced worker.	Uses the clinometer correctly but further practice or training is needed to become proficient.	Does not use the clinometer safely or correctly. Accuracy and proficiency are not within acceptable tolerances.	
Abney Level	Uses the Abney level with accuracy and proficiency of an experienced worker. No further training or practice is required.	Uses the Abney level with accuracy but some further training or practice may be required to become as proficient as an experienced worker.	Uses the Abney level correctly but further practice or training is needed to become proficient.	Does not use the Abney level safely or correctly. Accuracy and proficiency are not within acceptable tolerances.	

	4—Skilled	3—Moderately Skilled	2—Limited Skill	1—Unskilled	SCORE
Haga Altimeter	Uses the Haga altimeter with accuracy and proficiency of an experienced worker. No further training or practice is required.	Uses the Haga altimeter with accuracy but some further training or practice may be required to become as proficient as an experienced worker.	Uses the Haga altimeter correctly but further practice or training is needed to become proficient.	Does not use the Haga altimeter safely or correctly. Accuracy and proficiency are not within acceptable tolerances.	
Increment Borer	Uses the increment borer with accuracy and proficiency of an experienced worker. No further training or practice is required.	Uses the increment borer with accuracy but some further training or practice may be required to become as proficient as an experienced worker.	Uses the increment borer correctly but further practice or training is needed to become proficient.	Does not use the increment borer safely or correctly. Accuracy and proficiency are not within acceptable tolerances.	
Relaskop	Uses the Relaskop with accuracy and proficiency of an experienced worker. No further training or practice is required.	Uses the Relaskop with accuracy but some further training or practice may be required to become as proficient as an experienced worker.	Uses the Relaskop correctly but further practice or training is needed to become proficient.	Does not use the Relaskop safely or correctly. Accuracy and proficiency are not within acceptable tolerances.	

Sample Rubric for Conducting a Timber Cruise

	4—Skilled	3—Moderately Skilled	2—Limited Skill	1—Unskilled	SCORE
Establish Cruise Plots	Established cruise plots following accepted procedures and with accuracy and proficiency of an experienced worker. No further training or practice is required.	Established cruise plots safely and correctly. Some additional training may be required to become as proficient as an experienced worker.	Established cruise plots safely and correctly. Additional training and practice will be required to become proficient.	The student did not establish cruise plots safely or correctly. Accuracy and proficiency are not within acceptable tolerances.	
Measure DBH	Measured DBH following accepted procedures and with accuracy and proficiency of an experienced worker. No further training or practice is required.	Measured DBH safely and correctly. Some additional training may be required to become as proficient as an experienced worker.	Measured DBH safely and correctly. Additional training and practice will be required to become proficient.	Did not measure DBH safely or correctly. Accuracy and proficiency are not within acceptable tolerances.	
Measure Merchantable Height	Measured merchantable height following accepted procedures and with accuracy and proficiency of an experienced worker. No further training or practice is required.	Measured merchantable height safely and correctly. Some additional training may be required to become as proficient as an experienced worker.	Measured merchantable height safely and correctly. Additional training and practice will be required to become proficient.	Did not measure merchantable height safely or correctly. Accuracy and proficiency are not within acceptable tolerances.	
Tally Trees	Tallied trees following accepted procedures and with accuracy and proficiency of an experienced worker. No further training or practice is required.	Tallied trees safely and correctly. Some additional training may be required to become as proficient as an experienced worker.	Tallied trees safely and correctly. Additional training and practice will be required to become proficient.	Did not tally trees safely or correctly. Accuracy and proficiency are not within acceptable tolerances.	
Calculate Stand Volume	Calculated stand volume following accepted procedures and with accuracy and proficiency of an experienced worker. No further training or practice is required.	Calculated stand volume correctly. Some additional training may be required to become as proficient as an experienced worker.	Calculated stand volume correctly. Additional training and practice will be required to become proficient.	Did not calculate stand volume correctly. Accuracy and proficiency are not within acceptable tolerances.	

	4—Skilled	3—Moderately Skilled	2—Limited Skill	1—Unskilled	SCORE
Safety Practices	Followed all safety practices and procedures as would be expected of an experienced worker. No further training or practice is required.	Followed all safety practices. Some additional training may be required to become as proficient as an experienced worker.	Followed all but 1 or 2 safety practices. Additional training and practice will be required to become proficient.	The student did not follow 3 or more established safety practices.	
Workplace Skills	Followed all general workplace skills standards to a level expected of a proficient worker.	Followed workplace skill standards but Some additional mentoring may be required to reach the level expected of a proficient worker.	Followed most workplace skill standards but additional training will be required to become proficient.	Did not follow 3 or more established workplace skill standards.	
Total					

Sample Rubric for a Timber Sale Prospectus

Evaluate the student's performance in detailing the common elements of a timber sale prospectus shown below using the following scale:

- 4 — Professional — Accuracy and detail are at a level expected of a professionally prepared prospectus.
- 3 — Competent — All major points are covered but accuracy and detail are less than what would be expected in a professionally prepared prospectus.
- 2 — Adequate — Most major points are covered or accuracy and detail are far less than would be expected in a professionally prepared prospectus.
- 1 — Limited — Only a few points are covered and accuracy and detail are limited.

Description of Property	4	3	2	1
General Statements	4	3	2	1
Terms	4	3	2	1
Timing	4	3	2	1
Bidding Procedures	4	3	2	1
Payments	4	3	2	1

Sample Rubric for a Timber Contract

Evaluate the student's performance in detailing the common elements of a timber sale contract shown below using the following scale:

- 4 — Professional — Accuracy and detail are at a level expected of a professionally prepared contract.
- 3 — Competent — All major points are covered but accuracy and detail are less than what would be expected in a professionally prepared contract.
- 2 — Adequate — Most major points are covered or accuracy and detail are far less than would be expected in a professionally prepared contract.
- 1 — Limited — Only a few points are covered and accuracy and detail are limited.

Identification of Parties	4	3	2	1
Method of Payment	4	3	2	1
Description of Timber Sold	4	3	2	1
Care of Property	4	3	2	1
Arbitration	4	3	2	1
Guarantee of Ownership	4	3	2	1
Right of Ingress and Egress	4	3	2	1
Method of Harvest	4	3	2	1
Penalties for Nonperformance	4	3	2	1
Length of Agreement	4	3	2	1
Assumption of Risk	4	3	2	1
Signatures	4	3	2	1

Sample Rubric—Develop a Prescribed Burning Plan

Evaluate the student's performance in detailing the common elements of a prescribed burning plan using the following scale:

- 4—Professional—Accuracy and detail are at a level expected of a professionally prepared burn plan.
- 3—Competent—All major points are covered but accuracy and detail are less than what would be expected in a professionally prepared burn plan.
- 2—Adequate—Most major points are covered or accuracy and detail are far less than would be expected in a professionally prepared burn plan.
- 1—Limited—Only a few points are covered and accuracy and detail are limited.

Identifies objectives of the burn	4	3	2	1
States acceptable weather, moisture, and fire behavior parameters	4	3	2	1
Details pre-burn site preparations	4	3	2	1
Provides pre-burn safety information	4	3	2	1
Identifies equipment to be used	4	3	2	1
Identifies emergency assistance available	4	3	2	1
Shows maps of burn area	4	3	2	1
Provides checklist for burn preparation and burn crew briefing	4	3	2	1