Forest Ecology Study Guide

The following key points, learning objectives, and suggested activities will help you and your students prepare for the Forest Ecology component of the Oregon Envirothon competition. For study information specific to the North American competition, please see the Resources section on the NCF-Envirothon website at envirothon.org.

Key Point 1—Tree Physiology and Tree and Shrub Identification

Learning Objectives:

1. Know the parts and tissues of a tree and be able to explain the growth cycle and life cycle of a tree.

2. Understand the processes of photosynthesis and respiration and how they are important to the growth and reproduction of trees.

3. Identify tree and shrub species using a dichotomous key or field guide.

Suggested Activities:

1. Identify trees and shrubs from leaf and seed samples using a dichotomous key and a tree guide. Identify the common name and scientific (Latin) name for the following common trees and know their approximate ranges in Oregon:

- Douglas-fir
- Sitka Spruce
- Western hemlock
- Port-Orford-cedar
- Junipers
- Western larch
- Western white pine
- Oregon ash

- Redwood
- Englemann spruce
- Western Redcedar
- Incense cedar
- Pacific yew
- Red alder
- Birches
- Poplars

- Lodgepole pine
- Sugar pine
- Bigleaf maple
- Oregon white oak
- Ponderosa pine
- Cottonwoods
- Vine maple
- True firs (6)

Key Point 2—Forest Ecology

Learning Objectives:

1. Know the typical forest structure: canopy, understory and ground layers and crown classes.

2. Understand forest ecology concepts and factors affecting them, including the relationship between soil and forest types, tree communities, regeneration, competition, and primary and secondary succession.

3. Identify the abiotic and biotic factors in a forest ecosystem and understand how these factors affect tree growth and forest development. Consider factors such as climate, weather, fire, insect outbreaks, microorganisms, and wildlife.

4. Understand that Oregon is home to a variety of forest types, primarily dominated by coniferous trees like Douglas-fir, Western hemlock, Sitka spruce, and Ponderosa pine, with each type adapted to its specific climate and geography.

Suggested Activities:

1. Draw and compare food webs of a mature deciduous forest and a mature coniferous forest. Explain how wildlife habitat relates to the forest community and describe the niches of various organisms that live in both forest ecosystems.

2. Examine a "tree cookie" or core sample taken with an increment borer to determine the age, growing conditions, insect and disease damage, and past weather conditions.

3. Understand the ecology of fire: Explore patterns of change brought about by fires in a forest ecosystem.

4. Identify, understand the life cycles of, and know common control techniques for the following insect pests and diseases of trees in Oregon, including integrated pest management:
   - Armillaria
   - Dwarf Mistletoe
   - Emerald Ash Borer
   - Flat Headed Borers
   - Heartrot
   - Spruce Budworm
   - Swiss needle cast
   - Western Pine Beetle
   - White Pine Blister Rust

Key Point 3—Sustainable Forest Management

Learning Objectives:

1. Understand the term silviculture and be able to explain the uses of the following silviculture techniques: forest health thinning , prescribed burning, planting, harvesting (including single tree and group tree selection), shelterwood method, and clear-cutting with and without seed trees.

2. Know how to use forestry tools and equipment in order to measure tree diameter, height, volume and basal area.

3. Understand how the following issues are affected by forest health and management: biodiversity, forest fragmentation, forest health, air quality, aesthetics, fire, global climate change and recreation.

4. Describe sustainability and understand how sustainable forestry management practices and the Oregon forest protection laws and policies protect forests for future generations.

5. Understand that forests are managed to reflect the interests and practices of different landowners, which in Oregon include the state and federal governments, private timber companies, tribes and small woodland owners.

6. Understand how economic, social and ecological factors influence forest management decisions.

7. Understand that science and technology are used in all aspects of forest management.

Suggested Activities:

1. Use the following forestry tools and know how they are used in forest management: clinometer, increment borer, diameter tape, Biltmore stick, abney level, compass, prism and relescope.

2. Use a variety of volume tables to calculate the volume of lumber for several different tree species.

3. Compare two different forest types of Oregon (for example, a juniper woodland in eastern Oregon and a conifer forest in western Oregon). Identify economic, social and ecological factors that affect how both of these forests are managed.

4. Explain the information technology used to monitor and effectively manage forests, and give specific examples of how this technology is being used in various aspects of forest management.

Key Point 4—Trees as an Important Renewable Resource

Learning Objectives:

1. Understand the importance and value of trees in urban and community settings and know the factors affecting their health and survival.

2. Understand the economic value of forests and know many of the products they provide to people and society.

3. Explain the "ecosystem services" provided by trees and understand why trees and forests are important to human health, recreation, wildlife and watershed quality.

Suggested Activities:

1. Use the online tool *i-Tree* to calculate the tree benefits and ecosystem services provided by individual trees.

2. Create a display showing the value of trees in both urban and suburban settings. Identify the factors that affect their health and survival and explain how to properly care for trees in an urban environment.

3. Make a list of products and by-products that come from your home and are made from trees. Describe the chemical and physical properties of trees used in making these products.