

2025 Florida 4-H Forest Ecology Contest



The **Florida 4-H Forest Ecology Contest** is held every year at the [Austin Cary Forest's Roland T. Stern Learning Center](#) in Gainesville, Florida. This is a competitive event that encourages youth to identify forest trees, plants, wildlife, and forest health stresses, and to demonstrate their knowledge of forest ecology and management, map and compass, tree measurement, forest management, and natural history. Youth at all three 4-H age levels can compete individually or in teams.

The 2025 contest will be held Saturday, March 29, 2025 at Austin Cary Forest.

In addition, to help youth prepare for the contest, a clinic is held in the fall to provide an opportunity for youth to learn from experts and practice and apply their knowledge and skills.

CONTEST STATIONS

- ❖ **Tree Identification:** Identifying trees from their leaves and fruits
 - Juniors identify 15 species
 - Intermediates identify 20 species
 - Seniors identify 30 species
- ❖ **Forest Health:** Identifying insects, diseases, and stresses that affect forest health
 - Juniors identify 15 insects, diseases, or stresses
 - Intermediates identify 20 insects, diseases, or stresses
 - Seniors identify 30 insects, diseases, or stresses
- ❖ **Map and Compass:** Identifying topographic symbols and using a compass to navigate a course
 - Juniors answer 10 multiple-choice questions on identifying map symbols
 - Intermediates answer 10 multiple-choice questions on identifying map symbols and provide a compass bearing to reach a given point and pace out the distance between two points
 - Seniors answer 5 multiple-choice questions on identifying map symbols and complete a compass trail by providing the bearings and distances between three points
- ❖ **Forest Ecosystems:** Completing a multiple choice and true/false quiz on two forest ecosystems
 - Juniors watch a slideshow presentation to prepare
 - Intermediates read ecosystem descriptions to prepare
- ❖ **Forest Management:** Completing a multiple choice and true/false quiz on forest management and forestry
 - Seniors study the National 4-H Forestry Manuals and the National 4-H Forestry Invitational Handbook
- ❖ **Wildlife on a Forest Hike:** Identifying forest animals and ecosystem components on a hike
 - Juniors identify 20 species
 - Intermediates identify 20 species, may also be required to identify some animals by sound (birds and amphibians) or tracks (mammals)
- ❖ **Tree Measurement:** Measuring the merchantable height and diameter of mature trees
 - Seniors measure the height and diameter of 4 trees and calculate total volume per plot and per acre
- ❖ **Quiz Bowl:** Senior teams will compete in a quiz bowl

SCHEDULE: DAY OF THE CONTEST

- Check-in will be from 8:30 AM to 9:00 AM; the contest will get underway at 9:00 AM.
- Groups will move through each of stations from 9:00 AM - 12:00 PM.
- Tree Identification Assistance, Nature Walk, or other outdoor activities will be conducted from 12:00 to 1:00 PM or until the scoring has concluded.
- Youth can eat their lunches between 12:00 and 1:00 PM.
- An Awards Ceremony will be held between 1:00 and 2:00 PM (the ceremony will begin whenever the judging is completed).
 - All youth receive a certificate of participation.
 - Winning teams and individuals receive ribbons (1st, 2nd, and 3rd place).
 - The 1st place Senior Team is eligible to compete at the National Forestry Invitational.
 - The 1st place Senior individual is eligible for a scholarship to the UF School of Forest, Fisheries, & Geomatics Sciences, if they chooses to attend, renewable annually.
- Volunteers are welcome to help chaperone groups, score quiz sheets, and assist individuals who require reading or writing assistance.

CONTEST REGISTRATION PROCESS

Complete registration forms on the 4-H Online website and send in \$10.00 per competing youth. Adults must also register but will not be charged a fee.

WHAT TO BRING

Clipboard, pencil, lunch, water bottle, shoes/socks, insect repellent, sunscreen, and forest ecology skills.

For more information about the contest, please go our web site:

<https://programs.ifas.ufl.edu/florida-4-h-forest-ecology/>.

Questions? Please contact the Florida 4-H Forest Ecology Contest Coordinator at sfrc-plt@ifas.ufl.edu.



Florida 4-H Forest Ecology Stations & Requirements

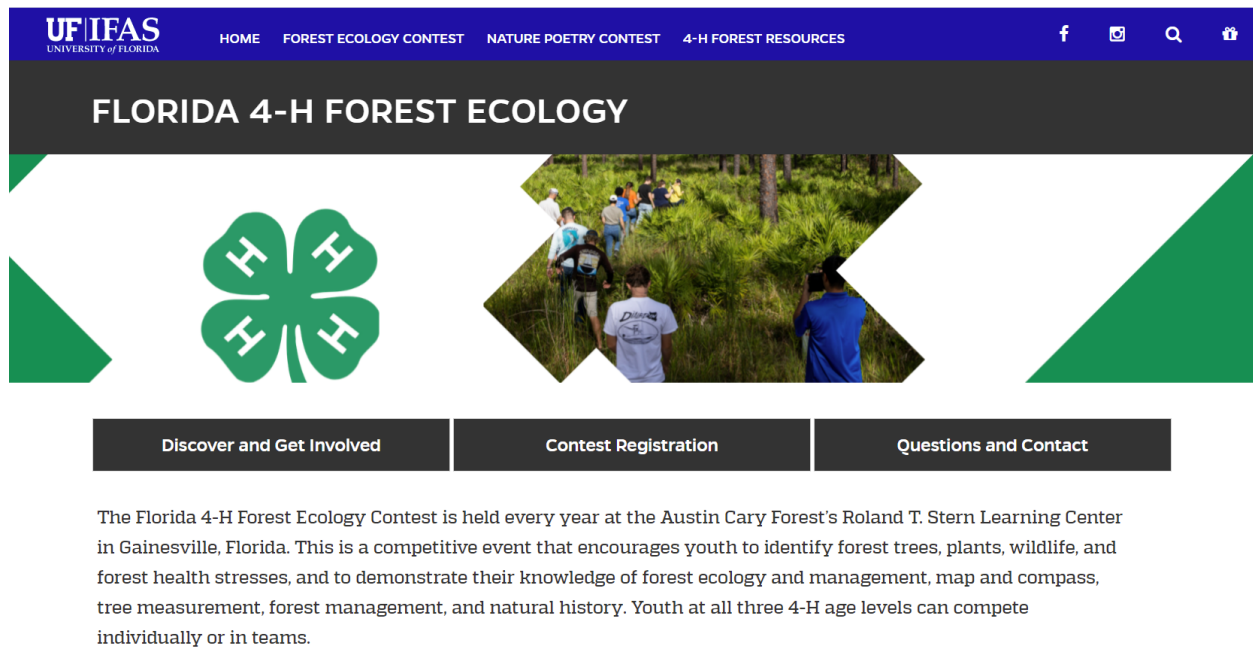
Station Name	Junior	Intermediate	Senior
Tree ID	ID 15 trees	ID 20 trees	ID 30 trees
Forest Health	ID 15 insects, diseases, or stresses	ID 20 insects, diseases, or stresses	ID 30 insects, diseases, or stresses
Forest Ecosystems Quiz	<p>Answer 10 multiple-choice or T/F questions from the ecosystem presentation</p> <p>2025 Ecosystems: Upland Hardwoods & Mangrove Forests</p>	<p>Answer 10 multiple-choice or T/F questions from the ecosystem descriptions</p> <p>2025 Ecosystems: Upland Hardwoods & Mangrove Forests</p>	N/A
Forest Management Quiz	N/A	N/A	Answer 10-20 multiple-choice or T/F questions on forest management and forestry
Map & Compass	<p>Maps: Answer 10 multiple-choice questions on identifying map symbols</p> <p>Compass: N/A</p>	<p>Maps: Answer 10 multiple-choice questions on identifying map symbols</p> <p>Compass: Provide a compass bearing to reach a given point and pace out the distance between two points</p>	<p>Maps: Answer 5 multiple-choice questions on identifying map symbols</p> <p>Compass: Complete a compass trail by providing the bearings and distances between three points</p>
Wildlife Hike	ID 20 animals	ID 20 animals and sounds/tracks	N/A
Tree Measurement	N/A	N/A	Measure the merchantable height and diameter of 4 mature trees and calculate total volume per plot/acre
Quiz Bowl	N/A	N/A	Teams compete one at a time in a timed session to answer 10 directed questions on forestry. Then, teams answer as many toss-up questions as possible in a speed bowl round

Florida 4-H Forest Ecology Contest Website

<https://programs.ifas.ufl.edu/florida-4-h-forest-ecology/>



The website includes detailed information on all of the contest stations as well as study resources, including videos! Additional study resources are added as needed or requested.



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FLORIDA 4-H FOREST ECOLOGY

Discover and Get Involved Contest Registration Questions and Contact

The Florida 4-H Forest Ecology Contest is held every year at the Austin Cary Forest's Roland T. Stern Learning Center in Gainesville, Florida. This is a competitive event that encourages youth to identify forest trees, plants, wildlife, and forest health stresses, and to demonstrate their knowledge of forest ecology and management, map and compass, tree measurement, forest management, and natural history. Youth at all three 4-H age levels can compete individually or in teams.

Please contact the Florida 4-H Forest Ecology Contest Coordinator (sfrc-plt@ifas.ufl.edu) with any suggestions or if you have resources to add to the website. Thanks!

Florida 4-H Forest Ecology Senior Quiz Bowl

How it works:

- One team will compete at a time. We will bring teams into the classroom in alphabetical order by county. Parents, escorts and mentors of the competing team are welcome to observe. No recording devices are allowed. No notes or study materials are allowed.
- Because we have a smaller and sometimes uneven number of Senior teams compared to the national level, the “one team at a time” approach works best and more fairly. See more in “Notes”.
- Each team will compete in two events, Directed Questions and Toss-Up Questions, which will be scored independently. Each team will be asked the same questions. A judge is present to serve as a referee and may overrule the moderator’s decision regarding whether an answer is correct or not. In the event the judge and moderator have to deliberate over an answer given during the timed Toss-Up round, the timer shall stop to give the team 2 full minutes to answer questions. A timekeeper is also present. The Quiz Bowl follows the rules found in the “4-H Invitational Handbook”, with exception to the procedural differences outlined above.

The questions:

- **Directed Questions:**
 - The Directed Questions event involves 10 questions from the moderator to each team. After the question is read, the team has 30 seconds to discuss and agree upon the answer; the team may collaborate and discuss, but the team captain must answer the question. The captain may ask to have the question repeated within five seconds of hearing the question with no penalty.
 - Points/scoring:
 - Ten points are awarded for correct answers.
 - No credit is given to partial or incorrect answers.
 - There is no penalty for incorrect answers.
- **Toss-Up Questions:**
 - Is perhaps best described as the “speed bowl”. The moderator will ask as many questions as time permits, within a 2-minute period.
 - There are 20 questions in the question bank.
 - Unlike the Directed Questions, **any member of the team may answer**, and the answer may begin even before the moderator stops reading the question. The moderator will stop reading the question when the answer begins.
 - **No team discussion is allowed once a team member begins their answer.** If this occurs, the answer will be counted as incorrect.

- **Hint:** If no one on the team knows the answer, it may be to your advantage for the captain to say “pass” or otherwise indicate “don’t know” quickly. You will get more questions!
- Points/scoring:
 - Ten points are awarded for correct answers.
 - If the answer is incorrect, five points are deducted from that team’s score.
 - If no answer is given, zero points are awarded.

Quiz Bowl Study Materials:

- Can be found at our website: <https://programs.ifas.ufl.edu/florida-4-h-forest-ecology/forest-ecology-contest/contest-stations/quiz-bowl/>
- They can also be found at the National 4-H Forestry Invitational website: <https://4hforestryinvitational.org/training/quiz-bowl-and-exam-study-guide>. Some questions are taken from the “Practice Questions” provided on the national site. Others are taken from the “Forestry Manuals” including Program A - Trees, Program B - Forests, and Program C - Recreation.

