

2025 Missouri FFA Forestry CDE Training Guide

Welcome to the 2025 Missouri FFA Forestry CDE Training Guide! This guide has been **completely revised** to assist Missouri's agricultural education instructors prepare Forestry Teams for Regional and State Career Development Events.

DISREGARD ALL PREVIOUS VERSIONS OF THIS TRAINING GUIDE!

CDE Purpose and Objectives

The purpose of the Forestry CDE is to stimulate students' interest in forestry and the principles and benefits of forest resource management. The objectives of the Forestry CDE are for students gain the ability to:

- Understand and have a basic knowledge of forestry and agroforestry principles
- Identify trees common to Missouri
- Recognize tools and equipment used in forest management
- Identify common tree and forest disorders in Missouri
- Correctly measure tree diameters and merchantable heights, and determine board foot volumes
- Evaluate individual trees in the forest based upon management objectives
- Interpret topographic maps and understand legal land descriptions.

Official Forestry CDE Rules

<https://missouriffa.org/cde-1de/cde-handbook/>

Training Guide Format

This guide follows the seven parts of the Forestry CDE, namely:

- A. General Knowledge
- B. Tree Identification
- C. Equipment Identification
- D. Tree/Forest Disorders
- E. Tree Measurement and Board Foot Volume Determination
- F. Forest Management Evaluation
- G. Map Reading and Legal Land Descriptions

Superintendent Contact Information

Feel free to contact me anytime with any questions you or your team members might have.

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CHANGES TO THE FORESTRY CDE

The State Forestry Committee and I agreed to the following additions to the CDE, and those changes are reflected in the pages that follow.

General Knowledge Test

The BIG change is Forestry Best Management Practices (BMPs) has REPLACED Agroforestry. While agroforestry can be an integral component of a farm operation, we want to focus on the 12.6 million acres of privately owned forestland in Missouri. Those acres play a major role in supporting the 10.3-billion-dollar forest products industry in the Show-Me State. This change will also allow instructors to focus training and better prepare them for the National Forestry CDE.

References

- *Missouri Forest Management Guidelines Unit I: Background Resource Elements*
<http://mdc.mo.gov/trees-plants/forest-care/missouri-forest-management-guidelines>
 - Chapter 1: Missouri Forest Resources
 - Chapter 2: Wildlife Habitat
 - Chapter 5: Forested Watersheds
 - Chapter 8: Forest Products
 - Chapter 9: Forest Health
- *Missouri Forest Management Guidelines Unit II: Foundations of Forest Management*
 - Chapter 11: Generally Accepted Principles for Silviculture
 - Chapter 12: Fundamentals of Forest Regeneration
- *Missouri Forest Management Guidelines Unit III: Standards, Guidelines and BMP's*
 - Chapter 13: Tending Treatments
 - Chapter 14: Forest Roads/Trails
 - Chapter 15: Timber Harvesting
 - Chapter 16: Pesticide Use
 - Chapter 17: Fire Management
- *Forest Management for Missouri Landowners*, MDC Most recent edition, Bruce Palmer
Available from your local MDC Field office.

NOTE: All three Units of the *Missouri Forest Management Guidelines* contain updated and more comprehensive forest management information than *Forest Management for Missouri Landowners*. Both, however, do complement each other and should help better prepare your team for this event.

Tree Identification

COMBINED green ash and white ash are now recognized to only the Genus level of *Fraxinus* spp.

ADDED American plum, *Prunus americana*

References

- *50 Common Trees of Missouri*, MDC 2005, David Knotts
- *Missouri's Oaks and Hickories*, Missouri Department of Conservation Field Guide, Reprinted from the August and December 1993, and January 1994 *Missouri Conservationist* by the Conservation Commission of the State of Missouri. Located on the DESE website under the General Curriculum Cont. tab.
- *Trees of Missouri Field Guide*, MDC 2003, Don Kurz
- Virginia Tech University Tree ID website <https://dendro.cnre.vt.edu/dendrology/factsheets.cfm>
- Forestry Images website <https://www.forestryimages.org/>

Equipment Identification

ADDED Insect Trap

CHANGED Scale Stick to Log Scale Stick

CHANGED Tree Planting Bar to Tree Planting Bar / Dibble Bar

References None

Tree / Forest Disorders

ADDED Anthracnose

ADDED Autumn-olive

ADDED Burning Bush

ADDED Bush Honeysuckle

ADDED Callery Pear

ADDED Oak Gall

ADDED Oak Skeletonizer

ADDED Tree-of-heaven

CHANGED Gypsy Moth to Spongy Moth

References

- Missouri Department of Conservation Forest Health News
<https://mdc.mo.gov/trees-plants/forest-care/forest-health-news>
- Forestry Images website <https://www.forestryimages.org/>

Tree Measurement and Board Foot Volume Determination NO CHANGES

Forest Management Evaluation NO CHANGES

Map Reading and Legal Land Descriptions NO CHANGES

A. General Knowledge

The General Knowledge exam consists of 50 questions (25 true/false and 25 multiple-choice) covering the following five, equally weighted, categories:

- Forest Ecology
- Forest Health
- Forest Management
- Best Management Practices
- Marketing Timber & Forest Products

Sample Questions

The following are examples from previously used state general knowledge exams:

Forest Ecology

1. Succession is the gradual replacement of one community of plants by another community. **(T)**
2. Soils with a high proportion of sand tend to be drier than those soils with a lot of clay. **(T)**
3. Which tree species would you **not** expect to see in a bottomland forest?
 - a. sycamore
 - b. post oak**
 - c. sweetgum
 - d. boxelder
4. East-facing slopes are wetter than west-facing slopes because:
 - a. The sun shines more on west slopes during the hottest part of the day**
 - b. The trees take up less water
 - c. There is increased evaporation from the soil
 - d. A and C

Forest Health

1. Unrestricted grazing is not detrimental to tree growth. **(F)**
2. Pesticides are commonly used in forest settings to control harmful insects and diseases. **(F)**
3. Soil erosion in a grazed forest can be ___ times greater than erosion in ungrazed forests
 - a. two
 - b. ten
 - c. twenty
 - d. one hundred**
4. Which forest pest was not introduced from a foreign country?
 - a. gypsy moth
 - b. oak wilt**
 - c. chestnut blight
 - d. emerald ash borer

Forest Management

1. Regenerating your forest is basically about managing the amount of light that reaches the forest floor. **(T)**
2. In pole stands, most trees average less than 5 inches DBH. **(F)**

3. How many seedlings will be planted on one acre at a spacing of 12'x12'?
 - a. 1,742
 - b. 889
 - c. 436
 - d. 302**

4. Which silvicultural system listed below would produce an uneven-aged forest?
 - a. shelterwood
 - b. single-tree**
 - c. seed tree
 - d. clearcut

Best Management Practices

1. Water bars intercept and divert water from exposed soil onto the forest floor where it can soak into the soil without causing erosion. **(T)**
2. Damage to residual trees is always avoidable in harvesting operations. **(F)**
3. What is the preferred **minimum** d.b.h. for snag and den trees?
 - a. 6 inches
 - b. 8 inches
 - c. 10 inches**
 - d. 12 inches
4. Which of these professionals has the **least training** in advising you on temporary or permanent bridge construction, and on proper size, construction and maintenance of culverts?
 - a. Soil & Water Conservation District engineers
 - b. MO Dept of Conservation engineers
 - c. MO Dept of Conservation fisheries biologists
 - d. MO Dept of Conservation foresters**

Marketing Timber & Forest Products

1. The most valuable log in a tree is the butt log. **(T)**
2. One cord contains 128 cubic feet of solid wood. **(F)**
3. White oak is best known for what wood product?
 - a. cooperage**
 - b. trim and molding
 - c. flooring
 - d. pallets
4. A lump-sum timber sale places all of the risk on the
 - a. seller
 - b. buyer**
 - c. forester
 - d. sawmill (assuming the sawmill is not the buyer)

B. Tree Identification

Tree identification can be particularly challenging during the spring, state CDE because twigs have lost their winter characteristics (especially color characteristics), buds are swelling, and leaves are not yet out! About the only trait a student might have is bark; which can be extremely variable.

One helpful habit you might encourage your students to do is look up, look down, and all around. Look up to determine the arrangement pattern (opposite vs alternate) of the tree in question by observing the branching pattern. Look down for evidence of acorns, nut husks, decaying leaves, and twigs cut off by squirrels. Look all around the tree in question to make sure you pick up a representative sample of the evidence. Make sure that the acorn caps, leaves and twigs came from the tree in question and not from a neighboring tree.

An easy way to ease your team member into tree identification is to remember the mnemonic:

MADBUck

It represents those species or species groups (Genera) that have *opposite* leaf/branch arrangement: **M** – maples, **A** – ashes, **D** – dogwoods, and **Buck** – buckeye.

