

2015 Ohio 4-H Forestry Competition

Handbook

| | Page |
|--|------|
| Introduction | 2 |
| Objectives | 3 |
| General Rules and Regulations | 4 |
| Tree Identification | 5 |
| Forest Health -- Insects | 8 |
| Forest Health -- Diseases | 9 |
| Tree Measurement | 11 |
| Compass and Pacing | 14 |
| Topographic Map Contest | 16 |
| Forestry Written Examination | 18 |
| Scoring Method for Individual and Team Competition | 18 |
| Forest Understandings and Facts | 19 |
| Glossary | 21 |
| A Summary of Federal Laws Affecting Forestry | 24 |
| References | 26 |

This handbook was adapted from the National 4-H Forestry Invitational Handbook.

<http://www.4hforestryinvitational.org/>
<http://u.osu.edu/4hforestry/>

INTRODUCTION

The Ohio 4-H Forestry Competition is designed to select the winning team from the state to represent Ohio in the National 4-H Forestry Invitational. Selected aspects included in the national event will be completed to allow 4-H Foresters to participate in competition events to select a representative team and to experience competition events to prepare for the National Invitational.

The National 4-H Forestry Invitational is the National Championship of 4-H Forestry. Each year, since 1980, teams of 4-H Foresters from many different states come to Jackson's Mill State 4-H Camp near Weston, West Virginia, to meet, compete and have fun. During two days of competition 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. Forestry Bowl
6. Forest Evaluation
7. Insect Identification
8. Disease Identification
9. Forestry Written Examination

In addition, the Invitational includes recreational activities such as local tours, campfires and lumberjack skills events. 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 setting, contests, leadership, and supplementary events are all directed to this end. The event is organized and managed by a national steering committee consisting of Extension Service forestry professionals, County Extension educators, US Forest Service professionals, forestry industry representatives, state forestry agency professionals and other university faculty.

OBJECTIVES

The objectives of the Ohio 4-H Forestry Competition and the National 4-H Forestry Invitational are to provide the opportunity and atmosphere for 4-H members 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 source of income, raw material, 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, district, state, and national 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 in 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 both the National 4-H Forestry Invitational and Ohio 4-H Forestry Competition, 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

1. Each club is allowed to enter only one team. A team will consist of no less than three and no more than four official entrants who are 4-H members in Ohio during the current year.
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. The team of contestants moving on to the National Invitational must be certified as the official state entry by the State Extension Director or by a person designated by the Director. The individuals or team may be selected by any procedure which a state considers appropriate.
5. All states participating in the Invitational must provide a signed statement from the State 4-H Office verifying that the team has insurance coverage while traveling and attending the Invitational.

General Contest Rules

1. Team entries must be registered by the specified due date.
2. Each team shall have no more than one head coach and two assistant coaches. Current 4-H members may serve as coaches for the team, but those individuals will be ineligible as future contestants.
3. Adult representatives from groups not competing in the current Invitational are welcome to observe. They may be asked to assist in the competition administration.
4. Only contestants and designated officials shall be within the perimeter of an event. Once a contestant has started an event, he/she will not be allowed to talk with anyone other than a designated official until completion of that particular event.
5. A team may be composed of either three or four members. Team scores will be based on the three highest scoring team members in each individual contest area. Individual contestants will compete for high-scoring individual honors.
6. Each contestant will bring a clip board or writing board, pencil, and calculator. Binoculars and hand lenses are permitted for use during contest events. Contestants are encouraged to wear field clothing and heavy shoes. Raingear is highly recommended.
7. No image or audio recording device such as cellphones, I-pods, still cameras, video cameras, movie cameras, or tape recorders will be permitted during competitive events. No competition participant (4-H team member, coach or adult chaperone) is allowed to write down or record any questions from the written exam.
8. The use of alcoholic, tobacco or other controlled substances will NOT be allowed. Rules of the 4-H camp will be enforced.
9. After the state competition, individual and team scores will be distributed to the team coach. Contest score sheets will not be distributed.
10. Closed-toed shoes will be worn by all participants in the forestry skills events. Sandals or other open-toed shoes will not be worn during participation in any of the forestry skills events.

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. 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 shortleaf instead of shortleaf pine, 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. Four 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 tree list." Maximum score for this event is 100 points.

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 Invitational web site. Individual species listed on the Competition'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.