Notes:

- The national rules vary slightly from the Florida rules.
- In the National Forestry Invitational Forestry Bowl, a large number of Senior teams compete in paired team competition, with single elimination playoffs. Florida rules allow for smaller teams or an odd number of teams with every team being asked the same questions.
- The Florida contest does not take questions from the “Forests and Forestry” textbook listed at the national site because this is not available online.
- The National 4-H Forestry Invitational website is: <https://4hforestryinvitational.org/>

Florida 4-H Forest Ecology Contest Tree Species List

Common Name	Scientific Name	Juniors (ID 15 of 20)	Intermediates (ID 20 of 28)	Seniors (ID 30 of 50)
American basswood*	<i>Tilia americana</i>			X
American beech*	<i>Fagus grandifolia</i>			X
American elm*	<i>Ulmus americana</i>		X	X
American holly*	<i>Ilex</i>	X	X	X
American hornbeam	<i>Carpinus</i>			X
American sycamore*	<i>Platanus</i>	X	X	X
bald cypress*	<i>Taxodium</i>	X	X	X
black cherry*	<i>Prunus serotina</i>		X	X
black locust*	<i>Robinia</i>			X
black walnut*	<i>Juglans nigra</i>		X	X
blackgum*	<i>Nyssa sylvatica</i>			X
boxelder*	<i>Acer negundo</i>		X	X
Brazilian peppertree	<i>Schinus</i>			X
Carolina willow**	<i>Salix caroliniana</i>			X
Chinese tallow	<i>Triadica sebifera</i>		X	X
common persimmon*	<i>Diospyros</i>		X	X
eastern cottonwood*	<i>Populus deltoides</i>			X
eastern Hophornbeam	<i>Ostrya virginiana</i>			X
eastern redcedar*	<i>Juniperus</i>	X	X	X
Florida maple**	<i>Acer</i>			X
flowering dogwood*	<i>Cornus florida</i>	X	X	X
honeylocust*	<i>Gleditsia</i>			X
laurel oak	<i>Quercus laurifolia</i>	X	X	X
live oak*	<i>Quercus virginiana</i>	X	X	X
loblolly pine*	<i>Pinus taeda</i>	X	X	X
longleaf pine*	<i>Pinus palustris</i>	X	X	X
melaleuca	<i>Melaleuca</i>	X	X	X
mockernut hickory*	<i>Carya tomentosa</i>			X
pecan*	<i>Carya illinoensis</i>	X	X	X
pignut hickory*	<i>Carya glabra</i>	X	X	X
pond pine**	<i>Pinus serotina</i>			X
red buckeye**	<i>Aesculus pavia</i>			X
red maple*	<i>Acer rubrum</i>	X	X	X
red mulberry*	<i>Morus rubra</i>			X
redbay	<i>Persea borbonia</i>			X
river birch*	<i>Betula nigra</i>			X
sassafras*	<i>Sassafras albidum</i>	X	X	X
sea grape	<i>Coccoloba uvifera</i>			X
Shumard oak**	<i>Quercus</i>			X
silver maple*	<i>Acer saccharinum</i>			X
slash pine	<i>Pinus elliotii</i>		X	X
southern magnolia*	<i>Magnolia</i>	X	X	X
southern red oak*	<i>Quercus falcata</i>		X	X
sugarberry**	<i>Celtis laevigata</i>			X
sweetgum*	<i>Liquidambar</i>	X	X	X
tuliptree*	<i>Liriodendron</i>	X	X	X

More on back...

Florida 4-H Forest Ecology Contest Tree Species List

Common Name	Scientific Name	Juniors (ID 15 of 20)	Intermediates (ID 20 of 28)	Seniors (ID 30 of 50)
turkey oak	<i>Quercus laevis</i>	X	X	X
water oak*	<i>Quercus nigra</i>	X	X	X
waxmyrtle	<i>Myrica cerifera</i>	X	X	X
white ash*	<i>Fraxinus</i>			X
white oak*	<i>Quercus alba</i>			X

NOTE: Highlighted trees are considered invasive to Florida.

*Species is on the National 4-H Forestry Invitational list.

**Species may be used as a substitute to learn about the following species that are on the national list:

Carolina willow for black willow*

Florida maple for sugar maple*

pond pine for pitch pine*

red buckeye for yellow buckeye*

Shumard oak for scarlet oak*, northern red oak*, and black oak*


sugarberry for hackberry*

A Key to Florida Trees on the Junior 4-H Forest Ecology Contest


1a	Narrow, thin, needle-like "leaves"	Go to 2
1b	Broad, flat leaves	Go to 5
2a	Individual needles 2 cm long or shorter	Go to 3
2b	Individual needles longer than 2 cm	Go to 4
3a	Needles held close to the stem or pressed into stem	Eastern redcedar
3b	Needles spread from branchlet like a feather	baldcypress
4a	Bundled needles in groups of 3, seldom 2, 10-17 cm	loblolly pine
4b	Bundled needles in groups of 3, rarely 2, 20-30 cm	longleaf pine
5a	Compound leaf	Go to 6
5b	Simple leaf	Go to 7
6a	9-17 leaflets	pecan
6b	5-7 leaflets	pignut hickory
7a	Opposite arrangement	Go to 8
7b	Alternate arrangement	Go to 9
8a	Lobes, palmate shape	red maple
8b	No lobes, ovate shape, parallel veins	flowering dogwood
9a	Palmate shape	Go to 10
9b	Oval shape	
10a	Shallow lobes	Go to 11
10b	Deep lobes	Go to 12
11a	Leaf ends in sharp tip; leaf is wider in the middle	American sycamore
11b	Leaf ends in indentation; leaf is wider at the bottom	tuliptree
12a	Pointed tip on lobes, star shape	sweetgum
12b	Rounded tip on lobes, mitten shape	sassafras
13a	No lobes, elliptical to oval shape	Go to 14
13b	Lobes	Go to 18
14a	Teeth or bristle on margin	Go to 15
14b	Smooth margin	Go to 16
15a	Coarse serrated teeth, 5-10 cm, wedge base	waxmyrtle
15b	Sharp bristle tip, often spines, 5-10 cm, stiff	American holly
16a	Large leaf, 13-20 cm, leathery	Southern magnolia

A Key to Florida Trees on the Junior 4-H Forest Ecology Contest

16b	Medium to small leaf, less than 13 cm	Go to 17
17a	Wedge base, acute tip, 8-10 cm	laurel oak
17b	Tapering base, round tip, 5-13 cm, leathery	live oak
17c	Oval shape, parallel veins, 3-5 cm	melaleuca
18a	General shape is elliptical to oval	Go to 19
18b	Spatulate shape, variable leaves, 5-20 cm	water oak
19a	Deep lobes, 12-23 cm, bristle tip, bell shaped base	Southern red oak
19b	Deep narrow lobes, 5-30 cm, wedge shaped base	turkey oak







Press Your Own Leaves

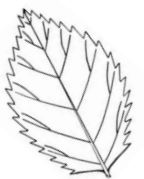


You Will Need:

- A leaf to press
- Two sheets of newspaper
- One sheet of heavy paper
- A few heavy books
(textbooks, and dictionaries
work well)



- 
1. Place your leaf between the two sheets of newspaper. Write the name of the species on the paper so you remember.
 2. Open one book to the center and insert your “leaf sandwich.” Close the book.
 3. Stack one or two heavy books on top of the book that contains the leaf.
 4. Let it sit for 1-2 weeks.
 5. Remove your leaf, carefully glue it to heavy paper, label the leaf, and add the page to your collection!
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TREE MEASUREMENTS - USING A BILTMORE STICK

Deborah B. Hill

To Measure Diameter

1. Diameter is measured at what is called Diameter Breast Height (DBH). This is 4.5 ft. (1.37 m) up the trunk from the ground. If the tree you are measuring is on a slope, diameter should be taken at 4.5 ft. (1.37 m) on the uphill side of the tree.
2. Hold the Biltmore stick against the tree at DBH, 25 in. (62.5 cm) from your eye. Make sure the edge of the stick that reads diameter is facing you.
3. Sight past the zero end of the stick and the edge of the tree.
4. Without moving your head, shift your eyes to other side of the tree and read the black diameter mark nearest to your line of sight.
5. Tree trunks usually are not round. If a trunk is very much out of round, you should measure both wide and narrow diameters and take the average of the two.

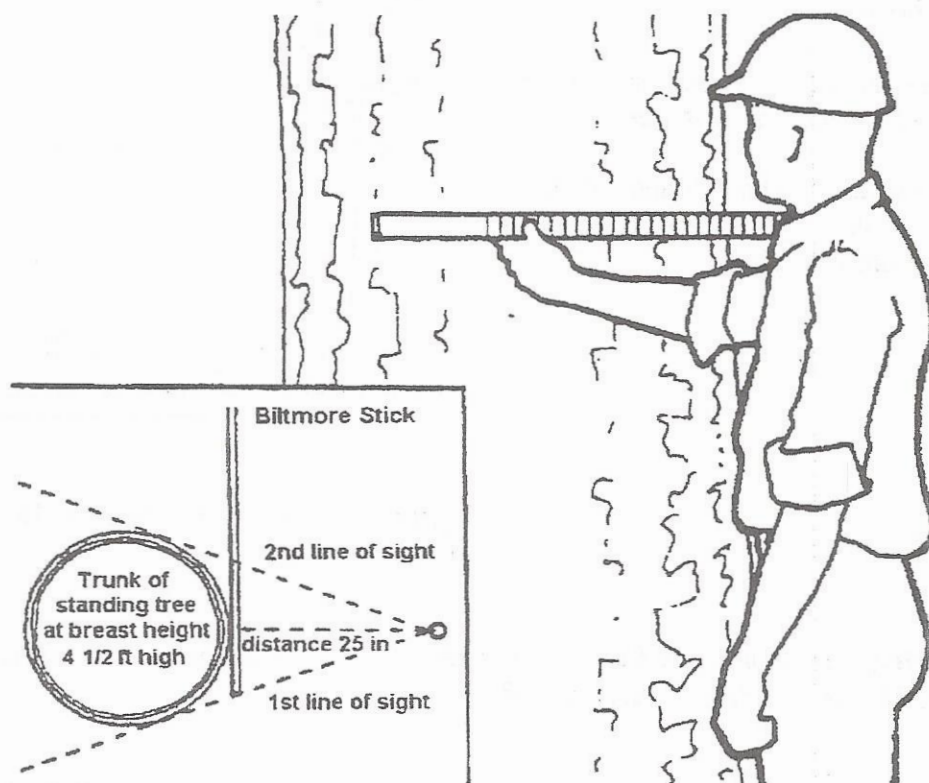


Figure 1. Using a Biltmore stick to find tree diameter.

To Measure Height

1. Stand 66 ft. (20.12 m) from the tree so that --
 - you are about on a level with the base of the tree. Walk out across the slope instead of up or down slope from the tree.
 - the tree is not leaning away from you.
 - you can see the top up to its merchantable height. If you are measuring for sawlogs, the merchantable height is the point where the top is 6 in. (15 cm) in diameter. For pulpwood, merchantable height is to a 3.6 in. (9 cm) diameter top; and for firewood, it is an 3.2 in. (8 cm) diameter top. Practice estimating these top diameters by standing back from a tree with a known diameter of 6, 3.6, or 3.2 inches (15, 9, or 8 cm) and comparing this to the tops of other trees.
2. Hold the stick vertically 25 in. (62.5 cm) from your eye with the lower end approximately at eye level and with the scale for measuring heights facing you.
3. Line up the zero end of the stick with the stump height - the height of the stump if the tree were cut. This is usually not more than 1 ft. (.3 m) from the ground.
4. Without moving your head or the stick, raise your eyes and sight to the merchantable top.
5. The nearest log mark or meter is the merchantable height of the tree.

Practice measuring heights and diameters to develop your skill before recording actual measurements from your plots.

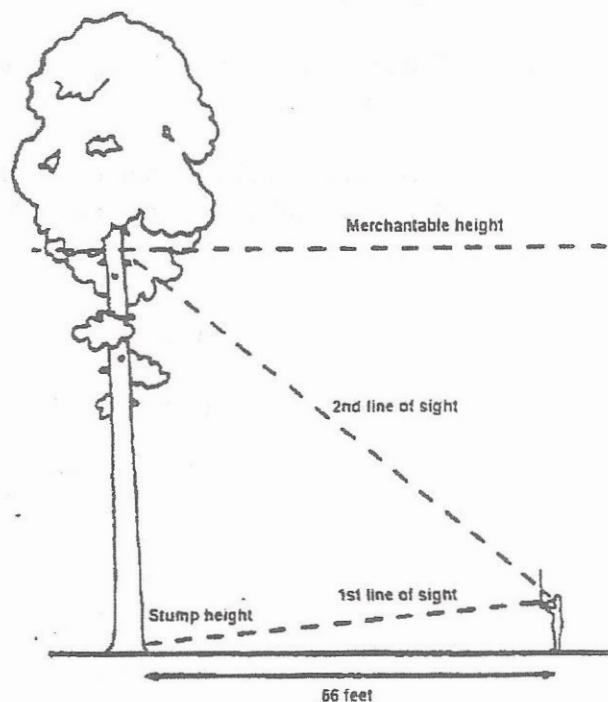


Figure 2. Measuring tree height with a Biltmore Stick.