Below are sample images of twigs, leaves, and bark of all trees on the CDE

Trees with OPPOSITE ARRANGEMENT (MADBUck)



sugar maple (*Acer saccharum*)



silver maple (*Acer saccharinum*)



red maple (*Acer rubrum*)



boxelder (*Acer negundo*)



green ash (*Fraxinus pennsylvanica*) NOTE: Now *Fraxinus* spp.



white ash (*Fraxinus americana*) NOTE: Now *Fraxinus* spp.



flowering dogwood (*Cornus florida*)



Ohio buckeye (*Aesculus glabra*)

Trees with ALTERNATE ARRANGEMENT



white oak (*Quercus alba*)



post oak (*Quercus stellata*)



bur oak (*Quercus macrocarpa*)



chinkapin oak (*Quercus muehlenbergii*)



pin oak (*Quercus palustris*)



black oak (*Quercus velutina*)



blackjack oak (*Quercus marilandica*)



northern red oak (*Quercus rubra*)



scarlet oak (*Quercus coccinea*)



shingle oak (*Quercus imbricaria*)



black walnut (*Juglans nigra*)



pecan (*Carya illinoensis*)



shagbark hickory (*Carya ovata*)



mockernut hickory (*Carya tomentosa*)



bitternut hickory (*Carya cordiformis*)



American elm (*Ulmus Americana*)



slippery elm (*Ulmus rubra*)



hackberry (*Celtis occidentalis*)



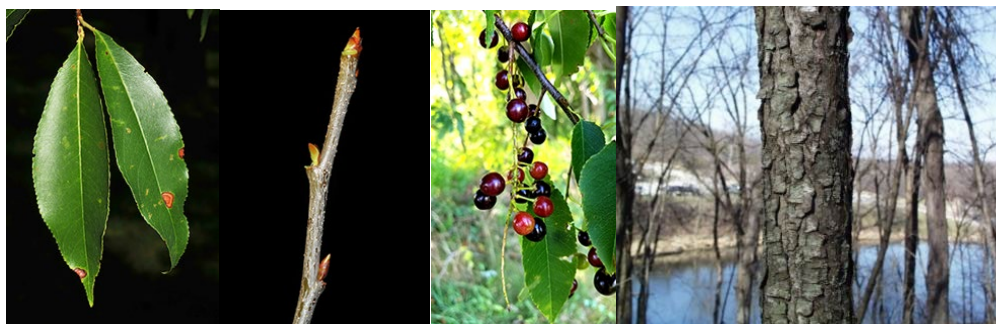
American basswood (*Tilia americana*)



baldcypress (*Taxodium distichum*)



American sycamore (*Platanus occidentalis*)



black cherry (*Prunus serotina*)



black locust (*Robinia pseudoacacia*)



honeylocust (*Gleditsia triacanthos*)



blackgum (*Nyssa sylvatica*)



downy serviceberry (*Amelanchier arborea*)



eastern cottonwood (*Populus deltoides*)



eastern redbud (*Cercis canadensis*)



eastern redcedar (*Juniperus virginiana*)



hawthorn (*Crataegus* spp.)



Kentucky coffeetree (*Gymnocladus dioicus*)



Osage-orange (*Maclura pomifera*)



pawpaw (*Asimina triloba*)



persimmon (*Diospyros virginiana*)



sassafras (*Sassafras albidum*)



red mulberry (*Morus rubra*)



river birch (*Betula nigra*)



shortleaf pine (*Pinus echinata*)



willow (*Salix* spp.)



yellow-poplar (*Liriodendron tulipifera*)



eastern hophornbeam (*Ostrya virginiana*)

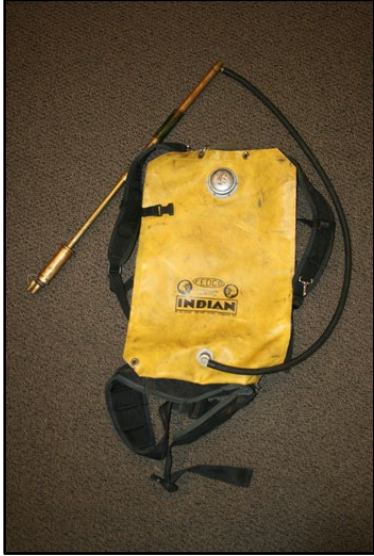


sweetgum (*Liquidambar styraciflua*)



American plum (*Prunus americana*)

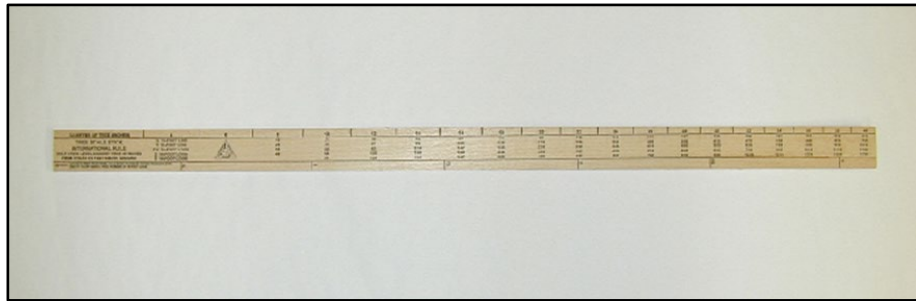
C. Equipment Identification



Backpack Water Pump



Bark Gauge



Biltmore Stick



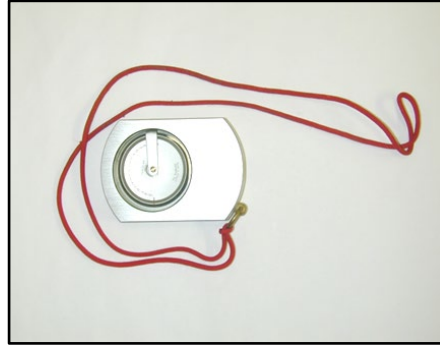
Broom Rake



Chainsaw



Chaps



Clinometer



Compass



Cruising Vest



Densiometer



Diameter Tape



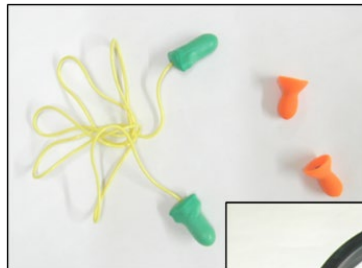
Digital Data Recorder



Drip Torch



Draw Knife / Bark Scribe



Hearing Protection



GPS Unit



Hard Hat



Increment Borer



Laser Rangefinder/Hypsometer



Loppers



Peavy-Canthook



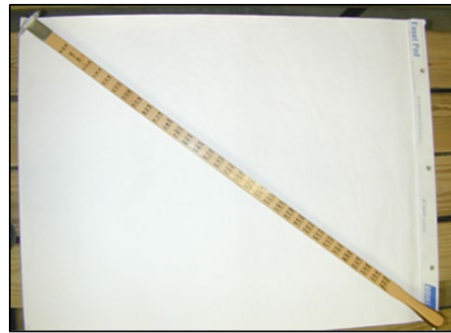
Pruning Saw



Pulaski-Forester Axe



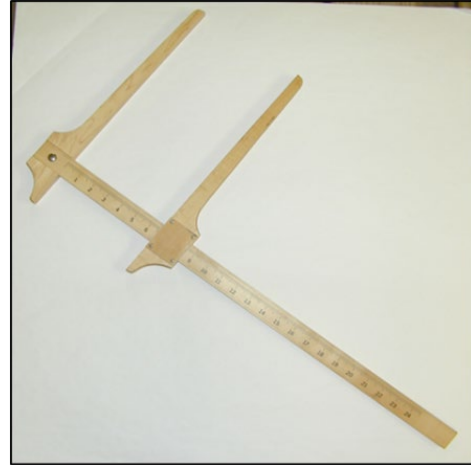
Safety Glasses



Log Scale Stick



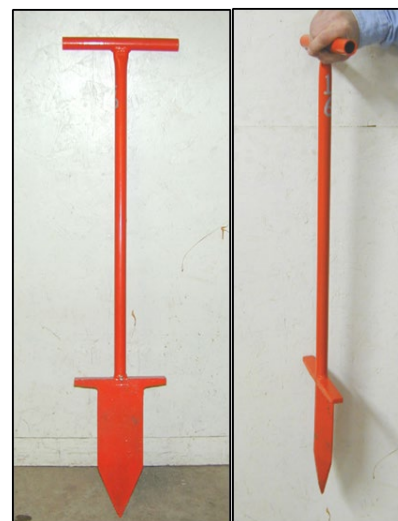
Sling Psychrometer



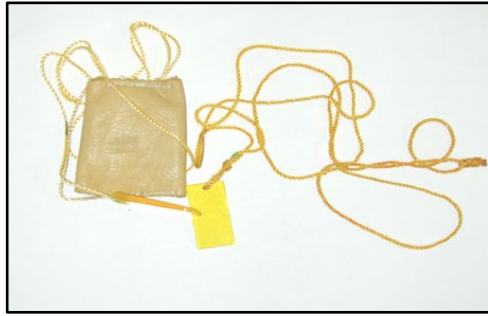
Tree Caliper



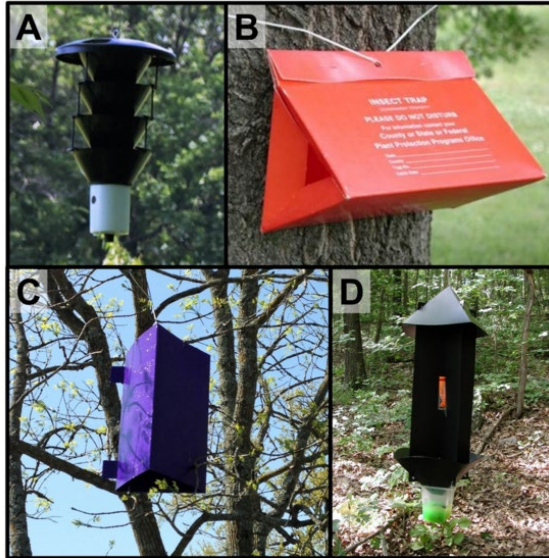
Tree Marking Gun



Tree Planting / Dibble Bar



Wedge Prism



Insect Trap (four different kinds)

D. Tree/Forest Disorders

Symptoms of ten (10) disorders from the list below will be displayed for participants to identify by common names. The disorder will be presented in one or more of the following forms:

- Actual sample of sign or symptom
- Picture of sign or symptom
- Written description of sign or symptom
- Written case history of the disorder in question

Each disorder will be designated by a number. Participants will identify the disorder presented using the number associated with the disorder from the Tree Disorder Identification List.

