

# FORESTRY CURRICULUM

## Unit 1: Introduction to Forestry

### OVERVIEW

#### Summary

Forestry is a one semester agriscience elective within the plant pathway of the Agriculture CTC program, and is available to the general student population as well. Unit 1 provides a basic understanding of what is considered to be a forest. After these characteristics have been determined, students will explore the different types of value that a forest has (both ecologically and economically) and how this value can be determined.

#### Content to Be Learned

- Concept of what makes a forest and its role as a natural resource.
- The economic value of a forest.
- The ecological value of a forest.
- Basic forest measurement practices.

#### Practices

- Constructing an explanation and summary of the components of a forest.
- Assessing the characteristics of a forest to determine its classification as a natural resource.
- Researching the history of conservation in the United States and determine its impact on current forest management practices.
- Summarizing the values of a forest and exploring the struggle that exists concerning the determination of greatest value.
- Exploring methods of forest measurement as a means of determining value by collecting field data.

#### Crosscutting Concepts

- Cause and effect.
- Influence of science, engineering and technology on society and the natural world.

#### Essential Questions

- What is the greatest contribution that a forest can make to our society?

## **Agriculture, Food and Natural Resources (AFNR) Career Cluster Content Standards**

- NRS.01. Performance Element: Plan and conduct natural resource management activities that apply logical, reasoned and scientifically based solutions to natural resource issues and goals.
- NRS.01.01. Performance Indicator: Apply methods of classification to examine natural resource availability and ecosystem function in a particular region.
  - NRS.01.01.01.a. Summarize and classify the different kinds of natural resources using common classification schemes (e.g., living versus nonliving, renewable versus nonrenewable, native versus introduced, etc.).
  - NRS.01.01.01.b. Assess the characteristics of a natural resource to determine its classification.
  - NRS.01.01.02.a. Summarize the components that comprise all ecosystems.
  - NRS.01.01.02.b. Analyze the interdependence of organisms within an ecosystem (e.g., food webs, niches, impact of keystone species, etc.) and assess the dependence of organisms on nonliving components (climate, geography, energy flow, nutrient cycling, etc.)
  - NRS.01.01.03.b. Analyze how biodiversity develops through evolution, natural selection and adaptation; explain the importance of biodiversity to ecosystem functions.
- NRS.02. Performance Element: Analyze the interrelationships between natural resources and humans.
- NRS.02.02. Performance Indicator: Assess the impact of human activities on the availability of natural resources.
  - NRS.02.02.01.a. Summarize the relationship between natural resources, ecosystems and human activity.
  - NRS.02.02.01.b. Assess and explain how different kinds of human activity affect the use and availability of natural resources (i.e., agriculture, industry, transportation, etc.).
- NRS.02.03. Performance Indicator: Analyze how modern perceptions of natural resource management, protection, enhancement and improvement change and develop over time.
  - NRS.02.03.01.a. Summarize and categorize the different social considerations in regards to the use of natural resources (e.g., public versus private, laws and regulations, economics, green technology, etc.).
  - NRS.02.03.01.b. Analyze how social considerations can affect the use and sustainability of natural resources.
  - NRS.02.03.02.a. Research and assess how historical figures played a prominent role in shaping how natural resources are viewed and used today (e.g., Aldo Leopold, Teddy Roosevelt, John Muir, Rachel Carson, Gaylord Nelson, etc.).
  - NRS.02.03.02.b. Examine and describe the relationship between current trends in natural resource systems and historical figures that played a prominent role in shaping how natural resources are viewed and used today.
  - NRS.02.03.02.c. Anticipate and predict how society's views and use of natural resources will continue to change as a result of historical figures and trends in modern society.
  - NRS.02.03.03.b. Analyze and document how some technological advancements changed how natural resources were used and viewed (e.g., Industrial Revolution, fossil fuels, green technology, etc.).
- NRS.02.04. Performance Indicator: Examine and explain how economics affects the use of natural resources.

