INTRODUCTION

The New York State 4-H Forestry Invitational is designed to help NYS youth learn more about forests, forestry skills and forest management. The State competition is designed to educate all youth and to select the NYS team that will be sent to the National 4-H Forestry Invitational in West Virginia.

4-H Foresters participate in forestry skills and knowledge events including:

1. Tree Identification
2. Tree Measurements
3. Compass and Pacing
4. Topographic Map Contest
5. Insect Identification
6. Disease Identification
7. Forestry Bowl- Exhibition only

The NYS manual is taken from the National Invitational Manual. All of the events are the same only the number of required trees, insects, and diseases have been reduced to reflect the ecosystems of New York State. The National Written Exam and Forest Evaluation events are not included at the NYS Invitational.

Although competitive in nature, the Invitational is managed as an extensive forestry educational experience. It provides an opportunity for exploration of the broad aspects of forestry.

The NYS 4-H Forestry Invitational is managed by Cornell Cooperative Extension.

Team Competition

The NYS 4-H Forestry Invitational will select 4 youth and an alternate to prepare for the National 4-H Forestry Invitational in West Virginia. Youth ages 14-19 can compete at the State event.
Currently youth compete as individuals and the top 5 are selected.

OBJECTIVES

The objectives of the New York State 4-H Forestry Invitational are to provide the opportunity and atmosphere for 4-H members from across the state to:

1. Develop leadership talents and to work toward achieving character development and effective citizenship

2. Develop an appreciation of the importance of conserving forests as a sources of income, raw materials, and enjoyment necessary for quality living; and

3. Acquire information and understanding of practical forestry skills in forest management and the use of forest and wood products.

In addition to meeting these objectives, the event encourages and promotes increased knowledge of forests and forestry by 4-H members, volunteer leaders, and Extension agents at local, county, and state levels. Although they may never be forest landowners, as future adults, 4-H members will learn to weigh and understand renewable resource management needs. Preparation of youth for this event: (1) presents, identifies, and locates the renewable resources of the forest environment such as forest products, water, outdoor recreation, wildlife, and selected grazing; (2) establishes a natural resource value system for participating 4-H members; (3) helps 4-H landowners understand the techniques of managing their land and improving the understanding of 4-H'ers as potential landowners; and (4) furnishes facts and scientific procedures for future landowners, administrators, and planners who are not professional land managers.

The Competitive Team Approach, which is used in the National 4-H Forestry Invitational, develops at all levels the following benefits: (1) Intensified learning opportunities using correct management information and factors concerning forest resources; (2) Standardizes, or presents, similar references, materials, guides, and understanding on tree identification, forest measurements, and use of silvicultural problems of management, insects, diseases, etc.; (3) Encourages rural, suburban, and urban teens to share ideas and visit potential management areas with a new perspective of 4-H forestry; (4) Provides new insight to senior members who serve as teen leaders with younger 4-H members in beginning forestry projects; (5) Allows teen members to formulate goals and discuss management procedures with other 4-H'ers and with professional land managers; and (6) Provides a new dimension for older 4-H member activities and incentives for younger members beyond the present project-oriented program.

GENERAL RULES AND REGULATIONS

This event will comply with all "Policies and Guidelines for National 4-H Competitive Events" as approved by USDA Extension Service, 1990.

Contestants and Eligibility- National Rules
NYS Competitors must be eligible to compete at the National Invitational.

1. Each state is allowed to enter only one team or up to two individual contestants. A team will consist of no less than three and no more than four official entrants who are 4-H members in their state during the current year. If a state is unable to muster a team, it may send up to two contestants to compete in the individual events only.

2. All contestants must have passed their 14th birthday on or before December 31 of the preceding year, and must not have passed their 19th birthday on January 1 of the contest year.

3. An individual may enter the National 4-H Forestry Invitational event only once.

4. Contestants in the National 4-H Forestry Invitational must not have participated in official post-secondary (university, college, junior college, or technical school) competitive events of a similar nature in the same subject matter area. Neither can he/she be a member of a post-secondary team undergoing training in preparation for an event. (For example, a contestant who has competed in an official collegiate forestry contest, either on or off campus, is ineligible to compete.) The State 4-H Program Leaders are responsible for determining the eligibility for participants in National 4-H Competitive Events from their respective States.

General Contest Rules

1. Staff and volunteers not competing in the current Invitational are welcome to observe. They may be asked to assist in the Invitational administration.

2. To be eligible for the National Team, NYS competitors must compete in all NYS events.

3. Each contestant will bring a clip board or writing board, pencil, and calculator. Contestants are encouraged to wear field clothing and heavy shoes.