Scoring: A total of 60 points are possible for this section; 6 points for each disorder.

Tree Disorder Identification List

1. Air pollution
2. Anthracnose
3. *Armillaria* root rot
4. Asian long-horned beetle
5. Autumn-olive
6. Butt or heart rot
7. Burning bush
8. Bush honeysuckle
9. Callery pear
10. Canker (other than *Hypoxylon* or Thousand Cankers)
11. Cedar-apple gall rust
12. Cicada
13. Climatic injury: snow/ice, wind, drought, hail
14. Emerald ash borer
15. Fire damage
16. Spongy moth
17. Herbicide damage
18. *Hypoxylon* canker
19. Japanese beetle
20. Landscape equipment damage
21. Lightning damage
22. Oak gall
23. Oak skeletonizer
24. Oak wilt
25. Pine wilt nematode
26. Pine sawfly
27. Scale
28. Spotted lanternfly
29. Sunscald
30. Tent caterpillar
31. Thousand Cankers Disease
32. Tree-of-heaven
33. Wildlife/Livestock damage
34. Wetwood or slime flux
35. Wood borer

The following pages contain examples of the tree/forest disorders contestants will be responsible for knowing.



Air pollution on spruce. Note damage throughout tree crown. No obvious progression up or down the tree.



Anthracnose. Sycamore anthracnose (left), maple anthracnose (right)



Armillaria root rot. White mycelial mat under epidermis encasing the root (left). Black shoe-string-like rhizomorphs proliferating under the bark.



Asian long-horned beetle. Adult (left). Exit (emergence) hole (right)



autumn-olive



Butt (Heart). In hardwood (left). In pine (right)



Burning Bush



Bush Honeysuckle



Callery Pear



Canker (other than Hypoxylon or Thousand Cankers)



Cedar-apple rust gall on eastern redcedar.



Cicada damage. Bark slits on yellow-poplar (left). Dieback of distal portion of red oak twig (red oak (right)



Climatic injury. Hail (upper left). Ice (upper right). Drought (lower left). Wind (lower right).



Emerald Ash Borer



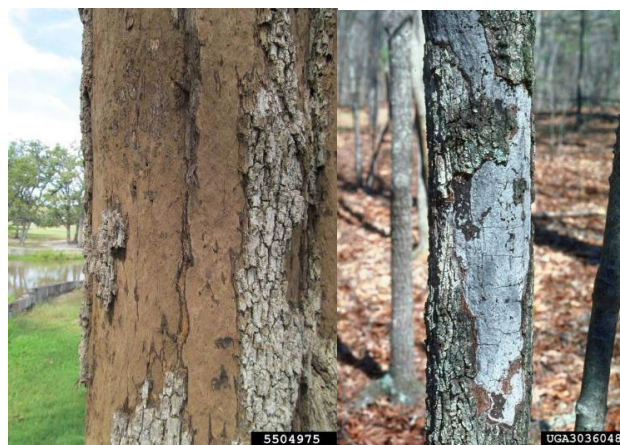
Fire Damage



Spongy moth (formerly gypsy moth)



Herbicide damage



Hypoxylon Canker



Japanese beetle



Landscape equipment damage



Lightning Damage



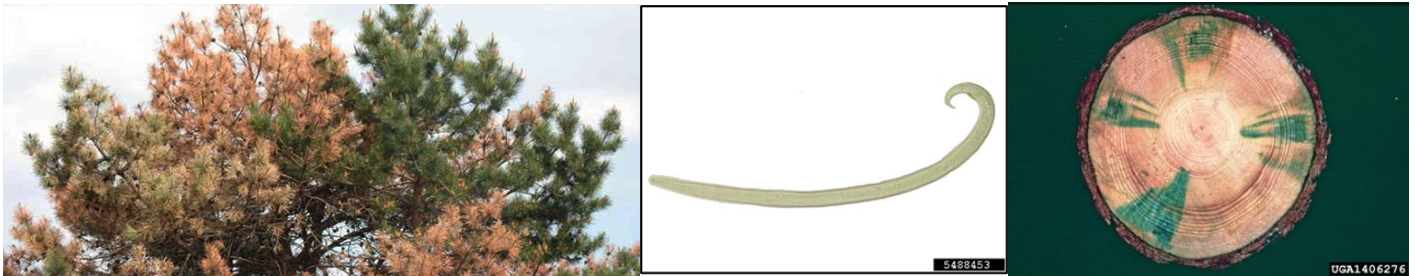
Oak Gall



Oak Skeletonizer



Oak Wilt



Pine Wilt Nematode



Pine Sawfly



Scale



Spotted Lanternfly



Sunscald



Tent Caterpillar



Thousand Cankers Disease



Tree-of-Heaven



Wildlife /Livestock Damage



Wetwood or Slime Flux



Wood Borer

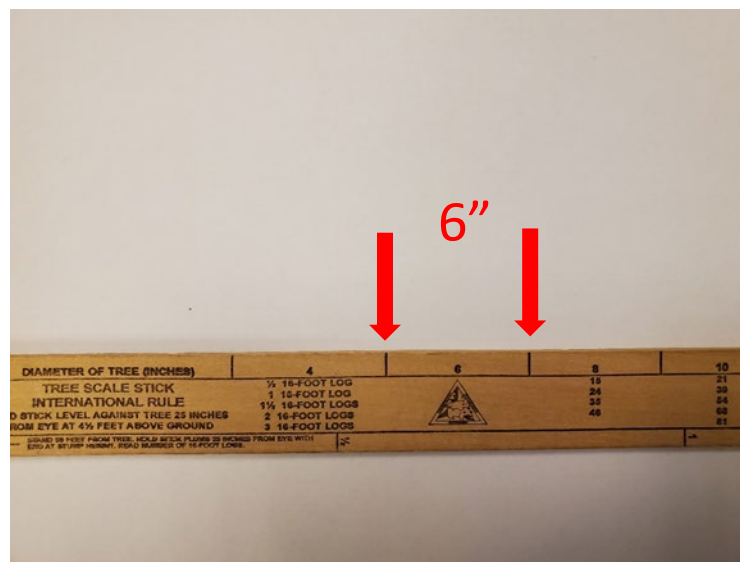
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E. Tree Measurement and Board Foot Volume Determination

WHILE TREE FORM AND MINIMUM MERCHANTABLE TREE DIAMETERS VARY ACROSS THE STATE, TO LEVEL THE PLAYING FIELD, TREE VOLUMES SHOULD BE DETERMINED USING THE FOLLOWING GUIDELINES:

Tree Diameter (DBH)

- Use a Biltmore Stick for determining tree diameter.
- Measure DBH at 4.5 feet above ground line on the UPHILL side of the tree.
- Very few trees are perfectly round. Therefore, take TWO measurements with the second measurement at right angles to the first measurement.
 - Make sure this second measurement is AT THE SAME ELEVATION as the first measurement. REMEMBER, you are determining DBH as measured on the higher, uphill elevation!
- All Biltmore Sticks are NOT necessarily the same! What I mean is some Biltmore Sticks estimate diameters in one-inch diameter classes and other sticks estimate diameter in two-inch diameter classes.
- Biltmore Sticks provided by MDC measure tree diameter in two-inch classes. And this can (and has) led to confusion when it comes to rounding.
 - **BY CONVENTION**, one cannot “grow” wood, so always **ROUND DOWN**. I will do my best to ensure District CDE Coordinators adhere to this convention.
 - When measuring, if the tree diameter falls anywhere between the tick marks, it is the diameter shown. In the image below, this is 6”



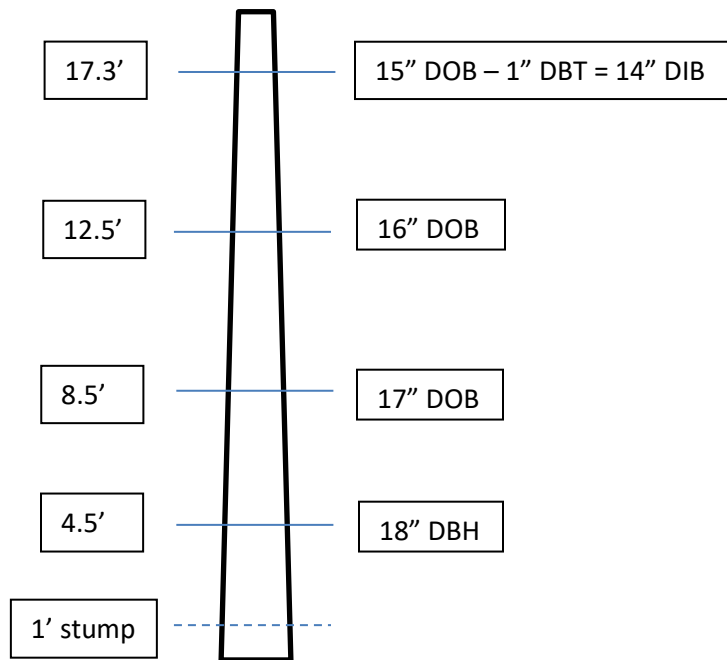
- If you determined the diameter fell EXACTLY on the tick mark between two numbers, then the diameter would be the LOWER number. In the image above, if you determined the diameter fell EXACTLY on the mark between the 6” and 8” class, the diameter would be 6 inches.
- Average your two measurements and then round **DOWN** to the nearest TWO-INCH diameter class. This is because once again one cannot ‘grow’ more wood than is there.