- NRS.02.04.01.a. Compare and contrast how the economic value of a natural resource affects its availability.
- NRS.02.04.01.b. Assess whether economic value increases or decreases the conservation, protection, improvement and enhancement of natural resources.
- ESS.01. Performance Element: Use analytical procedures and instruments to manage environmental service systems.
- ESS.01.01. Performance Indicator: Analyze and interpret laboratory and field samples in environmental service systems.
  - ESS.01.01.01.a. Identify sample types and sampling techniques used to collect laboratory and field data.
  - ESS.01.01.01.b. Determine the appropriate sampling techniques needed to generate data.
  - ESS.01.01.01.c. Collect and prepare sample measurements using appropriate data collection techniques.
  - ESS.01.01.02.b. Summarize the purpose of statistical analysis methods commonly used in environmental service systems research and explain examples of their use in practice.
  - ESS.01.01.02.c. Utilize data analysis to identify trends in a data sample and assess the confidence that can be drawn from those conclusions.
- ESS.01.02. Performance Indicator: Properly utilize scientific instruments in environmental monitoring situations (e.g., laboratory equipment, environmental monitoring instruments, etc.).
  - ESS.01.02.01.a. Identify basic laboratory equipment and explain their uses.
  - ESS.01.02.01.b. Demonstrate the proper use and maintenance of basic laboratory equipment.
  - ESS.01.02.01.c. Calibrate and use laboratory equipment according to standard operating procedures.

## **Unit 2: Forest Regions of North America**

### OVERVIEW

### **Summary**

During Unit 2, students will explore the types of forests that exist on the North American continent and make connections between the climate and geography that determine these forest types. The characteristics of each forest region will be examined, as well as the production capability and outputs of forest products. The ‘Urban Forest’ will also be examined as a forest type that is of considerable value.

### **Content to Be Learned**

- Characteristics of the North American forest regions.
- The economic and ecologically most valuable forest regions in North America.
- The concept and value of the ‘Urban Forest.’

## **Practices**

- Examining the characteristics of the North American forest regions.
- Researching and summarizing the factors that allow production capability of forest products.
- Determining the value of the ‘urban forest.’
- Developing a plan that would maximize the value of the ‘urban forest’ in the local area.

## **Crosscutting Concepts**

- Cause and effect.
- Influence of science, engineering and technology on society and the natural world.

## **Essential Questions**

- Which of the North American forest regions have the greatest value?
- How can the management of a forest increase or decrease its value?

## **AFNR Career Cluster Content Standards**

- NRS.01. Performance Element: Plan and conduct natural resource management activities that apply logical, reasoned and scientifically based solutions to natural resource issues and goals.
- NRS.01.02. Performance Indicator: Classify different types of natural resources in order to enable protection, conservation, enhancement and management in a particular geographical region.
  - NRS.01.02.01.a. Research and examine the characteristics used to identify trees and woody plants.
  - NRS.01.02.01.b. Apply identification techniques to determine the species of a tree or woody plant.
- NRS.01.03. Performance Indicator: Apply ecological concepts and principles to atmospheric natural resource systems.
  - NRS.01.03.02.a. Research and summarize how climate factors influence natural resource systems.
- PS.04. Performance Element: Apply principles of design in plant systems to enhance an environment (e.g. floral, forest landscape, and farm).
- PS.04.01. Performance Indicator: Evaluating, identifying and preparing plants to enhance an environment.
  - PS.04.01.01.a. Identify and categorize plants by their purpose (e.g., floral plants, landscape plants, house plants, etc.).
  - PS.04.01.01.b. Demonstrate proper use of plants in their environment (e.g., focal and filler plants in floriculture, heat tolerant and shade plants in a landscape design, etc.).
  - PS.04.01.02.a. Summarize the applications of design in agriculture and ornamental plant systems.
  - PS.04.01.02.b. Create a design utilizing plants in their proper environments.

# Unit 3: Forest Ecology

## OVERVIEW

### Summary

Students will examine the concept of ecology as it relates to the forest. The forest ecosystem consists of the interrelationship between trees and the biotic and abiotic elements within the forest. A focus of study will be on forest wildlife (both flora and fauna), native and invasive species, water and soil studies.

### Content to Be Learned

- The relationships of trees to one another and with their physical surroundings.
- Economically destructive invasive species.

### Practices

- Conducting a population study.
- Examining the physical properties of soil.
- Determining the effects of the forest on the groundwater supply.
- Researching carrying capacity of organisms and the interrelationships of populations within the forest.

### Crosscutting Concepts

- Cause and effect.
- Systems and system models.

### Essential Questions

- What relationships exist amongst the biotic and abiotic elements of the forest?

