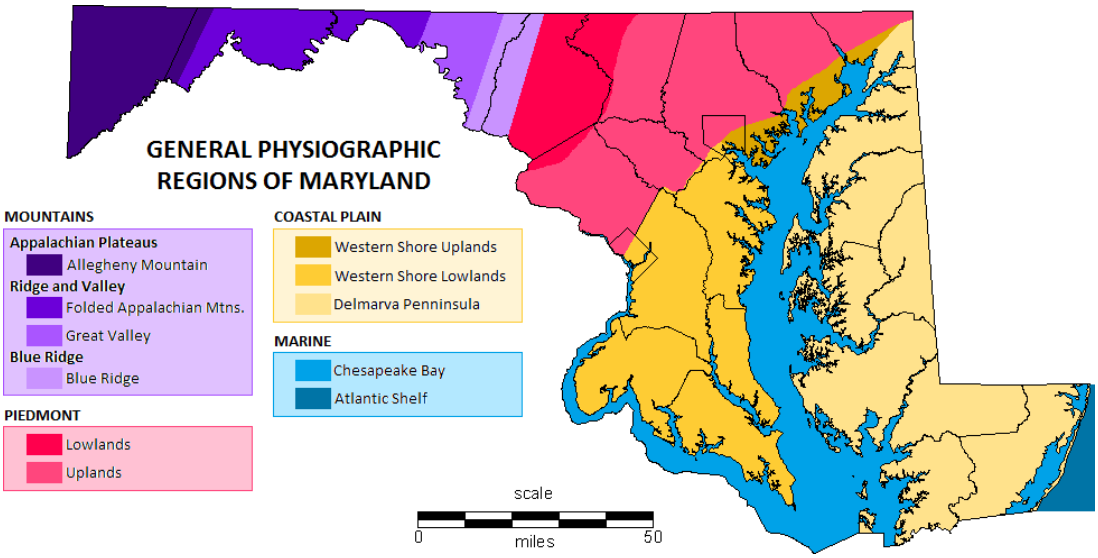
Envirothon Forestry Resource Guide



WELCOME TO MARYLAND' FORESTS…

Maryland is often described as "America in Miniature" because of its diverse land forms. From the Atlantic Ocean to the Appalachian Mountains, Maryland's forests reflect this unique diversity from vast plantations of Southern pine on the Eastern shore to high quality hardwoods in the western mountains. Ranked 42nd in land area among states, Maryland's 5 distinct physiographic provinces feature diverse forests, wildlife, soils, and aquatic life. Maryland's greatest natural resource, the Chesapeake Bay, is part of a 64,000 (165,760 sq. km.) square mile watershed that covers parts of six states. Maryland's forests play a key role in restoring and protecting the health of the Chesapeake Bay while supporting vital forest product, agricultural, and seafood industries.

Overall Objectives:

Students must be able to…

A. Understand and identify the five Physiographic Provinces of Maryland and the forest communities that are found there.

B. Understand the role that Maryland's forests play in restoring and protecting the Chesapeake Bay and its subwatersheds.

C. Perform accurate forest measurements and identify silvicultural practices.

D. Describe issues and threats facing Maryland's forest resource and identify programs and strategies to mitigate them.

Specific Objectives:

Students must be able to…

A. Understand and identify the five physiographic provinces of Maryland and the forest communities that are found there.

1. Identify the 5 physiographic provinces and describe the forest communities that make each one distinct.
2. Identify common species of trees and shrubs native to Maryland.
3. Describe the economic importance of sustainable forestry to specific regions of the state and identify key species and forest products.
4. Describe the role of forests in restoring and protecting river and stream ecosystems.

B. Understand the role that Maryland's forests play in restoring and protecting the Chesapeake Bay and its subwatersheds.

1. Identify the benefits of Riparian Forest Buffers and describe their importance in the Chesapeake Bay watershed.
2. Prescribe forest buffer restoration techniques using topographic, soils, wildlife, and aquatics information.
3. Describe the historical changes in forests in the Chesapeake Bay watershed and make comparisons to human and climate – caused changes in North American forests.
4. Identify the states in the Chesapeake Bay watershed and recognize key legislation and cooperative agreements that use riparian forests to restore water quality and protect tributaries.

C. Perform accurate forest measurements and identify silvicultural practices.

1. Demonstrate proficiency in using forestry tools in the field to collect accurate stand data using a diameter tape, scale stick, clinometer, and wedge prism.
2. Interpret forest data using graphs and tables including site index, volume, stocking chart, and rough cord volume.
3. Identify silvicultural concepts and harvest techniques including stands, crown classes, thinning, crop tree release, seed tree, and selective harvest methods.
4. Prescribe silvicultural techniques to enhance forest health, wildlife habitat, water quality, and economic growth.

D. Describe issues and threats facing Maryland's forest resource and identify programs and strategies to mitigate them.

1. Identify significant forest pests and diseases found both in Maryland and North America. Describe their impacts to forest health, biodiversity, and economies.

2. Identify factors contributing to the loss of the forest land base and describe efforts to reverse loss of forests, especially in urban areas.
3. Describe strategies and programs used to combat specific forest pests and compare to efforts used throughout North America.
4. Identify key invasive plant and tree species found in Maryland and describe their impact on biodiversity, forest health, and the economy.

Application/Analysis:

1. Interpret maps and graphics to delineate physiographic provinces, land forms, and watersheds.
2. Identify common species of trees and shrubs native to Maryland using a dichotomous key.
3. Identify non-native/invasive species found in Maryland using a field guide.
4. Explain the importance of riparian buffers in protecting watersheds.
5. Collect and interpret forest data using the following forestry tools (metric tools provided):
- Diameter tape
- Biltmore/tree scale stick
- 10 factor wedge prism
- Increment borer/core
- Clinometer
6. Interpret forest data using tables and graphs including site index, volume, stocking, and rough cord volume.
7. Describe impacts of forest pests Maryland and make comparisons to impacts throughout North America.
8. Identify and describe economic impacts of forest pests in Maryland and North America.

2017 National Envirothon Forestry Resource Websites

- 2015 Maryland Forest Health Highlights – USDA – Forest Service – A good overview of Maryland's forests, including forest area, ownership, and the major pests and diseases that threaten not only forests in Maryland, but many states and provinces https://www.fs.usda.gov/foresthealth/protecting-forest/forest-health-monitoring/monitoring-forest-highlights.shtml

- National Association of State Foresters – Maryland Forest Management Highlights – An excellent overview of forest management in Maryland, and features an action plan and statistics on land ownership. http://www.stateforesters.org/forest-action-plans/maryland.

- Tree Physiology https://envirothon.org/wp-content/uploads/2019/10/physiology_of_trees.pdf.
- Virginia Tech Dendrology Website – A great tree identification website featuring most species found in Maryland http://dendro.cnre.vt.edu/dendrology/factsheets.cfm

- 2014 Chesapeake Bay Agreement – Forests – An overview of the efforts to protect the Chesapeake Bay and its tributaries using forest buffers and BMP's https://www.chesapeakebay.net/what/what-guides-us/watershed-agreement

- Metric Conversion Charts http://www.metric-conversions.org/.

Forestry Resource Study Guide

MEASUREMENTS

Introduction:

Like many other disciplines, forestry is a science based on measurements. While participating in the Envirothon program, you will learn to use the same instruments and collect the same data that professional foresters use to learn about and manage our forest resources. Many students enjoy the forestry section of Envirothon because it is very "hands on". Becoming proficient with basic forest measurements is very important, because many of the more complex measurements require accurate forest data collection.

Learning Objectives:

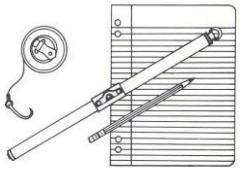
At the end of this section, you should:

- Understand why measurements are important in forestry and understand which tools are used to obtain specific measurements.

- Demonstrate proficiency in "pacing" to measure distances and determine how many paces you have in a chain (66 feet or 19.8 meters).

- Demonstrate proficiency in the use of the following forestry tools:
    - Diameter Tape
    - Biltmore Stick/Merritt Hypsometer
    - Clinometer
    - Wedge Prism

- Conduct a sample plot as part of a forest inventory using forestry instruments
- Apply data to specific charts and tables to determine forest growth conditions.



Let's Get Started:

Pacing: The most basic forest measurement is ***pacing*** or counting your number of steps to determine how far you've traveled in the woods. A compass will help you determine which direction you are walking, but *pacing* allows you to determine distance.

