

Pennsylvania 4-H Forestry Judging Project Book



"Our forests and our youth are Pennsylvania's greatest natural resources ... "

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College of Agricultural Sciences



18 U.S.C. 707

Pennsylvania 4-H Forestry Judging Project Book

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This handbook was adapted from the National 4-H Forestry Invitational Handbook, 2008 Edition.
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Introduction

Pennsylvania 4-H Forestry Judging is an activity (and a 4-H project) designed to teach youth about the fundamentals of forest management. Although it involves a state-level competitive judging event, its primary function is educational. Forest resources management is learned through participation in this activity. Additional benefits come from the development of leadership capabilities, meeting other youth interested in forestry, and interacting with forestry professionals from across the state. For older 4-H'ers (14 years old as of January 1 of the current year) there are also opportunities to travel and compete at the national contest held in West Virginia each year (usually at the end of July).

The information found in this handbook is provided for: 1) learning forest management concepts and skills, and 2) preparing participants for the state-level judging event. 4-H'ers should have a familiarity with forestry before under-taking this activity. While Pennsylvania's 4-H Forestry books: *Treetop*, *Trees+Me=Forestry*, and *Advancing in Forestry* provide an excellent background for this project, they are not entirely necessary to compete in this activity. A background in forestry through FFA, Envirothon, or Scouting may be sufficient.

Project Completion Guidelines (For those 4-H'ers who wish to take this on as a 4-H project)

To “complete” this project a 4-H'er must study, prepare, compete at the state-level contest (activity), and then develop a poster about what was learned during the experience. This poster might include drawings, photos, forestry items, and possibly even certificates of accomplishment from the state contest. Everything should be labeled clearly and neatly. There should be a title on the poster, and the poster should depict one or several lessons learned through taking the project. Check with your County 4-H Agent for any poster size requirements that your county may have. For additional information about the state event, contact:

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Objectives

The objectives of the Pennsylvania 4-H Forestry Judging Contest are to provide the opportunity and atmosphere for 4-H'ers to:

1. Develop leadership talents and to work towards achieving character development and effective citizenship.
2. Develop desirable attitudes toward the need and importance of conserving woodlands as a source of renewable commodities, and important noncommodity benefits necessary for quality living.
3. Acquire information and understanding of practical forestry skills in forest management and the utilization of forest and wood products.

General Rules and Regulations

- A. Senior Division contestants must be 14 years of age by January 1 of the year in which they are competing. Only Senior Division contestants are eligible to participate in the National Invitational. Nine to 13 year old 4-H'ers will compete in a Junior Division.
- B. The following supplies will be needed by contestants - clip board, pencil, paper, compass and tree scale stick. Sources for the compass and tree scale stick include the Ben Meadows Co. at (800) 241-6401, and Forestry Suppliers at (800) 647- 5368. Tree scale templates are provided at the National 4-H Forestry Invitational web site (<http://4hforestryinvitational.org/>) and in the PA 4-H project book, *Trees+Me=Forestry* (2nd edition).
- C. Field clothing is suggested, along with sturdy shoes.
- D. PA 4-H Code of Conduct will be followed.
- E. The state contest will consist of the following 5 events:
 1. Forestry Written Examination (Quiz)
 2. Tree Identification
 3. Forest Health Insects and Diseases
 4. Topographic Maps
 5. Compass and Pacing
 6. Forest Evaluation

NOTE: The Tree Measurement and the Forestry Bowl, while included in the national manual, are not part of the state contest. Additional Information is available through the national invitational web site: <http://4hforestryinvitational.org/>

FORESTRY WRITTEN EXAMINATION

Objective

Contestants will be given an opportunity to demonstrate their knowledge and understanding of forestry information by completing a written examination. The examination will cover a broad spectrum of subject matter similar to the Forestry Bowl but will allow for more detailed questions since contestants will get to read them.

Contest Rules

1. The examination will be an individual event with the score contributing to each individual participant's score and the team score. A maximum of 50 points is possible.
2. The examination may include multiple choice, fill-in-the-blank, matching, and discussion questions. One hour will be allowed for completion.
3. Discussion questions will be drawn from the following subject areas: forest management practices, forest health, forest regeneration, forest harvesting, and forests and society.

References For Written Exam

1. *Advancing in Forestry. 4-H Forest Resources Advanced Guide*. Penn State Cooperative Extension. The Pennsylvania State University. 60 p.
2. *Trees+Me=Forestry*. 2nd Edition. Penn State Cooperative Extension. The Pennsylvania State University. 60 p.
3. *National 4-H Forestry Manuals - Units A, B, and C*; available from the “Training Materials and References” section of the Invitational web site. (<http://www.aces.edu/N4HFI/>)
4. *Forests and Forestry* - 5th edition, by Holland and Rolfe. 1997. Interstate Publishers, Inc., Danville, Illinois.
5. Refer to the “Training” section of the Invitational web site for information about the “official” trees, insects, and diseases. (<http://4hforestryinvitational.org/>)
6. *National 4-H Forestry Invitational 2005 Handbook*. USDA, Extension Service, 50 p.

Only those species of trees, insects, and diseases listed in Tree Identification, Forest Health - Insects and Forest Health - Diseases will be addressed on the written exam.

TREE IDENTIFICATION

Objective

Contestants will learn to recognize and identify different tree species. This skill is valuable because tree species have varying requirements for growth, and differ in use and value.

Contest Rules

1. Each contestant will have the opportunity to identify 10 trees as found in a natural outdoor condition or from branches or other parts displayed. All trees to be identified will be taken from the "official tree list" below.
2. Contestants will be judged on the accuracy of identification and the spelling of common names. Scientific names will not be required. Incomplete names, such as maple instead of red maple or redcedar instead of eastern redcedar, will be considered incorrect. **Spelling, including capitalization, must be the same as that on the Official Tree List in order to be counted correct.**
3. Contestants will be given a specific time to identify the tree specimens and record the information on the score sheet.
4. Five points will be given for the correct common name. One point will be deducted for each name misspelled. Common names must be those used in the "official PA tree list." Maximum score for this event is 50 points.

Official PA Tree List

Common Name

Scientific Name

Gymnosperms (Conifers or Softwoods)

balsam fir	<i>Abies balsamea</i> Mill.
white fir	<i>Abies concolor</i> Lindl.
eastern redcedar	<i>Juniperus virginiana</i> L.
tamarack	<i>Larix laricina</i> K. Koch.
white spruce	<i>Picea glauca</i> Voss
blue spruce	<i>Picea pungens</i> Engelm.
red pine	<i>Pinus resinosa</i> Ait.
pitch pine	<i>Pinus rigida</i> Mill.
eastern white pine	<i>Pinus strobus</i> L.
Virginia pine	<i>Pinus virginiana</i> Mill.
Douglas-fir	<i>Pseudotsuga menziesii</i> Franco
eastern hemlock	<i>Tsuga canadensis</i> Carr.

Angiosperms (Broadleaf Trees or Hardwoods)

striped maple	<i>Acer pensylvanicum</i> L.
boxelder	<i>Acer negundo</i> L.
red maple	<i>Acer rubrum</i> L.
silver maple	<i>Acer saccharinum</i> L.
sugar maple	<i>Acer saccharum</i> Marsh.
yellow birch	<i>Betula alleghaniensis</i> Britton
sweet or black birch	<i>Betula lenta</i> L.
paper birch	<i>Betula papyrifera</i> Marsh.
American chestnut	<i>Castanea dentata</i> (Marshall) Borkhausen
pignut hickory	<i>Carya glabra</i> Sweet
shagbark hickory	<i>Carya ovata</i> K. Koch.
flowering dogwood	<i>Cornus florida</i> L.
American beech	<i>Fagus grandifolia</i> Ehrh.
white ash	<i>Fraxinus americana</i> L.
butternut or white walnut	<i>Juglans cinerea</i> L.
black walnut	<i>Juglans nigra</i> L.
yellow-poplar or tuliptree or tulip-poplar	<i>Liriodendron tulipifera</i> L.
cucumbertree	<i>Magnolia acuminata</i> L.
black tupelo or blackgum	<i>Nyssa sylvatica</i> Marsh.
sycamore	<i>Platanus occidentalis</i> L.
quaking aspen	<i>Populus tremuloides</i> Michx.
black cherry	<i>Prunus serotina</i> Ehrh.
white oak	<i>Quercus alba</i> L.
scarlet oak	<i>Quercus coccinea</i> Muenchh.
chestnut oak	<i>Quercus Montana</i> Willd.
northern red oak	<i>Quercus rubra</i> L.
black oak	<i>Quercus velutina</i> Lam.
black locust	<i>Robinia pseudoacacia</i> L.
black willow	<i>Salix nigra</i> Marsh.
sassafras	<i>Sassafras albidum</i> Nees.
American basswood	<i>Tilia americana</i> L.
American elm	<i>Ulmus americana</i> L.