### AFNR Career Cluster Content Standards

- NRS.01. Performance Element: Plan and conduct natural resource management activities that apply logical, reasoned and scientifically based solutions to natural resource issues and goals.
- NRS.01.06. Performance Indicator: Apply ecological concepts and principles to living organisms in natural resource systems.
  - NRS.01.06.01.a. Differentiate between population ecology, population density and population dispersion and describe the importance of these concepts to natural resource systems.
  - NRS.01.06.02.a. Research and summarize examples of invasive species.
  - NRS.01.06.02.b. Analyze factors that influence the establishment and spread of invasive species and determine the appropriate steps to prevent or minimize the impact of invasive species.
- ESS.03. Performance Element: Develop proposed solutions to environmental issues, problems and applications using scientific principles of meteorology, soil science, hydrology, microbiology, chemistry and ecology.

- ESS.03.02. Performance Indicator: Apply soil science and hydrology principles to environmental service systems.
  - ESS.03.02.02.a. Research and describe the process of soil formation through weathering.
  - ESS.03.02.03.a. Examine and explain how the physical qualities of the soil influence the infiltration and percolation of water.
- ESS.03.05. Performance Indicator: Apply ecology principles to environmental service systems.
  - ESS.03.05.01.a. Research the role that biodiversity plays in environmental service systems and how biodiversity can be measured.
  - ESS.03.05.02.a. Examine and explain the role played by habitats on environmental service systems.
  - ESS.03.05.03.a. Research and explain how carrying capacities relate to environmental service systems (e.g., waste processing, rate or production of pollution, disease, etc.).

## **Unit 4: Safety in the Workplace**

### OVERVIEW

### Summary

This unit will introduce students to basic tools and equipment used in the tree industry, as well as safe use and handling of these tools and equipment.

### Content to Be Learned

- Basic tool and equipment identification.
- General handling techniques.
- Safe practices in the tree industry workplace.

### Practices

- Identifying and safely using basic tools.
- Demonstrating safe practices in the workplace.

### Crosscutting Concepts

- Cause and effect.

### Essential Questions

- What practices allow for a safe and efficient workplace?

### AFNR Career Cluster Content Standards

- ESS.05. Performance Element: Use tools, equipment, machinery and technology common to tasks in environmental service systems.
- NRS.04. Performance Element: Demonstrate responsible management procedures and techniques to protect, maintain, enhance, and improve natural resources.

- NRS.04.01.Performance Indicator: Demonstrate natural resource protection, maintenance, enhancement and improvement techniques.
  - NRS.04.01.02.b. Assess and apply the methods used to improve a forest stand.
- CS.03. Performance Element: Examine and summarize the importance of health, safety and environmental management systems in AFNR workplaces.
- CS.03.01. Performance Indicator: Identify and explain the implications of required regulations to maintain and improve safety, health and environmental management systems.
  - CS.03.01.02.a. Summarize the importance of safety, health and environmental management in the workplace.
  - CS.03.01.02.b. Analyze existing required regulations within an AFNR workplace.
- CS.03.03. Performance Indicator: Apply health and safety practices to AFNR workplaces.
  - CS.03.04.01.a. Identify and differentiate the appropriate protective equipment for the safe use and operation of specific tools and equipment (e.g. PPE, etc.).
  - CS.03.04.02.a. Identify standard tools, equipment and safety procedures related to AFNR tasks.

## **Unit 5: Anatomy & Physiology of Trees**

<b>OVERVIEW</b>
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### Summary

To gain a greater understanding of the forest as a whole, students will examine the anatomy and physiology of a tree. Focus will start on the cellular level and continue with the structure and function of the internal and external parts of a tree. An understanding of the anatomy and physiology of trees will allow students to understand tree growth patterns and successful management practices.

### Content to Be Learned

- Internal and external tree anatomy.
- The functions of plant structures.
- The relationship between the structure and function of a tree the use of different species.
- The relationship between the structure and function of a tree and forest management.

### Practices

- Examining the internal structure of a tree.
- Comparing the internal structures of a variety of species.
- Determining the relationship between the internal structures and commercial use of tree products.
- Determining the relationship between the function of tree structures and resulting management practices.

### Crosscutting Concepts

- Patterns.
- Systems and system models.
- Cause and effect.

## **Essential Questions**

- Why are different tree species used for different commercial products?
- What beneficial management practices can result from knowledge of the anatomy and physiology of a tree?