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 25 trees as found in a natural outdoor condition or from branches or other parts displayed, and 25 herbarium specimens of trees found in sections of the United States other than the Invitational site. 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 balsam instead of balsam fir, 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. Two points will be given for the correct common name. One-half point will be deducted for each name misspelled. Common names must be those used in the "official tree list." Maximum score for this event is 100 points.

OFFICIAL NYS TREE LIST

Common Name	Scientific Name
Gymnosperms (Conifers or Softwoods)	
balsam fir	*Abies balsamea Mill.*
white fir	*Abies concolor Lindl.*
eastern redcedar	*Juniperus virginiana L.*
tamarack or eastern larch	*Larix laricina K. Kock.*
white spruce	*Picea glauca Voss*
blue spruce	*Picea pungens Engelm.*
red spruce	*Picea rubens Sarg.*
red pine	*Pinus resinosa Ait.*
pitch pine	*Pinus rigida Mill.*
eastern white pine	*Pinus strobus L.*
Douglas-fir	*Pseudotsuga menziesii Franco*
baldcypress	*Taxodium distichum Rich.* northern
white-cedar or arborvitae	*Thuja occidentalis L.* eastern
hemlock	*Tsuga canadensis Carr.*

Angiosperms (Broadleaf Trees or Hardwoods)

boxelder	*Acer negundo L.*
red maple	*Acer rubrum L.*
silver maple	*Acer saccharinum L.*
sugar maple	*Acer saccharum Marsh.*
Norway maple	*Acer platanoides L.*
yellow birch	*Betula alleghaniensis Britton*
tree of heaven	*Ailanthus altissima*
Norway maple	*Acer platanoides*
sweet birch or black birch	*Betula lenta L.*
paper birch	*Betula papyrifera Marsh.*
river birch	*Betula nigra L.*
pignut hickory	*Carya glabra Sweet*
shagbark hickory	*Carya ovata K. Koch.*
mockernut hickory	*Carya tomentosa Nutt.*
hackberry	*Celtis occidentalis L.*
flowering dogwood	*Cornus florida L.*
American beech	*Fagus grandifolia Ehrh.*
white ash	*Fraxinus americana L.*
honeylocust	*Gleditsia triacanthos L.*
American holly	*Ilex opaca Ait.*
butternut or white walnut	*Juglans cinerea L.*
black walnut	*Juglans nigra L.*
sweetgum	*Liquidambar styraciflua L.* yellow-
poplar or tuliptree or tulip-poplar	*Liriodendron tulipifera L.*
cucumbertree or cucumber magnolia	*Magnolia acuminata L.*
sycamore or American sycamore	*Platanus occidentalis L.*
eastern cottonwood	*Populus deltoides Bartr.*
quaking aspen	*Populus tremuloides Michx.*
black cherry	*Prunus serotina Ehrh.*
white oak	*Quercus alba L.*
bur oak	*Quercus macrocarpa Michx.*
northern red oak	*Quercus rubra L.*
black oak	*Quercus velutina Lam.*
black locust	*Robinia pseudoacacia L.*
black willow	*Salix nigra Marsh.*
sassafras	*Sassafras albidum Nees.*
American basswood	*Tilia americana L.*
American elm	*Ulmus americana 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 teams for the Tree Identification Contest. This web site can be accessed from the “Training References” section of the National Invitational web site. Individual species listed on the Invitational’ s Tree Identification web pages are linked to the Virginia Tech Dendrology web site. Other tree identification web sites are listed for additional help in training.

TREE IDENTIFICATION SCORE SHEET				
County	Group No.	Contestant's Name		
No.	Common Name	Correct +2	Misspell -1/2	Score
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
			Contestant's 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 10 insects or examples of their damage. Specimens will be selected from those on the "Official List of Insects."

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. The common name must be the one used in the "Official List of Insects."

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 National Invitational web site.

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.

Insect and Disease Web Sites

The Invitational web site provides links to other insect and disease identification web sites as additional training reference aids. These other web sites are not "Official References" for the contest.