This list was cross-referenced and checked for preferred common names, spellings, and scientific names. The following reference was used as the official source for common names, scientific names and spelling: Little, Elbert L. 1978. Important Trees of the United States. USDA Ag. Handbook 519, 70 pp.

Tree Identification Web Site

The Virginia Tech Dendrology web site is a suggested reference for training for the Tree Identification Contest. This web site can be accessed from the following web site:

<http://www.cnr.vt.edu/DENDRO/dendrology/main.htm>

PA TREE IDENTIFICATION SCORE SHEET

	Name			
No.	Common Name	Correct +5	Misspelled -1	Score
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
Contestant's Total Score				

FOREST HEALTH - INSECTS

Objective

Contestants will learn to recognize and identify forest insects or evidence of insect damage. This is a valuable skill because most insects that damage tree affect only certain tree species or groups of related species. Insect epidemics can cause high dollar value damage in the forests.

Contest Rules

1. Contestants will be required to identify 5 insects or examples of their damage. Specimens will be selected from those on the “official list of insects” below.
2. Contestants will be judged on the accuracy of identification and the spelling of the common names. Scientific names will not be required. Incomplete names such as caterpillar instead of eastern tent caterpillar will be considered incorrect. **Spelling, including capitalization, must be the same as that on the Official List of Insects in order to be counted correct.**
3. Contestants will be given a specific time to identify the insect or insect damage specimens.
4. Five points will be given for each correct common name. One point will be deducted for each name misspelled.

Official Reference for Insects and Diseases

The official reference for the Insect and Disease Identification Contests is the web site link for each insect or disease species listed on the Insect and Disease Identification web pages under the “Training References” section of the Invitational web site at:

http://4hforestryinvitational.org/training/insect-and-disease-contest/index_html

Official PA Insect List

Common Name

Scientific Name

Asian longhorned beetle	<i>Anoplophora glabripennis</i> (Motschulsky)
beech scale	<i>Cryptococcus fagisuga</i> (Lind.)
bronze birch borer	<i>Agrilus anxius</i> (Gory)
eastern tent caterpillar	<i>Malacosoma americanum</i> (Fabricius)
emerald ash borer	<i>Agrilus planipennis</i> (Fairmaire)
fall webworm	<i>Hyphantria cunea</i> (Drury)
forest tent caterpillar	<i>Malacosoma disstria</i> (Hubner)
gypsy moth	<i>Lymantria dispar</i> (Linnaeus)
hemlock woolly adelgid	<i>Adelges tsugae</i> (Annand)
locust borer	<i>Megacyllene robiniae</i> (Forster)
locust leafminer	<i>Odontota dorsalis</i> (Thunb.)
pine needle scale	<i>Chionaspis pinifoliae</i> (Fitch)
red oak borer	<i>Enaphalodes rufulus</i> (Haldeman)
twolined chestnut borer	<i>Agrilus bilineatus</i> (Weber)
white pine weevil	<i>Pissodes strobi</i> (Peck)

FOREST HEALTH - DISEASES

Objective

Contestants will learn to identify forest diseases and other forest health indicators. This is a valuable skill because most diseases that damage trees affect only certain tree species or groups of related species. Diseases can cause high dollar value damage in the forests. Not all indicators of forest health are diseases. Specimens will be selected and displayed which are representative of diseases and damage.

Contest Rules

1. Contestants will be required to identify 5 diseases, specimens of disease damage or other forest health indicators. Specimens will be selected from those on the "Official List of Diseases and Forest Health Indicators."
2. Contestants will be judged on the accuracy of identification and the spelling of the common names. Scientific names will not be required. Incomplete names will be considered incorrect. **Spelling, including capitalization, must be the same as that on the Official List in order to be counted correct.**
3. Contestants will be given a specific time to identify the disease or damage specimens.
4. Five points will be given for each correct common name. One point will be deducted for each name misspelled. The common name must be the one used in the "Official List of Diseases."

Official Reference for Insects and Diseases

The official reference for the Insect and Disease Identification Contests is the web site link for each insect or disease species listed on the Insect and Disease Identification web pages under the "Training References" section of the Invitational web site at:

http://4hforestryinvitational.org/training/insect-and-disease-contest/index_html

Official PA Disease List

Common Name	Scientific Name
Artist's conk	<i>Ganoderma applanatum</i>
annosum root disease	<i>Heterobasidion annosum</i>
beech bark disease	<i>Neonectria faginata</i> & <i>Neonectria ditissima</i>
black knot	<i>Apiosporina morbosa</i>
brown spot needle blight	<i>Scirrhia acicola</i>
cedar-apple rust	<i>Gymnosporangium juniperi-virginianae</i>
chestnut blight	<i>Endothia parasitica</i>
dogwood anthracnose	<i>Discula</i> sp.
Dutch elm disease	<i>Ceratocystis ulmi</i>
fusiform rust	<i>Cronartium fusiforme</i>
Hypoxylon canker	<i>Hypoxylon</i> sp.
nectria canker	<i>Nectria galligena</i> and <i>N. magnoliae</i>
needle cast fungi	<i>Hypoderma</i> sp. and <i>Lophodermium</i> sp.
oak wilt	<i>Ceratocystis fagacearum</i>
white pine blister rust	<i>Cronartium ribicola</i>

PA FOREST HEALTH – INSECT and DISEASES SCORE SHEET

	Name			
No.	Common Name	Correct +5	Misspelled -1	Score
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
Contestant's Total Score				

TOPOGRAPHIC MAPS

Objective

Contestants will learn the following in this contest event:

1. how to identify different features on a topographic map by their symbols;
2. how to determine the length of a line established between two points on the map;
3. how to determine the bearing (line of travel) between the two points on the map using a mirror-sighting type azimuth compass;

Topographic maps are frequently used in forestry as a tool for inventory and management of natural resources. It is important to be able to measure distances, locate property boundaries, and recognize natural and man-made features on these maps. Invitational contestants will learn how to apply their compass and pacing training in conjunction with the use of a 7.5 Minute Series topographic map. The scale on a 7.5 Minute Series map is 1:24,000. This means 1 inch on the map equals 24,000 inches or 2000 feet of actual distance on the ground.

Where to Get Topographic Maps for Practicing Your Skills?

Topographic maps were developed by the United States Government and can be ordered or downloaded from: The U.S. Geological Survey (USGS) by visiting their website <http://store.usgs.gov>. You can download maps for free from USGS by using their "Map Locator and Downloader" tool. While it may be possible to download the map you need, you might still want to order a paper copy. To download maps, you need access to a wide-scale printer. A standard printer using 8 ½ x 11 inch paper is not sufficient for printing most topographic maps. These maps are designed to be printed on large pieces of paper. If you cannot print a map to the size and quality that you need, carefully determine the maps you want, and order hard copies. Directions are on the USGS website. Some outdoor stores also sell USGS topographic maps, and many public libraries make them available as reference maps.

Contest Format and Rules

1. A mirror-sighting type azimuth compass will be provided for this event. Contestants will **not** be permitted to use their own mirror-sighting type azimuth compass.
2. The following additional equipment for the event is also provided:
 - a. 7.5 Minute Series Maps (same map for all contestants)
 - b. Rulers
3. The map used in the contest will have 5 symbols and/or features with arrows pointing to what needs identified. Each map symbol or feature is worth two (2) points for a total of ten (10) points
4. Only items from the following list of 21 topographic map symbols and features will be used in the contest:

Ridge	Valley	Peak
Railroad	Power Transmission Line	Open Area
Woodland	Marsh or Swamp	Perennial Stream
Intermittent Stream	Contour Line	Quarry
Primary Highway	Unimproved Road	Trail
Bridge	Building	Spring or Seep
School	House of Worship	Cemetery

To train for this part of the contest, contestants may want to study the official training reference material on the National 4-H Forestry Invitational web site.

<http://4hforestryinvitational.org/training/topographic-map-contest/map-symbols>

5. Contestants will measure the distance between the two points with a compass ruler. Using the “feet” scale at the bottom of the contest topographic map, the contestants will convert the measured distance on the map to the nearest 100-foot denomination, i.e., 900; 1,000; 1,100; 2,300, etc. This measurement is worth 10 points if answered correctly and 5 points if within plus or minus 100 feet.

To study for this part of the contest, contestants may want to review the official training reference material on the National 4-H Forestry Invitational web site.

<http://4hforestryinvitational.org/training/topographic-map-contest/length-of-a-line>

6. Contestants will determine the bearing (line of travel) between two points identified on the contest map using a mirror-sighting type azimuth compass provided by contest management. This bearing is worth 10 points, if within plus or minus 2 degrees of the correct bearing and 5 points if within plus or minus 4 degrees.

To study for this part of the contest, contestants may want to check out the 4-H Orienteering Book and review the official training reference material on the National 4-H Forestry Invitational web site.

<http://4hforestryinvitational.org/training/topographic-map-contest/bearing-of-a-line>

7. Contestants will determine the difference in elevation between two points identified on the contest map. Using the contour interval provided on the map, contestants will determine the elevation of two different points and then calculate the difference in elevation between them. For example, if point A is at 920 feet and point B is at 1260 feet, the change in elevation is 340 feet.