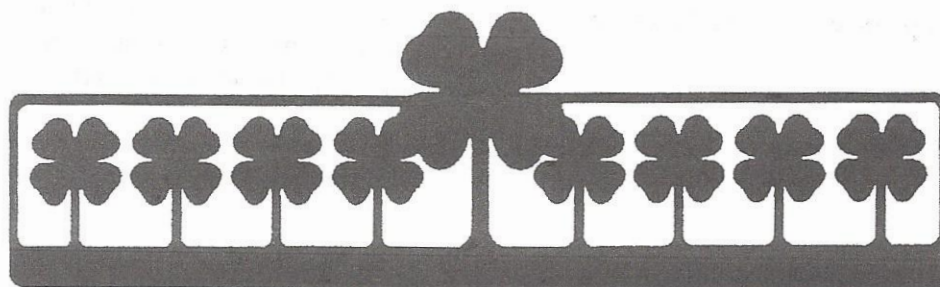
Note: Acknowledgment is made to Cornell University for the use of the material from their booklet entitled Understanding Forest Ecosystems.

(D. Hill 1.5M 9/98)

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4-H Forestry

Making a Tree Scale Stick



The first step in good forest management is the measurement of trees to establish a forest inventory. The most common tree measurements needed for inventory include DBH (diameter at breast height), merchantable height, and total height (Figure 1).

Many tools are available to take these measurements, but one of the simplest and easiest to use is the tree scale stick.

Although you can buy a tree scale, many people have enjoyed making personalized sticks. By following the directions in this project, you can construct a tree scale stick to measure trees accurately.

Under certain situations, your handmade tree scale stick can even outperform a manufactured stick. Some 4-H members with shorter arms find it impossible to hold a manufactured stick the required 25-inch distance from their eyes. You can make your stick for your arm length; therefore, tree measurements are more accurate. Also, manufactured sticks are not designed to measure total tree height, even though it is an important measurement.

Total height is needed to help determine pulpwood volumes in trees. You can make your stick to measure total height as easily as measuring merchantable height.

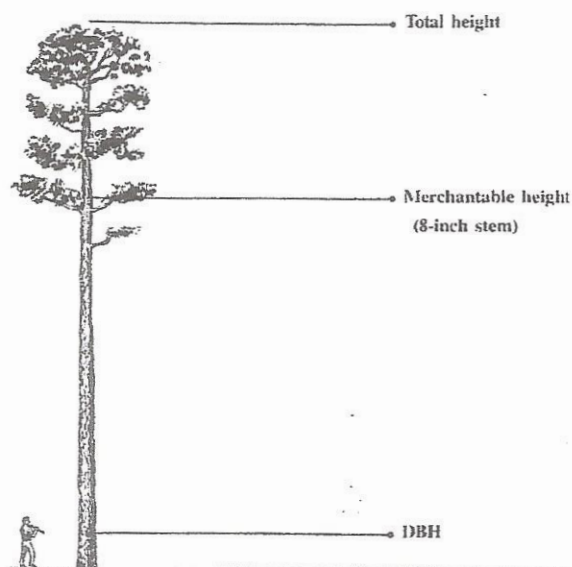


Figure 1. Three important tree measurements.

Project References

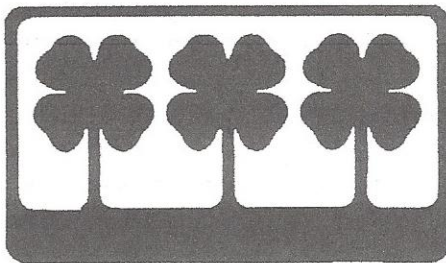
1. Extension Publication 2260 Are My Pine Trees Ready To Thin
2. Extension Publication 1473 4-H Forestry Project No. 7: Measuring Standing Sawtimber

Project Materials

1. A yardstick or similar-sized piece of wood
2. A tape measure in inches
3. A tape measure in centimeters
4. Three sheets of plain, unlined 8½- by 14-inch white paper
5. A fine point, permanent-ink pen
6. A long straightedge
7. Scissors
8. Glue
9. Scotch tape
10. Clear package tape, at least ½-inch wide

Sources of Help and Information

1. County Extension agent
2. 4-H volunteer leaders and parents
3. County forester, Mississippi Forestry Commission
4. District conservationist, Natural Resources Conservation Service, U.S. Department of Agriculture
5. District ranger, Forest Service, U.S. Department of Agriculture
6. Foresters with local forest industries
7. Consulting foresters, self-employed
8. Park managers, Mississippi Department of Wildlife, Fisheries, and Parks



Instructions

1. Measure your arm reach. Two arm-reach measurements are needed, one for measuring DBH and the other for measuring height, because you hold the tree scale stick differently to measure each. Correct measurement of your arm reach is critical. A mistake here will result in an inaccurate scale stick. Therefore, repeat arm-reach measurements at least twice to check for errors. Your arm reach will also change as you grow, so every year check your arm reach, and if it has changed, make a new tree scale stick.

Let's measure arm reach for DBH first. Hold the yardstick sideways against a large tree, just as if DBH were being measured (P1473 4-H Forestry Project No. 7: Measuring Standing Sawtimber). Grasp and hold the stick on its lower edge near where the stick touches the tree. The upper edge will have the DBH measurement scale, which you do not want to cover with your hand. In addition, hold your arm straight and in a comfortable position, since this is how you always will measure DBH.

Have a friend use the tape measure (inches) and determine the distance from the bone next to your eye to the yardstick (Figure 2). Hold the tape straight and tight and round off the measured distance to the nearest inch. This is your arm reach for DBH measurement. Record it below:

My arm reach for measuring DBH is _____ inches.

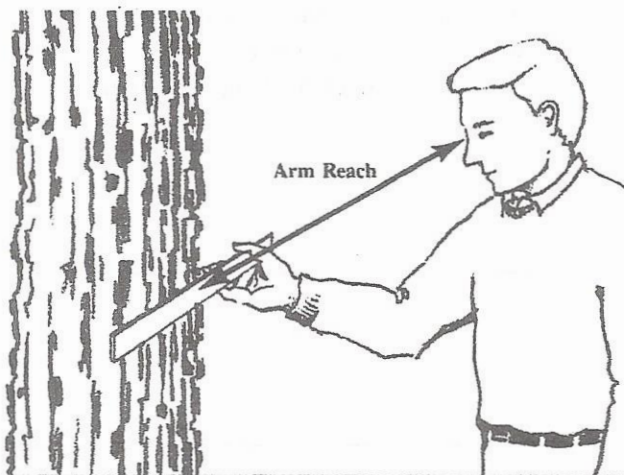


Figure 2. Determine your arm reach for DBH measurement.

2. Now, determine arm reach for total and merchantable height measurements. Measure 66 feet (1 chain) from a tree, look back at the tree, and hold the yardstick vertical as if merchantable height were being measured (P1473 4-H Forestry Project No. 7: Measuring Standing Sawtimber). Again, make sure you hold your arm straight and comfortably since you must hold it this way for all future height measurements.

As you did before for DBH, have your friend measure the distance from your eye bone to the yardstick and round off the distance to the nearest inch (Figure 3). This is your arm reach for height measurements. Record this measurement below:

My arm reach for measuring height is _____ inches.

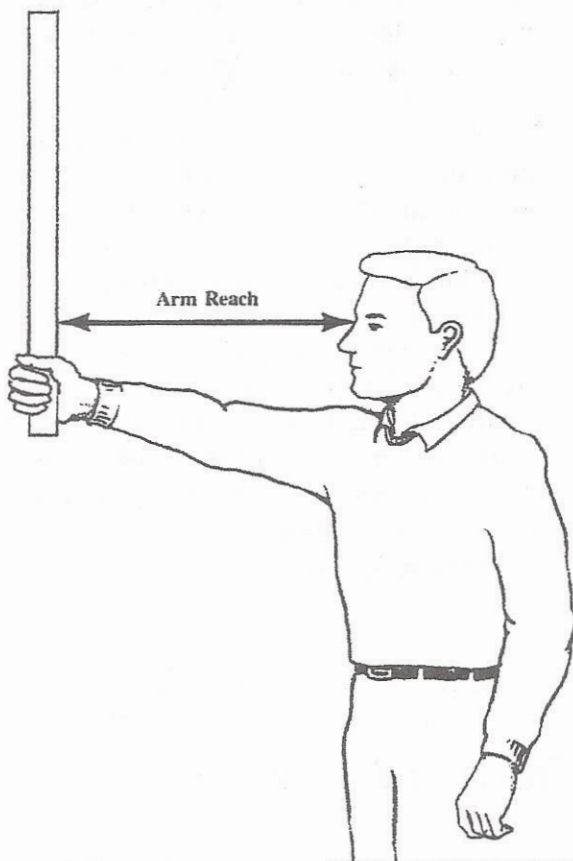


Figure 3. Determine your arm reach for height measurements.

3. Prepare your paper. Place three sheets of legal-size paper end to end on a table and allow them to overlap approximately $\frac{1}{4}$ inch. Tape the sheets together on one side, then flip the sheets over. Take the pen and straight-edge and draw three parallel lines the length of the paper (36 inches long and 1 inch apart). The first line will be used to mark off the scale for DBH measurement, the second for merchantable height, and the third total height. Each scale will be specific for your particular arm reach.

4. Mark your scale for DBH measurement. Look at Table 1. The far left column is actual tree DBH, while remaining columns in the table show distances to mark off on the tree scale stick to measure DBH accurately. As you will notice, scale distances are in centimeters, not inches, making it easier for you to measure distances.

Look at the top of Table 1 for the length of your arm reach for measuring DBH. Each number in that column below your arm reach is a distance on the scale stick that corresponds to a tree DBH on the same row.

Using a tape measure (centimeters) and pen, mark the distance for each DBH along the scale line you already drew. Remember always to measure from the far left-hand edge of the scale line, which is the zero point (DBH=0).

Hold the paper sideways, and number each mark along the scale line with the tree DBH it corresponds with (Figure 4). Be sure to print neatly and include instructions for measuring DBH with your tree scale stick. For example, "Tree diameter (inches), hold _____ inches from eye." (Fill in the blank with your arm reach for DBH measurement.)

5. Mark your scale for measuring merchantable height. Look at Table 2. This table shows how to mark off distances on the tree scale stick to correspond to different merchantable heights. Use this table as you did Table 1.

Find your arm reach for measuring heights, and place a mark at the correct distances along the scale line for each log and half-log length. Turn the paper straight up and down to write the number of logs next to each mark on the scale. Numbers written this way will be easy to read when heights are measured (Figure 4).

Include instructions for measuring merchantable height with your tree scale stick. For example, "Merchantable height (number of 16-foot lots), pace 66 feet from tree, and hold stick _____ inches from eye." (Fill in the blank with your arm reach for height measurements.)

6. Mark your scale for measuring total height. Look at Table 3. This table shows how to mark off distances on the tree scale stick to correspond to different total heights. Use this table as you did Tables 1 and 2.

Find your arm reach for measuring heights, and place a mark at the correct distance along the scale line for height (feet). Again, turn the paper straight up and down to write the heights, in feet, next to each mark so they will be easy to read (Figure 4).

Include instructions for measuring total height with your tree scale stick. For example, "Total height (feet), pace 66 feet from tree, and hold stick _____ inches from eye." Fill in the blank with your arm reach for height measurements.

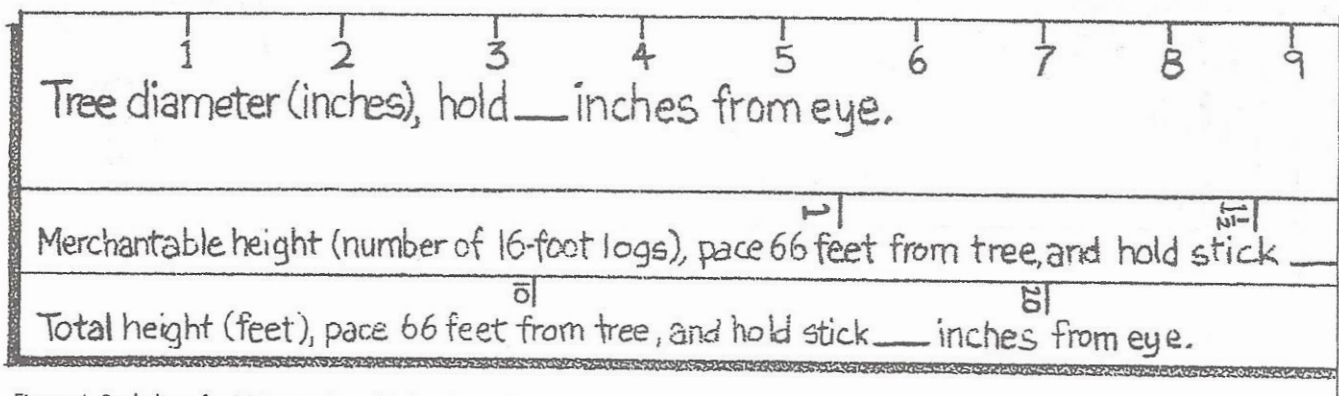


Figure 4. Scale lines for DBH, merchantable height, and total height.