- Some instructors have taught students in the past to “walk the stick” around the circumference of the tree at breast height to determine the circumference of the tree and then divide by 3.14 (or more crudely by 3) to determine the diameter.
 - This is neither an accepted practice by professional foresters **nor is it to be allowed in any Forestry CDE**. It certainly is NOT allowed at National, and I should know as I served on the National FFA Forestry CDE Judging Team!

Merchantable Tree Height

- Expect to outside bark diameter to **DECREASE one inch for every four-foot log section**
 - For those instructors who REALLY WANT TO KNOW the rationale, it is based on the following, and somewhat arcane, logic with respect to something foresters call, “tree form”; specifically, the Girard Form Class (GFC):
 - The Girard Form Class is the primary expression of tree form in the United States.
 - It is a quotient calculated as the ratio of **diameter inside bark (DIB)** at the top of the first 16-foot log to the **diameter outside bark** at breast height (DBH).
 - The closer the form class value is to 100, the closer the log resembles a cylinder, where a value of 100 means the log is nearly a cylinder.
 - To allow for log trimming and a 1-foot stump height the diameter inside bark is measured at 17.3 feet above the ground.
 - To calculate GFC, you need several things: DIB @ 17.3', DOB (diameter outside bark) @ 17.3', DBH (diameter @ 4.5'), and [single] bark thickness (which will be used to calculate double bark thickness).
 - Example:
 - Bark Thickness = 0.5"
 - Therefore, Double Bark Thickness = 1.0"
 - DOB @ 17.3' = 15"
 - DIB @ 17.3' = 14" (15" - 1")
 - DBH = 18.0"
 - $GFC = (14"/18") * 100 = 77.8\%$ or 78
 - Lucky for you, forest mensurationists (forest geeks who measure trees...LOTS of trees) have evaluated trees...LOTS of trees and have determined that for the most part, Missouri’s commercially valuable hardwood trees (oaks and hickories, including walnut) conform to a GFC of 78.

- So, let's graphically depict our example tree.

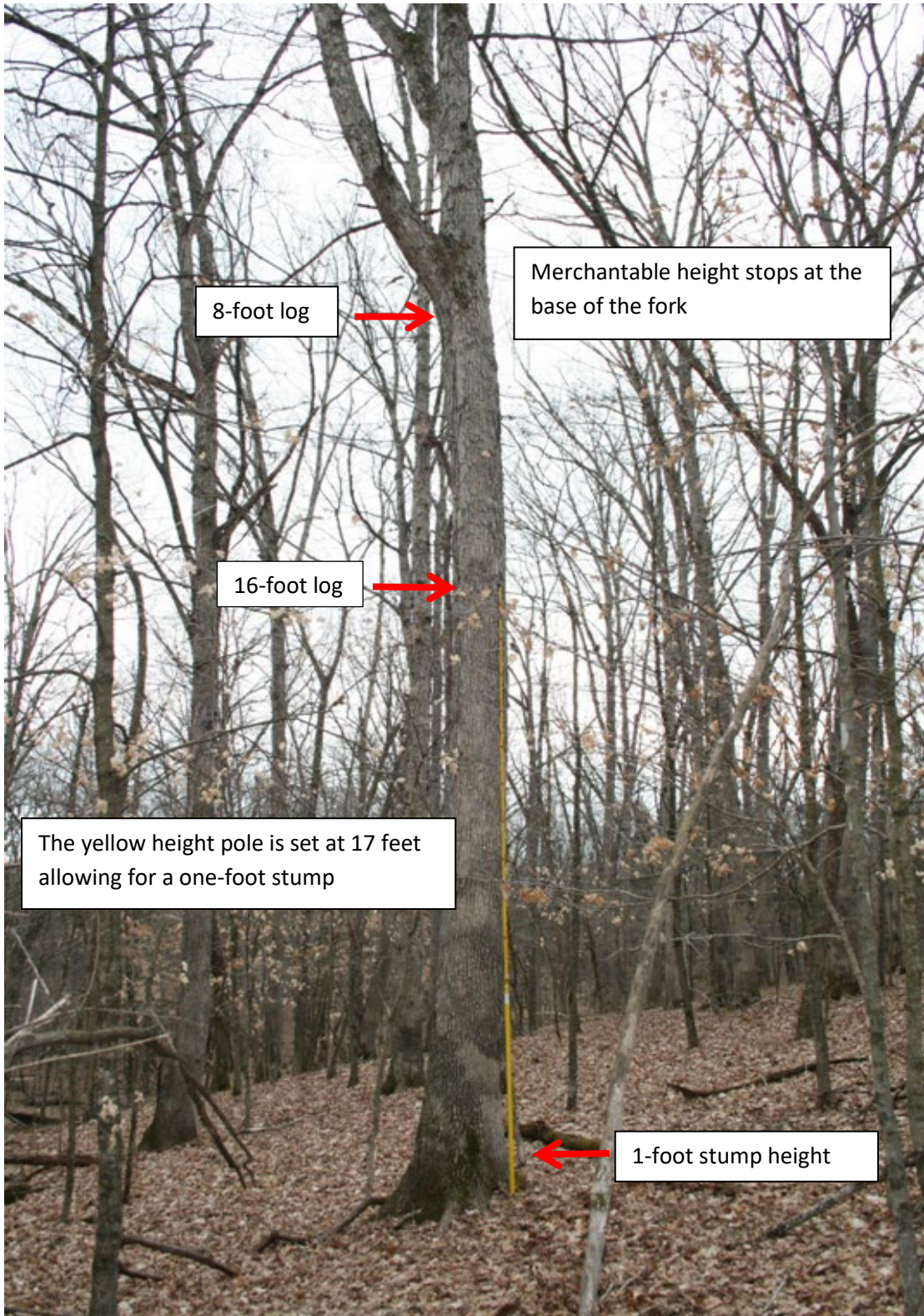


Therefore, $GFC = (14''/18'') * 100 = 77.8 \approx 78$

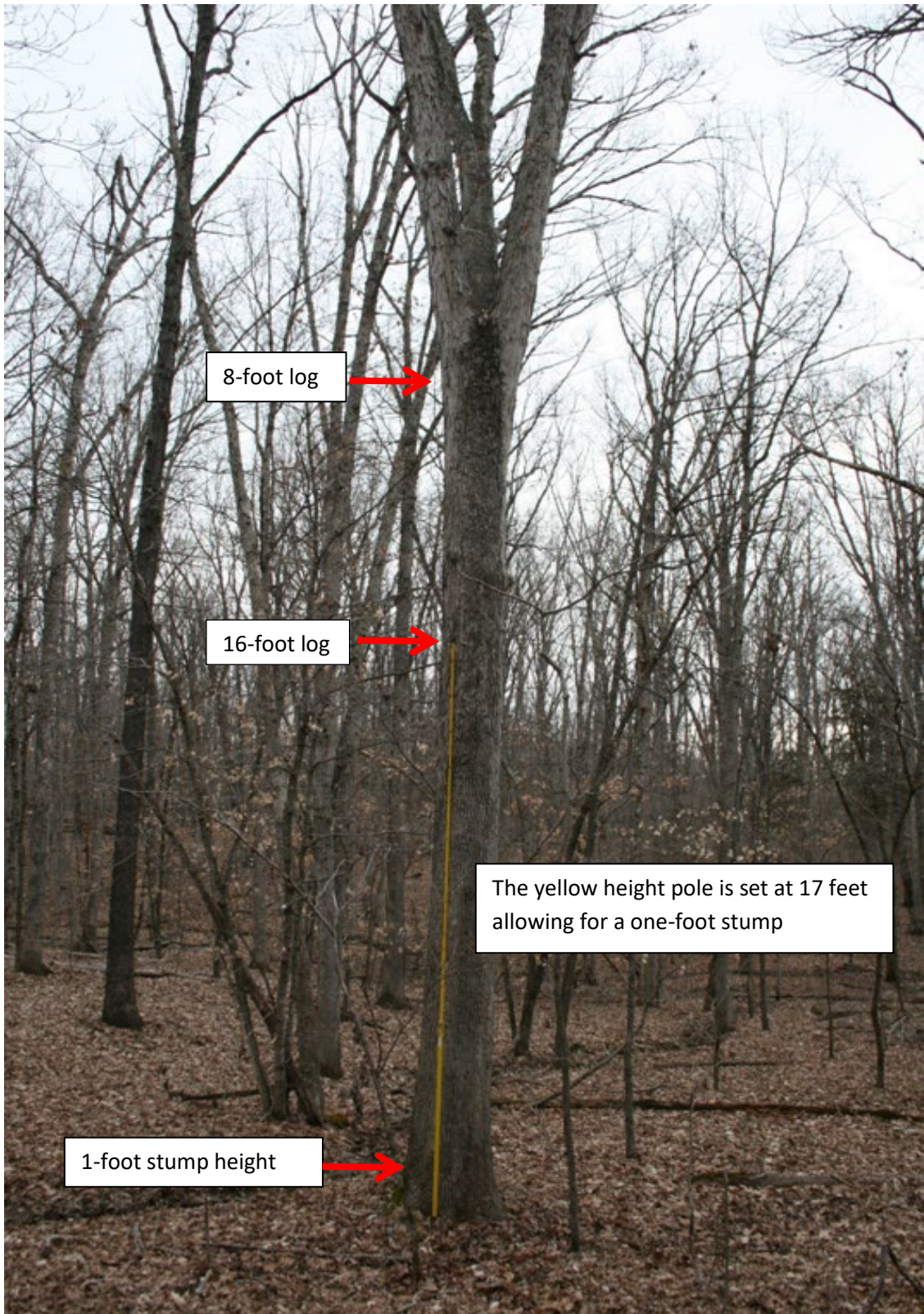
Now, the purists in the crowd will take notice that according to my 'rule' of a one-inch decrease in DOB for every four-foot section of log, 15" DOB should occur at 16.5' and not 17.3'.