This calculation is worth 10 points, if answered correctly. There will be no partial credit for “close” answers.

8. Instructions will be given to the contestants before beginning the contest. The exercise will be completed on an individual basis. A maximum of 30 points is possible for this contest event.

Topographic Map Score Sheet

Name _____

	Map Symbol or Feature	Possible Points	Score
A		2	
B		2	
C		2	
D		2	
E		2	
Distance		10	
Bearing		10	
Elevation Change		10	
Contestant's Score			

COMPASS AND PACING

Objective

Contestants will learn to estimate ground distances by the pacing method and how to determine direction of travel using a compass. This will be accomplished by measuring a course of five lines. The lines may be level, or slope up or down hill, and successive lines may or may not be continuous. The lines may also form the boundary of a defined area.

Contest Rules

1. Each contestant should determine the number of paces he or she takes per 100 feet on a practice course prior to the contest. Pacing distances **must** be estimated using a normal walking stride. **No heel to toe or other measurement is allowed.**
2. A mirror sighting azimuth type compass will be used during the contest. A hand-held compass will be provided at the starting stake of each line if contestants do not have their own compass. Contestants may use his /her own hand-held compass, provided that it is of a type that is neither more accurate nor more sophisticated than a Silva Ranger compass. No compass declinations will be needed.
3. The course layout will consist of five (5) lines with marked corners. Every effort will be made to avoid slopes over 15 percent, steep ravines, heavy brush, large rocks, and wetlands on the contest course.
4. Instructions will be given to the contestants before beginning the course. The exercise will be completed on an individual basis. Each contestant will measure the azimuth and the distance for each line, record the measurements on a score sheet, and return the score sheet to the official in charge.
5. A maximum of 10 points is possible for each of the five lines, 5 points for the correct azimuth, and 5 points for the correct distance. One-half point will be deducted for each degree of error in the azimuth up to a maximum of 5 points per line. One-half point will be deducted for each foot of error in distance up to a maximum of 5 points per line. Contestants may receive a maximum total score of 50 points.

Compass and Pacing Study Guide

Foresters are often required to estimate horizontal distances by the pacing method, and to determine direction of travel by using a compass. These methods are very useful in cruising timber and finding property boundaries.

All maps and land surveys express the distance between two points as the horizontal distance. This is the distance measured on the level. Thus it becomes necessary to correct for slope when estimating horizontal distance on the ground. Pacing is an expedient, but crude, method of determining ground distances. A pace is two steps (Figure 3). On level, open ground, pacing can become fairly accurate with practice. But, on slopes, and in brushy or rocky areas, its accuracy diminishes (Figure 4).

To correct for slope the following suggestions from the *Forestry Handbook* are provided:

In difficult terrain no attempt should be made to maintain a standard pace. Instead, allow for its inevitable shortening (downhill as well as uphill) by repeating the count at intervals. For example, on moderate slopes count every tenth pace twice: 1,2,3,4,5,6,7,8,9,10,10,11,etc. On steeper slopes it may be found necessary to repeat every fifth count: 1,2,3,4,5,5,6,etc. On the steepest slopes in very heavy brush, in swamps, or among boulders, every count may have to be repeated. Consistent accuracy in pacing under such conditions is attained only by practice and is maintained only by constant checking. (*Forestry Handbook*, 1955. Page 17-1.)

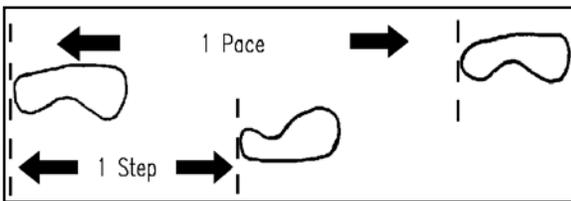


Figure 3. Illustration showing the difference percent slope.

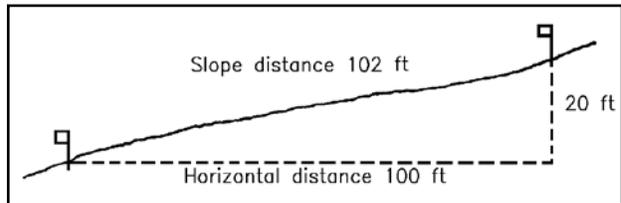


Figure 4. Estimating horizontal distance on a 20 percent slope.

A compass is used to tell the direction of travel by estimating the angle of deflection from magnetic north. Magnetic north is the direction toward which the compass needle always points. Most modern compasses are designed to measure direction in azimuths. Azimuths range from 0° to 360° (Figure 5).

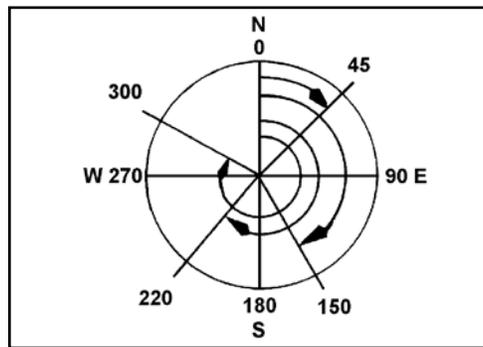


Figure 5. Azimuths are read from an azimuth compass

PA COMPASS and PACING SCORE SHEET

Name _____

Line	Azimuth	Correct 5 Points*	Distance	Correct 5 Points*	Score
A-B					
B-C					
C-D					
D-E					
E-A					
Contestant's Total Score					

* DEDUCTIONS: One-half point will be deducted for each degree of error in the azimuth up to a maximum of 5 points per line. One-half point will be deducted for each foot of error in distance up to a maximum of 5 points per line.

FOREST EVALUATION

Objectives

Contestants will learn to evaluate site factors and stand factors, which effect the growth of forest crops. In addition, they will learn to plan the future management of a forest stand. In order to successfully compete in this event, it is necessary for the participants to carefully study the material in the Forest Evaluation Study Guide, pages 16-23. Each part of the event is closely related to the others so it is very important to gain an understanding of these relationships.

Contest Rules

1. This is an individual event you will not complete the forest evaluation contest as a group.
2. Forest Evaluation is divided into four parts; I. Site Evaluation, II. Forest Stand Evaluation, III. Forest Inventory, and IV. Recommended Practices.
3. A fixed radius plot will be selected and designated for use in this event. The plot may be 1/10 acre (37.3 ft radius), 1/5 acre (52.7 ft radius), or 1/4 acre (58.9 ft radius).
4. Individuals will be given a situation description for the plot designated for the event. This situation description may include information about the landowner, his or her management objectives, local markets for forest products, etc. Individuals will be responsible for completing all four parts of Forest Evaluation.
5. Devices and conditions to aid participants in making their decisions may include compass, clinometer, Abney level, tree scale stick, marked plot boundaries, designated trees for Section III. INVENTORY, and a soil pit for Section I. SITE EVALUATION. Any standard tree scale stick may be used. Scale sticks may be purchased from companies such as Forestry Suppliers, Inc., Box 8397, Jackson, MS 39204; Ben Meadows Co., P.O. Box 80549, Atlanta, GA 30366; or TSI Co., Box 206, Flander, NJ 07936. Tree scale templates are provided at the National 4-H Forestry Invitational web site (<http://www.aces.edu/N4HFI/>) and in the PA 4-H project book, *Trees+Me=Forestry* (2nd edition).
6. Maximum score for this event is 100 points.
 - Twenty-five (25) points are possible for each of parts I and II. Thirty-five points for part III, and fifteen points for part IV.
 - For part I categories A, B, C, D, and E have a possible value of 5 points each.
 - For part II categories A, B, C, D, E are each worth 2 points. Part F has a value of 15 points.
 - For part III each correct answer of tree species, crown class, DBH, and height is worth 1 point. No points will be awarded for individual tree volumes and values. Board-foot volume per acre and tree value per acre are worth 7.5 points each, provided that they are within $\pm 10\%$ of the correct value.

Example: If 4,000 bd. ft. is the official volume per acre, then an answer between 3600 bd.ft. and 4400 receives 7.5 points; and under 3600 and over 4400 receives no points.
 - For part IV each management practice is worth 1 point.

Forest Evaluation Study Guide

Every acre of land should be devoted to its best use. This is an idea that landowners have had about agricultural land for many years. Level and slightly rolling land was used for row crops and grain, and rolling and better upland slopes for pasture and meadow. The general idea about forest land is that trees will grow well on all lands not suited for other crops. This is not correct. There are excellent, good, fair, and poor sites for timber production just as there are different kinds of farm crop land. There are forest lands that will economically support cultural practices and permanent physical improvements, and other stands in the same area might barely pay land taxes. There are acres that can be harvested every 10 years, and there are other acres that may never produce commercial timber. Forest Evaluation is based on the premise that trees will be harvested, now or in the future, to maximize the goals of a specified landowner.