In forestry, distance measurements are based on a ***chain***, which equals 66 feet. Many years ago surveyors literally dragged a 66-foot-long chain around with them to measure properties, which were measured in *chains* and *links.*

Today, foresters measure *chains* by knowing how many steps they take in 66 feet (19.8 meters). To determine your pace, measure out 66 feet (19.8 meters) using a 100-foot (30 meter) measuring tape, and count every other step (for example, every time your right foot hits the ground). Most people have between 12 and 15 *paces* per chain.

CHAIN FACTS:

- *80 chains = 1 mile (1.61km)*
- *10 square chains = 1 acre (.4 ha) (very helpful in determining the size of wildfires!)*
- *Several forestry tools are calibrated to be accurate at one chain.*

Tree Diameter:

Tree *diameter* is an important measure of tree growth, especially when combined with additional measurements such as the height and age of a tree (such as determining the *volume* or *site index* of a tree). *Diameter* is always measured on the uphill side of a tree at 4.5 feet (1.3 meters) up the trunk or

*Diameter Breast Height (*or *DBH* for short) using a ***diameter tape*** *(*or *d-tape* for short*)*.

The first thing you'll notice about the d-tape is that the inches look a lot longer than usual (3.14 inches or 7.97cm to be exact). This is because the d-tape is calibrated in "diameter equivalents of circumference by inches and tenths of inches" saving you the trouble of converting circumference into diameter. Remember that diameter measurements should be expressed to the nearest tenth of an inch (for example 11.7" or 29.7 cm). The reverse side of the tape shows feet calibrated in inches and tenths of inches.

Diameter Tape

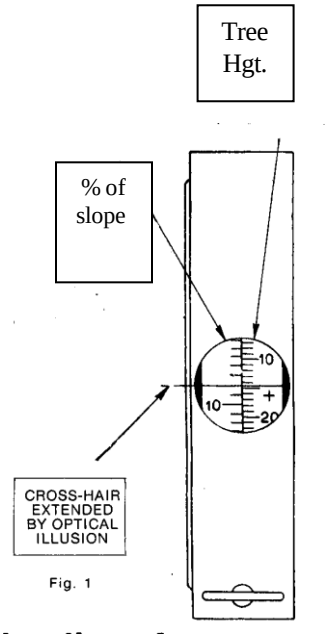
Measure Tree at DBH

Measure to nearest tenth of an inch

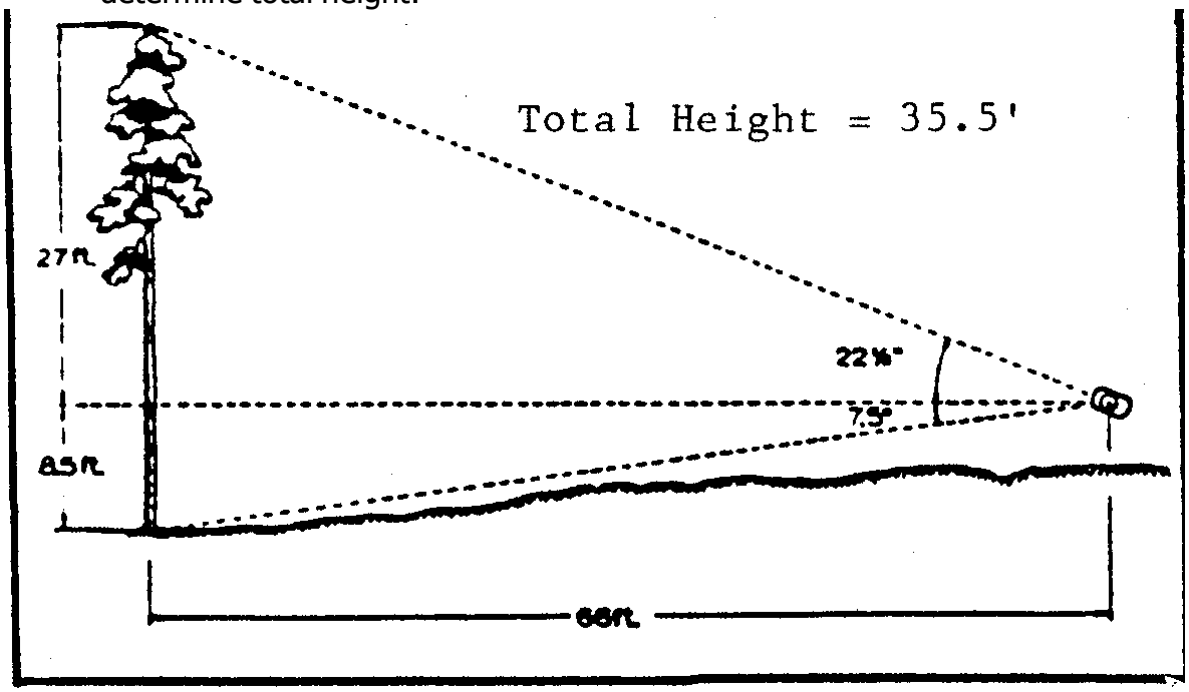
Tree Height:

Tree *height* is measured using the principle of triangulation with a ***clinometer.*** Of all the forestry tools you will use, the clinometer requires the most practice and skill. Assuming that the tree grows at a right angle to the ground (even on a slope), we use the clinometer at 1 *chain* (66 feet or 19.8 meters) away from the tree using the following steps:

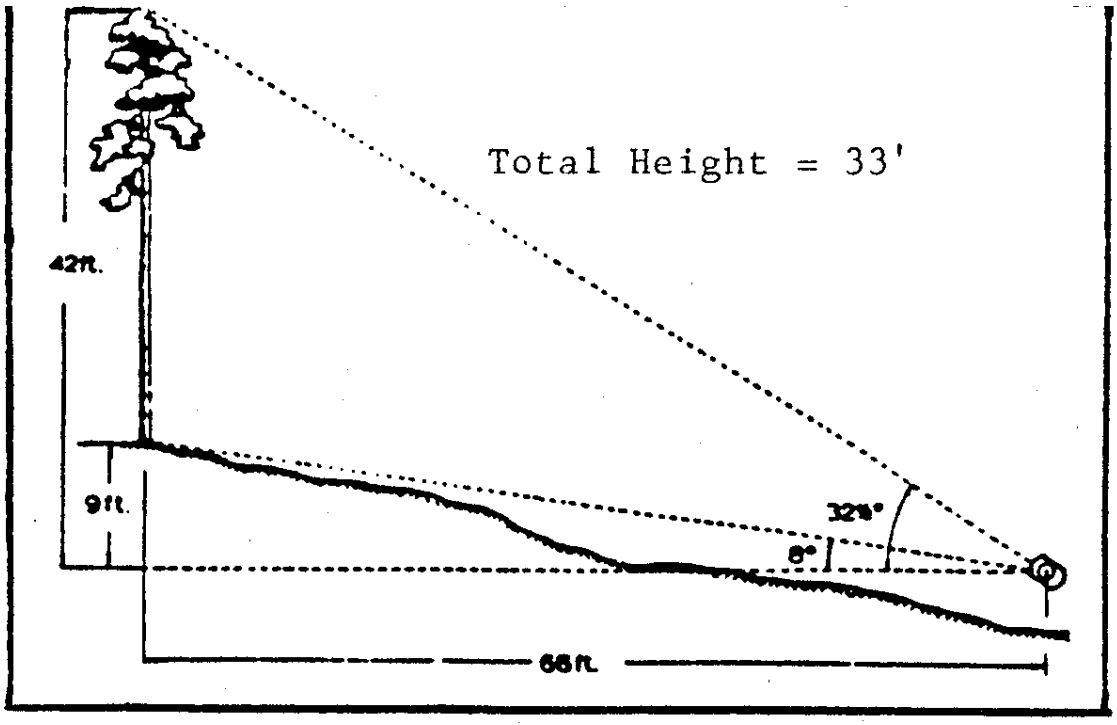
- With both eyes open, aim the black crosshair of the clinometer level with the base of the tree at the soil. Using the right-hand scale (the left scale is for measuring percentage of slope) you will read a "negative" number if the tree is on level ground or down slope. You will read a "positive" number if the tree is up slope.
- With both eyes open, aim the black crosshair of the clinometer to the top of the tree. This is a tricky measurement because your view may be obscured by leaves or nearby tree branches. If the top of the tree were an open umbrella, you'd want to be aiming at the point on the top of the umbrella.



