Illinois Envirothon Study Guide

Forestry

Citation:

Hayek, J. C., D. Shiley, and D. Cavanaugh-Grant. 2007. Illinois Envirothon Study Guide: Forestry. Department of Natural Resources and Environmental Sciences and Cooperative Extension. College of Agricultural, Consumer, and Environmental Sciences. University of Illinois at Urbana-Champaign. 15 p.

Acknowledgements

The Illinois State Envirothon Committee and the authors of this study guide would like to personally thank and acknowledge the following individuals and organizations for allowing their educational materials to be referenced and used as part of this guide.

DoITPoMS, University of Cambridge (image copyright)

Drs. Jeffrey Dawson and Rob Kantor, University of Illinois at Urbana-Champaign

Forestry Suppliers, Inc. http://www.forestry-suppliers.com

Illinois 4-H Forestry http://forestryjudging.nres.uiuc.edu/

Maryland Cooperative Extension http://extension.umd.edu/

National 4-H Forestry Invitational Contest Reference Materials and Publications
http://4hforestryinvitational.org/training/insect-and-disease-contest/index_html

Ohio State University Extension http://extension.osu.edu/

Oregon State University Extension Service http://extension.oregonstate.edu/

Pearson Education Inc., publishing as Benjamin Cummings

Penn State Cooperative Extension http://www.extension.psu.edu/

Purdue Extension http://www.ces.purdue.edu/

USDA Forest Service http://www.fs.fed.us/

University of Illinois at Urbana-Champaign http://www.uiuc.edu/

University of Illinois Extension http://web.extension.uiuc.edu/

University of Wisconsin Extension http://www.uwex.edu/

Wisconsin Department of Natural Resources http://dnr.wi.gov/index.asp

FORESTRY OBJECTIVES

Envirothon forestry contestants should be able to:

1. Identify native hardwood and conifer species by common name, leaf, twig, bark, and fruit characteristics.
    a. Identify primary forest products produced from selected Illinois tree species
    b. Identify general forest habitat type of selected tree species
    c. Understand how to identify a tree using a dichotomous key
    d. Understand the differences between an angiosperm (hardwoods) and gymnosperm (conifers/softwoods)

2. Determine leaf arrangement (opposite/alternate/whorled) and determine whether leaf is simple (oak), palmately compound (buckeye), pinnately compound (ash), or bipinnately compound (honeylocust).

3. Identify and define basic physiological components of a tree such as xylem, phloem, heartwood, sapwood, growth rings, buds, bundle scars, pith, etc.

4. Understand basic forest ecology terms and the concepts of succession, disturbance, and tolerance.

5. Define and understand common silvicultural (forest management) practices, including forestry best management practices (BMPs)
    a. How and why various silvicultural treatments are utilized
    b. Provide examples of forestry BMPs

6. Explain how forest plant communities and management relate to preferred wildlife habitat.

7. Provide an understanding and knowledge of past and current IL forest resources.

8. Identify common forestry equipment and its principal use in forestry.

9. Understand common forest measurement concepts and techniques.
    a. Define board feet, basal area, cord, and chain
    b. Calculate board feet from a standing tree or log using a volume table

10. Read and interpret topographic maps and plat maps for standard land features, legal location, and acreage.

11. Visually identify important tree diseases and the principal species they affect.

12. Visually identify important tree insects and the principal species they affect.

Table of Contents

Study Guide Developed by:

Jay C. Hayek, Visiting Extension Specialist in Forestry
Department of Natural Resources and Environmental Sciences
University of Illinois at Urbana-Champaign

Dave Shiley, Extension Educator – Natural Resources Management
University of Illinois Extension

Deborah Cavanaugh-Grant, Extension Specialist – Small Farm and Sustainable Agriculture
University of Illinois Extension

Department of Natural Resources and Environmental Sciences
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

UNIVERSITY OF ILLINOIS EXTENSION
Helping You Put Knowledge to Work

Section 1 – Tree Identification & Basic Tree Biology

A. Tree Identification, Habitat, and Uses

1. Identify common tree species by leaf, twig, bark, and fruit samples. Be able to successfully "key-out" a tree using a dichotomous key. Identify the predominant forest habitat (upland; bottomland/riparian, or both; swamp) of the 33 species listed below. Furthermore, understand the primary commercial timber uses and wildlife benefit of "*" tree species (refer to the 2006 *Forest Trees of Illinois* book).