OFFICIAL TREE LIST

| Common Name | Scientific Name |
|-------------------------------------|---------------------------------|
| Gymnosperms (Conifers or Softwoods) | |
| eastern redcedar | <i>Juniperus virginiana</i> L. |
| tamarack or eastern larch | <i>Larix laricina</i> K. Koch. |
| blue spruce | <i>Picea pungens</i> Engelm. |
| shortleaf pine | <i>Pinus echinata</i> Mill. |
| 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. |
| baldcypress | <i>Taxodium distichum</i> Rich. |
| northern white-cedar or arborvitae | <i>Thuja occidentalis</i> L. |
| eastern hemlock | <i>Tsuga canadensis</i> Carr. |

Angiosperms (Broadleaf Trees or Hardwoods)

| | |
|-----------------------------------|--|
| boxelder | <i>Acer negundo</i> L. |
| Norway maple | <i>Acer platanoides</i> L. |
| red maple | <i>Acer rubrum</i> L. |
| silver maple | <i>Acer saccharinum</i> L. |
| sugar maple | <i>Acer saccharum</i> Marsh. |
| Ohio buckeye | <i>Aesculus glabra</i> |
| yellow buckeye | <i>Aesculus flava</i> Ait. Willd. |
| tree-of-heaven | <i>Ailanthus altissima</i> (Mill.) Swingle |
| sweet birch or black birch | <i>Betula lenta</i> L. |
| river birch | <i>Betula nigra</i> L. |
| bitternut hickory | <i>Carya cordiformis</i> (Wangenh) K. Koch |
| pignut hickory | <i>Carya glabra</i> Sweet |
| shagbark hickory | <i>Carya ovata</i> K. Koch. |
| mockernut hickory | <i>Carya tomentosa</i> Nutt. |
| hackberry | <i>Celtis occidentalis</i> L. |
| flowering dogwood | <i>Cornus florida</i> L. |
| persimmon | <i>Diospyros virginiana</i> L. |
| American beech | <i>Fagus grandifolia</i> Ehrh. |
| white ash | <i>Fraxinus americana</i> L. |
| honeylocust | <i>Gleditsia triacanthos</i> L. |
| American holly | <i>Ilex opaca</i> Ait. |
| butternut or white walnut | <i>Juglans cinerea</i> L. |
| black walnut | <i>Juglans nigra</i> L. |
| sweetgum | <i>Liquidambar styraciflua</i> L. |
| yellow-poplar | <i>Liriodendron tulipifera</i> L. |
| cucumbertree or cucumber magnolia | <i>Magnolia acuminata</i> L. |
| red mulberry | <i>Morus rubra</i> L. |
| blackgum | <i>Nyssa sylvatica</i> Marsh. |
| Royal paulownia | <i>Paulownia tomentosa</i> (Thunb.) Steud. |
| American sycamore | <i>Platanus occidentalis</i> L. |
| eastern cottonwood | <i>Populus deltoides</i> Bartr. |
| black cherry | <i>Prunus serotina</i> Ehrh. |
| white oak | <i>Quercus alba</i> L. |
| scarlet oak | <i>Quercus coccinea</i> Muenchh. |
| bur oak | <i>Quercus macrocarpa</i> Michx. |
| northern red oak | <i>Quercus rubra</i> L. |
| black oak | <i>Quercus velutina</i> Lam. |
| chestnut oak | <i>Quercus prinus</i> L. |
| pin oak | <i>Quercus palustris</i> Muenchh. |
| black locust | <i>Robinia pseudoacacia</i> L. |
| black willow | <i>Salix nigra</i> Marsh. |
| sassafras | <i>Sassafras albidum</i> Nees. |

American basswood
American elm
red elm or slippery elm

Tilia americana L.
Ulmus americana L.
Ulmus rubra Muhl.

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 trees 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 (from specimens and/or slides). 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 competition 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 LIST OF INSECTS

Asian longhorned beetle
Beech scale
Eastern tent caterpillar
Emerald ash borer
Fall webworm
Forest tent caterpillar
Gypsy moth
Hemlock woolly adelgid
Ips engraver beetle
Japanese beetle
Locust leaf miner
Periodical cicada
Pine needle scale
Red oak borer
European elm bark beetle
Southern pine beetle
Tuliptree scale
Two-lined chestnut borer
Walnut twig beetle
White pine bark adelgid
White pine weevil

FOREST HEALTH -- DISEASES

Objective

Contestants will learn to identify forest diseases. 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. Specimens or slides will be selected and displayed which are representative of diseases and damage.

Contest Rules

1. Contestants will be required to identify 10 diseases or specimens of disease damage (from specimens and/or slides). Specimens will be selected from those on the "Official List of Diseases."
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

Armillaria root rot
Beech bark disease
Butternut canker
Cedar-apple rust
Chestnut blight
Dogwood anthracnose
Dutch elm disease
Elm yellows
Hypoxyton canker
Nectria canker
Needlecast fungi
Oak wilt
Sycamore anthracnose
Thousand cankers disease
White pine blister rust