Site Evaluation

The site is the habitat or environment in which a plant or plant community lives. There are a number of site factors that determine the desirability of a particular location for tree species. Some of the factors are soil depth, slope percent, aspect, and slope position. These factors can be used to determine the forest land capability class of a particular tract of land.

Soil depth is the distance from the soil surface down to unweathered rock or an impermeable layer, which restricts water movement and root penetration. For contest purposes shallow soils are less than 24 inches deep, and deep soils are greater than 24 inches deep.

Slope percent is the number of feet of rise or fall in 100 feet of horizontal distance. For contest purposes slope percent is broken into the following categories: 0-20 percent, 20-40 percent, and 40 percent plus. Slope percent can be measured with an Abney level or a clinometer. Figure 7 below illustrates a 24 percent slope.

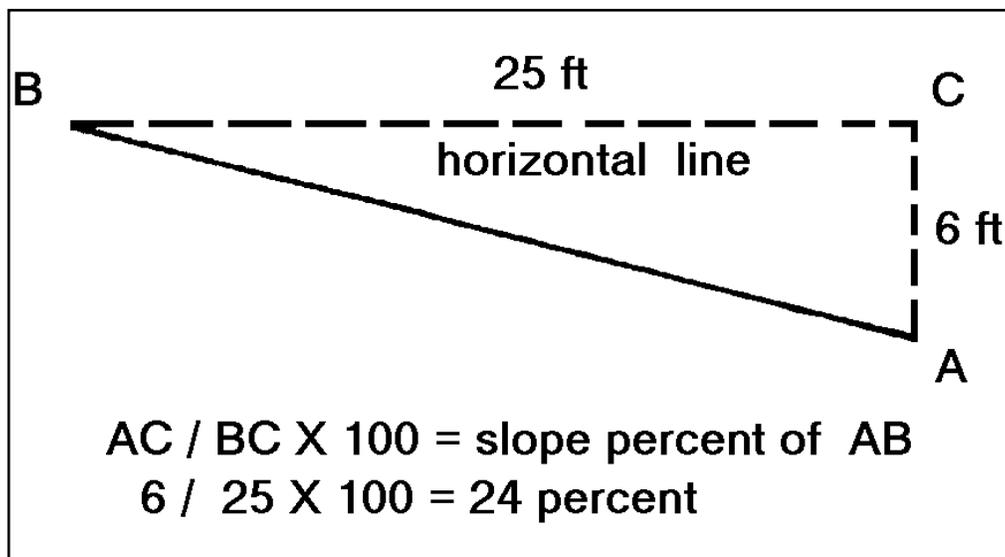


Figure 7. Method of determining slope percent.

Aspect is determined by taking a compass reading while facing down a slope. The direction water would run gives the compass direction. Any slope facing north and east of a line extending from northwest (315°) to southeast (135°) is considered to have a desirable northeast aspect. Any slope facing south and west of the same line is considered to have a less desirable southwest aspect. See figure 8, below.

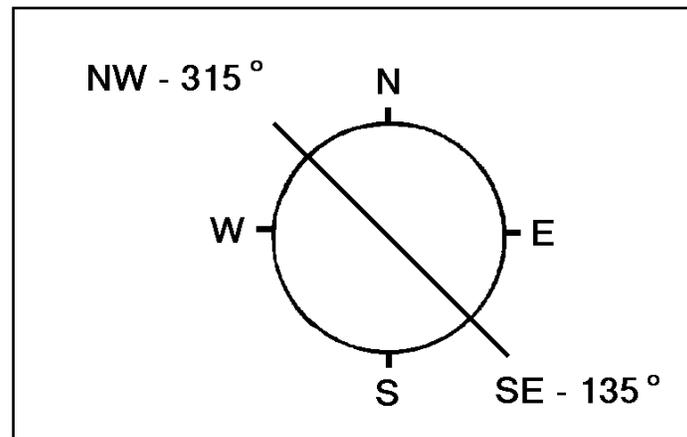


Figure 8. Method of determining aspect.

Slope position is determined only on hilly sites. The positions are classified as upper 1/3, middle 1/3 and lower 1/3. Ridge tops or level plateaus and bottomlands are classified separately in land capability.

Forest land capability classes are described below for the purpose of this contest:

Class I. Excellent has few limitations for tree growth. Most sites have little slope and no erosion problems. The soil is fertile and holds water well. It is well drained, but not droughty. These site will produce timber well.

Class II. Good is usually gently sloping. In some cases there are drainage problems that affect tree growth.

Class III. Fair may be fairly steep. Soils may have low fertility and tend to be droughty.

Class IV. Poor may be very steep with shallow soil. Sites may be rocky, shaly, have low fertility and be very dry.

Forest Stand Evaluation

Grazing damage is defined by the following categories for the purpose of this contest:

Grazed - tree seedlings eaten or trampled, soil compacted, and bark rubbed off

Ungrazed - no evidence of grazing damage.

Fire may be present as a destructive agent or a management tool. **Wildfire** can be very destructive particularly in hardwood forests. Destruction of the litter layer on the forest floor, crown scorch or burning of the foliage, and scalds or scars on the tree trunks are all evidence of wildfire damage.A

Prescribed fire or controlled burn is a forest management tool which can be used to manage

competing vegetation, prevent fuel accumulation, and improve wildlife habitat without damaging the crop trees.

Size distribution is classified into 4 categories for the purposes of this contest. In many stands of timber more than one size class is represented. Specific size classes are defined as follows: trees less than 1 inch in diameter – seedlings; trees from 1 to 3 inches in diameter – saplings; trees 4 to 10 inches in diameter – poles; and trees more than 10 inches – sawtimber.

Forest types are different from each other in species composition and management requirements. The following forest types, defined by the Society of American Foresters in *Forest Cover Types of North America*, are used in this contest:

Hard Pines (Type 77, Shortleaf Pine – Virginia Pine)

Dominant species – shortleaf pine and Virginia pine

Associated species – pitch pine, various oaks and hickories

Mixed Oaks (Type 53, White Oak; and Type 55, Northern Red Oak)

Dominant species – white oak and northern red oak

Associated species – black oak, scarlet oak, chestnut oak, white ash and yellow-poplar

White Pine (Type 21 – White Pine)

Dominant species – eastern white pine

Associated species – yellow-poplar, eastern hemlock, oaks, birches, black cherry, white ash, sugar maple, American basswood, shortleaf pine and pitch pine

Cove Hardwoods (Type 57, Yellow-poplar; Type 58, Yellow-poplar – Hemlock)

Dominant species – yellow-poplar

Associated species – eastern hemlock, black locust, red maple, sugar maple, sweet birch, oaks, cucumbertree, American basswood, blackgum and white ash

Red Oak, White Oak, Hickory (Type 52, White Oak, Red Oak, Hickory)

Dominant species – northern red oak, white oak, black oak, and hickories

Associated species – a wide variety of hardwood species

Northern Hardwoods (Type 25, Sugar Maple-Beech-Yellow Birch; Type 60, Beech-Sugar Maple)

Dominant species – American beech, sugar maple, (yellow birch - absent at Jackson's Mill)

Associated species – American basswood, red maple, eastern hemlock, white oak, northern red oak, white ash, black cherry, mockernut hickory, sweet birch, yellow-poplar, cucumbertree, black walnut

Stand origin can vary from one stand to another, even though the stands are of the same forest type and size distribution. Timber stands may originate by several different means. Natural stands may arise from **seedlings, sprouts**, or a **mixture** of both. Sprouts, also known as coppice, can be from either cut stumps or root suckers. Sprouts are important sources of new trees in the regeneration of most hardwood forests. Stands which originate from planted seedlings are called **plantations**. These stands may be of higher quality than their predecessors if genetically improved seeds or seedlings are used.

Stocking is a term used to describe how well the trees in a stand utilize the available space. Stocking, for the purposes of this contest, is measured using the average diameter of all trees 10 inches dbh and larger, and the number of trees per acre 10 inches dbh and larger. The figure 9 on page 26 is used to determine stocking. A **well-stocked** stand is one in which the trees are well distributed, and all the space is utilized, but the trees still have room to grow. An **understocked stand** is

one in which there are open spaces between the trees so that the stand will not produce its full potential. An **overstocked stand** is one which is so crowded that trees are growing very slowly, and some may be dying because of too much competition.

For example: If the plot size is 1/10 acre, average dbh of trees 10 inches and larger is 16 inches and the number of trees in the plot 10 inches dbh and larger is 12, is the stand understocked, well-stocked or overstocked? If there are 12 trees in a 1/10 acre plot there are 120 trees per acre. Look at the Stocking Guide (Figure 9) and find 120 trees per acre on the Y-axis. Now find 16 inches dbh on the X-axis. Extend the trees per acre horizontally toward the right and the dbh vertically toward the top until they intersect. The point of intersection falls in the part of the Stocking Guide labeled “overstocked.” This means the plot is overstocked.

Forest Inventory

When management recommendations are being prepared for a tract of forestland it is necessary to perform an inventory of the tree species present on the property. Inventories are also performed prior to the sale of harvested products (sawlogs, veneer logs, or pulpwood). Inventory data can include tree species, size, age, stocking level, volume, and value.