- Add or subtract the numbers: 1) If your eye is at a level between the base of the tree and the top, the two numbers are added together to determine total height.
- 2) If your eye is below the level of the base of the tree (upslope from you), the base reading must be subtracted from the top reading to determine total height:



EYE LEVEL BETWEEN BASE AND TOP OF TREE (BASE + TOP = HEIGHT)



EYE LEVEL BELOW BASE OF TREE (TOP – BASE = HEIGHT)

Determining the number of logs or sticks in a tree:

Trees are renewable resources that are used for thousands of products we use every day. To determine the *volume* of a tree, we must first know how many ***logs or sticks*** are in the tree. A ***log*** is a unit of measurement equaling 16 feet (4.8 m). For sawtimber (trees large enough to be cut into lumber at a sawmill), logs are measured from the stump of the tree to an 8" (17.9 cm) diameter top (about the size of a paint can). For pulpwood (trees that will be ground up into chips at the mill to produce paper pulp) we measure the number of 8-foot (2.4 m) *sticks* from the stump to a 4" (10.1 cm) diameter top.

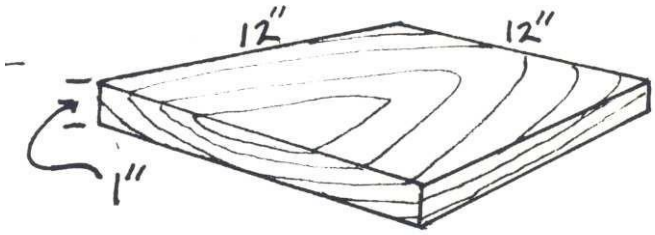
The instrument used to measure logs and sticks is the ***Merritt Hypsometer,*** which can be found on one side of the wooden ***Biltmore Stick***. The *Biltmore Stick,* or forester's yardstick, is named after the first forestry school at the Biltmore Estate near Ashville, North Carolina.

The *Merritt Hypsometer* works much like the clinometer, but it's much easier to use:

- Standing <u>one chain</u> away from the tree, hold the stick upright 25" (63.5 cm) away from your eye with the *Hypsometer* side of the stick facing you.
- With the butt of the stick aligned with the base of the tree, count the number of 16-foot logs by matching the graduations on the stick to the trunk of the tree, until you reach an <u>8" (17.9 cm) top or the first major *defect* in the tree.</u> A defect may be a large branch, a bend in the trunk, or a hollow cavity that would cause that part of the tree to be unusable at the sawmill. Measure to the nearest half-log (for example: 1 ½ or 3 ½ logs is OK)
- For pulpwood, measure to a 4" (10.1 cm) top, defects are less critical because the tree will be ground up into chips, not sawn into lumber.

Determining the volume of a tree:

Once we know the diameter, height, and the number of logs or stick a tree contains, we can determine the ***volume*** of the tree. This is an important number, especially when determining the value of the tree if it is sold for forest products. Just like in geometry, we are essentially determining the volume of a cylinder (tree trunk). In forestry, *volume* is expressed in ***board feet,*** which is an imaginary chunk of wood 12" (30.4 cm) X 12" X 1" (2.5 cm) thick.



BOARD FOOT

To make measurements easier, foresters often use *volume tables* to quickly compute volume. For eastern forests we use the *International ¼ inch rule* volume table, because it provides the most accurate volume measurements for the size classes of trees we have in Maryland. Some Biltmore Sticks have volume tables on them; because you are measuring a standing tree, make sure to use the tree scale side of the stick, not the log scale side.
For the Envirothon competition, a volume table or scale stick will be provided.

FORM CLASS 78

Gross volume of tree, International ¼-inch rule

Tree diameter (inches)	VOLUME (board feet) BY NUMBER OF USABLE 16-FOOT LOGS										
	1	1½	2	2½	3	3½	4	4½	5	5½	6
10	36	48	59	66	73	-----	-----	-----	-----	-----	-----
11	46	61	76	86	96	-----	-----	-----	-----	-----	-----
12	56	74	92	106	120	128	137	-----	-----	-----	-----
13	67	90	112	130	147	158	168	-----	-----	-----	-----
14	78	105	132	153	174	187	200	-----	-----	-----	-----
15	92	124	156	182	208	225	242	-----	-----	-----	-----
16	106	143	180	210	241	263	285	-----	-----	-----	-----
17	121	164	206	242	278	304	330	-----	-----	-----	-----
18	136	184	233	274	314	344	374	-----	-----	-----	-----
19	154	209	264	311	358	392	427	-----	-----	-----	-----
20	171	234	296	348	401	440	480	511	542	-----	-----
21	191	262	332	391	450	496	542	579	616	-----	-----
22	211	290	368	434	500	552	603	647	691	-----	-----
23	231	318	404	478	552	608	663	714	766	-----	-----
24	251	346	441	523	605	664	723	782	840	-----	-----
25	275	380	484	574	665	732	800	865	930	-----	-----
26	299	414	528	626	725	801	877	949	1,021	-----	-----
27	323	448	572	680	788	870	952	1,032	1,111	-----	-----
28	347	482	616	733	850	938	1,027	1,114	1,201	1,280	1,358
29	375	521	667	794	920	1,016	1,112	1,210	1,308	1,398	1,488
30	403	560	718	854	991	1,094	1,198	1,306	1,415	1,517	1,619
31	432	602	772	921	1,070	1,184	1,299	1,412	1,526	1,640	1,754
32	462	644	826	988	1,149	1,274	1,400	1,518	1,637	1,762	1,888
33	492	686	880	1,053	1,226	1,360	1,495	1,622	1,750	1,888	2,026
34	521	728	934	1,119	1,304	1,447	1,590	1,727	1,864	2,014	2,163
35	555	776	998	1,196	1,394	1,548	1,702	1,851	2,000	2,156	2,312
36	589	826	1,063	1,274	1,485	1,650	1,814	1,974	2,135	2,298	2,461
37	622	873	1,124	1,351	1,578	1,752	1,926	2,099	2,272	2,444	2,616
38	656	921	1,186	1,428	1,670	1,854	2,038	2,224	2,410	2,590	2,771
39	694	976	1,258	1,514	1,769	1,968	2,166	2,359	2,552	2,744	2,937
40	731	1,030	1,329	1,598	1,868	2,081	2,294	2,494	2,693	2,898	3,103

INTERNATIONAL ¼" RULE VOLUME TABLE USED FOR MOST EASTERN FORESTS

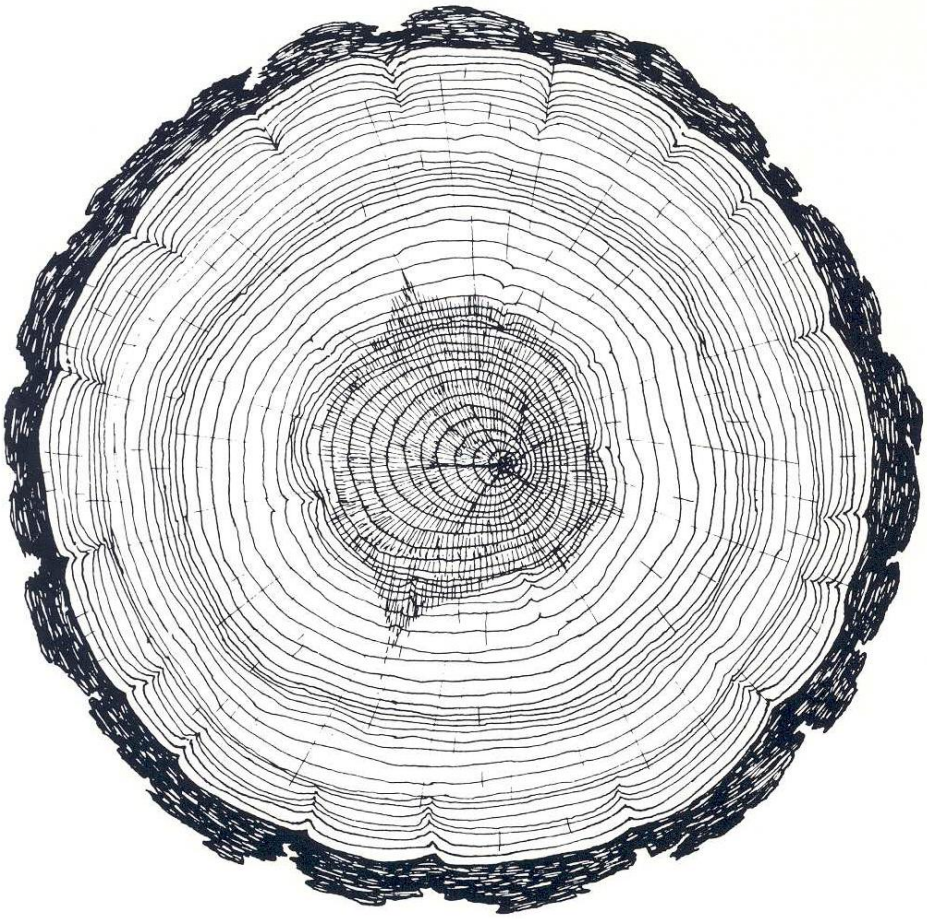
Determining tree age:

Another important measurement is tree age. Not only is counting the number of growth rings important to determine the tree's age, but interpreting the *spacing* of growth rings can tell us much about its life. Examining the growth of a tree can tell us many things about the growing conditions about the *site,* or environment the tree is growing in.