OFFICIAL NYS INSECTS LIST

Common Name	Scientific Name
Asian longhorned beetle	Anoplophora glabripennis (Motschulsky)
balsam woolly adelgid	Adelges piciae (Ratzeburg)
beech scale	Cryptococcus fagisuga (Lindinger)
bronze birch borer	Agrilus anxius (Gory)
caterpillar hunter beetle	Calosoma sycophanta (Linnaeus)
checkered beetle	Thanasimus dubius (Fabricius)
Douglas-fir tussock moth	Orgyia pseudotsugata (McDunnough)
eastern tent caterpillar	Malacosoma americanum (Fabricius)
emerald ash borer	Agrilus planipennis (Fairmaire)
European pine sawfly	Neodiprion sertifer (Geoffroy)
fall webworm	Hyphantria cunea (Drury)
forest tent caterpillar	Malacosoma disstria (Hubner)
gypsy moth	Lymantria dispar (Linnaeus)
hemlock woolly adelgid	Adelges tsugae (Annand)
Ips engraver beetles	Ips spp.
Japanese beetle	Popillia japonica (Newman)
locust borer	Megacyllene robiniae (Forster)
locust leafminer	Odontota dorsalis (Thunberg)
Nantucket pine tip moth	Rhyacionia frustrana (Comstock)
pales weevil	Hylobius pales (Herbst)
periodical cicada	Magicicada septendecim (Linnaeus)
pine needle scale	Chionaspis pinifoliae (Fitch)
red oak borer	Enaphalodes rufulus (Halderman)
redheaded pine sawfly	Neodiprion lecontei (Fitch)
smaller European elm bark beetle	Scolytus multistriatus (Marsham)
southern pine beetle	Dendroctonus frontalis
two lined chestnut borer	Agrilus bilineatus (Weber)
white pine weevil	Pissodes strobi (Peck)
whitemarked tussock moth	Orgyia leucostigma (J.E.Smith)

FOREST HEALTH -- INSECTS SCORE SHEET			
County		Contestant's Name	
No.	Common Name	Correct +5 Misspelled -1	Score
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
		Contestant's Score	

FOREST HEALTH -- DISEASES AND HEALTH INDICATORS

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 10 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 LIST OF DISEASES AND HEALTH INDICATORS

Common Name	Scientific Name
artist's conk	Ganoderma applanatum
annosus root disease	Heterobasidion annosum
beech bark disease	Nectria coccinea var. faginata
black knot	Apiosporina morbosa
brown spot needle blight	Scirrhia acicola
cedar-apple rust	Gymnosporangium juniperi-virginianae
chestnut blight	Endothia parasitica
clinker polypore	Inonotus obliquus
dogwood anthracnose	Discula sp.
Dutch elm disease	Ceratocystis ulmi
dwarf mistletoe	Arceuthobium spp
fusiform rust	Cronartium quercuum f.sp. fusiforme
hypoxylon canker	Hypoxylon sp.
lichens	numerous species
nectria canker	Nectria galligena and N. magnoliae
needle casts fungi	Hypoderma sp. and Lophodermium sp.
oak wilt	Ceratocystis fagacearum
red heart of pine	*Phellinus pini* (Thore) Fr.
white pine blister rust	Cronartium ribicola

Descriptions of these diseases appear in the references cited under the Insect Section.

FOREST HEALTH -- DISEASES SCORE SHEET			
County		Contestant's Name	
No.	Common Name	Correct +5 Misspelled -1	Score
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
		Contestant's Score	

TREE MEASUREMENT

Objective

Contestants will learn to measure standing trees in order to estimate the volume of forest products that may be obtained from the trees. Since most timber is bought and sold on a volume basis (usually by board foot volume), it is a good idea to have some estimate of total tree volume, volume per acre and volume by product before selling timber.

Contest Rules

1. 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.

2. A fixed radius plot will be selected and designated for use in this event. Contestants will be required to give the total volume of sawtimber per acre as determined from the sample plot volume. 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).

3. Contestants will identify 15 trees and estimate their diameters, merchantable heights, and volumes. All values will be recorded. Please note - 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. The smallest tree will be 10 inches DBH (diameter at breast height) and one log merchantable height. Merchantable height will be measured from stump height to an 8- inch top diameter, a major fork or serious defect (hollow or point of decay) which affects greater than half the tree's diameter at that point.

4. Tree volumes will be found in the International 1/4-inch volume table furnished at the contest site. Do not use the volume table on the tree scale stick.

5. One point will be awarded for each correct tree identification, two points for each correct DBH, and two points for each correct tree height, for a possible total of 75 points. No points will be awarded for individual tree volumes.

6. After all 15 trees have been measured, contestants will determine the total volume in the plot and the volume per acre. Twenty-five points will be allowed for the correct **volume per acre**. Remember, the total volume in the plot must be multiplied by a 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. Point allocation will be 25 for ±5% of the official volume, 20 points for ±10%, 15 points for ±15%, and no points over ±15%.

Example: If 4,000 bd. ft. is the official volume per acre, then an answer between 3800 bd. ft. and 4200 receives 25 points; 3600 to 3799 and 4201 to 4400 receives 20 points; 3400 to 3599 and 4401 to 4600 receives 15 points; and under 3400 and over 4600 receives no points.

7. Maximum score for this event is 100 points.

MEASUREMENT OF STANDING TREES STUDY GUIDE

When trees are sold as harvested products (sawlogs, veneer logs, or pulpwood), the sale is generally based upon a measured volume. 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.

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 will be explained.

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

If Diameter Measures	Record As
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.	