The two measurements used to estimate the volume of a tree are diameter and height. Diameter of standing trees is measured by a time-honored custom, at 4-1/2 feet above ground on the uphill side of the tree (if the tree is on a slope). This is abbreviated as **DBH** (diameter breast height). **Height** of a standing tree might be measured as **total** (the entire height from ground line to the top) or **merchantable**. Merchantable height implies the ability to cut lumber, veneer, or other products from the logs. It is the distance from the stump height to the top of the merchantable material in the tree and varies depending on the products to be made from the tree. The basic unit of height measurement for sawtimber is the log, which is 16 feet in length.

Contestants will identify 5 designated trees and estimate their diameters, merchantable heights, and volumes. For purposes of this contest tree diameters will be measured and recorded in even 2-inch diameter classes. Tree heights will be measured in 16-foot logs to the nearest full half-log. Contestants will be required to give the total volume and value of sawtimber per acre as determined from the five trees indicated on the sample plot.

Species of each numbered tree should be listed using the common names from the Official Tree List on pages 5-7.

Crown class of each tree should be determined and recorded. Tree crowns are classified as to the position in which they are found as either dominant, co-dominant, intermediate, or suppressed. These crown classes are defined below.

Dominant - Trees with crowns that extend above the average of the tree crowns and receives light from directly above and some from the sides.

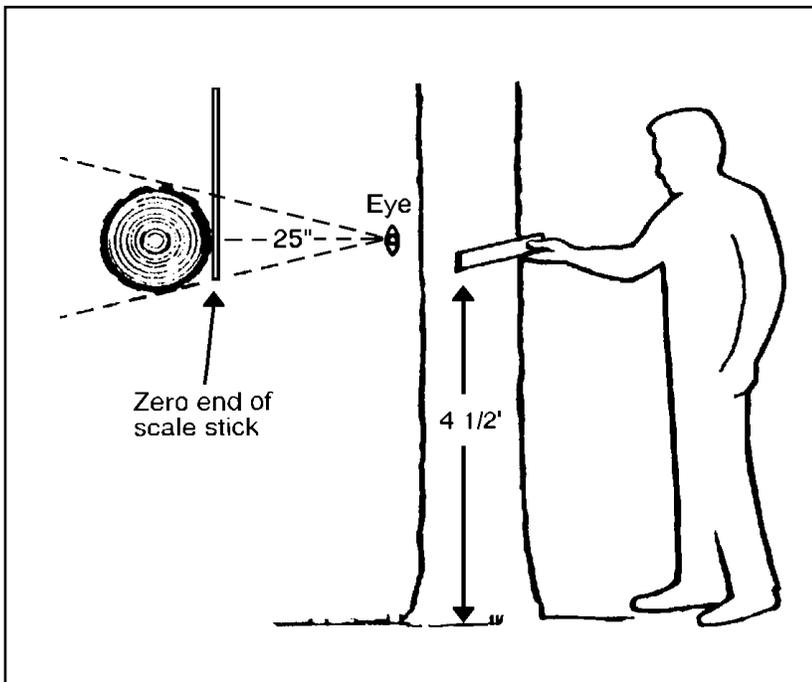
Co-Dominant - Trees with crowns that form the general level of the crown cover and receive full light from the top, but very little from the sides.

Intermediate - Trees that are shorter than the two preceding classes but with some branches extending into the general crown cover. Receives little light from above and none from the sides.

Suppressed - Trees with crown entirely below the general crown level and receiving no direct light either from above or below.

DBH(diameter at breast height) of each tree should be measured and recorded to the nearest even 2-inch diameter class. To measure diameter, foresters may use a caliper, diameter tape, or tree scale stick. Since the tree scale stick is to be used in the contest, the method of using it is explained below.

The drawing below shows how the tree scale stick is used to find tree diameter. Use the flat side of the stick, which reads, "Diameter of Tree (in inches)." The instrument on this side of the tree scale stick is called a **Biltmore Stick**. Hold the stick against the tree, perpendicular to the trunk, 25 inches from your eye at a height of 4 ½ feet above ground on the uphill side of the tree. Once the stick is placed against the tree, close one eye and line up the left end with the edge of the tree's bark. Now, **WITHOUT MOVING YOUR HEAD**, look across the stick to the right hand edge of the tree and read the diameter measurement at the point of intersection. Record the measurement by its proper even 2-inch diameter class. For example; if the tree measures between 15.0 and 16.9 inches it should be recorded as a 16 inch diameter tree.



Even 2-inch Diameter Classes

<u>If Diameter Measures</u>	<u>Record As</u>
9.0 - 10.9	10
11.0 - 12.9	12
13.0 - 14.9	14
15.0 - 16.9	16
17.0 - 18.9	18
19.0 - 20.9	20
etc.	

Figure 1. Use of tree scale stick to estimate tree diameter 4 1/2 feet above ground.

Merchantable Height (in 16-foot logs) of each tree should be measured and recorded to the nearest full half-log. To measure height, foresters may use a clinometer, laser hypsometer, relaskop, or tree scale stick. Since the tree scale stick is to be used in the contest, the method of using it is explained below.

To measure the merchantable height of a tree, pace out 66 feet from the base of the tree, to a point where the entire tree can be seen. It is a good idea to stay on the same contour as the tree or slightly up hill from it. Hold the tree scale stick so that the edge of the stick that reads "Number of 16 foot logs" faces you. The instrument on this edge of the tree scale stick is called a **Merritt Hypsometer**. The zero end should point toward the ground. Plumb the stick, at 25 inches from the eye. Sight the zero end to appear to rest at stump height. Stump height is usually considered to be six

inches to one foot above the ground. **DO NOT MOVE YOUR HEAD OR THE STICK.** Look up the stick to a point where the top of the last merchantable cut would be made in the tree (8-inch top diameter, a major fork, or serious defect which affects greater than half the tree's diameter at that point). Read the merchantable height to the nearest **full** half-log. For example, if the merchantable height is slightly more than 2 ½ logs you can record it as 2 ½ logs. But, if the merchantable height is slightly less than 2 ½ logs you must record it as 2 logs.

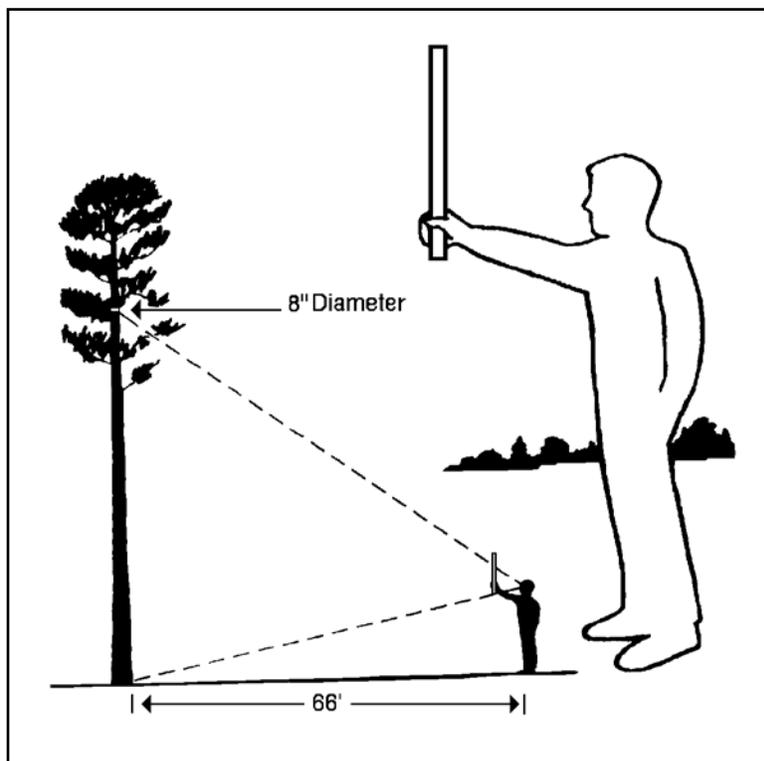


Figure 2. Use of tree scale stick to estimate merchantable height.

Practice on pacing is needed to find the 66-foot distance from the tree. The 25-inch distance from your eye to the stick is still the same as in measuring tree diameter.

Board-foot volume per acre – The board-foot volume of each tree should be determined and recorded using the International 1/4-inch volume table furnished at the contest (see table on page 25). Do not use the volume table on the tree scale stick. Then, after taking into account the plot size, the board-foot volume per acre should be calculated. Remember, the total volume in the plot must be multiplied by proper expansion factor (10 for a 1/10-acre plot, 5 for a 1/5-acre plot and 4 for a 1/4-acre plot) to determine the volume per acre.