TREE MEASUREMENTS

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 10 trees and estimate their diameters, merchantable heights, and volumes. 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 12 inches DBH (diameter at breast height) and one half (1/2) log merchantable height. Merchantable height will be measured from stump height to a 10-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 (see page 17). Do not use the volume table on the tree scale stick.
5. One point will be awarded for each correct tree identification, three points for each correct DBH, and three points for each correct tree height (-1.0 point for +/- half log), for a possible total of 70 points. No points will be awarded for individual tree volumes.
6. After all 10 trees have been measured, contestants will determine the total volume in the plot and the volume per acre. Thirty 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 30 for $\pm 5\%$ of the official volume, 20 points for $\pm 10\%$, 10 points for $\pm 15\%$, and no points over $\pm 15\%$. Example: If 4,000 bd. ft. is the official volume per acre, then an answer between 3800 bd. ft. and 4200 receives 30 points; 3600 to 3799 and 4201 to 4400 receives 20 points; 3400 to 3599 and 4401 to 4600 receives 10 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 –

For proper use of the Tree Scale Stick for measuring tree diameters and heights, refer to the “Tree Measurements – Using a Biltmore Stick” by Deborah B. Hill (http://www2.ca.uky.edu/forestryextension/publications/for_forfs/forfs98_13.pdf).

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 (tool to be used for the purposes of the competition).

Tree diameters should be recorded 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. | |

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.

| GIRARD FORM CLASS OF | | 78 | | | | | | | | | |
|---|-----|-------|------|-------|------|-------|------|-------|------|-------|------|
| INTERNATIONAL 1/4" BOARD FOOT VOLUME BY NUMBER OF MERCHANTABLE 16 FOOT LOGS | | | | | | | | | | | |
| DBH | 1 | 1 1/2 | 2 | 2 1/2 | 3 | 3 1/2 | 4 | 4 1/2 | 5 | 5 1/2 | 6 |
| 10 | 36 | 48 | 59 | 66 | 73 | | | | | | |
| 11 | 46 | 61 | 76 | 86 | 96 | | | | | | |
| 12 | 56 | 74 | 92 | 106 | 120 | 128 | 137 | | | | |
| 13 | 67 | 90 | 112 | 130 | 147 | 158 | 168 | | | | |
| 14 | 78 | 105 | 132 | 153 | 174 | 187 | 200 | | | | |
| 15 | 92 | 124 | 156 | 182 | 208 | 225 | 242 | | | | |
| 16 | 106 | 143 | 180 | 210 | 241 | 263 | 285 | | | | |
| 17 | 121 | 164 | 206 | 242 | 278 | 304 | 330 | | | | |
| 18 | 136 | 184 | 233 | 274 | 314 | 344 | 374 | | | | |
| 19 | 154 | 209 | 264 | 311 | 358 | 392 | 427 | | | | |
| 20 | 171 | 234 | 296 | 348 | 401 | 440 | 480 | 511 | 542 | | |
| 21 | 191 | 262 | 332 | 391 | 450 | 496 | 542 | 579 | 616 | | |
| 22 | 211 | 290 | 368 | 434 | 500 | 552 | 603 | 647 | 691 | | |
| 23 | 231 | 318 | 404 | 478 | 552 | 608 | 663 | 714 | 766 | | |
| 24 | 251 | 346 | 441 | 523 | 605 | 664 | 723 | 782 | 840 | | |
| 25 | 275 | 380 | 484 | 574 | 665 | 732 | 800 | 865 | 930 | | |
| 26 | 299 | 414 | 528 | 626 | 725 | 801 | 877 | 949 | 1021 | | |
| 27 | 323 | 448 | 572 | 680 | 788 | 870 | 952 | 1032 | 1111 | | |
| 28 | 347 | 482 | 616 | 733 | 850 | 938 | 1027 | 1114 | 1201 | 1280 | 1358 |
| 29 | 375 | 521 | 667 | 794 | 920 | 1016 | 1112 | 1210 | 1308 | 1398 | 1488 |
| 30 | 403 | 560 | 718 | 854 | 991 | 1094 | 1198 | 1306 | 1415 | 1517 | 1619 |
| 31 | 432 | 602 | 772 | 921 | 1070 | 1184 | 1299 | 1412 | 1526 | 1640 | 1754 |
| 32 | 462 | 644 | 826 | 988 | 1149 | 1274 | 1400 | 1518 | 1637 | 1762 | 1888 |
| 33 | 492 | 686 | 880 | 1053 | 1226 | 1360 | 1495 | 1622 | 1750 | 1888 | 2026 |
| 34 | 521 | 728 | 934 | 1119 | 1304 | 1447 | 1590 | 1727 | 1864 | 2014 | 2163 |
| 35 | 555 | 776 | 998 | 1196 | 1394 | 1548 | 1702 | 1851 | 2000 | 2156 | 2312 |
| 36 | 589 | 826 | 1063 | 1274 | 1485 | 1650 | 1814 | 1974 | 2135 | 2298 | 2461 |
| 37 | 622 | 873 | 1124 | 1351 | 1578 | 1752 | 1926 | 2099 | 2272 | 2444 | 2616 |
| 38 | 656 | 921 | 1186 | 1428 | 1670 | 1854 | 2038 | 2224 | 2410 | 2590 | 2771 |
| 39 | 654 | 976 | 1258 | 1514 | 1769 | 1968 | 2166 | 2359 | 2552 | 2744 | 2937 |
| 40 | 731 | 1030 | 1329 | 1598 | 1868 | 2081 | 2294 | 2494 | 2693 | 2898 | 3103 |

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 or may not be continuous.