A tree's age, when compared to its diameter or height, can be an excellent indicator of how productive a specific *site* is for growing a particular species of tree, or can be an indicator of *stocking* (or how crowded the trees are).

Because trees are many times older than we are, growth rings serve as a "history book" of the tree and its surrounding community. Droughts, wet seasons, injuries, and even forest fires can be reflected in tree growth rings.

GROWTH RINGS ON PINE TREE CROSSCUT



On standing trees, age is determined by using an ***increment borer,*** which is a threaded hollow drill that is turned by hand into a tree's trunk until the borer reaches the center of the tree. The *increment core,* a pencil-thin sample of wood, is extracted from the trunk, showing the tree's growth rings and ring spacing. Although this boring does not usually harm forest trees, it is not recommended for urban or other "specimen" trees. During the Envirothon competition, a sample increment core or the tree's known age will usually be provided.

Always bore on uphill side of tree

Pull extractor to remove increment core

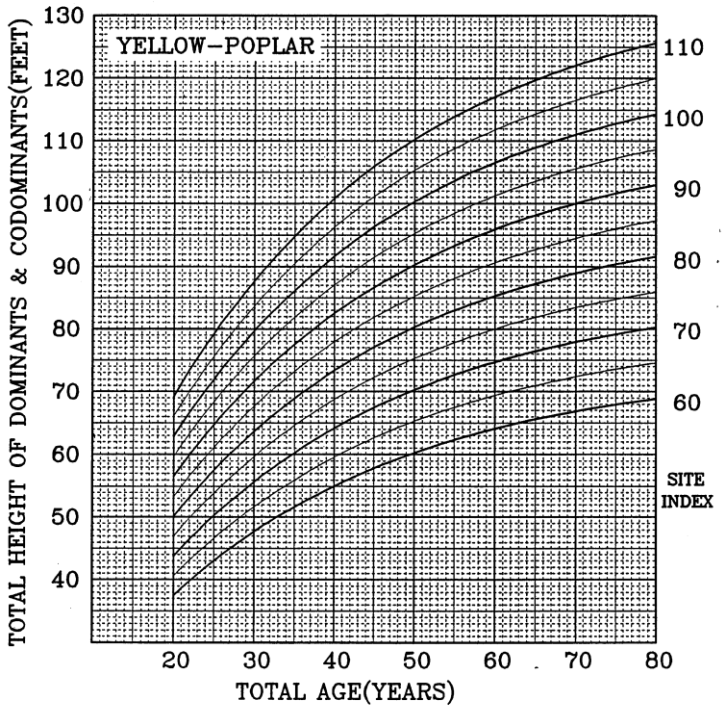
Determining Site Index:

The productivity of a *site,* or forest community depends on many factors. Soils, climate, aspect (compass direction the slope faces), and other physiographic factors influence the tree's ability to thrive and produce wood. In North America, ***site index*** is the most common expression of *site quality,* and is based on tree growth patterns at a specific age, which for eastern forests is 50 years of age.

Because each species of tree has different growth requirements, each species has its own *site index.* Many decades of researching species-specific growth patterns of trees has yielded *site index tables,* or *curves* for each major species of tree.

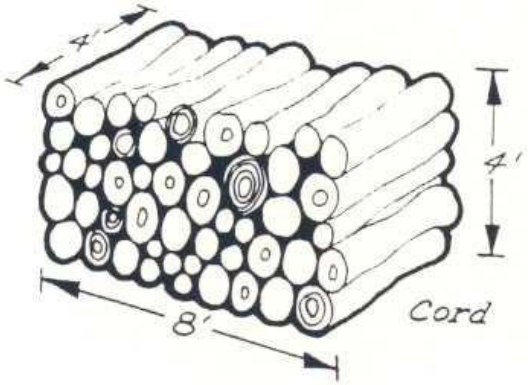
For example, using the site index table, if you measure a *dominant* (typical of the largest in the stand) yellow poplar and find it to be 30 years old and 58 feet high, the site index is 70. By age 50, dominant yellow poplars grown in uncrowded conditions on that site could be expected to grow 70 feet high. A relatively low height of 58 feet may suggest that other species found on the site should be favorably considered in thinning, harvesting, or future reforestation.

YELLOW POPLAR SITE INDEX



Determining the firewood volume of standing trees:

Many of us heat our homes with firewood because it is an inexpensive and renewable resource. Because we want to wisely use our forest resources, poorly formed trees that may not be usable as lumber, and large branches left after harvesting may be used as firewood. The volume of firewood is expressed in a ***cord***, a stack of firewood measuring 4 feet (1.2 m) wide X 4 feet high X 8 feet (2.4 m) long. Firewood is sold by the *cord,* and in Maryland can only be sold by the *cord or half-cord.* Firewood sold by the stack, pick-up load, bundle is illegal and regulated by the Maryland Department of Agriculture.



To determine the firewood volume of standing trees, foresters use a ***cord volume table***

dbh Inches	HEIGHT IN FEET TO A 4 INCH DIAMETER TOP								
	10	20	30	40	50	60	70	80	90
6	.02	.03	.05	.06	.07	.09			
8	.03	.05	.08	.10	.12	.14	.16	.19	
10		.08	.12	.15	.18	.21	.25	.28	.31
12			.17	.22	.27	.32	.37	.42	.47
14			.22	.29	.36	.43	.50	.56	.63
16				.38	.46	.55	.64	.73	.81
18				.47	.58	.69	.80	.91	1.02
20				.58	.71	.84	.98	1.11	1.24
22				.69	.85	1.01	1.17	1.33	1.49
24				.81	1.00	1.20	1.38	1.57	1.76

Determining basal area:

Once we've learned how to take measurements on individual trees, we will now look at the characteristics of the forest community. One important measurement is determining the ***basal area,*** or level of tree *stocking* on a particular site. *Basal area* is a measurement of the cross-sectional area of a given tree stem (or trunk) expressed in square feet at DBH (4.5 feet or 1.3 m). The *basal area* of a forest stand is the sum of the basal areas of individual trees, and is expressed in square feet per acre.

Determining the basal area of an individual tree requires a d-tape and a calculator. The formula is:

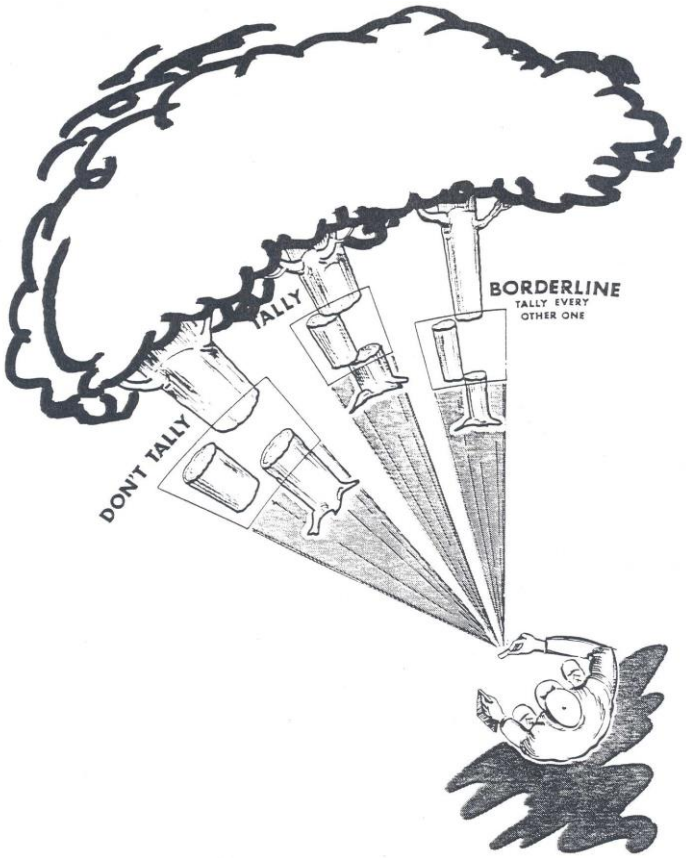
$$BA = .005454 \times DIAMETER^{2}$$

Foresters use a surprisingly simple, yet innovative instrument to determine the basal area on a specific site or *sample point.* The ***wedge prism*** is a small piece of glass that has been ground to refract light rays at a specific offset angle, which creates an "optical illusion". Technically speaking, in most eastern forests, we use a 3.03 diopter prism ground to an angle of 104.8 minutes. Most importantly, this means that tree that is measured or *tallied* is equal to 10 square feet of basal area, so we are using a wedge prism that has a *basal area factor* of 10 (BAF = 10).