Tree value per acre – The dollar value of each tree should be determined by multiplying the volume of each tree, expressed in thousand board feet, by the value of that species per thousand board feet. Values for each species will be given in the written situation description. For example: if a 20 inch, 2½ log white oak contains 348 board feet, and white oak sells for \$300 per thousand board feet, then the value of the tree equals $\$300 \times 0.348 = \104.40 . Then, after taking into account the plot size, the tree value per acre should be calculated.

RECOMMENDED PRACTICES

A list of forest management practices appears on the Forest Evaluation Score Sheet. Each team will be given a **written scenario** with information about the landowner and his or her objectives for management. Based on the data you collected about the site and forest stand, and on the landowner's management objectives, consider each practice listed on the score sheet. Mark the practices you recommend. The practices recommended should be those which will improve the stand and help accomplish the landowner's objectives.

Sample Scenario – Henrik and Dolores Svensen are a couple in their late forties. Their twins will be starting college next fall and they are looking to the 40 acre woodlot to supply them with some cash to help pay for some of the college expenses. Henrik enjoys hunting deer and turkey on his property and often invites one or two friends to hunt with him. They would not want any activity in their woods to damage the wildlife habitat. They have owned the woodlot for about 20 years and have managed it diligently over that time. They have a Stewardship plan that was drawn up right after they purchased the property and it has been updated once since then. Local markets are good with red oak worth \$300, white oak worth \$250, and mixed hardwoods worth \$200 per thousand board feet on the stump. After your inventory and observation of their woodlot what recommendations would you make that would help them meet their objectives at this time?

Thinnings - are partial cuttings in even-aged timber stands. They are designed to improve future growth by regulating stand density. Thinnings can be commercial, where some or all of the wood harvested is put to use, or precommercial, where no wood is utilized.

Salvage or Sanitation Harvests - are cuttings by which the dead, dying, damaged, or deteriorating trees are removed to prevent the spread of pests as well as putting this "at risk" wood to use.

Selection Harvest - is a regeneration method used in uneven-age stands, or to create uneven-age stands, in which individual trees or groups of trees are removed. Some trees in each age class are removed including mature trees, poorly-formed trees, and trees of undesirable species.

Shelterwood or Seed Tree Harvests - are regeneration methods designed to create an even-aged timber stand. These harvests remove the mature stand leaving only a few trees for seed or to shelter the new stand.

Clearcutting - a regeneration method that involves the removal of the entire stand in one cutting to create an even-aged stand. Regeneration is provided for naturally, where desirable tree species seedlings or seed exists, or artificially through planting, where conversion to a more desirable species is recommended.

Prescribed Burning - is generally used as a means of controlling hardwood vegetation in softwood stands. Prescribed burning also improves wildlife habitat, stimulates sprouting seed germination, and encourages the growth of herbaceous plants.

Wildlife Habitat Improvement - Wildlife will generally coexist with any forest management scenario, but the type of wildlife will vary depending on the management system a forester employs. Most wildlife species prefer a varied landscape with many edge and riparian zones. The type of wildlife a forester manages for is largely dependent on landowner objectives but also the type of forest a particular site will support.

Recreational Opportunities - Recreation often goes hand-in-hand with forest management. Hiking, hunting, fishing, cross-country skiing, ATV riding, mountain biking, and bird watching are

only a few of the types of recreation for which a forester might manage a forest. The ultimate decision should be largely based on the objectives of the landowner.

Non-Timber Forest Products - This area of forest management can work simultaneously with other forest management practices and is more developed in some regions of the United States such as the Pacific Northwest. It may be a hobby for some landowners yet can also generate a significant cash income for other landowners. Such things as Ginseng, St. John's Wort, and a whole host of mushroom species are items that a forester should be aware of and could be managing for given proper site conditions.

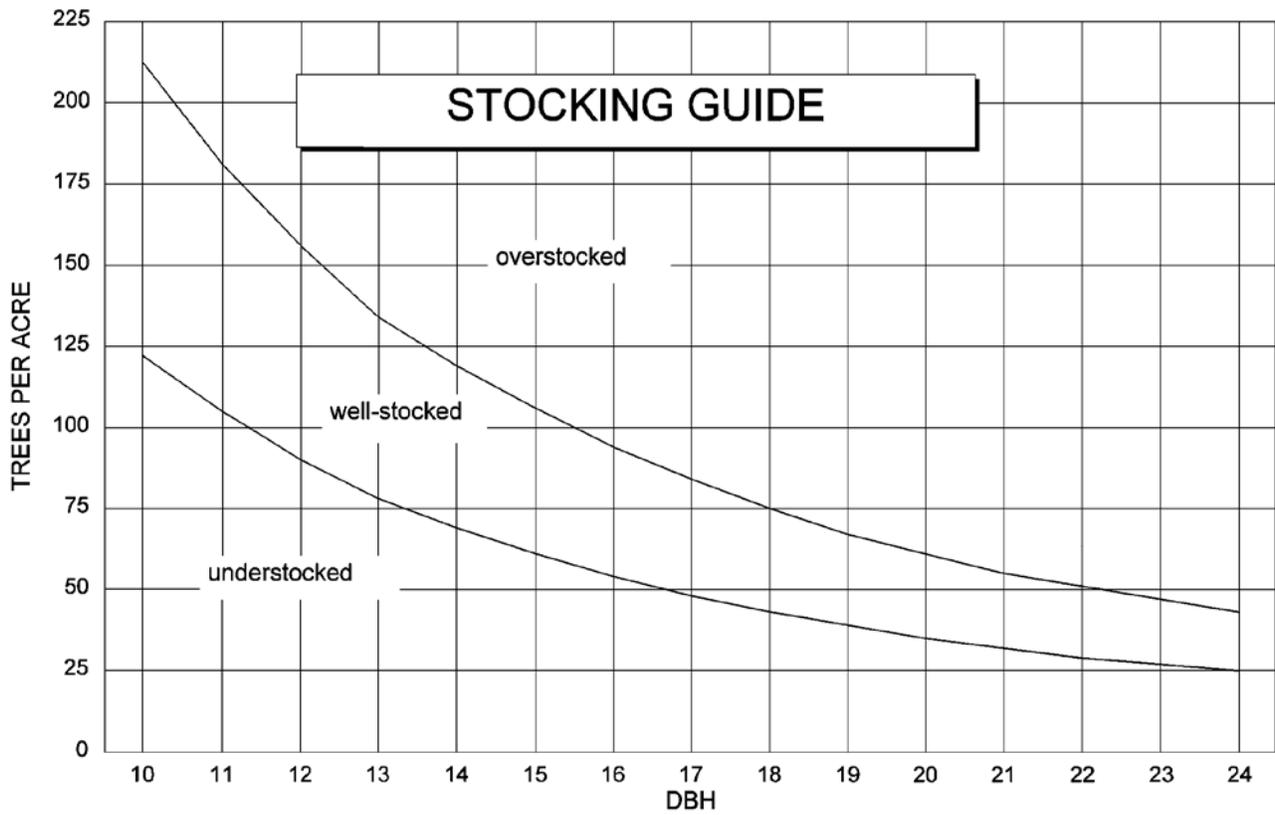


Figure 9. Method of determining stocking.

VOLUME TABLE

To use this table, first measure the diameter at breast height (DBH) of a tree and place it into the proper even 2-inch diameter class. Next measure the merchantable height of the tree in 16-foot logs to the nearest full half log. Read down the left hand column until you come to the row containing the DBH. Then, move across from left to right until you come to the column containing the tree merchantable height at the top. At the intersection of that row and column you will find the merchantable volume of the tree. Read and record each tree volume directly and separately. **FOR CONTEST PURPOSES, DO NOT USE THE VOLUME TABLE ON THE TREE SCALE STICK.**

International ¼ inch Log Rule -- Form Class 78

VOLUME (board feet) BY NUMBER OF 16-FOOT LOGS

DBH	1	1½	2	2½	3	3½	4	4½	5
10	36	48	59	66	73	-----	-----	-----	-----
12	56	74	92	106	120	128	137	-----	-----
14	78	105	132	153	174	187	200	-----	-----
16	106	143	180	210	241	263	285	-----	-----
18	136	184	233	274	314	344	374	-----	-----
20	171	234	296	348	401	440	480	511	542
22	211	290	368	434	500	552	603	647	691
24	251	346	441	523	605	664	723	782	840
26	299	414	528	626	725	801	877	949	1,021
28	347	482	616	733	850	938	1,027	1,114	1,201
30	403	560	718	854	991	1,094	1,198	1,306	1,415
32	462	644	826	988	1,149	1,274	1,400	1,518	1,637
34	521	728	934	1,119	1,304	1,447	1,590	1,727	1,864
36	589	826	1,063	1,274	1,485	1,650	1,814	1,974	2,135
38	656	921	1,186	1,428	1,670	1,854	2,038	2,224	2,410
40	731	1,030	1,329	1,598	1,868	2,081	2,294	2,494	2,693

FOREST EVALUATION SCORE SHEET

Name _____

Total Score _____

I. SITE EVALUATION: Circle (A) Soil Depth, (B) Slope Percent, (C) Aspect, and (D) Slope Position as they apply to the area. (25 Points)

