

California Envirothon

Forestry Learning Objectives

I. Plant Biology

Students should be able to:

1. Explain the formation and function of different types of tissues found in trees and other plants (including xylem, phloem, cambium, cuticle, stomata, vascular bundle, apical meristem, and lateral meristem).
2. Describe the different types of leaves and their evolutionary advantages within specific environments/climates.
3. Identify the differences between the following: monocot, dicot, angiosperm, gymnosperm, deciduous, coniferous, evergreen, hardwood, and softwood.
4. Explain the chemical processes of photosynthesis, cellular respiration, and transpiration and predict how changes in environmental conditions (light, water, temperature) affect these processes.
5. Describe how tree rings form, how they are used in dendrochronology, and what factors and/or disturbances can be detected within a tree ring analysis.

II. Forest Ecology

Students should be able to:

6. Explain the structure of a forest ecosystem and identify different crown classes.
7. Describe the typical structure of a forest soil and identify unique characteristics of forested soils.
8. Explain how forest structure and soils influence water quality and analyze how disturbance or management practices may alter these benefits.
9. Identify and describe the roles of mycorrhizal fungi and other symbiotic relationships in forest ecosystems.
10. Describe successional change in a California forested stand over time, including changes in species composition, shade tolerance, and vertical positions within the canopy.

III. Forest Communities

Students should be able to:

11. Describe successional change in an ecosystem over time, including changes in species composition, shade tolerance, and interactions with disturbances.
12. Describe the role of fire in California forest ecosystems, explain how historical fire suppression altered fire-dependent ecosystems, and evaluate current fire management strategies used to restore ecosystem health and reduce wildfire risk.
13. Explain how different plant communities provide different types of habitat and describe the importance of habitat variety, snags, and downed logs in wildlife spaces.
14. Identify the four most common forest plant communities in California (Douglas-fir, Redwood, Ponderosa Pine, California Mixed Conifer) and compare how climate, elevation, and disturbance shape their distribution.

IV. Forest Management and Society

Students should be able to:

15. Describe the ecosystem services provided by forests, grasslands, and other plant communities.
16. Explain the uses of the following silviculture techniques (*i.e. prescribed burning, cultural burn, single tree selection, group tree selection/patch cut, shelterwood method, seed-tree method, and clear-cutting, etc.*) and evaluate their ecological and social tradeoffs.
17. Describe how forests and other plant communities are used for recreation.

18. List human uses for forest and plant products and describe how these products are obtained from natural resources.
19. Define an urban forest and describe common urban forestry practices.

V. Field Skills

Students should be able to:

20. Identify common California trees and plants by leaves, bark, branching patterns, buds, fruit, and other characteristics without the use of a key ([see CAE Tree ID List](#)).
21. Use common forestry tools, such as:
 - a. Biltmore stick
 - b. D-tape
 - c. Wedge prism/Angle gauge
 - d. Tree caliper
 - e. Clinometer
 - f. Increment borer
 - g. GPS/GIS/Avenza
22. Identify common plant pests and diseases without use of a key, describe how they are spread, and list methods of control. ([see CAE Pest ID List](#))
23. Interpret current and historical aerial photographs in the context of land use, succession, and forest growth.
24. Interpret maps, including but not limited to township/range/section, ownership, distances/scale, directional headings, and topography.
25. Understand how forests are managed to produce timber, and trace forest products from resource extraction to end use.