When using the wedge prism, it is very important to remember that the instrument must always be held directly above the "plot center" stick for accuracy.

The "optical illusion" the wedge prism creates (as a result of the angle it is ground) appears to "offset" a portion of the tree's stem or trunk when viewed, preferably at DBH.

If the offset portion viewed through the prism appears to connect with the main stem of the tree, <u>you will "tally" that tree as "in" or "countable"</u>. If the offset portion appears completely removed from the main stem of the tree, do not "tally" that tree as it is "out" or "not countable". For trees that appear to be "borderline" or on the edge, simply tally every other tree. The following diagram illustrates this measurement:



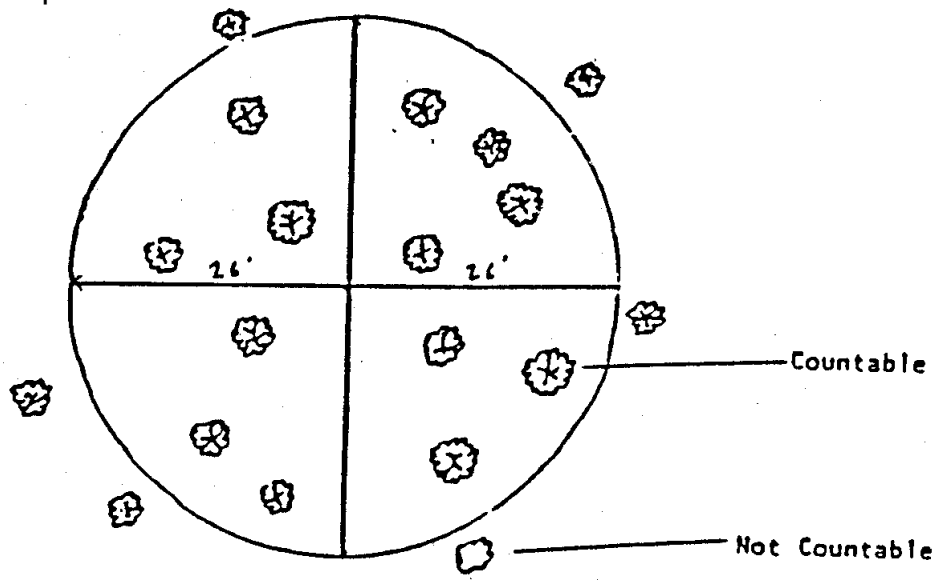
After determining the number of "in" or countable trees, as well as any every other "borderline" tree, simply multiply that number by 10 to determine your basal area
(because you are using a 10 BAF prism). For example, if you have 8 "in" trees, your basal area is 80, or you have "80 square feet of basal area per acre". If you think about it, an acre (.4 hectares) contains 43, 560 square feet, while in this example, only 80 square feet is actually occupied by tree stems, or trunks. The branches and crowns of the trees, as well as other smaller vegetation occupy the remainder of a forested acre.

Determining the stocking level:

In addition to basal area, another important piece of data is the *stocking level,* often expressed in "trees per acre". Nobody has time to measure off an entire acre (.4 hectare) and count every tree, so we again depend on a *sample*

point to give us representative number of the *stand* or property we are collecting forest data on.

To complete this measurement, we begin at our "*plot center*" and measure out 26 feet (7.8 m) in each of the *cardinal* directions (north, south, east, and west) and flag the circle boundaries. This circle is equal to 1/20th acre. We then count all of the trees within this circle that are greater than 2" (5.08 cm). We then calculate the *trees per acre* by multiplying that number of trees by 20. In the example below, 13 trees within the circle multiplied by 20 indicates there are 260 trees per acre.



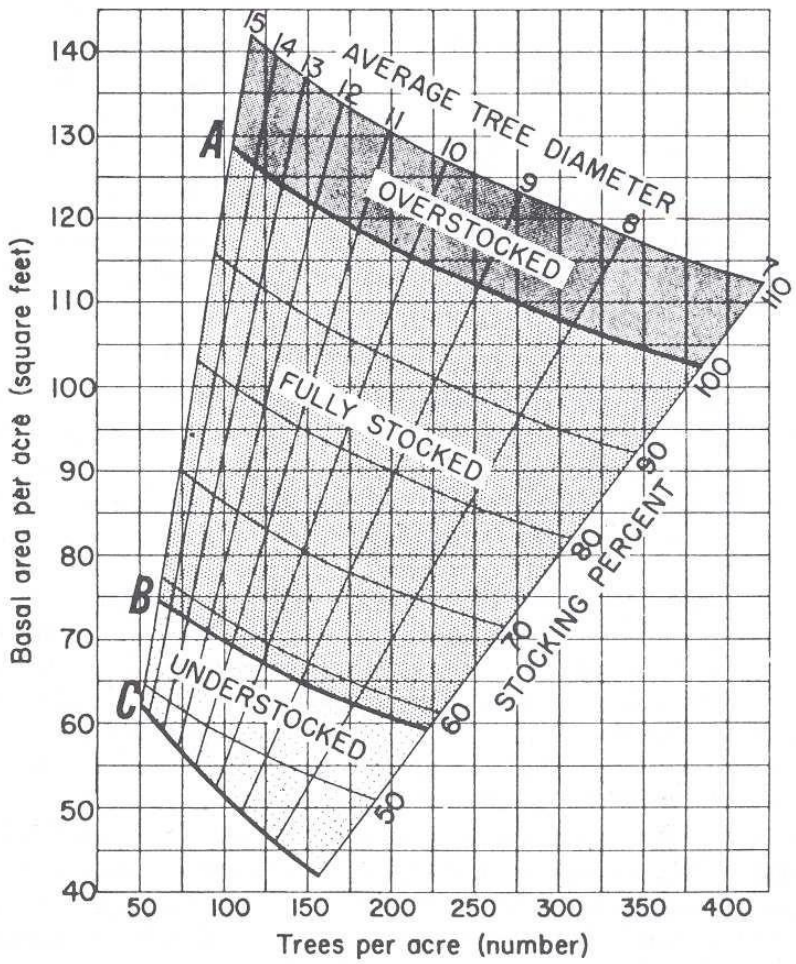
1/20TH ACRE CIRCULAR PLOT

An important tip: Although each measurement is sometimes conducted on the same sample plot, don't confuse *basal area* with the *1/20th acre tree count.* When using the wedge prism above "plot center", measure all of the trees as far as you can see (there may be a huge tree in the distance that is "in"). When counting trees in your 1/20th acre plot, count only those within the radius of your circle. During the Envirothon competition, each of these measurements would be conducted on a separate plot to avoid confusion…

Determining stocking level using a table:

After we determine the *trees per acre* by conducting a 1/20th sample acre plot, we can combine this data with the *basal area* of the site to determine whether the forest is *understocked, fully stocked,* or *overstocked.* This information is very important to the forester when making forest management

recommendations and deciding which *silvicultural* practices to implement based on the landowner's objectives (remember that nearly 76% of Maryland's forest land is owned by private landowners). A chart like the one shown below is used to determine stocking level.



About sample points:

Foresters often conduct a stocking level measurement on the same sample point where they collect basal area information, site index, volume measurements, tree age, height, and species composition data. This information, when combined with numerous other sample points (one sample point may be conducted for every five acres) gives a clear, statistically accurate picture of the forest community being studied. Sample points are designated based on a grid pattern (for example: 7 chains x 7 chains if you wanted to complete a sample plot every 5 acres) while the property is being mapped in the office. This ensures

statistical accuracy and eliminates bias (and sometimes causes you to have to collect data in wetlands, on steep slopes, and thick brush!). Conducting sample points involves bringing all of your forestry skills (compass reading, pacing, tree identification, and proficiency in using instruments) together!

Summary…

Many students enjoy the forestry resource area of the Envirothon program because it is very "hands-on". As you can see, it is important to become competent in using forestry tools to obtain accurate measurements, especially when you combine two measurements together to determine *site index* or *stocking level.* Becoming proficient with forestry tools takes practice, and your local forestry professionals can assist you.