To them I simply say I am merely trying to show the **GENERAL** logic as to how we came up with the 'rule'. I hope this helps you, the instructor, at least appreciate the method behind our madness!

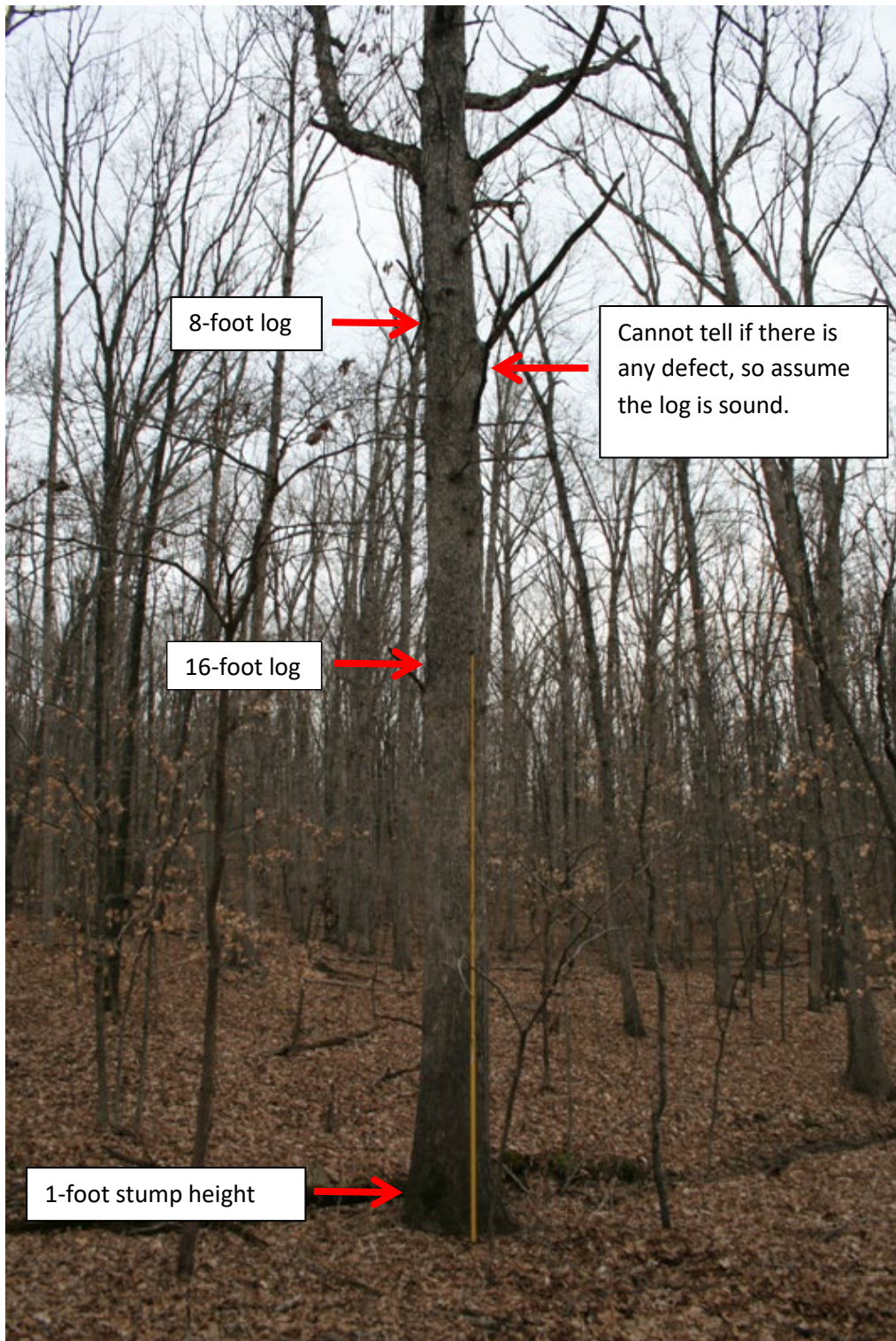
- Merchantable height STOPS on a tree where:
 - Outside bark tree diameter becomes 10 inches, OR
 - Where a major fork in the tree stem occurs, OR
 - Where a limb has a diameter equal to ONE-HALF the diameter of the tree at that point
- NO volume is to be determined for logs above the fork or defect
- No volume is to be determined for ANY side limbs
- NO volume is to be determined for ANY log less than 8 feet (1/2 log).
 - In other words, if there is not a full half-log (8 feet) between the top of the last merchantable half-log and one of the stoppers for merchantable height, then NO VOLUME is to be determined for that portion.
- Stump height is considered to be 12 inches
- All merchantable log sections are to be considered SOUND with NO deduction for defects



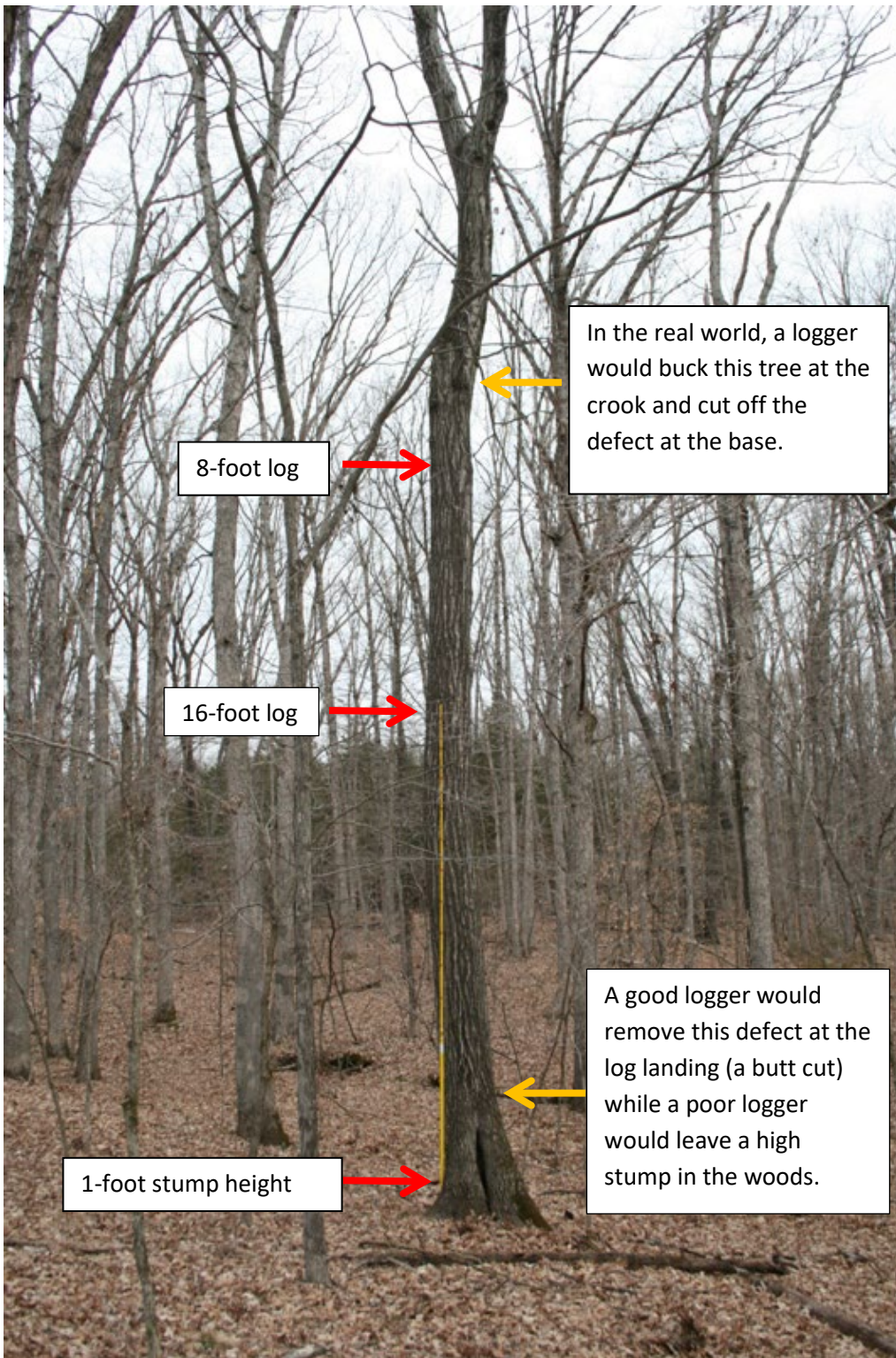
Merchantable Height Example 1. The diameter of the large side branch on the left at 24 feet (1-1/2 logs) is more than one-half the diameter of the tree at that point.