## **AFNR Career Cluster Content Standards**

- PS.02. Performance Element: Apply principles of classification, plant anatomy, and plant physiology to plant production and management.
- PS.02.02. Performance Indicator: Apply knowledge of plant anatomy and the functions of plant structures to activities associated with plant systems.
  - PS.02.02.01.a. Identify structures in a typical plant cell and summarize the function of plant cell organelles.
  - PS.02.02.02.a. Identify and summarize the components, the types and the functions of plant roots.
  - PS.02.02.02.b. Analyze root tissues and explain the pathway of water and nutrients into and through root tissues.
  - PS.02.02.03.a. Identify and summarize the components and the functions of plant stems.
  - PS.02.02.03.b. Analyze and describe the difference in arrangement of vascular tissue between monocot and dicot plant stems.
  - PS.02.02.03.c. Evaluate the function of the xylem, phloem and cambium tissues and the impact on plant systems.
  - PS.02.02.04.a. Research and summarize leaf morphology and the functions of leaves.
  - PS.02.02.04.b. Analyze how leaves capture light energy and summarize the exchange of gases.
- PS.02.03. Performance Indicator: Apply knowledge of plant physiology and energy conversion to plant systems.
  - PS.02.03.02.a. Summarize the stages of cellular respiration including their products and byproducts.
  - PS.02.03.03.a. Summarize primary growth and the role of the apical meristem.
  - PS.02.03.03.b. Analyze plant growth and assess the process of secondary plant growth.
  - PS.02.03.03.c. Relate the principles of primary and secondary growth to plant systems.

# **Unit 6: Tree Classification and Identification**

## **OVERVIEW**

### **Summary**

Unit 6 will focus on the classification and identification of common trees in North America. Students will learn basic plant taxonomy to be able to better understand the relationship of species. The common and scientific names will be used for identification purposes; students will learn to identify trees using a variety



of characteristics, not just by their leaves.

### **Content to Be Learned**

- Common and scientific names of common trees of Rhode Island.
- Characteristics of trees that determine economic or ecological value.

### **Practices**

- Identifying common trees of Rhode Island.

### **Crosscutting Concepts**

- Patterns.

### **Essential Questions**

- What characteristics of a tree will help determine proper identification?

### **AFNR Career Cluster Content Standards**

- NRS.01. Performance Element: Plan and conduct natural resource management activities that apply logical, reasoned and scientifically based solutions to natural resource issues and goals.
- NRS.01.02. Performance Indicator: Classify different types of natural resources in order to enable protection, conservation, enhancement and management in a particular geographical region.
  - NRS.01.02.01.a. Research and examine the characteristics used to identify trees and woody plants.
  - NRS.01.02.01.b. Apply identification techniques to determine the species of a tree or woody plant.
- PS.02. Performance Element: Apply principles of classification, plant anatomy, and plant physiology to plant production and management.
- PS.02.01. Performance Indicator: Classify plants according to taxonomic systems.
  - PS.02.01.01.a. Identify and summarize systems used to classify plants based on specific characteristics.
  - PS.02.01.01.c. Classify agricultural and ornamental plants according to the hierarchical classification system
  - PS.02.01.02.a. Describe the morphological characteristics used to identify agricultural and herbaceous plants (e.g., life cycles, growth habit, plant use and as monocotyledons or dicotyledons, woody, herbaceous, etc.).
  - PS.02.01.02.b. Identify and describe important plants to agricultural and ornamental plant systems by common names.
  - PS.02.01.02.c. Identify and describe important plants to agricultural and ornamental plant systems by scientific names.

## **Unit 7: Silviculture**

### OVERVIEW

## **Summary**

In the unit on silviculture, student will take all accumulated knowledge from prior units and focus on learning responsible management procedures and techniques to protect, maintain, enhance, and improve the structure and health of trees. Practical applications will be demonstrated on trees growing on the Chariho campus.

## **Content to Be Learned**

- Identification of characteristics of a healthy tree population.
- Enhancement and improvement techniques for individual tree specimens.

## **Practices**

- Evaluating individual tree health.
- Determining management practices required for enhancing or improving the health of individual trees.

## **Crosscutting Concepts**

- Cause and effect.

## **Essential Questions**

- What management practices will enhance or improve the growth of trees?

## **AFNR Career Cluster Content Standards**

- NRS.04. Performance Element: Demonstrate responsible management procedures and techniques to protect, maintain, enhance, and improve natural resources.
- NRS.04.01. Performance Indicator: Demonstrate natural resource protection, maintenance, enhancement and improvement techniques.
  - NRS.04.01.02.a. Identify and categorize characteristics of a healthy forest.
  - NRS.04.01.02.b. Assess and apply the methods used to improve a forest stand.