7. Assemble your tree scale stick. Carefully cut out the three scale lines—DBH, merchantable height, and total height. The DBH scale can be 1 inch wide and the two height scales can each be $\frac{1}{2}$ inch wide. Lightly glue the DBH scale on the front of the yardstick and the two height scales on the back. When gluing, line up the zero point with the left-hand edge of the yardstick. In addition, line up the top edge of the DBH scale line as close to the upper edge of the yardstick as possible. Place one height scale near the upper edge and one near the lower.

After the glue has dried, place clear packaging tape over the tree scale lines to protect them from water and dirt. Your tree scale stick is now ready to use.

Using the tree scale stick to measure DBH and merchantable height is fully explained in P1473 4-H Forestry Project No. 7: Measuring Standing Sawtimber. Total tree height measurement may be something you are not familiar with. It is explained next.

8. Measure total height. Total height is measured by holding the scale stick vertically one arm reach from your eye while standing at a distance of 66 feet (one chain) from the tree. With one eye, line up the bottom of the scale stick with the point where the tree stem touches the ground.

Now, without moving your head, sight on the very uppermost reach of the main stem and find the adjacent total height value on the scale stick.

You can measure most trees accurately if you stand 66 feet from them. Exceptions are very large trees (greater than 80 feet in height) and very small trees (less than 30 feet). If a tree is more than 80 feet in height, pace away from the tree an additional 66 feet, making the total distance two chains or 132 feet. Measure total height normally, and whatever height you see on the scale, multiply it by 2 to get the correct height of the tree.

For trees shorter than 30 feet, pace only two chains, or 33 feet, from the tree. Measure the height, and divide the reading on the scale stick by two to get the correct tree height. With these two tricks you should be able to measure the height of any tree.

Summary

- Collect project materials.
- Determine your arm reach for DBH and height measurements.
- Draw three lines, 36 inches in length, on paper. Use the first line for the DBH scale, the second for merchantable height, and the third for total height.
- Based on your arm length, locate the correct distances for scale lines in the tables.
- Mark off each scale, starting from the left edge as zero.
- Cut out the scale lines and assemble your scale stick.

Now get out there and have fun measuring trees!

Table 1. Scale graduations for DBH (diameter at breast height). Mark off distances on the scale line, starting at the left-hand edge (zero point).

DBH (inches)	Arm Reach (inches)										
	20	21	22	23	24	25	26	27	28	29	30
	Distance in centimeters										
1	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
2	4.8	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9
3	7.1	7.1	7.1	7.2	7.2	7.2	7.2	7.2	7.2	7.3	7.3
4	9.3	9.3	9.3	9.4	9.4	9.4	9.5	9.5	9.5	9.5	9.5
5	11.4	11.4	11.5	11.5	11.6	11.6	11.6	11.7	11.7	11.7	11.8
6	13.4	13.4	13.5	13.6	13.6	13.7	13.7	13.8	13.8	13.9	13.9
7	15.3	15.4	15.5	15.6	15.6	15.7	15.8	15.8	15.9	16.0	16.0
8	17.2	17.3	17.4	17.5	17.6	17.7	17.8	17.8	17.9	18.0	18.1
9	19.0	19.1	19.3	19.4	19.5	19.6	19.7	19.8	19.9	20.0	20.0
10	20.7	20.9	21.1	21.2	21.3	21.5	21.6	21.7	21.8	21.9	22.0
11	22.4	22.6	22.8	23.0	23.1	23.3	23.4	23.6	23.7	23.8	23.9
12	24.1	24.3	24.5	24.7	24.9	25.1	25.2	25.4	25.5	25.6	25.8
13	25.7	26.0	26.2	26.4	26.6	26.8	27.0	27.1	27.3	27.4	27.6
14	27.3	27.6	27.8	28.0	28.3	28.5	28.7	28.9	29.0	29.2	29.4
15	28.8	29.1	29.4	29.6	29.9	30.1	30.3	30.5	30.7	30.9	31.1
16	30.2	30.6	30.9	31.2	31.5	31.7	32.0	32.2	32.4	32.6	32.8
17	31.7	32.1	32.4	32.7	33.0	33.3	33.6	33.8	34.1	34.3	34.5
18	33.2	33.5	33.9	34.2	34.6	34.9	35.1	35.4	35.7	35.9	36.1
19	34.6	35.0	35.4	35.7	36.1	36.4	36.7	37.0	37.2	37.5	37.8
20	35.9	36.4	36.8	37.2	37.5	37.9	38.2	38.5	38.8	39.1	39.3
21	37.3	37.7	38.2	38.6	39.0	39.3	39.7	40.0	40.3	40.6	40.9
22	38.6	39.1	39.5	39.9	40.4	40.8	41.1	41.5	41.8	42.1	42.4
23	39.8	40.4	40.8	41.3	41.7	42.2	42.6	42.9	43.3	43.6	44.0
24	41.1	41.6	42.2	42.6	43.1	43.5	44.0	44.4	44.7	45.1	45.4
25	42.3	42.9	43.4	44.0	44.4	44.9	45.3	45.8	46.2	46.5	46.9
26	43.5	44.1	44.7	45.2	45.8	46.2	46.7	47.1	47.6	48.0	48.3
27	44.7	45.4	46.0	46.5	47.0	47.6	48.0	48.5	48.9	49.4	49.8
28	45.9	46.6	47.2	47.8	48.3	48.8	49.3	49.8	50.3	50.7	51.1
29	47.1	47.7	48.4	49.0	49.6	50.1	50.6	51.1	51.6	52.1	52.5
30	48.2	48.9	49.6	50.2	50.8	51.4	51.9	52.4	52.9	53.4	53.9
31	49.3	50.0	50.7	51.4	52.0	52.6	53.2	53.7	54.2	54.7	55.2
32	50.4	51.2	51.9	52.6	53.2	53.8	54.4	55.0	55.5	56.0	56.5
33	51.5	52.3	53.0	53.7	54.4	55.0	55.6	56.2	56.8	57.3	57.8
34	52.6	53.4	54.1	54.9	55.6	56.2	56.8	57.4	58.0	58.6	59.1
35	53.6	54.4	55.2	56.0	56.7	57.4	58.0	58.7	59.3	59.8	60.4
36	54.6	55.5	56.3	57.1	57.8	58.5	59.2	59.9	60.5	61.1	61.6
37	55.7	56.5	57.4	58.2	58.9	59.7	60.4	61.0	61.7	62.3	62.9
38	56.7	57.6	58.4	59.3	60.1	60.8	61.5	62.2	62.9	63.5	64.1
39	57.7	58.6	59.5	60.3	61.1	61.9	62.7	63.4	64.0	64.7	65.3
40	58.7	59.6	60.5	61.4	62.2	63.0	63.8	64.5	65.2	65.9	66.5
41	59.6	60.6	61.5	62.4	63.3	64.1	64.9	65.6	66.3	67.0	67.7
42	60.6	61.6	62.5	63.5	64.3	65.2	66.0	66.7	67.5	68.2	68.9
43	61.5	62.6	63.5	64.5	65.4	66.2	67.0	67.8	68.6	69.3	70.0
44	62.5	63.5	64.5	65.5	66.4	67.3	68.1	68.9	69.7	70.4	71.2
45	63.4	64.5	65.5	66.5	67.4	68.3	69.2	70.0	70.8	71.6	72.3
46	64.3	65.4	66.5	67.5	68.4	69.3	70.2	71.1	71.9	72.7	73.4
47	65.2	66.3	67.4	68.4	69.4	70.3	71.2	72.1	72.9	73.7	74.5
48	66.1	67.3	68.3	69.4	70.4	71.3	72.3	73.2	74.0	74.8	75.6
49	67.0	68.2	69.3	70.3	71.4	72.3	73.3	74.2	75.1	75.9	76.7
50	67.9	69.1	70.2	71.3	72.3	73.3	74.3	75.2	76.1	76.9	77.8
51	68.8	70.0	71.1	72.2	73.3	74.3	75.3	76.2	77.1	78.0	78.8
52	69.6	70.8	72.0	73.1	74.2	75.3	76.3	77.2	78.1	79.0	79.9
53	70.5	71.7	72.9	74.1	75.2	76.2	77.2	78.2	79.1	80.1	80.9
54	71.3	72.6	73.8	75.0	76.1	77.2	78.2	79.2	80.1	81.1	82.0
55	72.1	73.4	74.7	75.9	77.0	78.1	79.1	80.2	81.1	82.1	83.0
56	73.0	74.3	75.5	76.7	77.9	79.0	80.1	81.1	82.1	83.1	84.0
57	73.8	75.1	76.4	77.6	78.8	79.9	81.0	82.1	83.1	84.1	85.0
58	74.6	76.0	77.2	78.5	79.9	80.9	82.0	83.0	84.1	85.1	86.0
59	75.4	76.8	78.1	79.4	80.6	81.8	82.9	84.0	85.0	86.0	87.0
60	76.2	77.6	78.9	80.2	81.5	82.7	83.8	84.9	86.0	87.0	88.0

Table 2. Scale graduations for merchantable height. Mark off distances on the scale line, starting at the left-hand edge (zero point).

Height (number of 16-foot logs)	Arm Reach (inches)										
	20	21	22	23	24	25	26	27	28	29	30
	Distance in centimeters										
1	12.3	12.9	13.5	14.2	14.8	15.4	16.0	16.6	17.2	17.9	18.5
1.5	18.5	19.4	20.3	21.2	22.2	23.1	24.0	24.9	25.9	26.8	27.7
2	24.6	25.9	27.1	28.3	29.6	30.8	32.0	33.3	34.5	35.7	36.9
2.5	30.8	32.3	33.9	35.4	36.9	38.5	40.0	41.6	43.1	44.6	46.2
3	36.9	38.8	40.6	42.5	44.3	46.2	48.0	49.9	51.7	53.6	55.4
3.5	43.1	45.3	47.4	49.6	51.7	53.9	56.0	58.2	60.3	62.5	64.6
4	49.3	51.7	54.2	56.6	59.1	61.6	64.0	66.5	69.0	71.4	73.9
4.5	55.4	58.2	61.0	63.7	66.5	69.3	72.0	74.8	77.6	80.4	83.1
5	61.6	64.7	67.7	70.8	73.9	77.0	80.0	83.1	86.2	89.3	92.4

Table 3. Scale graduations for total height. Mark off distances on the scale line starting at the left-hand edge (zero point).