Merchantable Height Example 2. Obvious multiple forks at 24 feet (1-1/2 logs)



Merchantable Height Example 3. Large side branch on left at 28 feet is half the diameter of the main stem, so this is the stopping point. BUT you cannot ‘grow a log’, so the correct call is 1-1/2 logs. Since you cannot tell if the trunk is hollow where the dead branch comes in from the right just below 24 feet, assume the log is sound.



Merchantable Height Example 4. In FFA competition, we will select only defect-free trees for the timber cruising exercise, so not to confuse contestants. Therefore, in this case, the correct call would be 1-1/2 logs. But, note the left-hand comments above.

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F. Forest Management Evaluation

Formerly called Timber Stand Improvement, this portion of the Missouri Forestry CDE has changed to:

1. Conform more closely with the National Forestry CDE
2. Allow both instructors and District CDE Coordinators more flexibility in establishing the area for evaluating the trees.

Find 15 trees for your students to evaluate among a larger group of trees. The area can be a circle, square, rectangle, or even an irregular like along a riparian corridor. The only caution I give you is that it should NOT be in a park...or at least a well-maintained portion of a park where park staff have 'cleaned up the woods'.

Create a scenario for your students to determine whether each of the 15 trees you have identified should either be:

- Harvested (utilize the tree)
- Left to Grow (remain in the stand for good reason)
- Deadened (undesirable tree, not merchantable or beneficial for wildlife from a food perspective, or if no den trees in stand, could be deadened for that purpose)

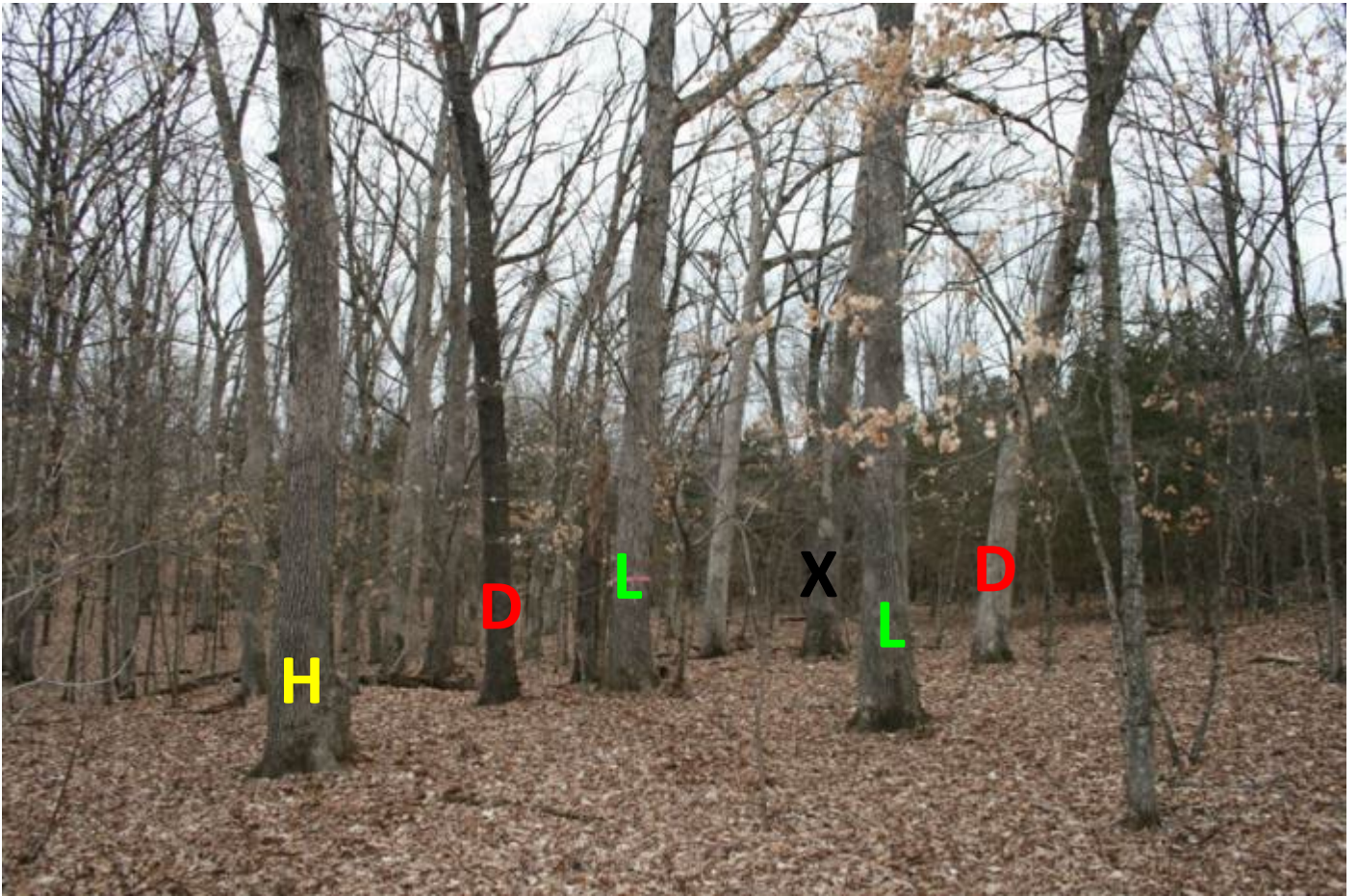
Possible Scenario Description

This landowner is trying to rejuvenate their woodland property they recently purchased. They have noticed young oak seedlings on the forest floor. They want to encourage their growth and development but want to keep some of the main canopy until the young trees can grow and develop on their own. They have also noticed woodpeckers and owls in their woodland and want to ensure they continue calling these woods home.

To meet their goals, you prescribe a shelterwood regeneration system. You determined stand density to be approximately (fill in the blank, say 150) trees per acre. This density is too high to allow the seedlings to develop, so you plan to reduce the stand density to (fill in the blank, say 40) trees per acre.

Some trees that need to be removed are of commercial value meaning they have a merchantable diameter of at least 12 inches d.b.h. and markets exist for a wide variety of wood products including pallets, railroad ties, flooring, lumber, and barrels. There is even a market for hickory tool handles at a nearby Amish mill. This upland forest is scheduled for a single-tree selection harvest meaning some trees are ready for harvest and some should be left to grow. Currently there are no den trees present for wildlife habitat. For each of the 15 numbered trees, your job is to decide whether to harvest the tree, leave it to grow, or deaden it on the stump for wildlife. Those trees of good form and vigor have a high potential to be present the next time a harvest is scheduled, so they are good candidates to leave. When evaluating each tree, remember to: (1) consider all its nearest neighbors and (2) its relation to those trees you are planning to leave.

In the following images, assume the labeled trees (except any marked with an 'X' which denote a dead tree) are the ones that have been marked in some fashion for students to evaluate.

