2023 NH Envirothon Forestry Learning Objectives

These Learning Objectives serve as an overview of the types of knowledge and skills expected of students at the state level of competition.

Forestry Introduction

Plant communities shape our world. Forests comprise 30.8 percent of global land area *(Food and Agriculture Organization of the United Nations, 2020)*[1]. Humans rely on the biodiversity of forests for many services, including timber for homes, wood pulp for paper, biochemical models for future medications, recreation, aesthetic beauty, and countless others. A good understanding of plant biology, forest ecology, and human impacts to these ecosystems will help to inform good management practices to conserve these areas for future generations.

Just like the ecosystems we study, human society and culture are incredibly diverse. In the same way that biodiversity makes ecosystems more resilient, these differences in human perspective and experience make us stronger as a global community. Every person's story and relationship with the environment is important, and we must work together to ensure that everyone's stories are heard, including the historically marginalized and economically disadvantaged. We invite you to seek out stories from your own communities – to discover the unsung conservation heroes, to learn the histories that aren't typically taught in classrooms, to highlight local environmental issues, and to explore what types of natural resource conservation are occurring in your local community, state/province, and nation.

Students should be able to:
- Provide an informed opinion about current issues in forestry and plant communities.
- Think critically about solutions to current issues regarding forestry and plant communities.
- Work collaboratively in a team to synthesize and apply knowledge.
- Make connections between concepts in Forestry and the subjects of Soils and Land Use, Aquatic Ecology, Wildlife, and the Current Issue.

Students will be able to:

Plant Biology

1. Explain the fundamentals of plant biology as they apply to trees and other common plants, including:
   a. Anatomy
   b. Adaptations
2. Describe the evolution of different plant families, and how their unique adaptations help them to thrive in their environments.
3. Explain the formation and function of different types of tissues found in trees and other plants (including xylem, phloem, cambium.
4. Identify the differences between the following: angiosperm, gymnosperm, deciduous, coniferous, evergreen, hardwood, and softwood.
5. Explain the chemical processes that take place within plants (including their fundamental importance, basic chemical reaction equations, and impact on plant survival) such as:
   a. Photosynthesis
   b. Transpiration
6. Understand the difference between carbon storage and sequestration.

Forest Ecology

7. List the biotic and abiotic components of a forest ecosystem.
8. Describe the major types of forests found in your region and generally in other regions of the world.
9. Differentiate between hardwood, softwood, and mixed stands.
10. Diagram the energy flow in a forest ecosystem and describe the relationships between trophic levels.
11. Explain how forested ecosystems benefit water quality.
12. Define resilience and describe what it means for ecosystems and plant species.

Plant Communities

13. Explain what factors influence why certain plant communities develop in certain areas, including climate, soil type, aspect, topography, elevation, seed dispersal, available light, available nutrients, and competition.
14. Describe successional change in an ecosystem over time, including changes in species composition, shade tolerance, and interactions with disturbances.
15. Differentiate between primary and secondary succession.
16. Identify the causes of erosion in plant-dominated ecosystems and recommend practices for prevention and mitigation. (natural and recreation, forestry practices)
17. Describe the role that plant communities play in nutrient cycling, including carbon, nitrogen, and phosphorus.
18. Describe the role that plant communities play in the water cycle, including major events such as flooding, droughts, and storms.
19. Explain how different plant communities provide different types of habitat and describe the importance of this habitat variety to wildlife.
20. Apply concepts of landscape ecology to plant communities, including:
    a. Patterns and spatial differences in landscape, growing conditions, and vegetation type
    b. Conditions affecting the distribution of plant species
    c. Effects of disturbance on an ecosystem and its impact on plant species
    d. Importance of habitat connectivity in the spread and adaptation of plant species
    e. Genetic diversity in species across landscapes and the importance of this genetic diversity to healthy species populations

Forests and Society

The following Learning Objectives should be applied on a local and state level.

21. Describe the ecosystem services provided by forests.
22. List the economic benefits provided by forests.
23. Describe the impact of changes in climate on forests.
24. List human uses for forest and plant products and describe how these products are obtained from natural resources.
25. Describe common forestry practices, including thinning, harvesting, and regeneration methods.
26. Explain the concept of Best Management Practices (BMPs) in forestry and list examples.
27. Describe the different types of forest management.
28. Explain how management strategies differ between even and uneven aged stands.
29. Apply silvicultural practices to make recommendations based on management goals.

Field Skills

30. Identify common local trees and plants by leaves, bark, branching patterns, buds, fruit, and other characteristics without the use of a key.

31. Identify uncommon local trees and plants with the use of a key.

32. Use common forestry tools, such as:
      a. Biltmore stick/Merritt hypsometer
      b. D-tape
      c. Clinometer

33. Make management recommendations based on ecological conditions of the forest and management goals (such as wildlife habitat, timber production, recreation, et cetera).

34. Identify common plant pests and diseases without use of a key, describe how they are spread, and list methods of control.

35. Utilize and make common forestry measurements, such as diameter at breast height (DBH), total tree height, merchantable height, board feet, log, and basal area.

36. Measure carbon storage and carbon sequestration in trees.