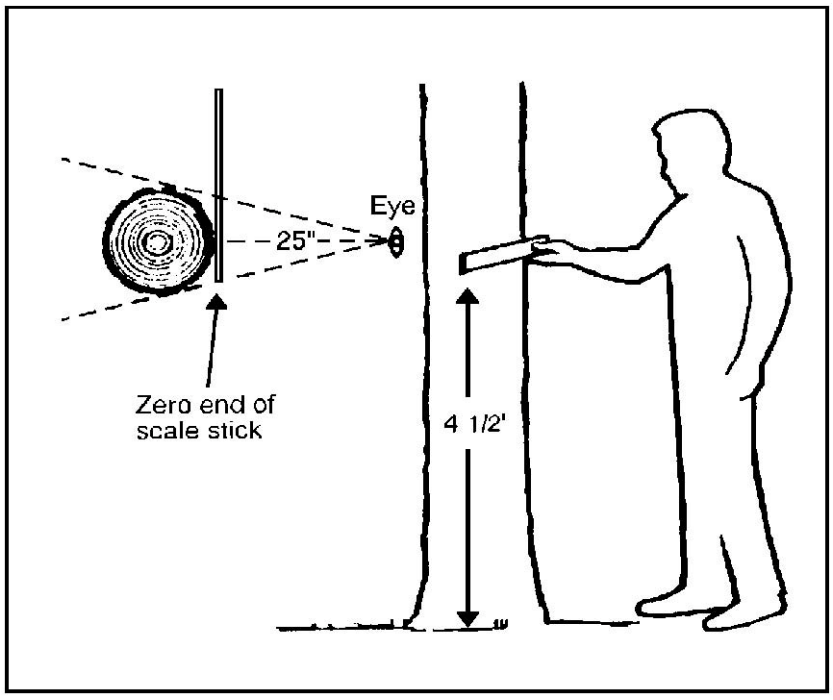

Figure 1. Use of tree scale stick to estimate tree diameter 4 1/2 feet above ground.

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, for purposes of this contest, will be measured from 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.

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.

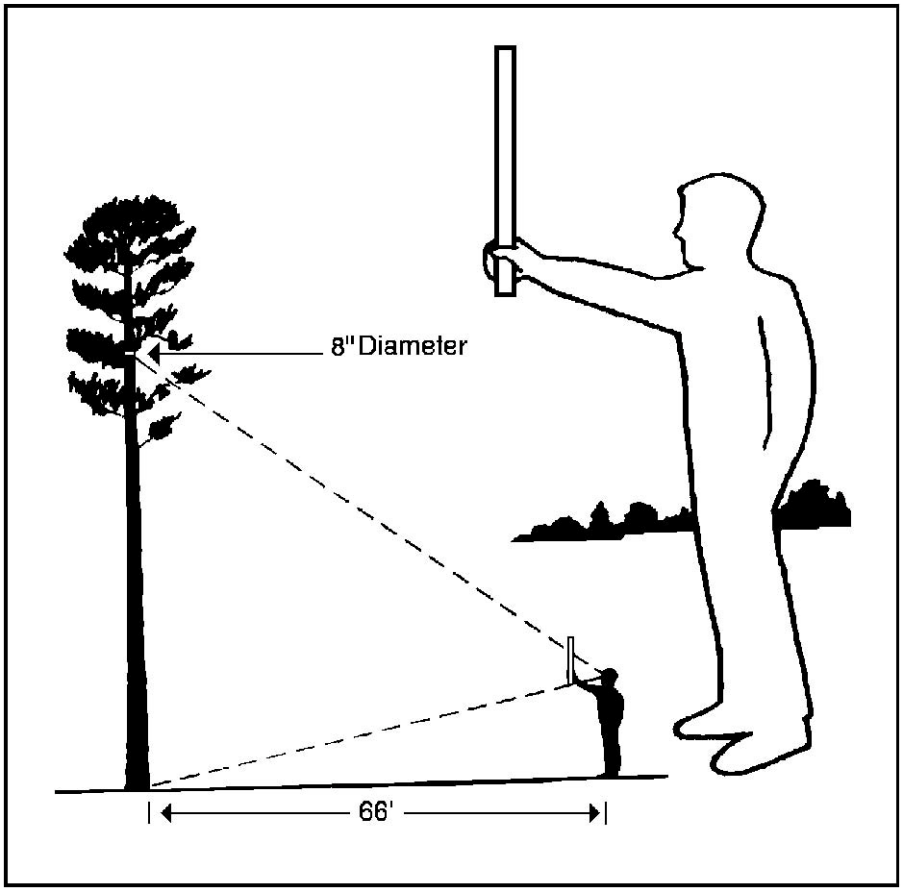

Figure 2. Use of tree scale stick to estimate merchantable height.