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 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 that is 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 27°W.
4. The course layout will consist of five (5) lines with staked corners. Every effort will be made to 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 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.)

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 0° to 360° . Bearings range from 0° to 90° in each of four quadrants.

TOPOGRAPHIC MAP CONTEST

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
4. How to correct the bearing of a line for declination
5. How to determine the change in elevation between two points on the map

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. (use of a calculator is permitted)
2. The contest committee will also provide the following equipment for the contest event: a. 7.5 Minute Series Map (same map for all contestants) b. Rulers calibrated in tenths of an inch
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. Each is worth three (3) points for a total of thirty (30) points. Answers must be spelled correctly and multi-word answers need to be in the order specified below. One point will be deducted from answers with these errors. Please note, no symbols or features are capitalized; however deductions will NOT be made for capitalization.

| | | |
|-------------------------|---------------------------|---------------------------|
| ridge | valley | peak |
| saddle | depression | open area |
| woodland | marsh | perennial stream |
| intermittent stream | index contour line | intermediate contour line |
| primary highway | unimproved road | trail |
| bridge | building | cemetery |
| school | house of worship | spring |
| campground | quarry | gravel pit |
| mine tunnel | tank | power transmission line |
| railroad – single track | railroad – multiple track | |

To train for this part of the contest, contestants should study the official training reference material on the Invitational's web site. The web address for this part of the contest event is:<http://4hforestryinvitational.org/training/topographic-map-contest/map-symbols>

5. Contestants will measure the distance between the two points with a ruler calibrated in tenths. 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. To train for this part of the contest, contestants should study the official training reference material on the Invitational's web site. The web address for this part of the contest event is:

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

This measurement is worth 5 points, if answered correctly. There will be no partial credit for "close" answers.

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. To train for this part of the contest, contestants should study the official training reference material on the Invitational's website. The web address for this part of the contest event is:

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

This bearing is worth 5 points, if within plus or minus 2 degrees of accurate bearing.

7. Contestants will correct the bearing for declination. To train for this part of the contest, contestants should study the official training reference material on the Invitational's web site. The web address for this part of the contest event is:

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

This corrected bearing is worth 5 points, if calculated correctly.

8. 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 5 points, if answered correctly. There will be no partial credit for "close" answers.

9. Instructions will be given to the contestants before beginning the contest. The exercise will be completed on an individual basis.

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

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.

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, forest dendrology, measurements, and forests and society.
4. Study references are provided in the reference list on the Ohio 4-H Forestry Competition webpage.

SCORING METHOD FOR INDIVIDUAL AND TEAM COMPETITION

Individual and team scores for the Ohio 4-H Forestry Competition are determined by the method illustrated in the table below. Remember, a team may be made up of three or four members; but only the top three in each individual category and the two team events count toward the total team score.

| Event Categories | Total Possible Points | | | | Team Scores |
|--------------------------|-----------------------|-----|-----|-----|-------------|
| | A | B | C | D | |
| Tree Identification | 100 | 100 | 100 | 100 | 300 |
| Tree Measurements | 100 | 100 | 100 | 100 | 300 |
| Compass & Pacing | 100 | 100 | 100 | 100 | 300 |
| Map Reading | 50 | 50 | 50 | 50 | 150 |
| Forest Health - Insects | 50 | 50 | 50 | 50 | 150 |
| Forest Health - Diseases | 50 | 50 | 50 | 50 | 150 |
| Written Exam | 50 | 50 | 50 | 50 | 150 |
| TOTALS | 500 | 500 | 500 | 500 | 1500 |

The maximum score an individual contestant may achieve is 500 points, and the maximum team score is 1500 points.

FOREST UNDERSTANDINGS 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 forestry team 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 Man

1. The original forests of the nation were primary sources of building the nation.
2. Forests yield many essential products for man's 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.

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 at 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: Trees grown from seed and sprout origin, 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 at DBH

Saw timber: Trees more than 10 inches in diameter at DBH

Seedling: A tree grown from seed; used to define a young tree before it reaches sapling size, less than 1" in diameter at 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 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 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.
3. Information presented within the "official" Invitational web site links 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 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 Handbook. USDA, Extension Service, 50 pp.