A. Depth of Soil	Deep - 24" or more						Shallow - less than 24"					
B. Slope Percent	Rolling 0-20%		Steep 21-40%		Very Steep 41%+		Rolling 0-20%		Steep 21-40%		Very Steep 41%+	
	NE	SW	NE	SW	NE	SW	NE	SW	NE	SW	NE	SW
D. Slope Position												
Bottom	I	II	I	II	I	II	I	II	I	III	II	III
Lower 1/3	I	II	I	II	I	III	I	III	II	III	III	IV
Middle 1/3	I	II	II	III	II	III	II	III	III	IV	IV	IV
Upper 1/3	II	III	III	III	IV	IV	III	IV	III	IV	IV	IV

E. Forest Land Capability Class: Determine the proper class by drawing a line down from the **Aspect** circled and across from the **Slope Position** circled. The Roman numeral where these lines intersect indicates the class. **Circle the class below.**

I. Excellent II. Good III. Fair IV. Poor

Part I Score _____

II. FOREST STAND EVALUATION: Check the correct answer in each section A-F. (25 Points)

A. Grazing Damage

Grazed _____
 Ungrazed _____

D. Forest Type

Hard Pines _____
 Mixed Oaks _____
 White Pine _____
 Cove Hardwoods _____
 Red Oak, White
 Oak, Hickory _____
 Northern
 Hardwoods _____

E. Stand Origin

Seedling _____
 Sprout _____
 Mixed _____
 Plantation _____

B. Fire

Unburned _____
 Wildfire _____
 Prescribed Fire _____

F. Stocking

Under stocked _____
 Over stocked _____
 Well stocked _____

C. Size Distribution: (There may be more than one answer)

Seedling _____ Sapling _____ Pole _____ Sawtimber _____

Plot size _____

Part II Score _____

III. FOREST INVENTORY (35 Points)

Plot Size _____

Tree Number	Tree Species (1 point)	Crown Class (1 pt)	DBH (1 pt)	Merch. Height (1 point)	Board-foot Volume	Tree Value
1						
2						
3						
4						
5						
Total Board Foot Volume and Tree Value in Plot						
Per acre values (7.5 points each)						

Crown Class: D = dominant, C = co-dominant,
I = intermediate, and S = suppressed

Part III Score _____

IV. PRACTICES RECOMMENDED: Mark those practices you recommend.
(15 Points)

10. Which species (1 or more) would you favor on this site? _____
11. Protect the area from wildfire. Report any fire to the state forestry agency _____
12. Clearcut the stand and plant with a desirable species _____
13. Conduct a shelterwood or seed-tree harvest _____
14. Use Best Management Practices such as seeding landings and haul roads, installing waterbars to prevent erosion, leaving buffer strips along streams, minimizing stream crossings, and abiding by the Sustainable Forestry Guidelines _____
15. Manage stand for non-timber forest products _____
16. Conduct a selection harvest _____
17. Manage stand for wildlife habitat improvement _____
18. Stand is not yet merchantable, leave alone to grow _____
19. Conduct a prescribed burn _____
20. Clearcut the stand and allow for natural regeneration _____
21. Manage stand for recreational opportunities _____
22. Conduct a salvage or sanitation cutting _____
23. Conduct a thinning _____
24. Fence the area from livestock _____

Part IV Score _____

SCORING METHOD FOR INDIVIDUAL COMPETITION

Individual scores for the State 4-H Forestry Field Day are determined by the method illustrated in the table below.

<u>Event Categories</u>	<u>Individual Score</u>
Forestry Written Examination	50
Tree Identification	50
Forest Health -- Insects	25
Forest Health – Diseases	25
Topographic Maps	40
Compass and Pacing	50
Forest Evaluation	100
TOTALS	<hr/> 340

The maximum score an individual contestant may achieve is 330 points.

FORESTRY CONCEPTS AND FACTS

The following concepts and facts cover the broad range of forestry. An understanding of each statement will benefit resource managers, well rounded citizens, and 4-H forestry members. Some are so logical or simple that they may be taken for granted and overlooked.

Characteristics, Distribution, and Status of Forest Resources

1. Trees have distinctive characteristics by which they can be identified.
2. Trees depend upon water, soil nutrients, sunlight, and air for growth.
3. Climate, soil, and topography influence the natural range and distribution of the different types of forest communities.
4. Forest communities influence their climate and their soil.
5. Forest litter, humus, and roots give forest soils an exceptional ability to absorb moisture and resist erosion.
6. In the forest some organisms are adapted to living in the forest soil, some on the forest floor, some in the undergrowth, and some in trees.
7. Forests are constantly undergoing change, and as they mature and are harvested or die, some species of plants and animals may be replaced by others.
8. The interrelationships among the plant and animal members of forest communities and their environments determine the characteristics of a particular forest.
 - a. Each plant and animal in a forest community influence that community.
 - b. Forest communities influence the plants and animals of which they are composed.
9. Fires, diseases, insects, man, and animals may be harmful or beneficial to the forest.
10. Some lands are better adapted for the growing of forests than for other uses.
11. Forests have certain characteristics which make them attractive for recreational activities.
12. An expanding population and new uses for forest products and services make necessary more intensive multiple purpose management of forest resources.

Understanding the Uses of Forest Resources and Their Importance to Humans

1. The original forests of the nation were primary sources of building the nation.
2. Forests yield many essential products for human use.
3. Many communities are highly dependent upon local forests, forest industries, and forest recreation for economic stability.
4. New uses for the products of the forest are being discovered through research and development.

5. Forests provide a wide variety of recreational opportunities.
6. Forests are important in helping to protect watershed from floods and droughts.

Understanding Problems and Techniques of Management

1. Forests can be managed to produce a continuous supply of wood and wood products, wildlife, water, and recreational opportunity.
2. Foresters use various practices in managing forest resources:
 - a. Insects and disease control
 - b. Fire control
 - c. Harvesting practices
 - d. Thinning and pruning operations
 - e. Reforestation
3. Volume and growth data are essential in determining management practices necessary to produce the optimum amount of forest products.
4. Research is essential for the development of new and improved forest management practices and the more efficient utilization of forest products and services.

Understanding Policy and Administrative Techniques

1. Public use of forest land carries an obligation for good citizenship.
2. Small woodland owners control a major portion of commercial forest lands which are a potential source of larger quantities of forest products and services.
3. The woodland owner can obtain technical advice and assistance in forest management from many public and private organizations and agencies.
4. Current state and federal programs provide financial assistance as incentives for better management of forest resources.
5. Many progressive public and private owners of forest lands are managing forests for multiple uses rather than solely for timber production.
6. Forest owners have responsibilities as well as rights in the management and use of forests under democratic living.
7. Cooperation between public agencies, private owners, and the general public is necessary in protecting forests against fires, diseases, insects, and excessive animal populations.
8. Policy decisions must be made to settle differences of opinion which arise from competing uses of the forests.

Pennsylvania Forestry Facts

1. The forests of Pennsylvania provide a vast array of benefits including recreational opportunities, habitat for wildlife, clean water, and renewable forest products.
2. Pennsylvania's forests are composed of two major forest types: Northern Hardwood (38%) and Oak/Hickory (47%).
3. Species such as red maple, black cherry, northern red oak, and sugar maple are the most prevalent trees in the state and comprise the largest volume of sawtimber.
4. Nearly 60% of Pennsylvania's 28 million acres is forested. This amounts to almost 17 million acres. Pennsylvania has more forested acres today than it did in 1955.
5. Private forest landowners own approximately 70% (12.5 million acres) of the forestland in Pennsylvania. There are over 500,000 private forestland owners in the state.
6. The largest government land managers in Pennsylvania include the Bureau of Forestry, the Game Commission, and the U.S. Forest Service.
7. Pennsylvania's forest products industry generates \$5.5 billion in sales annually and employs nearly 90,000 individuals at over 3,000 facilities across the state.
8. The state's forest products industry includes foresters, loggers, sawmills, wood concentration and distribution facilities, veneer producers, paper companies, pallet companies, and value-added manufacturers.
9. The forest products industry has a presence in every county in the state. Lancaster County has the most establishments and employees.
10. Nationally, Pennsylvania ranks number one in hardwood production.

USA Forestry Facts

1. America's forests cover about 737 million acres, or 32% of the nation's land area.
2. America's forests still cover about 70% of the area they covered when the Pilgrims landed in 1620.
3. Private individuals own about 59% of the U.S. forest land base; local, state and federal governments own about 27%; and the forest products industry owns about 14%.
4. Growth rates exceed harvest rates in America's forests by a wide margin. In 1992 net growth was 21.6 billion cubic feet and harvest was only 16.3 billion cubic feet.
5. More than 244 million acres, about 33% of America's forests, are preserved in wilderness areas, national parks, wildlife refuges, and other parks and preserves where no commercial activity is permitted.
6. The U.S. is a net importer of most raw materials used to sustain the domestic economy, including wood and wood products.
7. The U.S. population is presently growing at the rate of 1% each year. If this rate is sustained the population will double in less than 100 years.
8. The per-person use of wood in the U.S. is about 80 cubic feet each year, an increase of more than 30% since 1970.
9. Wood is the only natural resource on earth that is at once renewable, recyclable, reusable, and biodegradable.
10. The energy required to grow our wood supply is free. It comes from the sun.