Total height (feet)	Arm Reach (inches)										
	20	21	22	23	24	25	26	27	28	29	30
	Distance in centimeters										
10	7.7	8.1	8.5	8.9	9.2	9.6	10.0	10.4	10.8	11.2	11.5
20	15.4	16.2	16.9	17.7	18.5	19.2	20.0	20.8	21.6	22.3	23.1
30	23.1	24.2	25.4	26.6	27.7	28.9	30.0	31.2	32.3	33.5	34.6
40	30.8	32.3	33.9	35.4	36.9	38.5	40.0	41.6	43.1	44.6	46.2
50	38.5	40.4	42.3	44.3	46.2	48.1	50.0	52.0	53.9	55.8	57.7
60	46.2	48.5	50.8	53.1	55.4	57.7	60.0	62.3	64.7	67.0	69.3
70	53.9	56.6	59.3	62.0	64.7	67.3	70.0	72.7	75.4	78.1	80.8
80	61.6	64.7	67.7	70.8	73.9	77.0	80.0	83.1	86.2	89.3	92.4

**Florida 4-H Forest Ecology Contest
Forest Health Dichotomous Keys
(Junior, Intermediate, & Senior)**

FLORIDA 4-H FOREST ECOLOGY CONTEST
FOREST HEALTH DICHOTOMOUS KEY
JUNIOR

- 1a Tree damage is caused by an insect go to 2
- 1b Tree damage is not caused by an insect go to 7

- 2a Damage is caused by a larvae or caterpillar go to 3
- 2b Damage is not caused by a larvae or caterpillar go to 4

- 3a The insects live in a web that is no bigger than a basketball,
is found in the branch unions of fruit trees (apple, cherry,
plum) and the insects leave their webs to feed Eastern tent
caterpillar
- 3b The insects live in and feed inside of their web, the web can
cover large parts of hardwood tree canopies Fall webworm

- 4a The tree damage is caused by a large insect depositing its
eggs in 1/4-1/2" diameter branches using an ovipositor..... Cicada
- 4b The insects are not as described above and are beetles go to 5

- 5a The beetle is the largest bark beetle in the southeastern
United States, its damage is seen in the lower 10 ft of the
tree stem, as is associated with large globs of resin Black turpentine
beetle
- 5b The beetle is not as described above go to 6

- 6a The beetle makes "noodles" of wood tissue that it pushes
out of the tree as it bores into the wood, it has a symbiotic
relationship with a fungus that it eats Ambrosia beetle
- 6b The beetle has 1/8" exit holes, its galleries are made up of
individual chambers for their grubs to mature in and feed on
the inner bark of the tree Southern pine
beetle

- 7a The damage is caused by a fungus or living organism go to 8
- 7b The damage is caused by environmental occurrences,
human-made, or parasitic plant go to 13

- 8a The damage to the tree is best described as a canker go to 9
- 8b Not as described above go to 10

- 9a The canker is often found on oak trees and other hardwoods, it can appear smooth black or grey..... Hypoxylon canker
- 9b The canker is found on pine and is associated with a lot of resin or pitch production by the tree Pitch canker
- 10a The disease has two different host plants from two different tree species..... go to 11
- 10b Not as described above go to 12
- 11a The two hosts are red cedar (*Juniperus virginiana*) and apples or crabapple (*Malus* species), on the cedar it produces large round galls and on the apple causes orange leaf spots Cedar apple rust
- 11b The two hosts are pine (loblolly and slash, especially) and oak (water, willow, and laurel), the fungus causes galls to form on branches of the pine and leaf spots on the oak..... Fusiform rust
- 12a The fungus grows as clusters of mushrooms at the base of trees like a little “army”, it can also grow rhizomorphs that look like black-brown shoestrings..... Armillaria root rot
- 12b The fungus infects the needles of pine trees and causes them to turn red-brown and be prematurely dropped from the tree Needlecast
- 13a The damage are V-shaped grooves cut into the bark of trees, it was caused by humans during the collection of pine resin from trees to make turpentine, is sometimes associated with metal attached to the tree Catface
- 13b Not as described above go to 14
- 14a Damage looks like vertical slashes in the tree’s bark and is caused by giant sparks of electricity Lightning
- 14b The damage looks like a green plant growing on the branches of its host tree, it does not lose its leaves in the winter, is a higher parasitic plant Mistletoe

FLORIDA 4-H FOREST ECOLOGY CONTEST
FOREST HEALTH DICHOTOMOUS KEY
INTERMEDIATE

- 1a Tree damage is caused by an insect.....go to 2
- 1b Tree damage is not caused by an insectgo to 12

- 2a Damage is caused by a larvae or caterpillar.....go to 3
- 2b Damage is not caused by a larvae or caterpillargo to 7

- 3a The caterpillar or larvae make webs to live ingo to 4
- 3b The caterpillar or larvae do no make webs to live ingo to 6

- 4a The caterpillar or larvae make their webs in the tips of pine tree and the webs are often brown because of the frassPine webworm
- 4b Not as described above.....go to 5

- 5a The caterpillar or larvae feed in group on pine trees and move together to mimic a larger animal as a defense mechanism.....Pine sawflies
- 5b Not as described above.....go to 6

- 6a The insects live in a web that is no bigger than a basketball, is found in the branch unions of fruit trees (apple, cherry, plum) and the insects leave their webs to feedEastern tent caterpillar
- 6b The insects live in and feed inside of their web, the web can cover large parts of hardwood tree canopiesFall webworm

- 7a The tree damage is caused by an adult insect laying its eggsgo to 8
- The insects are not as described above and are beetlesgo to 9

- 8a large insect depositing its eggs in 1/4-1/2" diameter branches using an ovipositor, adult insect is 2" long.....Cicada
- 8b Adult insect is a moth and it deposits her eggs in the tips of newly growing pine branchesPine tip moth

- 9a The beetle is the largest bark beetle in the southeastern United States, its damage is seen in the lower 10 ft of the tree stem, as is associated with large globs of resinBlack turpentine beetle
- 9b The beetle is not as described above.....go to 6a

- 10a The beetle gallery is just under the surface of the barkgo to 11

- 10b The beetle makes “noodles” of wood tissue that it pushes out of the tree as it bores into the wood, it has a symbiotic relationship with a fungus that it eatsAmbrosia beetle
- 11a The beetle has 1/8” exit holes, its galleries are made up of individual chambers for their grubs to mature in and feed on the inner bark of the pine tree.....Southern pine beetle
- 11b The beetle makes X-shaped galleries under the bark of pine treesIps beetle
- 12a The damage is caused by a fungus or bacteriumgo to 13
- 12b The damage is caused by environmental occurrences, are human-made, or parasitic plant.....go to 21
- 13a The damage to the tree is best described as a cankergo to 14
- 13b Not as described above.....got to 16
- 14a The canker is caused by a bacterium that makes the dead branches appear blackened and have a shepherd’s hook appearanceFireblight
- 14b Not as described above.....go to 15
- 15a The canker is often found on oak trees and other hardwoods, it can appear smooth black or grey.....Hypoxylon canker
- 15b The canker is found on pine and is associated with a lot of resin or pitch production by the tree.....Pitch canker
- 16a The disease has two different host plants from two different tree speciesgo to 17
- 16b Not as described above.....go to 18
- 17a The two hosts are red cedar (*Juniperus virginiana*) and apples or crabapple (*Malus species*), on the cedar it produces large round galls and on the apple causes orange leaf spots.....Cedar apple rust
- 17b The two hosts are pine (loblolly and slash, especially) and oak (water, willow, and laurel), the fungus causes galls to form on branches of the pine and leaf spots on the oakFusiform rust
- 18a The fungus grows at the base of treesgo to 19
- 18b The disease is found on the leaves or needles of the host plantgo to 20

- 19a The fungus grows at the base of a conifers, it grows as a
 conk or shelf-fungus, is brown with a white edge (margin).....Annosus root rot
- 19b The fungus grows as clusters of mushrooms at the base of
 trees like a little “army”, it can also grow rhizomorphs that
 look like black-brown shoestrings.....Armillaria root rot
- 20a The fungus infects leaves of oak trees causing raised bumps
 on the leaves that appear a lighter shade of greenOak leaf blister
- 20b The fungus infects the needles of pine trees and causes
 them to turn red-brown and be prematurely dropped from
 the treeNeedlecast
- 13a The damage are V-shaped grooves cut into the bark of trees,
 it was caused by humans during the collection of pine resin
 from trees to make turpentine, is sometimes associated with
 metal attached to the tree.....Catface
- 13b Not as described above.....go to 14
- 14a The damage appears as an overgrowth of tissue that can be
 round, oval, or elongated, they can appear on branches,
 stems, or leaves, and can be cause by insects, diseases, or
 abiotic factorsGalls
- 14b Not as described above.....go to 15
- 15a Damage looks like vertical slashes in the tree’s bark and is
 caused by giant sparks of electricityLightning
- 15b The damage looks like a green plant growing on the
 branches of its host tree, it does not lose its leaves in the
 winter, is a higher parasitic plant.....Mistletoe

FLORIDA 4-H FOREST ECOLOGY CONTEST
FOREST HEALTH DICHOTOMOUS KEY
SENIOR

- 1a Tree damage is caused by an insect go to 2
- 1b Tree damage is not caused by an insect go to 15

- 2a Damage is caused by a larvae or caterpillar go to 3
- 2b Damage is not caused by a larvae or caterpillar go to 8

- 3a The caterpillar or larvae make silk webs to live in go to 4
- 3b The caterpillar or larvae do no make webs to live in go to 6

- 4a The caterpillar or larvae make their silk webs in the branch tips of
 pine tree and the webs are often brown because of the frass Pine webworm
- 4b Not as described above go to 5

- 5a The insects live in a silk web that is no bigger than a basketball, is
 found in the branch unions of fruit trees (apple, cherry, plum) and the
 insects leave their webs to feed Eastern tent caterpillar
- 5b The insects live in and feed inside of their web, the web can cover
 large parts of hardwood tree canopies Fall webworm

- 6a The caterpillar or larvae feed in group on pine trees and move
 together to mimic a larger animal as a defense mechanism Pine sawflies
- 6b Not as described above go to 7

- 7a The tree damage is caused by an adult insect laying its eggs with an
 ovipositor in slits on the underside of twigs go to 8
- 7b Not as described above go to 10

- 8a Large insect with membranous wings deposit its eggs in 1/4-1/2"
 diameter branches using an ovipositor, adult is 2" long Cicada
- 8b Not as described above go to 9

- 9a Adult insect is a moth and it lays her eggs in the tips of newly growing
 pine branches Pine tip moth
- 9b Adult chews through the bark and wood of a branch and lays her eggs
 in the end of the branch, which falls off and overwinters on the
 ground Twig girdler

- 10a The insect is found on the underside of sycamore leaves, the insects' wings are lacey appearing, even if the insect is not found black tar-like dots of frass can be found, leaves have stippling from feeding Sycamore lace bug
- 10b Insect is not a beetle go to 14
- 10c Insect is a beetle..... go to 11
- 11a The beetle is the largest bark beetle in the southeastern United States, its damage is seen in the lower 10 ft of the tree stem, as is associated with large globs of resin Black turpentine beetle
- 11b The beetle is not as described above go to 12
- 12a The beetle gallery is just under the surface of the bark..... go to 13
- 12b The beetle makes "noodles" of wood it pushes out of the tree as it bores into the wood, it has a symbiotic relationship with a fungus that it eats Ambrosia beetle
- 13a The beetle has 1/8" exit holes, its galleries are made up of individual chambers for their grubs to mature in and feed on the inner bark of the pine tree..... Southern pine beetle
- 13b The beetle makes X-shaped galleries under the bark of pine trees..... Ips beetle
- 13c The beetle is tan with black spots and feeds on the leaves of cottonwoods and other *Poplar* species..... Cottonwood leaf beetle
- 14a The insect is an adult female that looks like a dome-like bump on the branch, twig, or needles. The insect is stationary and uses its piercing-and-sucking mouthparts to connect to the branches to feed..... Scale insects
- 14b The insect feeds on young bald cypress leaves. Their feeding causes the leaves to grow a gall. Cypress twig gall
- 15a The damage is caused by a fungus or bacterium go to 16
- 15b The damage is caused by environmental occurrences, are human-made, or parasitic plant go to 30
- 16a The damage to the tree is best described as a canker go to 17
- 16b Not as described above go to 20
- 17a The canker is caused by a bacterium that makes the dead branches appear blackened and have a shepherd's hook appearance Fireblight
- 17b Not as described above go to 18

- 18a The canker is often found on oak trees and other hardwoods, it can appear smooth black or grey Hypoxylon canker
- 18b Canker is not described as above go to 19
- 19a The canker is found on pine and is associated with a lot of resin or pitch production by the tree Pitch canker
- 19b The disease is caused by a conk or shelf fungus on the stems of hardwood trees, when fresh the fungus is brown but turns black and breaks off the tree over time, is associated with hollow trees Hispidus canker
- 20a The disease has two different host plants from two different tree species go to 21
- 20b Not as described above go to 22
- 21a The two hosts are red cedar/Juniper (*Juniperus virginiana*) and apples or crabapple (*Malus* species), on the cedar it produces large round galls and on the apple causes orange leaf spots Cedar apple rust
- 21b The two hosts are pine (loblolly and slash, especially) and oak (water, willow, and laurel), the fungus causes galls to form on branches of the pine and leaf spots on the oak Fusiform rust
- 22a The fungus grows at the base of trees go to 23
- 22b Not as described above go to 24
- 23a The fungus grows at the base of a conifers, it grows as a conk or shelf-fungus, is brown with a white edge (margin) Annosus root rot
- 23b The fungus grows as clusters of mushrooms at the base of trees like a little “army”, it can also grow rhizomorphs that look like black-brown shoestrings Armillaria root rot
- 24a The disease is found on the leaves or needles of the host plant go to 25
- 24b The disease is a vascular wilt of redbay, swamp bay, avocado, it is caused by a fungus that is moved around by a beetle, symptoms include wilting and discoloration or streaking under the bark in the vascular tissue Laurel wilt
- 25a The disease is caused by a bacterium, symptoms appear on the leaves of hardwoods, like oak, at can look like drought stress, the edge (margin) of the leaves become dead and brown (necrotic) sometimes with a yellow halo between the dead tissue and live Bacterial leaf scorch
- 25b Not as above go to 26