Forestry Resource Study Guide

SILVICULTURE

Introduction:

Silviculture is considered both an art and a science. In fact, you may find as many definitions of the term as foresters who practice it! If you major in forestry in college, you can expect to take several semester-long courses studying Silviculture. For Envirothon, let's look at several definitions found in books on the subject:

- *"The art and science of controlling the establishment, growth, composition, health, and quality of forests and woodlands to meet the diverse needs and values of landowners and society on a sustainable basis."*
- *"The science of producing and tending a forest, from regeneration to harvesting. It addresses the biological, ecological, and economic aspects – both short and long term."*
- *"The art, science, and practice of establishing, tending, and reproducing forest stands with desired characteristics."*

Among these definitions, three themes stand out: trees, environment, and people. Because trees are renewable and sustainable resources, and we depend on literally thousands of forest products every day, *Silviculture* represents the "how" and "why" our forests sustain an ever-growing need for forest products balanced with our need to conserve and protect habitat, soils, water quality, and air quality.

Learning Objectives:

At the end of this section you should:

- Understand the definition and concept of a forest *stand* as it relates to silvicultural practices.

- Be able to recognize and identify *crown classes* in a forest *stand.*
- Be able to identify and understand Intermediate harvest treatments and Regeneration harvest treatments.
- Understand the important role Silviculture plays in producing a renewable and sustainable forest resource and conserving Maryland's diverse forest ecosystems.
- Be able to identify *even-aged* stands and *un-even aged* stands

Let's Get Started:

As mentioned earlier, silviculture is both an art and a science. The professional forester engages in the *art* of silviculture by applying sound forest management techniques to help meet the landowner's objectives, which may be timber production, wildlife habitat conservation, recreation, watershed protection, or a combination of all of these objectives.

The forester applies the *science* of silviculture after collecting the same forest measurement data that we learned to collect in the Forest Measurements section. Factors such as species composition, stocking levels, site index, basal area, volume and soils are used to make informed science-based decisions about implementing silvicultural practices. Let's take a look at some important principles:

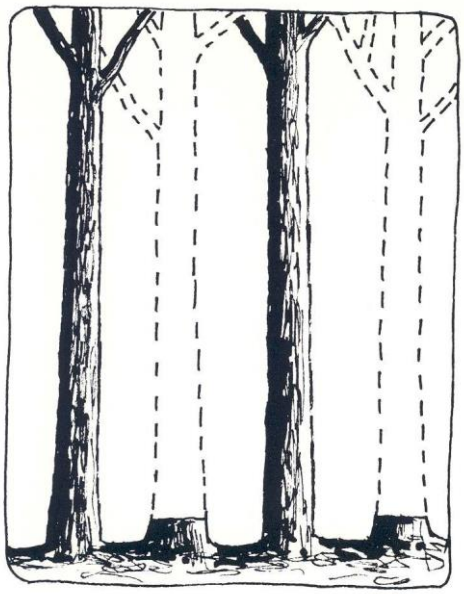
- **Height growth** of trees is generally a function of species and site. By nature, certain species grow taller than others, and the *site* (the combination of biotic, climatic, topographic, and soil conditions of an area) the tree grows on influences its height.
- **Diameter growth** of trees is a function of competition for water, sunlight, and nutrients. For example, an increment core taken from a tree five or ten years after a forest thinning will show a significant increase in the space between growth rings, indicating the tree is increasing its diameter as a result of reduced competition.
- **Stand:** A basic concept of forestry, a *stand* is a grouping of trees of sufficiently uniform species composition, age, and condition to be distinguished from surrounding stands and managed as a single unit.
- **Even-aged Stand:** A stand of trees that is relatively the same age. In Maryland, pine is most often managed with this technique by harvesting all of the trees and replanting with a short period of time.
- **Uneven-aged Stand:** A group of trees of a variety of ages and sizes growing together on a uniform site.

Silvicultural Techniques:

Let's look at some basic silvicultural systems: *Intermediate Treatments,* and *Regeneration Treatments:*

INTERMEDIATE TREATMENTS – Are any manipulation of a young forest to ensure the desired stand composition, spacing, stem quality, and growth performance might otherwise have been lost if the forest had been left to develop on its own. There are more than a half-dozen intermediate treatments foresters prescribe, but we're only going to look at two:

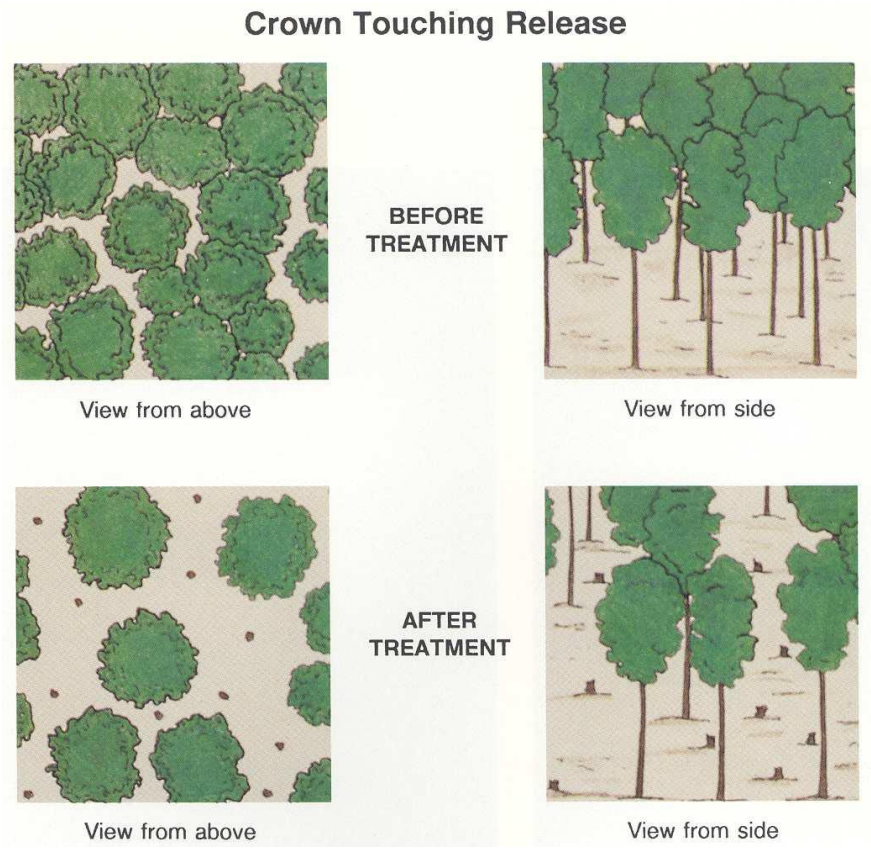
- ***Thinning*** – A thinning is usually performed in even-aged stands with the primary goal of redistributing growth potential to the "*crop"* trees (the trees you want to remain) or to benefit the quality of the remaining stand. There are several different techniques used for thinning, but all are designed to create more sunlight, water, and food for the remaining stand while generating forest products and income.



THINNING AN EVEN-AGED STAND

- ***Crop Tree Release*** - Often prescribed in uneven-aged hardwood stands with trees that are 12" (30.4 cm) or more in diameter, the selected crop trees are "released" by felling or *girdling* (cutting into the cambium around the tree to kill it, creating habitat for wildlife) those trees that compete with the crop tree. This practice is accomplished by locating "crop trees" at a fairly uniform spacing throughout the stand. Crop trees

should have a healthy crown, be a species of potentially high value, and produce *mast* (seeds, nuts, or fruit for wildlife). 25 to 35 crop trees per acre (.4 hectares) should remain after releasing, this will space crop trees about 35 to 45 feet (10.5 m to 13.5 m) apart. Competing trees that have crowns that touch – or nearly touch – the crown of the crop tree should be released. Remove trees on at least three sides of the crop tree. Trees that are removed should be utilized for products such as pulpwood, firewood, or lumber.