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 (see page 15). 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
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**
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

TREE MEASUREMENT SCORE SHEET					
County:		Contestant Name:			
No.	Species (1 Point)	DBH (2 Points)	Height (16 Ft Logs) (2 Points)	Volume Board Feet	Score
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
	Total board foot volume in plot				
(a) Subtotal of Tree Scores (75 points possible)					
(b) Score for Volume Per Acre (25 points possible)					
Contestant Score (a + b)					

COMPASS AND PACING

Objective

Contestants will learn to estimate ground distances by using the pacing method and 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. Successive lines may not be continuous.

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 Silva Ranger mirror-sighting type azimuth or quadrant compass will be used during the contest. A hand-held compass of each type will be provided at the starting corner of each line. A contestant may use his or her own hand-held compass, provided that it is of a type neither more accurate nor more sophisticated than a Silva Ranger compass. Compass declination should be set at zero.

3. Contestants using a quadrant compass are required to use the correct two letter designation with each bearing recorded on the score sheet, for example N 27º W.

4. The course layout will consist of five (5) lines with staked corners. Every effort will be ma avoid slopes over 15 percent, steep ravines, heavy brush, large rocks and wetlands on the contest course.

5. 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 or bearing and the distance for each line, record the measurements on a score sheet, and return the score sheet to the official in charge.

6. Contestants may receive a maximum total score of 100 points. A maximum of 20 points is possible for each of the five lines, 10 points for the correct azimuth or bearing and 10 points for the correct distance. One-half point will be deducted for each degree of error in the azimuth or bearing up to a maximum of 10 points per line. One-half point will be deducted for each foot of error in distance up to a maximum of 10 points per line.

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, that 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 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.)

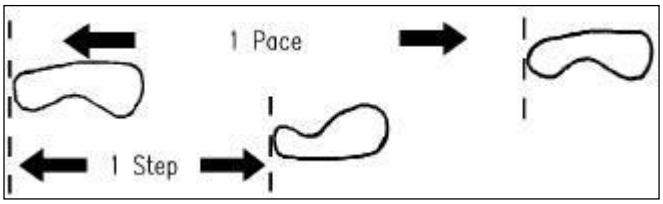

Figure 3. Illustration showing the difference between a step and a pace.

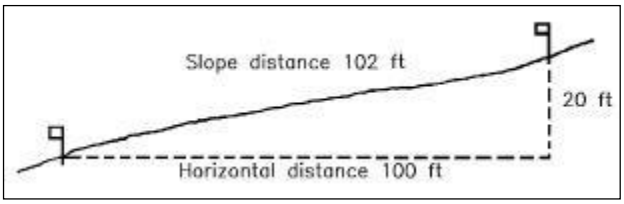

Figure 4.Estimating horizontal distance on a 20 percent slope

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 compasses are designed to measure direction in either azimuths or bearings. Azimuths range from 0º to 360º (Figure 5). Bearings range from 0º to 90º in each of four quadrants (Figure 6).

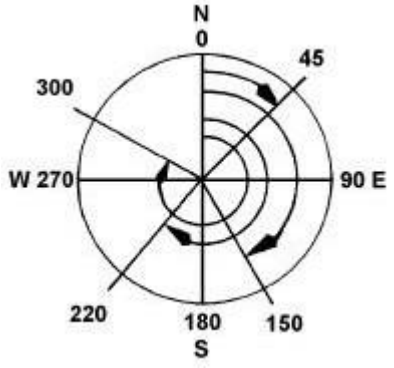

Figure 5. Azimuths are read from azimuth compass

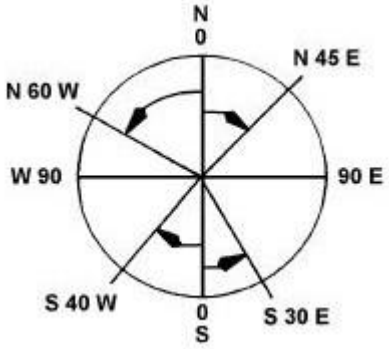

Figure 6. Bearings are read from a an quadrant compass

COMPASS AND PACING SCORE SHEET					
County			**Contestant's Name**		
Line	Azimuth or Bearing	Points	Distance	Points	Score
A-B					
B-C					
C-D					
D-E					
E-F					
				Contestant Score	

TOPOGRAPHIC MAP CONTEST

Objective Constants

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;

4. how to correct the bearing of a line for declination.

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.

Contest Rules

1. The topographic map contest committee will provide mirror-sighting type azimuth compasses for this event. Contestants will **not** be permitted to use their own mirror-sighting type azimuth compasses.

2. The contest committee will also provide the following equipment for the contest event.

   a. 7.5 Minutes Series Map (same map for all contestants)
   b. Rulers

3. The map used in the contest will have 10 symbols and/or features identified on it with labeled arrows pointing to the map symbol or feature that needs identifying.