Gymnosperms	**Angiosperms**	Silver Maple*
Eastern Larch (tamarack)	Yellow-Poplar*	Eastern Cottonwood*
Eastern Redcedar*	Basswood*	Sycamore*
Northern White-Cedar	Black Cherry*	Shagbark Hickory*
Baldcypress*	Northern Red Oak*	Bitternut Hickory
Scotch Pine	Shingle Oak	Pecan*
Red Pine	Pin Oak	White Ash*
Shortleaf Pine	Black Oak	Green Ash
Eastern White Pine*	White Oak*	American Elm*
	Bur Oak	Slippery Elm
	Swamp White Oak	Sassafras
	Sugar Maple*	Eastern Black Walnut*

2. Understand common tree identification characteristics such as leaf arrangement (alternate, opposite, whorled); leaf forms (simple, pinnately compound, bipinnately compound, and palmately compound); winter twig characteristics; leaf shapes, margins, bases, and tips; and fruit type (refer to the 2006 *Forest Trees of Illinois* book).

3. Gymnosperm vs. Angiosperms (as related to common IL trees)
   a. Gymnosperm: naked seed (typically in a cone-like structure); needle-leaf
   b. Angiosperm: enclosed seed; typically broadleaf

Section 1 Folder: [Tree ID]
In addition:

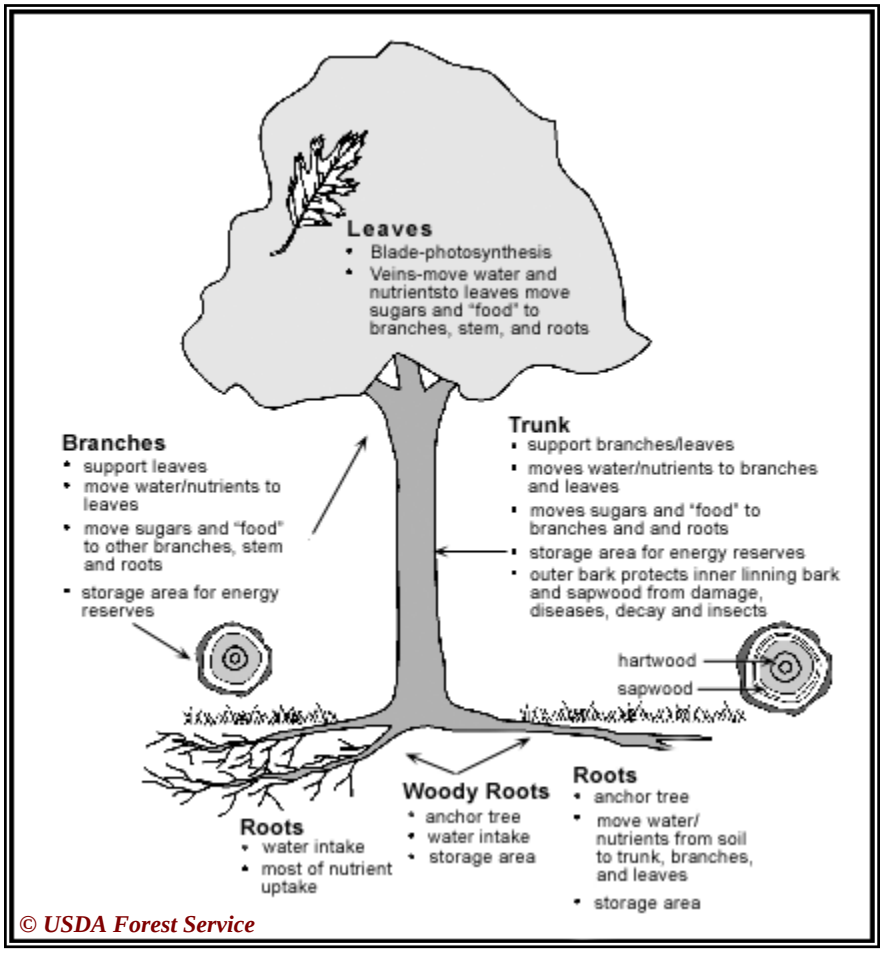
Missouri's Oaks and Hickories http://www.mdc.mo.gov/forest/IandE/oak_hickory/