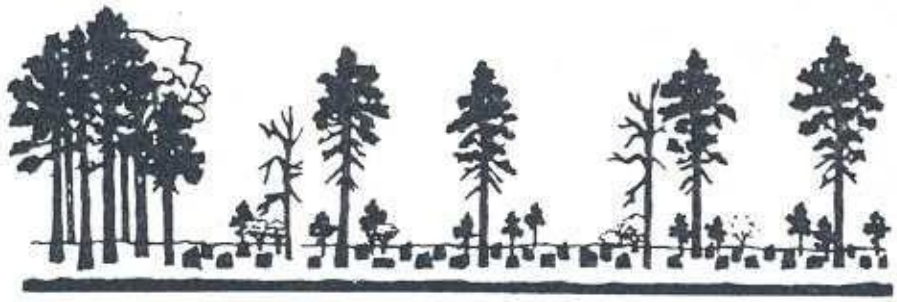


EXAMPLES OF CROP-TREE RELEASE TECHNIQUES

REGENERATION TREATMENTS – Have the ultimate goal of removing the existing forest stand and planning for the reestablishment of the forest either through natural regeneration (using existing seed deposited in the forest soil or sprouts) or artificial regeneration (tree planting). Again, there are several regeneration treatments foresters prescribe to ensure healthy and sustainable forests, but let's look at three:

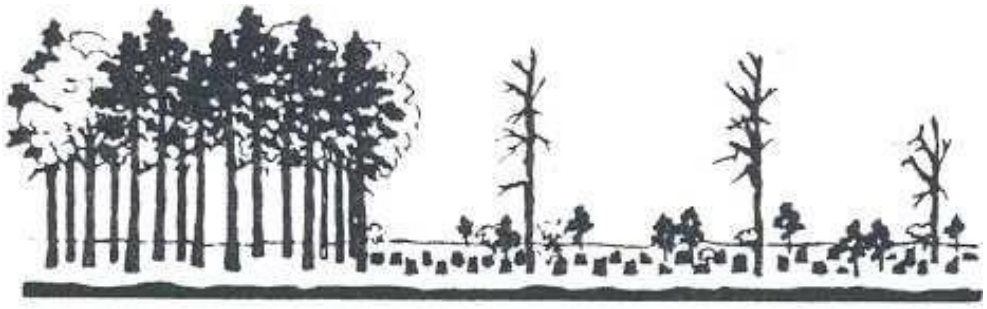
- ***Seed Tree Method -*** This technique removes all of the existing trees down to 2 inches (5.0 cm) in diameter, leaving mature "seed" trees to repopulate the site. Generally 8-20 seed trees per acre (.4 hectares) are left after the harvest, and are usually of a single species. Seed trees are selected prior to the harvest and are the most dominant, well-formed trees in the stand. In Maryland, loblolly pine is often regenerated by this

method because the winged pine seeds are scattered by the wind. Once a successful crop of trees has been regenerated on the site, the seed trees should be removed in a second harvest.



SEED TREE HARVEST

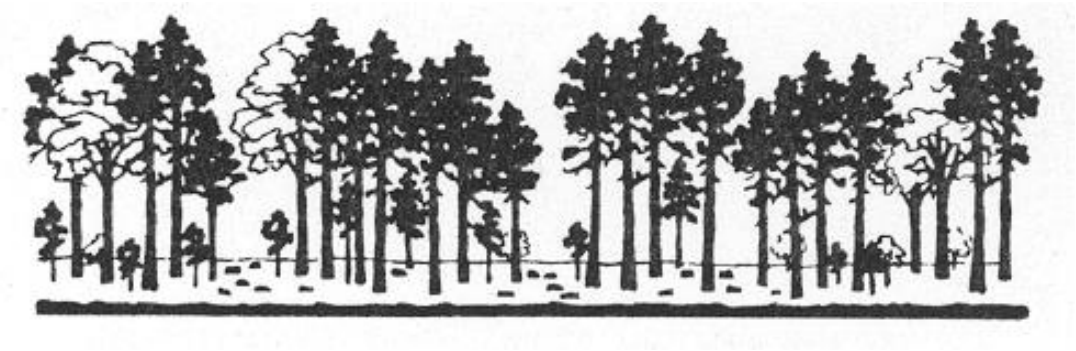
- ***Clearcut Method -*** The purpose of the clearcut harvesting method is to promote the regeneration of *shade intolerant species* (young trees that require full sunlight) by creating openings at least 1 acre (.4 hectares) in size by removing all trees down to two inches (5.0 cm). Regeneration following a clearcut is very rapid and prolific, because it maximizes the site's ability to naturally reproduce the forest. In Maryland, *site preparation* often follows a clearcut harvest to remove logging *slash* (residual branches and other brush) by prescribed burning, herbicide spraying, or using a bulldozer to push slash into *windrows* to create wildlife habitat. If the Seed Tree method is not used, *artificial regeneration* (reforestation planted by a crew or machine) may be used



CLEARCUT HARVEST WITH WILDLIFE SNAGS

- ***Single Tree Selection Method -*** Under this system, single trees are marked for removal. The goal of this method is to maintain a self-sustaining forest of multiple age classes. Cutting a specific number of trees in each size class controls the structure of the forest, and the cutting pattern is repeated at regular intervals throughout the stand "rotation". The objective of this method is to create an *uneven age* forest while maintaining a continuous forest cover. This uneven age

management system favors the reproduction of *shade tolerant* (young trees that grow well in the shade of larger trees) *species.* In Maryland, these species include American beech, sugar maple, hemlock, dogwood, red maple, and black gum. In oak-dominated forest types, the uneven aged management system is generally not recommended.



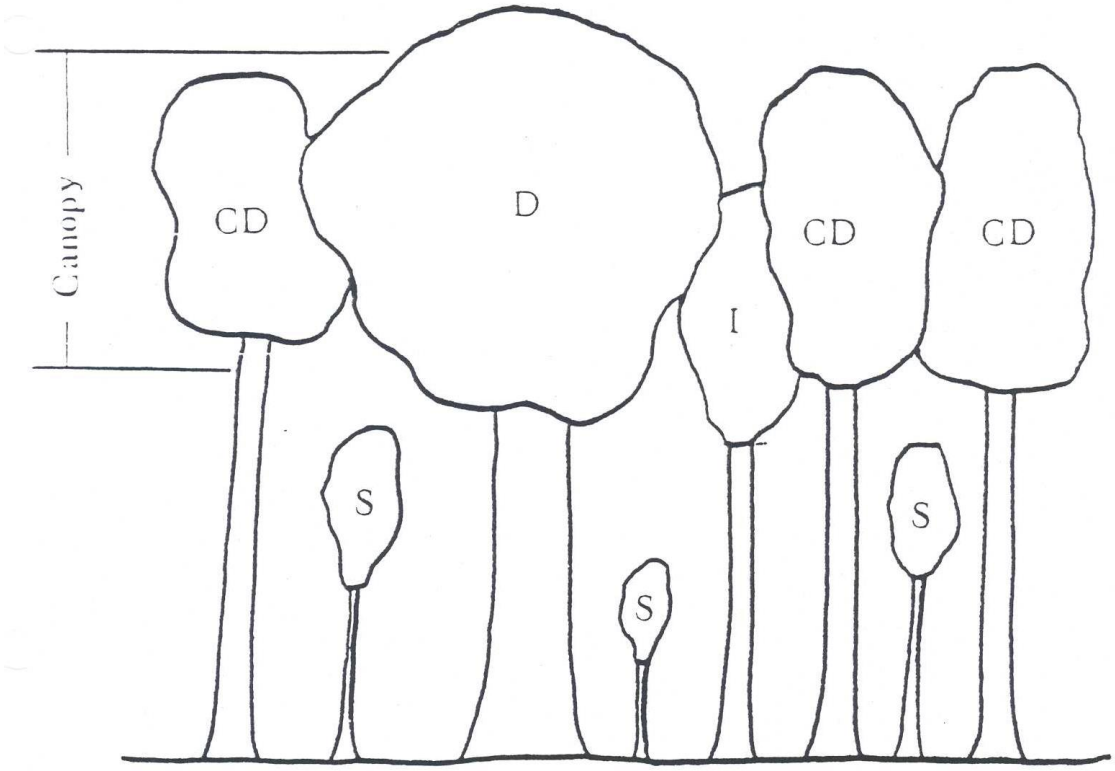
SINGLE TREE SELECTION HARVEST

About Crown Classes…

In a forest community, trees occupy different positions in the canopy and understory. These positions can be referred to as *crown classes* and the ability to identify them, and the species that they are composed of, is key to making sound silvicultural decisions. Crown classes are identified as:

- ***Dominant –*** Trees receive full sunlight from above and the sides. In even-aged stands, dominant trees are often shade intolerant species. In Maryland, the species would include loblolly pine, Virginia pine, black walnut, yellow poplar, sycamore, green ash, black oak, scarlet oak, and others
- ***Co-dominant –*** Trees receive full sunlight from above and partial sunlight from the sides. In Maryland, species that are moderately tolerant include white pine, hickory, yellow birch, red oak, white oak, black cherry, red cedar, and others.
- ***Intermediate –*** Receive partial sunlight from above and sides. Intermediate trees include any of the above species, and may become dominant or co-dominant in the event of the loss of the dominant tree through harvesting, weather-related event, disease, or fire.
- ***Suppressed -*** Trees receive only partial sunlight from above. In even-aged stands, species are usually shade tolerant or "understory" trees. In