- 26a The fungus infects the needles of pine trees and causes them to turn red-brown and be prematurely dropped from the tree Needlecast
- 26b Not as described above go to 27
- 27a The disease is caused by a fungus that grows on the upper surface of leaves, it looks like white fluff Powdery mildew
- 27b Not as described above go to 28
- 28a The disease is found on sycamore trees, it causes dead areas (necrosis) of leaves in a delta-shape along the veins, and causes cankers of the branches, the cankers result in witch's brooms Sycamore anthracnose
- 28b Not as described above go to 29
- 29a The fungus infects leaves of oak trees causing raised bumps on the leaves that appear a lighter shade of green..... Oak leaf blister
- 29b The fungus grows on the upper surface of maples and hollies, appears as black splotches on the leaves that are raised from the leaf tissue, are leathery to the touch Tar spot
- 30a The damage are V-shaped grooves cut into the bark of trees, it was caused by humans during the collection of pine resin from trees to make turpentine, is sometimes associated with metal attached to the tree..... Catface
- 30b Not as described above go to 31
- 31a The damage appears as an overgrowth of tissue that can be round, oval, or elongated, they can appear on branches, stems, or leaves, and can be cause by insects, diseases, or abiotic factors..... Galls
- 31b Not as described above go to 32
- 32a Damage looks like vertical slashes in the tree's bark and is caused by giant sparks of electricity Lightning
- 32b Not as above go to 33
- 33a The damage looks like a green plant growing on the branches of its host tree, it does not lose its leaves in the winter, is a higher parasitic plant Mistletoe
- 33b An abnormal overgrowth of twigs or branches growing from one area, often associated with branch damage (insect, disease, pruning), the tree overgrows to compensate for the loss of branches and leaves Witch's broom

Florida 4-H Forest Ecology Contest

Map & Compass Study Resources

Topographic Map Symbols



What is a Topographic Map?

A map is a representation of the Earth, or part of it. The distinctive characteristic of a topographic map is that the shape of the Earth's surface is shown by contour lines. Contours are imaginary lines that join points of equal elevation on the surface of the land above or below a reference surface, such as mean sea level. Contours make it possible to measure the height of mountains, depths of the ocean bottom, and steepness of slopes.

A topographic map shows more than contours. The map includes symbols that represent such features as streets, buildings, streams, and vegetation. These symbols are constantly refined to better relate to the features they represent, improve the appearance or readability of the map, or reduce production cost.

Consequently, within the same series, maps may have slightly different symbols for the same feature. Examples of symbols that have changed include built-up areas, roads, intermittent drainage, and some lettering styles. On one type of large-scale topographic map, called provisional, some symbols and lettering are hand-drawn.

Reading Topographic Maps

Interpreting the colored lines, areas, and other symbols is the first step in using topographic maps. Features are shown as points, lines, or areas, depending on their size and extent. For example, individual houses may be shown as small black squares. For larger buildings, the actual shapes are mapped. In densely built-up areas, most individual buildings are omitted and an area tint is shown. On some maps, post offices, churches, city halls, and other landmark buildings are shown within the tinted area.

The first features usually noticed on a topographic map are the area features, such as vegetation (green), water (blue), and densely built-up areas (gray or red).


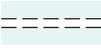

Many features are shown by lines that may be straight, curved, solid, dashed, dotted, or in any combination. The colors of the lines usually indicate similar classes of information: topographic contours (brown); lakes, streams, irrigation ditches, and other hydrographic features (blue); land grids and important roads (red); and other roads and trails, railroads, boundaries, and other cultural features (black). At one time, purple was used as a revision color to show all feature changes. Currently, purple is not used in our revision program, but purple features are still present on many existing maps.

Various point symbols are used to depict features such as buildings, campgrounds, springs, water tanks, mines, survey control points, and wells. Names of places and features are shown in a color corresponding to the type of feature. Many features are identified by labels, such as "Substation" or "Golf Course."














Topographic contours are shown in brown by lines of different widths. Each contour is a line of equal elevation; therefore, contours never cross. They show the general shape of the terrain. To help the user determine elevations, index contours are wider. Elevation values are printed in several places along these lines. The narrower intermediate and supplementary contours found between the index contours help to show more details of the land surface shape. Contours that are very close together represent steep slopes. Widely spaced contours or an absence of contours means that the ground slope is relatively level. The elevation difference between adjacent contour lines, called the contour interval, is selected to best show the general shape of the terrain. A map of a relatively flat area may have a contour interval of 10 feet or less. Maps in mountainous areas may have contour intervals of 100 feet or more. The contour interval is printed in the margin of each U.S. Geological Survey (USGS) map.

Bathymetric contours are shown in blue or black, depending on their location. They show the shape and slope of the ocean bottom surface. The bathymetric contour interval may vary on each map and is explained in the map margin.



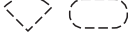






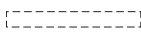











BATHYMETRIC FEATURES

Area exposed at mean low tide; sounding datum line***	
Channel***	
Sunken rock***	


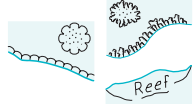





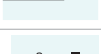

BOUNDARIES

National	
State or territorial	
County or equivalent	
Civil township or equivalent	
Incorporated city or equivalent	
Federally administered park, reservation, or monument (external)	
Federally administered park, reservation, or monument (internal)	
State forest, park, reservation, or monument and large county park	
Forest Service administrative area*	
Forest Service ranger district*	
National Forest System land status, Forest Service lands*	
National Forest System land status, non-Forest Service lands*	
Small park (county or city)	

BUILDINGS AND RELATED FEATURES




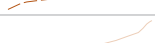





Building	
School; house of worship	
Athletic field	
Built-up area	
Forest headquarters*	
Ranger district office*	
Guard station or work center*	
Racetrack or raceway	
Airport, paved landing strip, runway, taxiway, or apron	
Unpaved landing strip	
Well (other than water), windmill or wind generator	
Tanks	
Covered reservoir	
Gaging station	
Located or landmark object (feature as labeled)	
Boat ramp or boat access*	
Roadside park or rest area	
Picnic area	
Campground	
Winter recreation area*	
Cemetery	

COASTAL FEATURES




Foreshore flat	
Coral or rock reef	
Rock, bare or awash; dangerous to navigation	
Group of rocks, bare or awash	
Exposed wreck	
Depth curve; sounding	
Breakwater, pier, jetty, or wharf	
Seawall	
Oil or gas well; platform	

CONTOURS







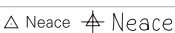




Topographic

Index	
Approximate or indefinite	
Intermediate	
Approximate or indefinite	
Supplementary	
Depression	
Cut	
Fill	
Continental divide	

Bathymetric

Index***	
Intermediate***	
Index primary***	
Primary***	
Supplementary***	

CONTROL DATA AND MONUMENTS

Principal point**	
U.S. mineral or location monument	
River mileage marker	
Boundary monument	
Third-order or better elevation, with tablet	
Third-order or better elevation, recoverable mark, no tablet	
With number and elevation	
Horizontal control	
Third-order or better, permanent mark	
With third-order or better elevation	
With checked spot elevation	
Coincident with found section corner	
Unmonumented**	

CONTROL DATA AND MONUMENTS – *continued*

Vertical control

Third-order or better elevation, with tablet	BM × 5280
Third-order or better elevation, recoverable mark, no tablet	× 528
Bench mark coincident with found section corner	BM + 5280
Spot elevation	× 7523

GLACIERS AND PERMANENT SNOWFIELDS

Contours and limits	
Formlines	
Glacial advance	
Glacial retreat	

LAND SURVEYS

Public land survey system

Range or Township line	—————
Location approximate	- - - - -
Location doubtful	- · - · -
Protracted	- · - · - · - · -
Protracted (AK 1:63,360-scale)	—————
Range or Township labels	R1E T2N R3W T4S
Section line	—————
Location approximate	- - - - -
Location doubtful	- · - · -
Protracted	- · - · - · - · -
Protracted (AK 1:63,360-scale)	—————
Section numbers	1 - 36 1 - 36
Found section corner	+
Found closing corner	+
Witness corner	WC
Meander corner	MC
Weak corner*	+

Other land surveys

Range or Township line	·····
Section line	·····
Land grant, mining claim, donation land claim, or tract	— · — · — · — · —
Land grant, homestead, mineral, or other special survey monument	□
Fence or field lines	- - - - -

MARINE SHORELINES

Shoreline	
Apparent (edge of vegetation)***	
Indefinite or unsurveyed	

MINES AND CAVES

Quarry or open pit mine	×
Gravel, sand, clay, or borrow pit	×
Mine tunnel or cave entrance	←
Mine shaft	■
Prospect	x
Tailings	
Mine dump	
Former disposal site or mine	

PROJECTION AND GRIDS

Neatline	39°15' 90°37'30"
Graticule tick	55'
Graticule intersection	
Datum shift tick	

State plane coordinate systems

Primary zone tick	640 000 FEET
Secondary zone tick	247 500 METERS
Tertiary zone tick	260 000 FEET
Quaternary zone tick	98 500 METERS
Quintary zone tick	320 000 FEET

Universal transverse metcator grid

UTM grid (full grid)	273
UTM grid ticks*	269

RAILROADS AND RELATED FEATURES

Standard gauge railroad, single track	
Standard gauge railroad, multiple track	
Narrow gauge railroad, single track	
Narrow gauge railroad, multiple track	
Railroad siding	
Railroad in highway	
Railroad in road	
Railroad in light duty road*	
Railroad underpass; overpass	
Railroad bridge; drawbridge	
Railroad tunnel	
Railroad yard	
Railroad turntable; roundhouse	

RIVERS, LAKES, AND CANALS

Perennial stream	
Perennial river	
Intermittent stream	
Intermittent river	
Disappearing stream	
Falls, small	
Falls, large	
Rapids, small	
Rapids, large	
Masonry dam	
Dam with lock	
Dam carrying road	

RIVERS, LAKES, AND CANALS – *continued*

Perennial lake/pond	
Intermittent lake/pond	
Dry lake/pond	
Narrow wash	
Wide wash	
Canal, flume, or aqueduct with lock	
Elevated aqueduct, flume, or conduit	
Aqueduct tunnel	
Water well, geyser, fumarole, or mud pot	
Spring or seep	

ROADS AND RELATED FEATURES

Please note: Roads on Provisional-edition maps are not classified as primary, secondary, or light duty. These roads are all classified as improved roads and are symbolized the same as light duty roads.

Primary highway	
Secondary highway	
Light duty road	
Light duty road, paved*	
Light duty road, gravel*	
Light duty road, dirt*	
Light duty road, unspecified*	
Unimproved road	
Unimproved road*	
4WD road	
4WD road*	
Trail	
Highway or road with median strip	
Highway or road under construction	
Highway or road underpass; overpass	
Highway or road bridge; drawbridge	
Highway or road tunnel	
Road block, berm, or barrier*	
Gate on road*	
Trailhead*	

SUBMERGED AREAS AND BOGS

Marsh or swamp	
Submerged marsh or swamp	
Wooded marsh or swamp	
Submerged wooded marsh or swamp	
Land subject to inundation	

Max Pool 4.3!

SURFACE FEATURES

Levee	
Sand or mud	
Disturbed surface	
Gravel beach or glacial moraine	
Tailings pond	

TRANSMISSION LINES AND PIPELINES

Power transmission line; pole; tower	
Telephone line	
Aboveground pipeline	
Underground pipeline	

VEGETATION

Woodland	
Shrubland	
Orchard	
Vineyard	
Mangrove	

* USGS-USDA Forest Service Single-Edition Quadrangle maps only.

In August 1993, the U.S. Geological Survey and the U.S. Department of Agriculture's Forest Service signed an Interagency Agreement to begin a single-edition joint mapping program. This agreement established the coordination for producing and maintaining single-edition primary series topographic maps for quadrangles containing National Forest System lands. The joint mapping program eliminates duplication of effort by the agencies and results in a more frequent revision cycle for quadrangles containing National Forests. Maps are revised on the basis of jointly developed standards and contain normal features mapped by the USGS, as well as additional features required for efficient management of National Forest System lands. Single-edition maps look slightly different but meet the content, accuracy, and quality criteria of other USGS products.