4. Contestants will have to identify 10 map symbols and features from the following list of 29 topographic map symbols and features (only answers identical to the listed names will be considered correct). Each map symbol or feature is worth three (3) points for a total of thirty (30) points.

ridge
valley
peak
saddle
depression
open area
woodland
marsh
perennial stream
intermittent stream
index contour line
intermediate contour line
primary highway
road

trail
bridge
building
school
house of worship
cemetery
campground
quarry
spring
mine tunnel
tank
gravel pit
railroad – single track
railroad – multiple track
power transmission line

To train for this part of the contest, contestants should study the official training reference material on the National Invitational's web site.

5. Contestants will measure the distance between the two points with a 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 7 points, if answered correctly.

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 personnel at the site.

This bearing is worth 7 points, if within plus or minus 2 degrees of accurate bearing.

7. Contestants will correct the bearing for declination.

This corrected bearing is worth 6 points, if calculated correctly.

8. Instructions will be given to the contestants before beginning the contest.

9. A maximum of 50 points is possible for this contest event.

10. Study materials for this section can be found at the National Invitational web site.

Topographic Map Score Sheet			
State	**Group**	**Contestant's Name**	
	Map Symbol or Feature	**Correct +3 Misspelled -1**	**Score**
A			
B			
C			
D			
E			
F			
G			
H			
I			
J			
		Correct +5	
Distance			
Bearing			
Corrected Bearing			
Elevation Change			
		Contestant's Score	

FORESTRY BOWL

OBJECTIVES

The Forestry Bowl will provide an opportunity for teams of three or four contestants to demonstrate their knowledge of forestry and related subject matter in a competitive setting where attitudes of friendliness, fairness, and excitement prevail. Teams will be established at the State event.

The Forestry Bowl at the NYS Invitational is exhibition only. All competitors are expected to participate.

EQUIPMENT

Panels -- Two interconnecting panels, each to accommodate four contestants plus a moderator panel with suitable controls are to be used. The equipment will be checked prior to the start of each round of competition.

Time keeping device -- A stop watch or other appropriate device is to be used.

Score keeping device -- This may be a blackboard or flip chart.

Questions -- A packet of questions for each round shall be prepared in advance. Each packet shall contain at least 30 questions but not more than 50. If there are several acceptable answers to a question, all answers shall be listed. For the semifinal and final rounds questions may include a visual aid such as a color slide.

Setup -- See diagram on page 30 for a sample bowl contest setup.

OFFICIALS

Moderator (Quiz Master) -- The moderator assumes complete direction of all rounds, asks all questions, designates contestants to answer questions, accepts or rejects all answers unless over- ruled by the referee judges, but may seek interpretation of questions which are ruled on unanimously.

Referee Judges -- One or two judges may be used. The referee judges may rule jointly or individually on the acceptability of an answer. Either both referee judges or one referee judge and the moderator must agree on the acceptability or rejection of a question and/or answer if either is challenged by team captains (See Procedure for Protest 1., page 28).

Time-keeper -- A time-keeper will be used to indicate to the moderator the expiration of the time allowed in which to answer questions. The time-keeper may be one of the referee judges.

Score-keepers -- One or two individuals will keep score on each round. If two score-keepers are used, one will keep score in such a manner that all points awarded or taken away in penalties may be checked; and one will maintain scores visible to the moderator, the contestants, and the viewing audience. A judge may serve as score-keeper.

PROCEDURE OF PLAY

Starting the Contest

1. Teams are assembled and seated at their respective panels.

2. The team captains shall be seated nearest the moderator.

3. The question packet is opened by the moderator.

4. The moderator will give the correct answers, except in the final round. No discussion is permitted.

Part I

5. A coin is tossed to determine which team captain will answer the first question.

6. The second question will be answered by the captain of the opposing team. Succeeding questions will be asked alternately of each team, and rotated among team members, until a total of 24 questions has been asked.

7. Only the designated team member may answer the question. The team member has ten (10) seconds to begin the answer, and ten (10) seconds in which to complete the answer. A request to repeat the question must be made within five (5) seconds, and the question will be repeated only once.

8. If the answer is correct, 10 points will be awarded the team. No points will be given for partial or incorrect answers.

Part 2

9. Part 2 begins with the moderator reading a toss-up question (as with all succeeding questions) until a contestant activates a buzzer.

a. If a buzzer is activated during the reading of any question, the moderator immediately will cease reading the question and the contestant activating the buzzer shall begin the answer based on that portion of the question read.

b. If the answer given is incorrect, or no answer is given, five (5) points are taken from that team's score and the moderator repeats the question. The opposing team then has ten (10) seconds for any member to activate the buzzer and answer the question. If the answer is incorrect, 5 points will be taken from that team's score.

c. If a bonus question is attached to an incorrectly answered toss-up or a toss-up question is unanswered following an activated buzzer, that bonus question is transferred to the next possible toss-up question to which no bonus question is attached.