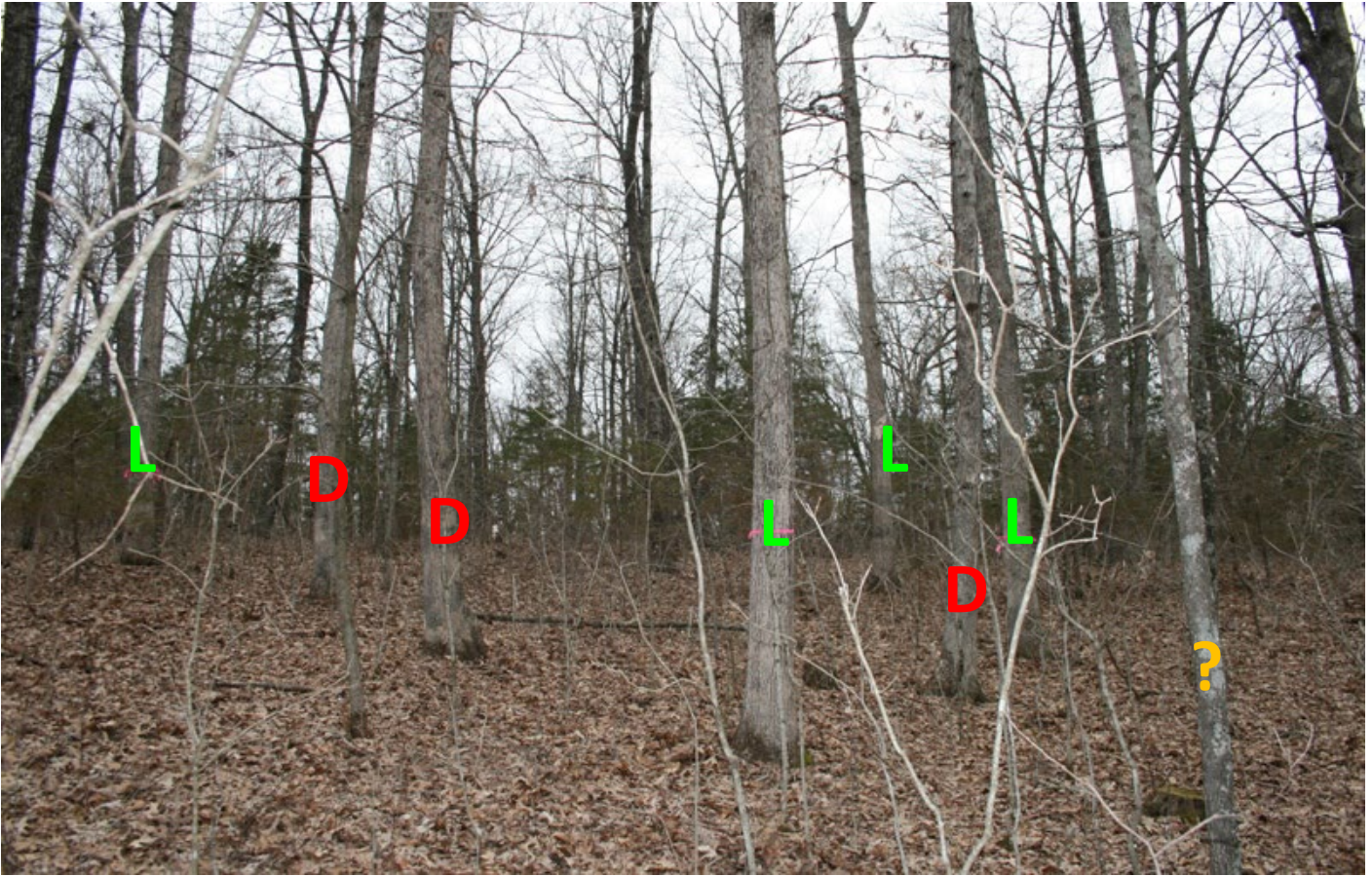


Example 1

The **X** tree is a dead tree in the stand and should be one you would NOT mark for evaluation because it is already dead. However, it should be considered an existing den tree and MAY influence a student's decision if the scenario calls for leaving a certain number of den trees. The student would then 'count' this den tree. This is what I mean when I say, "students need to consider neighboring trees as well as trees in the entire stand when determining if the marked tree should be harvested, left, or deadened."

Let's look at the **D** trees next. The one on the left is a red oak. It is of poor form and crowding the **L** tree in the center of this image. If it is less than 12" DBH, it is not considered merchantable by our FFA standards and should be deadened. The **D** tree on the right is a white oak of poor form AND it is crowding the **L** tree in the left side of the image.

Now let's consider the **H** and **L** trees. One might be tempted to leave all three trees. This might be acceptable upon looking UP and seeing if the tree crowns are competing with one another. If they are then one of them must be harvested. I chose the one on the left because it has a poorer form compared to the other two AND is it of harvestable size.

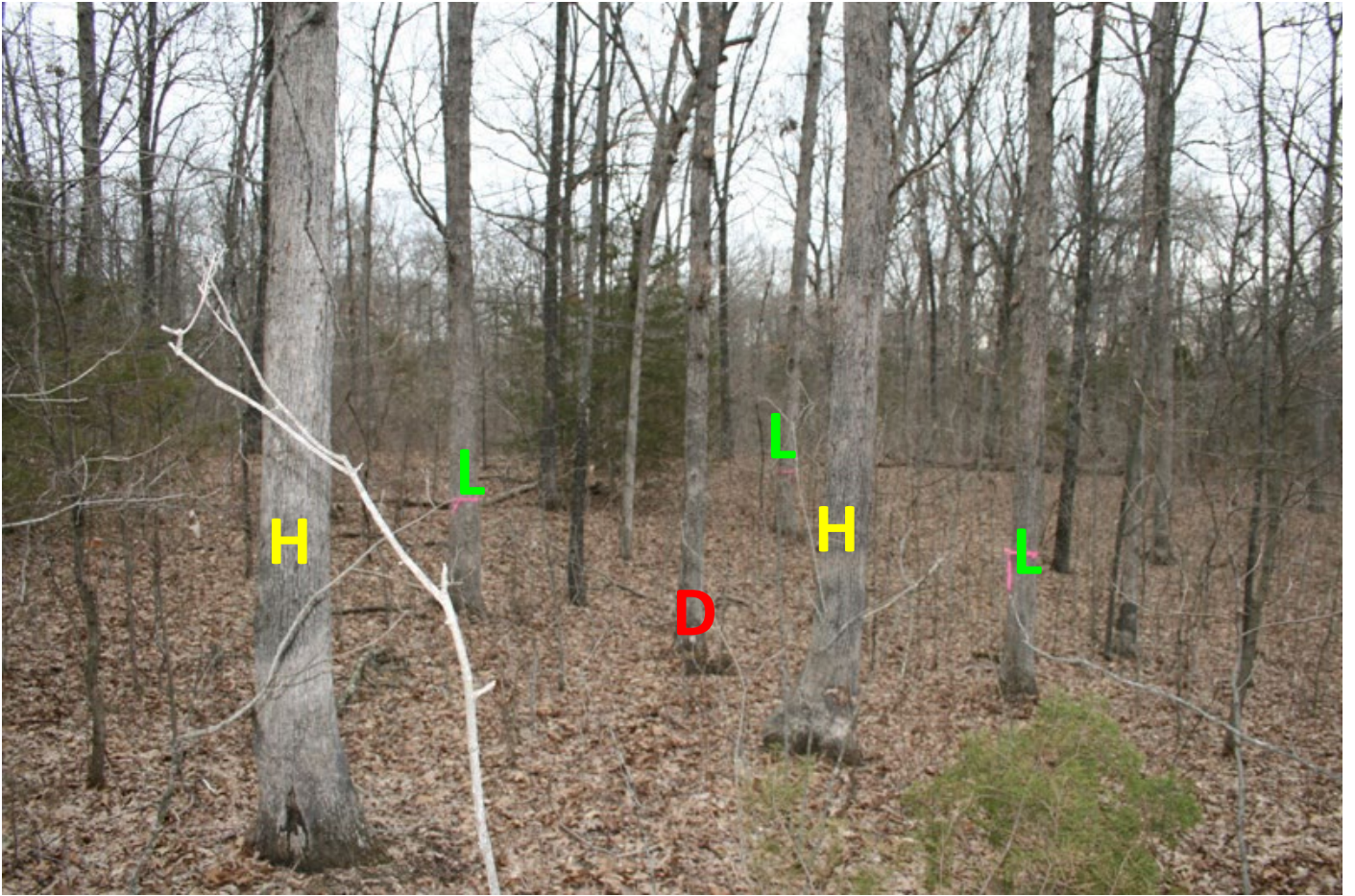


Example 2

This is a younger stand as noted by the smaller tree diameters. Here it is a matter of first determining which of the marked trees have the best form and then deciding which ones to keep based upon spacing. Again, the key is to look UP when selecting the **L** trees. All the other marked trees would be deadened because they not of merchantable size.