** Provisional-Edition maps only.

Provisional-edition maps were established to expedite completion of the remaining large-scale topographic quadrangles of the conterminous United States. They contain essentially the same level of information as the standard series maps. This series can be easily recognized by the title "Provisional Edition" in the lower right-hand corner.

*** Topographic Bathymetric maps only.

Topographic Map Information

For more information about topographic maps produced by the USGS, please call: 1-888-ASK-USGS or visit us at <http://ask.usgs.gov/>

Map Symbols!

Can you find...

Draw it here!

Railroad Track	
Marsh	
Forest	
Interstate (Primary) Highway	
Bridge	
House of Worship	
School	
Building – Shopping Mall	
Campground	
Cemetery	
Powerline	
Trail	
What is the elevation difference between two index contour lines?	
What is the elevation difference between two regular contour lines?	

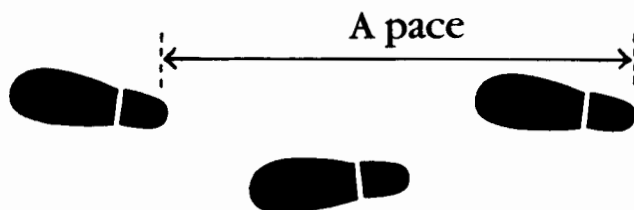
Compass & PACING

FOR-47

by
Dr. Deborah B. Hill
Department of Forestry

Pacing is a simple means of measuring linear distance by walking. It can be used outdoors or indoors, in the woods or over land.

Pacing's measurement dates back to Roman times. The Roman pace, measured from the heel of the foot to the heel of the same foot in the next stretch, was about 58.1 inches. Today this is known as the geometric pace, which measures about 5 feet.



To make pacing work for you, you need to know how much distance your pace covers. You can determine this by walking a pre-measured course a few times and then checking the pacing chart below. A pace equals two normal steps, beginning and ending on your dominant foot.

A common use for pacing in forestry is to pace off 66 feet from a tree in order to get a measurement of tree height. This is why you determine your pace on a 66-foot course.

1. Begin by measuring a 66-foot course with a tape measure. You will use this distance to establish your pace accurately.
2. Pace off the course measured at Step #1. Repeat two or three times and compare results.
3. Look up the number of your paces on the chart below to determine how many linear feet each of your paces covered.

EX: If it takes you 24 paces to cover 66 feet, each of your paces is 2.75 feet.

4. When you need to go from one point to another and do not know how far it is, pace the distance. Record the number of paces and multiply your individual pace by the number of paces to get the answer.

EX: If it takes you 10 paces to cover an unknown distance, multiply your known pace (say, 4.26 feet) by 10 to get 42.6 feet.



UNIVERSITY OF KENTUCKY
COLLEGE OF AGRICULTURE
COOPERATIVE EXTENSION SERVICE
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P A C I N G C H A R T

# paces/ 66 feet	feet/ pace	# paces/ 66 feet	feet/ pace	# paces/ 66 feet	feet/ pace	# paces/ 66 feet	feet/ pace
10.0	6.60	14.5	4.55	19.0	3.47	23.5	2.81
10.5	6.28	15.0	4.40	19.5	3.38	24.0	2.75
11.0	6.00	15.5	4.26	20.0	3.30	24.5	2.70
11.5	5.74	16.0	4.13	20.5	3.22	25.0	2.64
12.0	5.50	16.5	4.00	21.0	3.14	25.5	2.59
12.5	5.28	17.0	3.88	21.5	3.07	26.0	2.54
13.0	5.08	17.5	3.77	22.0	3.00	26.5	2.49
13.5	4.89	18.0	3.67	22.5	2.93	27.0	2.44
14.0	4.71	18.5	3.57	23.0	2.87		

5. If you are given a specific distance to travel (say, 66 feet) between two points, divide your pace (say, 4 feet) into the distance you are given to figure out how many paces you need to get there (16.5 paces in this case.)

Competitions usually give you either the linear distance you need to travel between two points *or* two clearly visible points between which you have to pace the distance.

Compass

A compass tells you in what direction you are headed relative to magnetic north. You can combine use of a compass with your newly found knowledge of pacing to find your way across country (where there may not be any paths or roads) with the help of a topographic map that shows mountains, streams and other landmarks. Using a compass and pacing with a topographic map across country or through a forest is called *orienteering*.

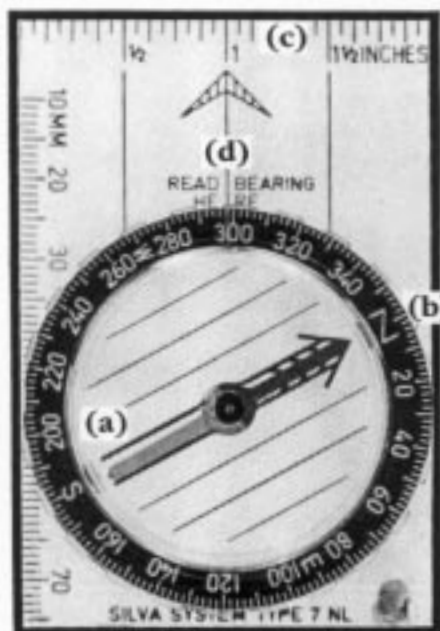
In order to use a compass successfully, you need to know: a) where magnetic north is; b) where you are in relation to where you want to be (e.g., is this area east of your home, or south?); and c) how to set the bearing for where you want to go.

The following will help you use a compass correctly to identify the direction in which you are headed.

1. The circular part of the unit is the compass itself and is measured in 360 degrees.
2. The red needle (the one that moves) always points to magnetic north.
3. Each small mark on the rim of the compass is 2 degrees.
4. Each large mark on the rim of the compass is 10 degrees.
5. The inches or millimeters marked on the edge of the compass help you use the *scale* on a map to tell how far it is between two points.
6. The hole in the corner of the compass is for a string so you can carry it around your neck.

Using the Compass

1. Turn the rim of the compass until the moving needle lies between the arrow marks drawn on the bottom of the compass. (a)
2. Make sure the red end of the needle points to the "N" on the rim. (b)
3. Always have the front of the compass (the inch ruler edge) pointed in the direction you are heading. (c)
4. Hold the compass level (parallel to the ground) so the needle can float freely in the liquid inside the circle.
5. Turn your body to face squarely in the direction you are headed. Hold the compass close to your body at about chest level so that you can look down on it and read it easily.
6. Read compass bearing (direction you are heading) at the front of the compass where it says "read bearing here." (d)
7. Determine the correct number of degrees where the solid line crosses the compass rim.
8. Making sure your compass is sighted on the point you are headed toward, walk in a straight line toward that objective.



Educational programs of the Kentucky Cooperative Extension Service serve all people regardless of race, color, age, sex, religion, handicap, or national origin.

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, C. Oran Little, Director of Cooperative Extension Service, University of Kentucky College of Agriculture, Lexington, and Kentucky State University, Frankfort.

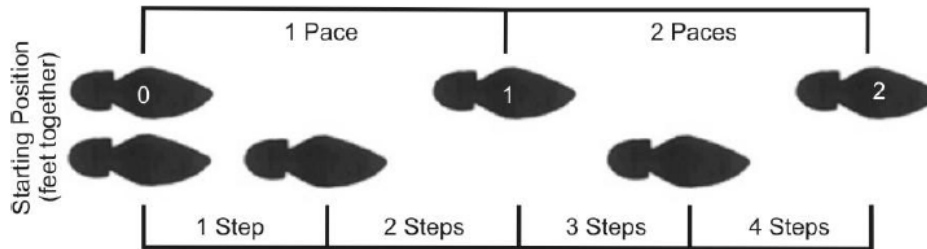
Advanced Level Compass Worksheet

Vocabulary:

Pace – An average unit of length consisting of two normal walking steps.

Pace Count – The number of times one foot (using either your left or right foot) touches the ground over a given distance.

Average Pace Count – The sum of Pace Count #1 and Pace Count #2 divided by two.



Determining Your Pace:

To determine your Pace, you must first determine your Pace Count. First, measure 100 feet and walk this distance. As you walk, count the number of times one of your feet hits the ground. If your first step is with your **right** foot, count the number of times your **left** foot touches the ground. If your first step is with your **left** foot, count the number of times that your **right** foot touches the ground.

Step 1: Your Pace may vary slightly, so try it twice to get your Average Pace Count. For Pace Count #1, walk 100 feet and count the number of times your right (or left foot) touches the ground. Do the same for Pace Count #2. Add Pace Count #1 and Pace Count #2 together. Then divide the sum of Pace Count #1 and Pace Count #2 by two to get your Average Pace Count.

Pace Count #1 = _____ paces per 100 feet

Pace Count #2 = _____ paces per 100 feet

$$\frac{\text{Pace Count \#1}}{\text{Pace Count \#1}} + \frac{\text{Pace Count \#2}}{\text{Pace Count \#2}} = \frac{\text{Total}}{\text{Total}} \div 2 = \frac{\text{Average Pace Count}}{\text{Average Pace Count}}$$

Step 2: Divide 100 feet by your Average Pace Count to get your Pace.

$$100 \text{ feet} \div \frac{\text{Average Pace Count}}{\text{Average Pace Count}} = \frac{\text{Pace (ft)}}{\text{Pace (ft)}}$$

Calculating a Distance

Your Pace can be used to calculate the distance between two points. To do this, count the number of paces it takes you to walk from point A to point B. Write that number on the line below where it says "number of paces." You already calculated your pace on the previous page. Write that number on the line for "pace." This number will be the same for all the calculations on this page. The only thing that will change is the number of paces you count for each distance.

Finding a Bearing

To find your bearing, stand in front of the sign for point A and point your direction of travel arrow to point B. Turn your dial, so that the magnetic arrow is pointing North, or "red Fred is in the red shed." This number is your bearing. This example shows a bearing of approximately 143° (each line represents 5°).

Write your bearing in the space provided for each set of points. This number will be different for each set of points.



1. The distance from A to B is: _____ x _____ = _____
Number of Paces Pace (ft) Feet

The bearing from A to B is: _____

2. The distance from B to C is: _____ x _____ = _____
Number of Paces Pace (ft) Feet

The bearing from B to C is: _____

3. The distance from C to D is: _____ x _____ = _____
Number of Paces Pace (ft) Feet

The bearing from C to D is: _____

4. The distance from D to E is: _____ x _____ = _____
Number of Paces Pace (ft) Feet

The bearing from D to E is: _____

Pacing and Navigating

(one pace is every time one foot hits the ground = 2 steps)

The first time, I count _____ paces to walk 100 feet.

$$100 \text{ feet} \div \text{_____ paces} = \text{_____ (1) feet per pace}$$

The second time, I count _____ paces to walk 100 feet.

$$100 \text{ feet} \div \text{_____ paces} = \text{_____ (2) feet per pace}$$

The third time, I count _____ paces to walk 100 feet.

$$100 \text{ feet} \div \text{_____ paces} = \text{_____ (3) feet per pace}$$

Take the average of your three times pacing:

$$\text{_____ (1)} + \text{_____ (2)} + \text{_____ (3)} \div 3 = \text{_____ feet per pace}$$

My pace is _____ feet. **REMEMBER THIS NUMBER!**

Distance = your pace in feet × the number of paces you count from A to B

From Point A to Point B is _____ paces x _____ = _____ feet

From Point B to Point C is _____ paces x _____ = _____ feet

From Point C to Point D is _____ paces x _____ = _____ feet

From Point D to Point E is _____ paces x _____ = _____ feet

FLORIDA 4-H FOREST ECOLOGY WILDLIFE ON THE FOREST HIKE



STUDY GUIDE

Juniors and Intermediates will take a short hike and be asked to identify 20 animals. There are 4 different types of animals in the contest (amphibians, reptiles, birds, and mammals); you should expect a mix of at least some from each group.

Participants will be given a list of 53 possible animals (by common name) and will need to match those names to the numbers on prepared specimens (taxidermy or preserved). Both Juniors and Intermediates should be prepared to identify specimens visually. Additionally, Intermediates may be asked to identify some animals by sound (birds and amphibians) or tracks (mammals).

The [Florida 4-H Forest Ecology Contest](#) website has links to useful web resources with images for each species. This study guide provides additional tips and common techniques for identification of wildlife, including general characteristics to consider, and specific information by animal group.

General Identification Considerations

When you are out on a forest hike, you might see glimpse of an animal just in the corner of your eye.... What was it?

There are so many different animals in the forest, and before you even have a chance to pull out your binoculars or your ID guide, you have already started gathering information about what kind of animal it might be. You might first want to think about WHERE you are: what part of Florida, what type of forest, is there water nearby, other ecosystems? WHEN is it: what season, time of year, time of day? HOW was the animal moving: did it fly up high, scurry by in the grass, run fast, or slither slowly?