10. At the completion of the reading of a question or when a buzzer is activated, ten (10) seconds are allowed in which to begin an answer, and another ten (10) seconds are allowed in which to complete the answer. A request to repeat the question must be made within five (5) seconds, and the question will be repeated only once.

11. The answer must be given by the contestant activating the buzzer. It shall be the responsibility of the moderator to determine if an actual answer is started and completed within the time period.

12. If the time in which to answer a question elapses without a contestant activating the buzzer, the question is discarded. If a bonus question was attached to an unanswered toss-up question, the bonus question is then transferred to the next toss-up question to which no bonus is attached.

13. If the toss-up question is correctly answered within the 10-second time limit, that team scores 5 points.

a. If a bonus question is attached to the correctly answered toss-up question, the moderator then reads the bonus question and a 10-second discussion period is permitted for the team consultation to determine the answer. The end of the 10-second period is signaled by the timer. At the signal from the timer, a 10-second period is then permitted for the team captain or designee to begin the answer.

b. Successful completion of the answer will result in that team being awarded 10 points for that bonus question.

c. All parts of the bonus questions must be answered correctly with no partial points permitted regardless of the number of parts of the question answered correctly.

d. Failure to answer a bonus question or failure to answer correctly, results in no penalty (loss of points) to the team.

Completing the Contest

1. The moderator will continue reading toss-up and bonus questions until all toss-up questions and their accompanying bonus questions have been asked or 30 minutes have elapsed, whichever comes first, except the last round which may last 45 minutes or less.

2. Following the final question, the scores of the two score keepers shall be compared. If there is disagreement as to the score of the game, the score that is tabulated on the written score card will be used.

SAMPLE QUESTIONS FOR BOWL

1. A board foot is equivalent to a board that measures: Answer -- 12" wide, 1" thick, 12" long, or 144 cubic inches.

2. The board foot formula is: Answer -- Length in feet x width in inches x thickness in inches divided by 12.

3. Diameter at breast height (DBH) is measured on the tree trunk at what distance above the average ground level? Answer -- 4.5 feet

4. A standard cord of wood is measured: Answer -- 4' x 4' x 8' (128 cubic feet)

5. Habitat is: Answer -- The area where a plant or animal lives.

REFERENCES FOR FORESTRY BOWL AND WRITTEN EXAM

1. National 4-H Forestry Manuals - Units A, B, and C; available from the "Training References" section of the Invitational web site.

2. Forests and Forestry - 5th edition, by Holland and Rolfe. 1997. Interstate Publishers, Inc., Danville, Illinois.

3. Information presented within the "official" Invitational web site links or Invitational CD for species of trees, insects or diseases. The "official" links are the web pages to which each tree, insect or disease species is linked from the Invitational's web site. Refer to the "Training References" section of the Invitational web site or Invitational CD for the "official" tree, insect and disease training pages and the web site links to each tree, insect or disease species.

4. National 4-H Forestry Invitational 2005 Handbook. USDA, Extension Service, 50 pp.

Only those species of trees, insects, and diseases listed in Tree Identification, Forest Health -- Insects and Forest Health -- Diseases and Health Indicators will be addressed in bowl questions.

SCORING

The winning team will receive 100 points. The second place team will receive 90 points. Teams that reach the semifinal round will receive 80 points, the round before that 70 points, etc. All teams will receive the points due for competing in the first round, whether or not they advance.

Spectators will be allowed only for the final round of competition, except when authorized by the Management Committee member supervising the Forestry Bowl.

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 viable seed meet 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 – Trees 4 to 10 inches in diameter

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 – Trees less than 1 inch in diameter

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.

Sapling – Trees from 1 to 3 inches in diameter

Saw timber – Trees more than 10 inches in diameter Seedling -

A tree grown from seed.

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 untrammeled 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 horse back 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.

A SUMMARY OF FEDERAL LAWS AFFECTING FORESTRY

Laws form the legal basis for using and managing our nation's forests. Since 1890, more than 140 laws affecting forestry have been passed by the United States Congress and signed by the President. In the early years most laws enabled or authorized the protection and management of the nation's forests. Many of the laws passed in recent years restrict or regulate the use and management of these forests. Some of the more important Federal laws are described below:

Creative Act of 1891 -- Authorized the President of the United States to set aside public lands bearing forests as public reservations commonly called Forest Reserves.

Organic Administration Act of 1897 -- Provided that the Forest Reserves, later to be called National Forests, were established to improve and protect the forest, to secure favorable conditions of water flow, and to furnish a continuous supply of timber.

Transfer Act of 1905 -- Transferred the administration of the Forest Reserves from the United States Department of the Interior to the United States Department of Agriculture.