Mohlenbrock, Robert H. 2006. *Forest Trees of Illinois*, 9th ed. Springfield, IL: Illinois Department of Natural Resources. 332 p.
Available for purchase at http://www.ilcf.org/shop/info.asp?catID=4&ProductID=47

B. Basic Tree Biology

1. Identify basic tree parts and define function of tree growth zones

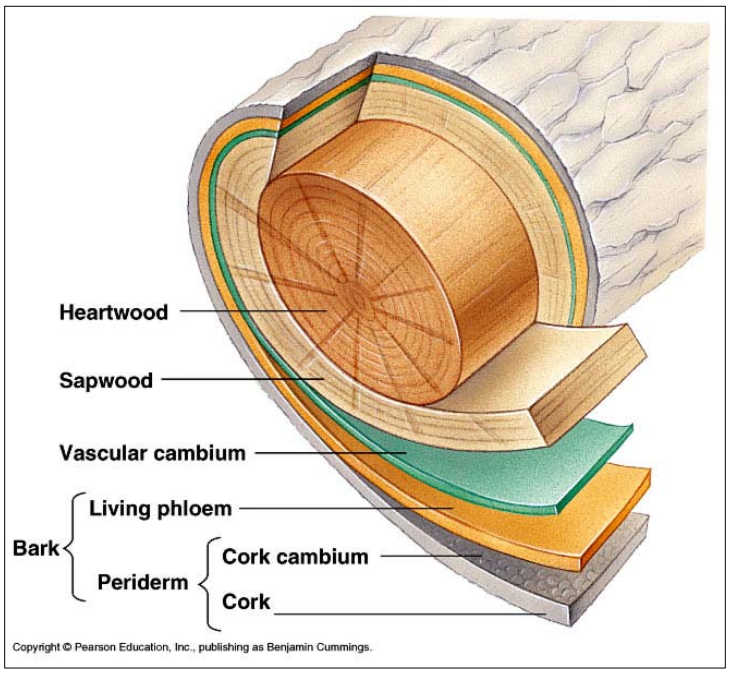
   - Crown
     - Leaves
     - Branches
   - Trunk
   - Roots

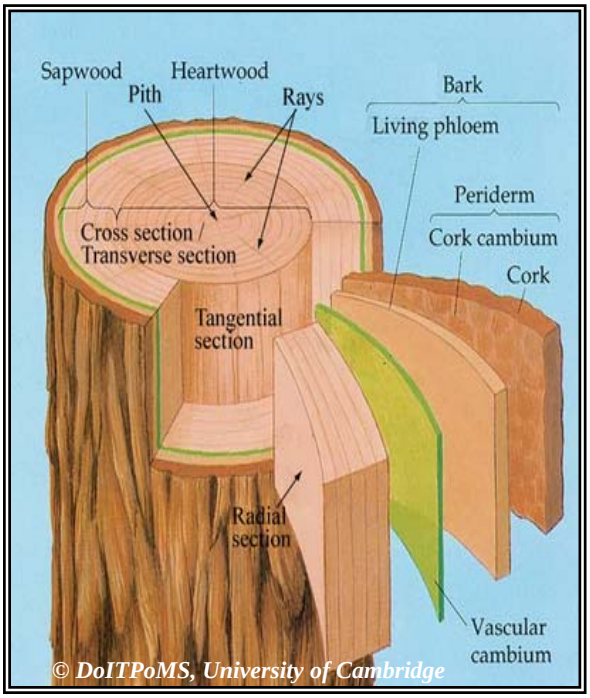


2. Understand and explain typical tree growth and life cycle including the pattern of tree growth rings

3. Identify parts and define function of “trunk” growth zones

    a. Bark
    b. Cambium
    c. Xylem
    d. Phloem





Section 1 Folder: [Basic Tree Biology]

Section 2 – Forest Ecology, Silviculture, and Forest Wildlife Management

A. Basic Forest Ecology Concepts

1. Identify the major factors influencing forest composition and structure in Illinois forests.
2. Understand ecological succession and the successional trends common to present-day Illinois oak-hickory forests and the major factors leading to this trend.
3. Understand forest disturbance and provide several common examples.
4. Understand concepts and examples of shade tolerance and flood tolerance.
5. Describe commodity and non-commodity values and benefits of forests.
6. Be able to define the following forest ecology terms:

Biodiversity	Conservation	Prescribed Fire	Watershed
Succession	Ecology	Ecosystem Management	Forest
Regeneration	Carbon Sequestration	Competition	Silviculture
Riparian Forest Buffer	Forester	Forestry	Agroforestry
Canopy	Fragmentation	Disturbance	Wildlife Habitat

Section 2 Folder: [Forest Ecology]

B. Basic Silvicultural Terms & Concepts

1. Be able to define general silvicultural terms, methods, and concepts applicable to Illinois forests and the factors that influence forest management decisions (e.g., economic, social, aesthetics, regeneration, wildlife, ecological, water quality, etc.).

2. Understand concept of shade tolerant vs. shade-intolerant concerning forest regeneration and competition.

3. Define general silvicultural intermediate treatments:
   - Crop tree release
   - Improvement Cutting (a.k.a., timber stand improvement…TSI)
   - Thinning
   - Pruning
   - Salvage and Sanitation Cutting

4. Understand General Forest Regeneration Harvest Methods
   - Even-aged management methods
     - Shelterwood
     - Clearcut
     - Seed Tree
   - Uneven-aged management methods
     - Group Selection
     - Single Tree Selection

5. Define and understand concept of forestry best management practices (BMPs)
   a. Forestry BMPs are preventative measures that minimize erosion impacts and water quality issues resulting from forest management operations.
      i. Examples: water bars; riparian buffers; streamside management zones (SMZs); portable skidder bridges; reseeding skid trails; culverts; etc.

6. Understand duties and functions of a professional forester
   a. DNR forester – free services to private forest landowners including forest management plans, timber sales, improvement marking, tree planting plans, government forestry programs, general forest management guidance, and education.
   b. Consulting forester – services provided on fee basis including timber appraisals, timber sales, forest management plans, litigation, tree planting, forest improvement work, and timber basis.

Section 2 Folder: [Silviculture]

C. Basic Forest Wildlife Management

Explain how forest plant communities relate to the preferred habitat of the following wildlife species (i.e., forest cover types; age structure; snags and dead-and-downed trees; availability of food; and riparian areas). http://www.ces.purdue.edu/extmedia/FNR/FNR-102.html

Wildlife Species
Beaver
Bobcat
Bobwhite Quail
Eastern Wild Turkey
Great Horned Owl
Grey Squirrel
Mink
Red-eyed Vireo
Whitetail Deer
Wood Duck

Section 2 Folder: [Forest Wildlife Management]
Including:

Wildlife Habitat Evaluation Handbook (September 2001) by Edward L. Neilson, Jr. and Delwin E. Benson, Oklahoma State University, Cooperative Extension Service, Stillwater, Oklahoma. No. 482. p. 150. (*To order, visit* http://www.whep.org/manual.htm)

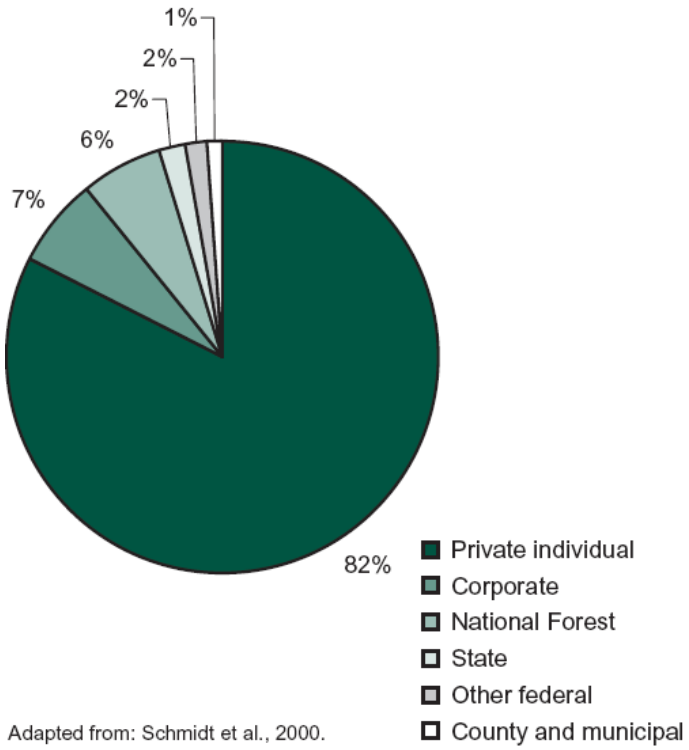
Section 3 – Knowledge of IL Forest Resources & Benefits