There are many ways that biologists can identify wildlife while on a forest hike. One is SIGHT, if you are lucky enough to see them. Hearing the SOUNDS an animal makes can be very informative, either from its mouth (singing or croaking) or the sound of its movement (some animals make a lot of sound when they move, and others are very quiet). You might also see the footprints ("TRACKS") or remains of a digested meal ("SCAT") on the trail.

Below we give you some tips on how biologists generally identify animals in each of these groups, followed by some specific study references to use for this contest. Primary study resources are online websites, where you can view images, identification information, hear calls and sounds, and see tracks.

Amphibians



- **What, Who, and Where are Amphibians**
 - Frogs, Toads, Newts, and Salamanders
 - Cold-blooded; require a **warm** environment
 - Live on land and water; near a water source (ponds, roadside ditches, lakes)
 - Have gills as larvae and lungs as adults

- **How to tell amphibians apart from reptiles:**
 - Amphibians have soft, smooth, or warty skin that is usually moist.
 - Reptiles have hard and scaly skin with scutes or bony plates.

- **How to tell amphibians apart from each other:**
 - If it has a tail, it is a salamander or newt. If it does not, it is a frog or toad.
 - Frogs typically have smooth and slimy skin. Toads have warty and dryer skin.

- **Tips to ID frogs:**
 - Each frog species has a unique call.
 - Listen to each one relative to the other
 - Create *your own* “sounds like....” (examples below, but create your own!)
 - A squeaky tennis shoe (Cuban tree frog)
 - “Write me, Write me” (green tree frog)
 - Tree frogs have large, round toe pads specialized for climbing.

- **Amphibians in the forest ecology contest:**
 - Green Treefrog*
 - Southern Leopard Frog*
 - Southern Toad*
 - Cuban TreeFrog*
 - Eastern Narrowmouthed Toad*
 - Eastern Newt

**Intermediates may be asked to identify these animals by sound (calls)*

- **Study Resources**
 - The best single resource for learning amphibians in Florida is the **Florida Museum of Natural History Discover Herpetology** website: (<https://www.floridamuseum.ufl.edu/discover-herps/>)

 - *To learn frog calls (for intermediates), study the calls noted below from the website: (<https://www.floridamuseum.ufl.edu/discover-herps/florida-frog-calls/>):
 - “Green Treefrog”
 - “Southern Leopard Frog”
 - “Southern Toad (Breeding Chorus)”
 - “Cuban TreeFrog”
 - “Eastern Narrowmouthed Toad”

Reptiles



- **What, Who, and Where are Reptiles**
 - Reptiles include crocodilians, snakes, lizards, turtles, and tortoises
 - Air-breathing, cold-blooded vertebrates
 - Have skin made of scales, bony plates, or both
 - They're all around us, in forests, lakes, swamps, and even your backyards
- **Skin:** different reptiles have different skin types and textures, such as scales vs bony plates.
- **Color:** color can be tricky; sometimes the same species has different variations.
- **Pattern:** different reptiles have different patterns on their skin or shell, but sometimes the same species can have different patterns.
- **Size:** this isn't the best option since younger animals are smaller and can be confused for something else, but it is still good to keep in mind.
- **Location/habitat:** the area that a reptile is found in can help narrow down what it could be; some animals like wet habitat, some prefer dry areas.
- **Behavior:** different reptiles behave differently, and some might only be active at night or during the day, possibly helping you figure out what it is.
- **Difference between a tortoise and a turtle:**
 - Tortoises live only on land while turtles inhabit water and land.
 - Look at shell shape and foot shape.
- **How to identify lizards and snakes:**
 - Can vary greatly by size, color, pattern, behavior, habitat, and location.
- **Difference between a venomous (V) and non-venomous (NV) snake:**
 - (NV) Head is narrow, barely distinguishable from neck; (V) head is broad "triangular" in shape.
 - (NV) body is relatively thin and narrow; (V) body is heavy or "fat" in appearance.
 - (NV) tail usually tapers to a long, thin point, never with rattles; (V) tail is blunt and usually ending with a cluster of modified scales; never tapers to a tipped point.
 - (NV) eye has a round pupil; (V) eye has an elliptical pupil.

- **Reptiles in the forest ecology contest:**

- American alligator
- Black racer
- Coral snake
- Cottonmouth
- Cuban brown anole
- Eastern box turtle
- Eastern diamondback rattlesnake
- Eastern indigo snake
- Fence lizard
- Five-lined ground skink
- Gopher tortoise
- Green anole
- Pygmy rattlesnake
- Yellow rat snake

- **Study Resources**

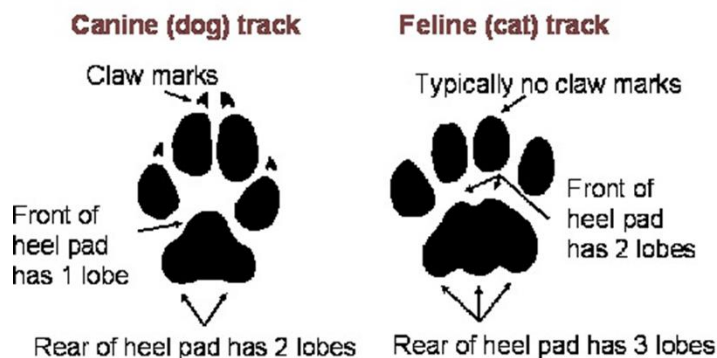
- The best single resource for learning reptiles in Florida is the **Florida Museum of Natural History Discover Herpetology** website:
(<https://www.floridamuseum.ufl.edu/discover-herps/>)

Mammals



- **What, Who, and Where are Mammals**

- **Very diverse!** Size, color, pattern, behavior, and location
 - If you are lucky to see a mammal in the wild it can be easy to ID
 - Use sign of animals: TRACKS and SCAT
- **Color:** If you are lucky to see a mammal in the wild knowing what color some species are compared to others can help you ID the species.
- **Tracks:** The size and shape of animal tracks and can be helpful:
 - The best way to learn tracks is to find tracks and compare them with pictures.
 - Consider substrate; sandy or hard ground can change size of track.
 - Front and hind foot can look different. Try to identify the length of the stride; often you do not see full set of tracks.
 - Look at spacing of toenails, width of paw, shape, position of toes and pads.



- **Scat:** The droppings, feces, dung, manure, poop of a mammal is often a distinctive way to identify a species. Size, shape, color, and contents are all keys.



• **Mammals in the forest ecology contest:**

- Armadillo
- Black bear*
- Bobcat*
- Cottontail rabbit
- Florida panther*
- Gray squirrel
- Opossum
- Pocket gopher
- Raccoon*
- Red fox*
- Sherman's fox squirrel
- Striped skunk*
- White-tailed deer*
- Wild pig (feral swine)*

*Intermediates may be asked to identify these animals by tracks

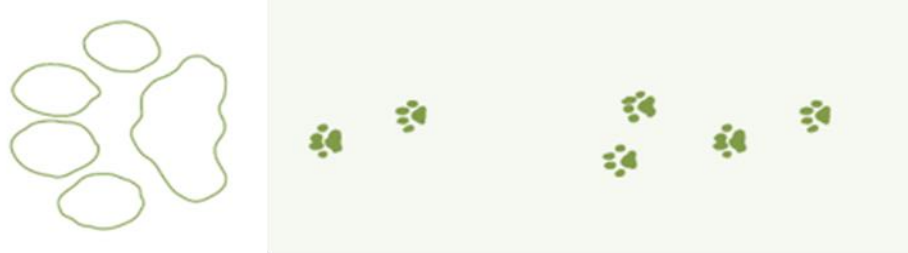
• **Study Resources**

- There are numerous online resources for learning mammals in Florida; please refer to the [Florida 4-H Forest Ecology](#) contest website for resources for each species.
- *To learn tracks (for intermediates), please see the examples below for each species (note, these images are not to scale; during the contest expect tracks to be displayed at scale):

- Black bear* (4 ½" front, 7-9" hind width)



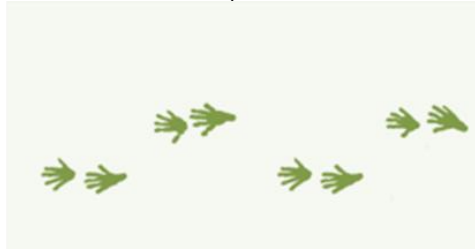
- Bobcat* (1 ¾ - 2" width)



- Florida panther* (3 – 3 ½" width)



- Raccoon* (2 ½" front – 4" hind width)



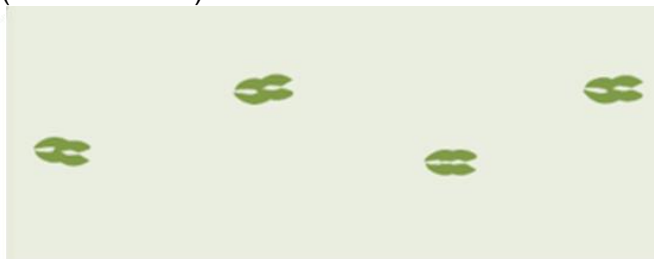
- Red fox* (2 – 2 ¼" width)



- Striped skunk* (1 ½" width)



- White-tailed deer* (2 ½ – 3" width)



- Wild pig (feral swine)* (2 – 2 ½" width)



Birds



- **What, Who, Where are Birds**
 - Warm-blooded vertebrates
 - Have feathers and lay eggs
 - Capable of true flight (most)
 - They're in most ecosystems, in forests, deserts, mountains, meadows, lakes, swamps, and even your backyard
- **How do you identify birds**
 - Size, color, beak shape, song/call, behavior, and location.
 - Some birds are VERY different and easy identify; some are VERY similar!
 - Understanding the basic parts of a bird can help you identify it.
- Some bird species have **different plumage** (color of feathers) depending on the season, their sex, and their age.
- **Bird size** is a useful ID tool and can be broken down into four groups:
 - Sparrow-size or smaller; Robin-size; Crow-size; Goose-size or larger
- **Beak shape** can be a key factor to figuring out what category the birds are in and is linked to what they eat and their habitat.
- Learning **bird calls** is an important skill to work on because it is often easier to hear the birds instead of seeing them. You might want to think of a “sounds like” phrase to remember each song. The best way to learn bird calls is to go outside and practice! The app Merlin is also a useful tool (<https://merlin.allaboutbirds.org/>)
- **Birds in the forest ecology contest:**
 - American crow*
 - Barred owl*
 - Blue jay*
 - Carolina chickadee*
 - Chuck-will's-widow*
 - Eastern towhee*
 - Florida scrub jay
 - Northern bobwhite*
 - Northern mockingbird
 - Pileated woodpecker
 - Red-bellied woodpecker
 - Red-cockaded woodpecker
 - Red-shouldered hawk*
 - Sharp-shinned hawk
 - Tufted titmouse*
 - Turkey vulture
 - Wild turkey*
 - Wood duck
 - Wood stork

*Intermediates may be asked to identify these animals by sound (songs)

- **Study Resources**

- There are numerous online resources for learning birds in Florida; please refer to the [Florida 4-H Forest Ecology](#) contest website for resources for each species.
- The best single resource for learning birds and their songs in United States is the **Cornell Lab of Ornithology** “All About Birds” website: (<https://www.allaboutbirds.org/guide/>)
- *To learn bird songs (for intermediates), go the Cornell “All About Birds” webpage for each species (linked to the Forest Ecology Contest page and at <https://www.allaboutbirds.org/guide/>), click on “sounds”, to study the call mentioned below. Birds often have a variety of calls and songs; we have selected just 1 that is most common (typically the first one on the list) for you to learn for this contest:
 - American crow: *Florida, March 04, 200; 0:34; first call on the list*
 - Barred owl: *Oregon, May 28, 1992; 0:29; first song on the list*
 - Blue jay: *New York, June 23, 2013; 0:22; first call on the list*
 - Carolina chickadee: *West Virginia, May 05, 1999; 0:25; first song*
 - Chuck-will's-widow: *New Jersey, May 30, 2018; 0:29; first song*
 - Eastern towhee: *New York, May 06, 2020; 0:32; first song*
 - Northern bobwhite: *New Jersey, July 14, 2017; 0:34; first song*
 - Red-shouldered hawk: *California, July 16, 2020; 0:29; first call*
 - Tufted titmouse: *New York, April 24, 2018; 0:31; first song*
 - Wild turkey: *California, May 24, 2020; 0:31; first song*