GLOSSARY

Abney Level - An instrument used to determine the percent of slope of a site.

Aspect - A compass reading taken facing down a slope in the direction water would run, give the compass direction of a slope.

Best Management Practices (BMPs) - A practice or combination of practices, that is determined by a state to be the most effective, practicable means of preventing or reducing the amount of pollution generated by nonpoint sources (such as managed forests) to a level compatible with water quality goals.

Clinometer - Height measuring device.

Conservation - Gifford Pinchot, a turn of the century forester closely associated with President Teddy Roosevelt, applied the word to describe a natural resource philosophy. It meant "wise use." Through the years it has taken on an extended meaning that really says "wise use over a period of time." The time factor forces us to consider the consequences of current use compared to future use.

Coppice - A stand of forest originating from the stumps or roots of trees previously cut. Most hardwood species sprout readily when cut young. Very few conifers will sprout from the stump.

Crown Class - Tree crowns are classified as to the position in which they are found. The following are the main generally recognized classes.

Dominant - Trees with crowns that extend above the average of the tree crowns and receives light from directly above and some from the sides.

Co-Dominant - Trees with crowns that form the general level of the crown cover and receive full light from the top, but very little from the sides.

Intermediate - Trees that are shorter than the two preceding classes but with some branches extending into the general crown cover. Receives little light from above and none from the sides.

Suppressed - Trees with crown entirely below the general crown level and receiving no direct light either from above or below.

Cull - Tree or log of merchantable size, but no market value.

DBH - Diameter of a tree at breast height or 4 1/2 feet above ground.

Duff - Often referred to as litter which is made up of materials of the upper layer of the forest floor. This includes freshly fallen leaves, twigs and slightly decomposed organic matter.

Erosion - The wearing away of the soil and minerals by climatic agents such as wind and water.

Exposure - That portion of the slope that is directly in the path of wind, rain, sun. That part of a slope open to action of the elements.

Forest Land Capabilities - The productivity of the land as it is affected by particular location or position on a slope.

Forest Types - A classification of species indicating the majority of the species represented in an area.

Germination - This process occurs when a viable seed meets favorable conditions that will allow it to grow.

Girdle - To chop or remove a strip of bark or a section of wood containing the food-carrying tissue of a tree in an even strip from the perimeter of the tree or twig.

Harvest - The removal of marketable products from the forest.

Mature Tree - A tree that has reached a maximum growth that the forest manager decides is a merchantable product.

Multiple-Land-Use - A term used to indicate the management of timber wildlife and recreation in an integral, consolidated program.

Merchantable Height - A term used to indicate the marketable length of a tree.

National Forests - These differ from National Parks in that recreation is not their only use. Recreation may be a primary use in some part of the national forest. For example, there are more acres of Wilderness areas in national forests than national parks. The national forest system administers 154 forests and 19 grasslands. On most national forest land timber, water, wildlife, recreation, and grazing are compatible resources. These are managed for productive and sustained yields according to the land's capability.

National Parks - The National Park Service was established by Congress to promote and regulate the use of national parks, monuments, and reservations and to conserve the scenery and the natural and historic objects and the wildlife therein. The Park Service administers 295 separate areas. The Service manages some areas for historical or recreational uses. Each of the 35 national parks was established to preserve a unique natural area for our enjoyment and study. National Parks are confused with national forests.

Old Growth - This term describes eastern forests and virgin western forests with trees over 100 years of age.

Partial Cut - Method of cutting mature trees such as shelterwood cut, selection cut, or seed tree cut.

Pole Timber - A young tree that is 4" to 10" in DBH.

Prescribed Burn - Controlled burning to enhance forest management techniques in silviculture, wildlife management, fire hazard control, etc.

Preservation - In natural resources, other than wood preservation, this term is related to land use. The meaning stems from 19th century land reserves wherein areas and resources were set aside for limited or restricted use and development. Preservation often restricts land to recreation or scientific study. Preservation may be contrasted to the principle of multiple use which rather intensively develops one or more of an area's resources.

Reproduction - A natural establishment of seedlings or sprouts 0-1" DBH.

Residual Stand - That portion of trees left after any partial cut.

Sanitation Cutting - The removal of dead, damaged, or susceptible trees; essentially to prevent the spread of pests or pathogens and so promote forest hygiene.

Sawtimber - A tree greater than 10" DBH that can be sawn into lumber.

Sapling - A young tree from 1" to 4" DBH.

Seedling - A tree grown from seeds, less than 1" DBH

Silviculture - A term used to indicate the establishment, development, care, and reproduction of stands of timber.

Site - The combination of biotic, climatic, and soil conditions with the ecological factors of an area to produce forests or other vegetation.

Slope Position - A particular location on a slope as upper, middle, or lower slope; ridge top; or bottom land. A specific topographic location.

Sprout - A tree originating from a root or stump.

Stocking - A measure of the proportion of the area actually occupied by trees.

Streamside Management Zone (SMZ) - A strip of land adjacent to a water body or stream channel where soils, organic matter and vegetation are managed to protect the physical, chemical and biological integrity of surface water adjacent to and downstream from forestry operations. An SMZ also may be called a "filter strip" or "buffer zone."

Sustainable Forestry Initiative (SFI) - A comprehensive program of forestry and conservation practices designed to ensure that future generations of Americans will have the same abundant forests and wildlife that we enjoy today. SFI is sponsored by the American Forest & Paper Association (AF&PA). AF&PA member companies have agreed to use sustainable forestry practices on the forestland they manage and to promote sustainable forestry on the forestlands of others.

Sustained Yield - Management of a forest stand to provide a constant supply of timber and revenue.

Timber Stand Improvement (TSI) - Any practice designed to improve a stand of timber by removal of vines, culls, and undesirable species.

Wilderness - In the strictest sense, this means that an area that has never been developed by man. A 1964 Wilderness Act defined it thus: "A Wilderness, in contrast with those areas where man and his own works dominated landscape, is hereby recognized as an area where the earth and its community of life are untrammelled by man, where man himself is a visitor and does not remain." In common use the word is associated with these undeveloped areas and those set aside with a little development. In some cases man-made items are dismantled to reduce the area to a primitive state. Under these broader uses some roadless areas are considered wilderness when the access is limited to hiking, canoeing, or horseback riding and the use is set aside for recreation. To most of the general public, wilderness experiences are gained in a number of settings involving wild but not necessarily true Wilderness areas.

Wild Fire - Fires burning out of control regardless of how or why they were started.

Wolf Tree - A tree that occupies more than its fair share of growing space.

SUGGESTED FORESTRY REFERENCES

- 1) *Advancing in Forestry. 4-H Forest Resources Advanced Guide*. Penn State Cooperative Extension. Hansen R.S., S.S. Smith, and J.C. Finley. 2000. The Pennsylvania State University. 60 p.
- 2) *Trees+Me=Forestry*. 2nd Edition. Penn State Cooperative Extension. Hansen R.S., J.C. Finley, and S.S. Smith. 2006. The Pennsylvania State University. 60 p.
- 3) *Forestry Handbook*. SAF, 1989. Jules Kazimir, Dept. 8-0318, Wiley- Interscience, A Division of John Wiley & Sons, Inc., 605 Third Avenue, New York, New York 10158. Price--\$54.95
- 4) *Important Trees of the Eastern United States*. FS-466. October 1991. USDA FS 112pp. (Available from the USDA Forest Service or your State Forester.)
- 5) *Know Your Trees*. Identification Book of the American Forestry Association. American Forestry Association, 1319 Eighteenth Street N.W., Washington, D.C. 20036. 374 pp.
- 6) *The Stewardship of Northern Hardwoods: A Forest Owner's Handbook*. 1995. State University of New York, College of Environmental Science and Forestry, 1 Forestry Drive, Syracuse, NY 13210.
- 7) *Forests and Forestry* - 5th edition, by Holland and Rolfe. 1997. Interstate Publishers, Inc., Danville, Illinois.
- 8) *Common Trees of Pennsylvania*, DCNR, Bureau of Forestry.
<http://www.dcnr.state.pa.us/forestry/commontr/index.aspx>

Additional Reference for Insects and Diseases

The two references listed below are additional references that may be helpful in training for the Insect and Disease Identification contests. However, they are not “Official” references for the Insect and Disease Identification contests.

Insects That Feed on Trees and Shrubs, by Warren T. Johnson and Howard H. Lyon. 1976.
Cornell University Press, Sage House, 512 East State St., Ithaca, New York 14850.

Diseases of Trees and Shrubs, by Wayne A. Sinclair, Howard H. Lyon and Warren T. Johnson.
1987. Cornell University Press, Sage House, 512 East State St., Ithaca, New York 14850.