A. Understand the General History of Illinois Forests from Presettlement to the Present

Based on Crocker and Little's (2007) latest assessment of Illinois' forest resources, Illinois is home to approximately 4.8 million acres of forest land. According to the Illinois Department of Natural Resources, over 169,000 private forest landowners control nearly 3.7 million acres of forest land, or 82% of Illinois' forest land base. The average forest ownership size in Illinois is approximately 21 acres. Nearly 97% of Illinois forests are comprised of hardwoods (angiosperms) with the remaining 3% comprised of conifers (gymnosperms).

Be able to describe Illinois' changing forest trends since settlement: 1820 – 13.8 million acres of forest land; 1924 – 3.0 million acres; 2005 – 4.5 million acres; 2007 – 4.8 million acres.

Figure 36.
Percentage of timberland in Illinois by ownership class, 1998..



Adapted from: Schmidt et al., 2000.

1. Identify major forest types found in Illinois and the characteristic species associated with each forest type:

    - Oak-Hickory (65%)
    - Elm-Ash-Cottonwood (22%)
    - Maple-Beech-Birch (8%)
    - Oak-Gum-Cypress (2%)
    - Oak-Pine (1%)
    - Loblolly-Shortleaf Pine; White-Red-Jack Pine (2%)

2. Be able to analyze and "type" a specific forest based on dominant tree species and habitat.
    a. Example: Predominant tree species in this forest consist of mature green ash, silver maple, bur oak, and cottonwood.
        i. Answer = Elm-Ash-Maple forest type: floodplain/bottomland forest

3. Understand the value of trees in urban/suburban settings and the factors affecting their health and survival.

Reference Folder #3 [Knowledge of IL Forest Resources & Benefits]

Section 4 – Forestry Equipment, Tree Measurements, and Map Interpretation

A. Forestry Equipment [identify and understand use]

Biltmore Stick	Caliper
Clinometer	Compass
Diameter Tape (D-Tape)	Geographic Positioning System (GPS)
Increment Borer	Merritt Hypsometer
Prism	Relascope

Reference Folder #4 [Forestry Equipment]

B. Basic Tree Measurements

1. Be able to determine tree DBH (diameter breast height), number of merchantable 8' logs, and total merchantable volume using a Biltmore stick, Merritt hypsometer, and volume table.

2. Define DBH (diameter breast height), basal area, cord, board feet, and tree/log volume.

Reference Folder #4 [Tree Measurements]

C. Topographic and Plat Map Interpretation

1. Correctly identify map symbols from *4-H_Map_Symbols.pdf*
2. Correctly measure distance, contour intervals, etc., from a Topo Map
3. Provide the legal description and acreage of a "shaded" area using a plat map

Reference Folder #4 [Map Interpretation]

Section 5 – Forest Health

A. Identify Eight Major Tree Diseases and their environmental and economic impact

Anthracnose	Dutch Elm Disease
Armillaria Root Rot	Nectria Canker
Black Knot	Oak Wilt
Cedar-Apple Rust	Verticilium Wilt

1. Visually identify important tree diseases and the principal species they affect.

Reference Folder #5 [Forest Health – Tree Diseases]

B. Identify Twelve Major Tree Insects and their environmental and economic impact

Asian Longhorn Beetle	Hemlock Wooly Adelgid
Eastern Tent Caterpillar	Japanese Beetle
Emerald Ash Borer	Mountain Pine Beetle
European Elm Bark Beetle	Red Oak Borer
Fall Webworm	Southern Pine Beetle
Gypsy Moth	Twolined Chestnut Borer

1. Visually identify important tree insects and the principal species they affect.

Reference Folder #5 [Forest Health – Tree Insects]