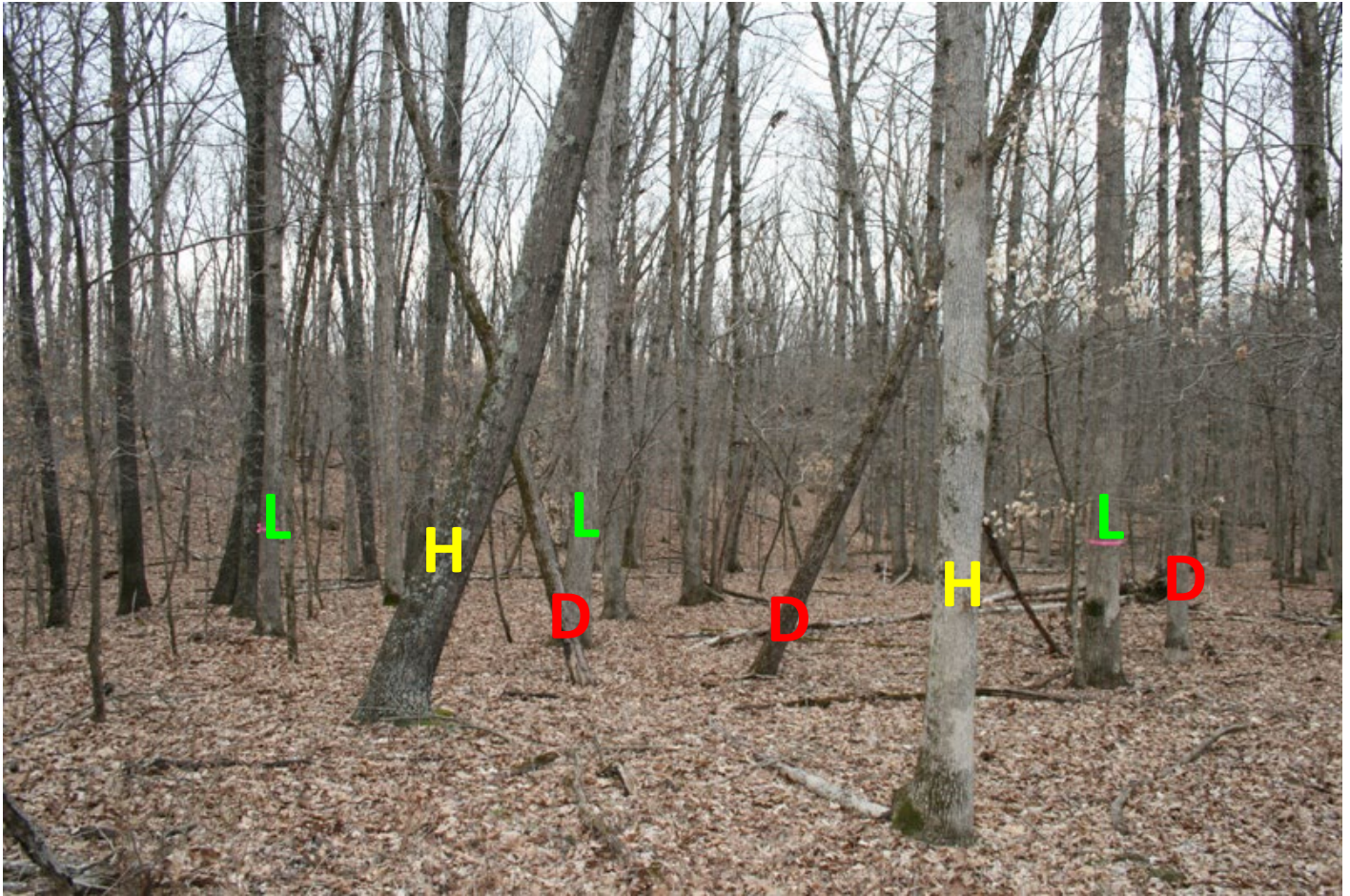
A general rule of thumb for spacing crop trees is ‘double the diameter’; meaning ‘two feet between the crop tree and its neighbor for every inch of the crop tree’s diameter.’ This rule allows for more trees per acre in younger stands. Ideally, the mature forest stand would have about 35 trees, 35 feet apart on every acre. Of course, Mother Nature oftentimes has other plans.

As for the ‘?’ , if you were to mark such a tree for students to evaluate it, if its crown is not competing with the **L** trees, you could keep it for species diversity and a source of food for wildlife. **It just depends on the scenario described.**



Example 3

Of the marked trees in this image, the larger white oaks are of merchantable size and could be harvested to allow the three L trees room to grow. The **D** tree is a white oak of poor form and competing with the **L** trees but too small to be harvested.



Example 4

Leaning trees like these red oaks need to be removed. The larger red oak to the left is of merchantable size and could be harvested while the smaller red oak to the right should be deadened. The white could be harvested with the red oak. The three remaining white oaks are spaced sufficiently far apart and would be left to grow.



The number of wildlife den trees to leave will depend upon the described scenario. Timber oriented objectives will leave fewer den trees than wildlife or recreation-oriented objectives.



Before selecting any crop tree, inspect the trunk carefully for epicormic branches. These small branches are indicative of slow growth and the tree's attempt to stimulate growth by producing more leaf area. Unfortunately, releasing such a tree only stimulates these weak branches and one will end up with a main stem loaded with branches.



Not only must you look around when selecting crop trees, but you must also LOOK UP. Releasing a crop tree with a weak, slow-growing crown like the one shown here buys you nothing. This tree will not be able to respond to the TSI compared to another crop tree that has a balance, vigorous crown.



“Twins” present unique challenges. Twins are sprouts from the same stump.

In the twin on the left, one cannot place his/her boot easily between them. In this situation, there is higher risk that cutting only one stem will allow defect to enter into the base of the remaining stem. Either keep both trees or remove both trees. If they are growing well, with no visible defects, and there are no better neighboring trees then the proper call would be to keep them. However, if there is a better crop tree growing next to these twins then both should be removed.

In the twin on the right, one can place his/her boot easily between the two stems. In this situation, one stem can be safely removed without too much fear of adversely affecting the remaining stem. But which tree to remove? At first glance, one might choose the larger stem on the left. However, note the epicormic branches and the slight lean. Therefore, the better choice is the stem on the right. While smaller, it has better overall form.

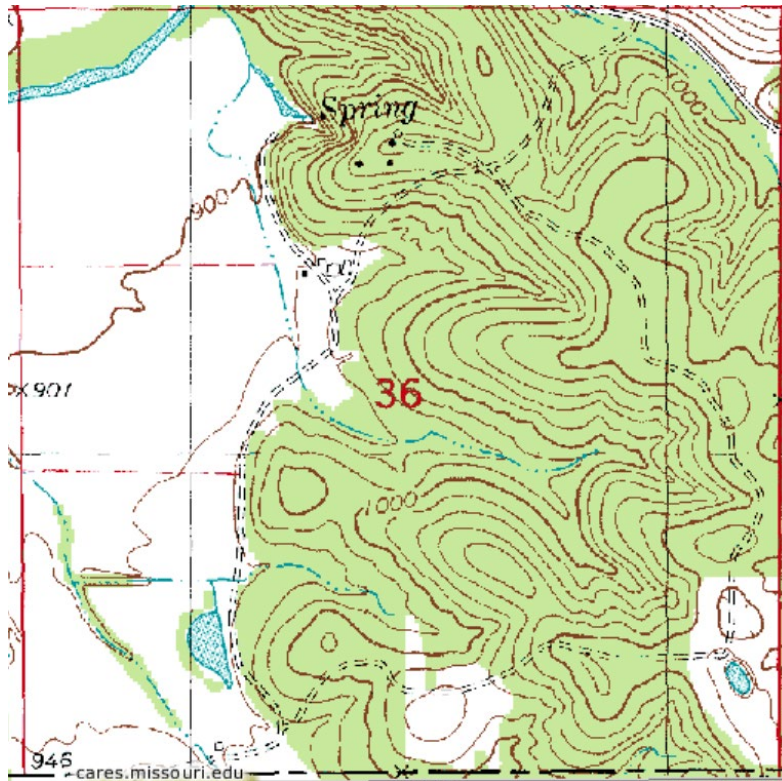
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G. Map Reading – Legal Land Descriptions

The United States Geological Service (USGS) has a very useful online education series for teaching how to understand topographic maps. The web address is:

http://education.usgs.gov/common/lessons/teaching_with_topographic_maps.html

Below are a few sample questions that your team members will be asked at the Regional and State CDE.



1. What is the difference in elevation between the highest elevation in the SE $\frac{1}{4}$ NE $\frac{1}{4}$ of Section 36 and the occupied dwelling in the SE $\frac{1}{4}$ NW $\frac{1}{4}$ of Section 36?
 - a. 80 feet
 - b. 180 feet**
 - c. 280 feet
 - d. 380 feet
2. What percentage of the SW $\frac{1}{4}$ SE $\frac{1}{4}$ of Section 36 is forested?
 - a. 25%
 - b. 50%
 - c. 75%**
 - d. 100%
3. The contour interval is ___ feet.
 - a. 5
 - b. 10
 - c. 15
 - d. 20**

4. The road in Section 36 running north-south is a(n) ____ road.
 - a. light-duty
 - b. unimproved dirt**
 - c. medium-duty
 - d. heavy-duty

5. What is the highest contour line in the NW $\frac{1}{4}$ of Section 36?
 - a. 1,100
 - b. 1,110
 - c. 1,120**
 - d. 1,140

6. What is the elevation of the occupied dwelling on the west side of the unimproved road in the SE $\frac{1}{4}$ NW $\frac{1}{4}$ Section 36?
 - a. 900 feet
 - b. 920 feet**
 - c. 940 feet
 - d. 960 feet

7. The intermittent stream in the NW $\frac{1}{4}$ SE $\frac{1}{4}$ Section 36 is flowing in which general direction?
 - a. north
 - b. south
 - c. east
 - d. west**

8. If traveling west on the road in the SE $\frac{1}{4}$ of Section 36, you would be
 - a. going downhill
 - b. climbing
 - c. staying level**
 - d. roller coaster type ride

9. Which 40-acre parcel has the steepest terrain?
 - a. NE $\frac{1}{4}$ NW $\frac{1}{4}$ Section 36**
 - b. NW $\frac{1}{4}$ NW $\frac{1}{4}$ Section 36
 - c. SW $\frac{1}{4}$ SE $\frac{1}{4}$ Section 36
 - d. SE $\frac{1}{4}$ SW $\frac{1}{4}$ Section 36

End of Training Manual