Twenty-five Percent Fund Act of 1908 -- Established the procedure for paying the states twenty-five percent of the monies received from national forest timber sales to benefit public schools and public roads in counties where national forests are located. These payments are made in lieu of taxes.

Weeks Law of 1911 -- Authorized purchasing and adding to the National Forest System forested, cut-over, or denuded lands within the watersheds of navigable streams which are necessary to regulate the flow of navigable streams or to produce timber.

Smith-Lever Act of 1914 -- Established a Federal-State Cooperative Extension program to provide education for the public in agriculture and natural resources.

Clarke-McNary Act of 1924 -- Authorized technical and financial assistance to the states for forest fire control and for production and distribution of forest tree seedlings. (Sections 1 through 4 were repealed by the Cooperative Forestry Assistance Act of 1978.)

McSweeney-McNary Act of 1928 -- Authorized a comprehensive Forest Service research program. (This act was repealed and supplanted by the Forest and Rangeland Renewable Resources Research Act of 1978.)

Multiple Use - Sustained Yield Act of 1960 -- Established a policy of multiple use, sustained yield management for the renewable resources of the National Forest System.

McIntyre-Stennis Act of 1962 -- Established a cooperative forestry research program for state land-grant colleges and universities.

Clean Air Act of 1963 -- Gave the Federal government enforcement powers regarding air pollution for the first time. This act and subsequent amendments impact the forest industry by affecting prescribed burning for forest management and emissions from forest products manufacturing plants.

Wilderness Act of 1964 -- Established the National Wilderness Preservation System by setting aside sections of federal forest land as wilderness.

National Environmental Policy Act of 1969 -- Required that environmental considerations be incorporated into all Federal policies and activities, and that all Federal agencies prepare environmental impact statements for any actions significantly affecting the environment.

Federal Water Pollution Control Act Amendments of 1972 -- Established as a national objective restoring and maintaining the chemical, physical, and biological integrity of the nation's water and required area wide planning to prevent future water pollution that could be associated with growth, development, and land use, including timber management.

Endangered Species Act of 1973 -- Provided for the protection and conservation of threatened and endangered fish, wildlife, and plant species. Directs all Federal agencies to utilize their authorities and programs to further the purpose of the act.

National Forest Management Act of 1976 -- Established additional standards and guidelines for managing the national forests, including directives for national forest land management planning and public participation.

Cooperative Forestry Assistance Act of 1978 -- Authorized the Secretary of Agriculture to work in cooperation with State Foresters in nine cooperative forestry assistance programs. Among these programs is the Forestry Incentives Program, a federal cost-share program designed to encourage the management of private forest lands.

Renewable Resources Extension Act of 1978 -- Authorized expanding the forest and rangeland renewable resources portion of the extension education program.

Forest and Rangeland Renewable Resources Research Act of 1978 -- Authorized expanding forest and rangeland renewable resources research.

Reforestation Tax Incentives (part of the Recreational Boating Safety and Facilities Improvement Act of 1980) -- Provided tax credits and deductions for landowners who reforest their property, as an incentive to encourage reforestation.

Food Security Act of 1985 (1985 Farm Bill) -- Established the Conservation Reserve Program. The program was designed conserve 40 to 45 million acres of highly erodible cropland by paying landowners to plant permanent vegetative cover, such as grass or trees, and maintain that vegetative cover for 10 years.

Food, Agriculture, Conservation, and Trade Act of 1990 (1990 Farm Bill) -- Established the Forest Stewardship Program, a program designed to encourage multiple resource forest management on nonindustrial private forest lands. A companion program, the Stewardship

Incentives Program, was designed to provide cost-share assistance funding to encourage the implementation of management practices.

Coastal Zone Act Reauthorization Amendments of 1990 -- Required that states with Coastal Zone Management Programs develop and implement Coastal Nonpoint Pollution Control Programs to control sources of nonpoint pollution (including managed forests) which impact coastal water quality.

SUGGESTED REFERENCES

1. 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

2. Important Trees of the Eastern United States. FS-466. October 1991. USDA FS 112pp. (Available from the USDA Forest Service or your State Forester.)

3. Know Your Trees. Identification Book of the American Forestry Association. American Forestry Association, 1319 Eighteenth Street N.W., Washington, D.C. 20036. 374 pp.

4. 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.

FORESTRY BOWL AND WRITTEN EXAM REFERENCES

1. National 4-H Forestry Manuals - Units A, B, and C; available from the "Training References" section of the Invitational web site.

2. Forests and Forestry - 5th edition, by Holland and Rolfe. 1997. Interstate Publishers, Inc., Danville, Illinois.

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4. National 4-H Forestry Invitational 2007 Handbook. USDA, Extension Service, 50 pp.