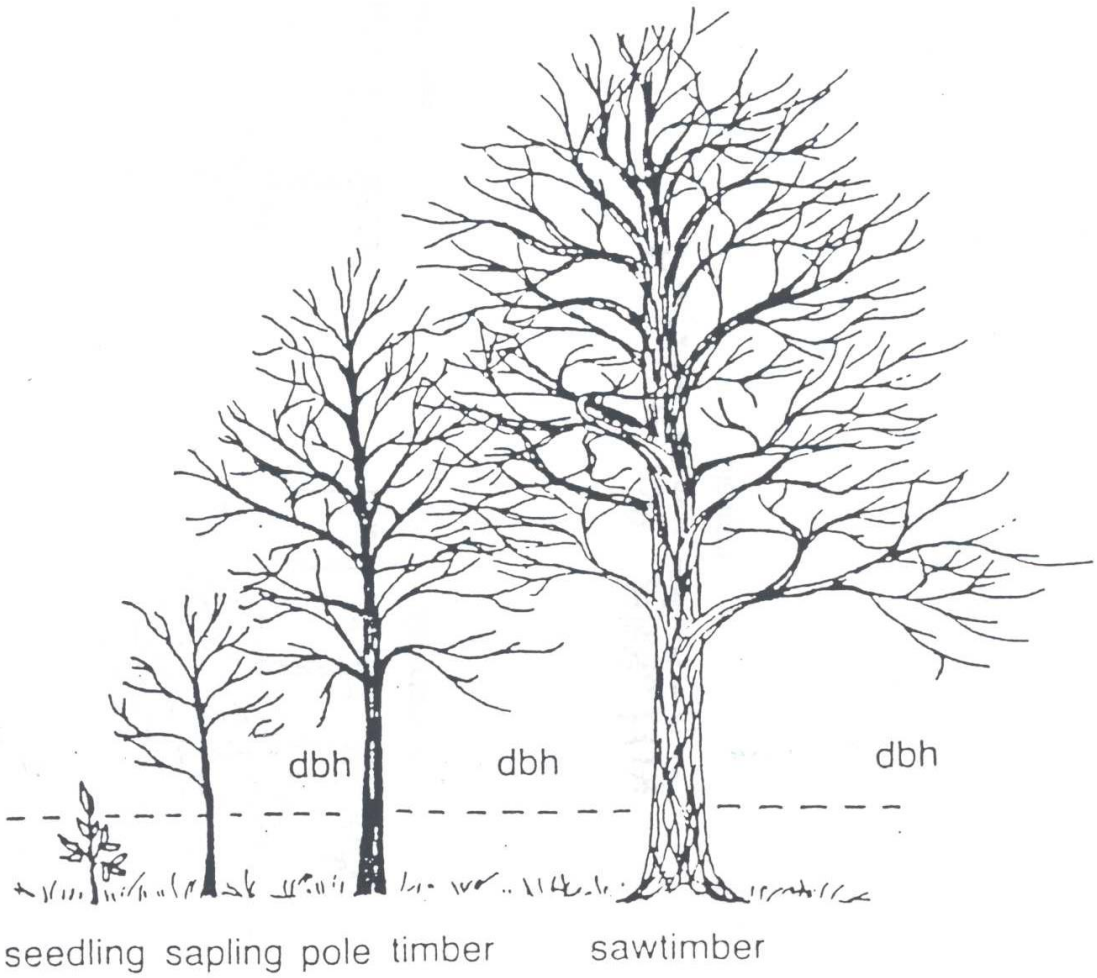
Maryland, species include hemlock, American beech, sugar maple, red maple, dogwood, American holly, redbud, dogwood, and others.



CROWN CLASSES (D) DOMINANT, (CD) CO-DOMINANT, (I) INTERMEDIATE, AND (S) SUPPRESSED

About Size Classes…

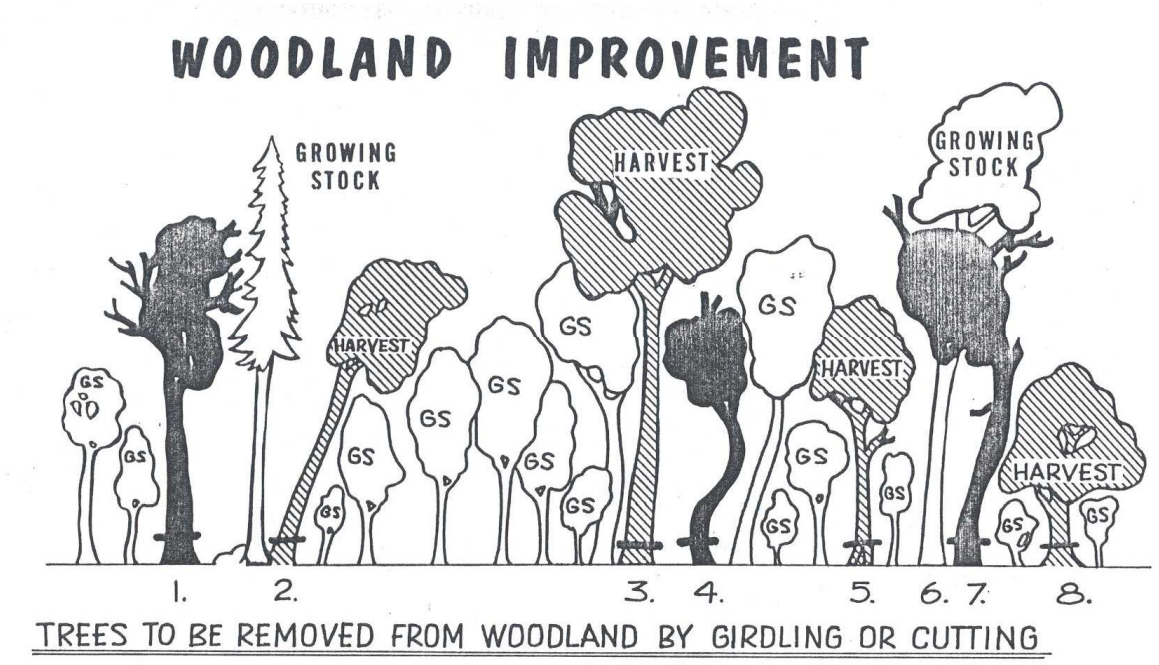
Foresters classify trees into various *size classes* when conducting inventories of forest stands. When conducting a sample plot using the various forestry tools described in the measurements section, the species, size class, site index, and volume (often in *logs* or *sticks*) is noted on a *tally sheet.* This inventory process is often called *cruising timber.* The following *size classes* are used:



< 2”	2”-5.9”	6”-11.9”	12”+
(< 5 cm)	(5 cm–14.9cm)	(15.2 cm-30.2 cm)	(30.5+ cm)

Putting It All Together…

After collecting forest data through measurements and studying the property, a forester may make the following decisions…



Summary…

As you can see, silviculture is both an *art* and a *science.* After data is collected using the various tools and tables found in the forest measurements section, that data is used to make decisions on implementing *silvicultural* techniques. Because private landowners own seventy-six percent of Maryland's forest, these decisions are often based on the landowner's *management objectives,* or what outcomes they want to accomplish by participating in a Forest Stewardship program.

Forestry Resource Study Guide

Tree Identification

Introduction…

Because Maryland has five distinct physiographic provinces from the Coastal Plain to the Allegheny Plateau, our state features a great diversity of tree species, which makes the tree identification station of the Envirothon a challenge!

During the competition, your team must identify 10 or 15 species of trees by their correct common name. Professional foresters have completed college courses in ***dendrology***, or the science of tree identification, and have to identify literally hundreds of species of trees and shrubs by both their common and scientific names.

When identifying trees, nearly all of your senses may be utilized (except hearing!), to examine the entire tree. Here are several characteristics to look for when identifying tree species:

- Leaf shape – Are they simple or compound? Are the margins (edges) of the leaf smooth or toothed? Are the undersides of the leaves fuzzy? If the tree has needles, how many of them are in a bundle? Are the leaves scales like?
- Bark – Is the bark smooth or scaly? Does the bark peel off or change texture further up the stem of the tree?
- Branching structure – Are the tree's branches alternate or opposite? (Remember in Maryland, only maple, ash, and dogwood are the most common opposite-branched tree)
- Twigs and buds – Are the twigs stout or thin? Does the tree have clusters of buds or single buds? What do the bud scales look like?

There are many other tree identification tips, often used to distinguish one species of tree from another (for example: red oaks have pointed lobes, while white oaks have rounded lobes), and these are learned through experience and training from your teacher or forestry resource professional.

Special Thanks:

A word of special thanks goes to the Virginia Polytechnic Institute and State University College of Natural Resources for the use of their Tree Identification Fact Sheets. For more info on Virginia Tech's College of Natural Resources, visit them at. http://dendro.cnre.vt.edu/dendrology/data_results_with_common.cfm. All images used by permission.

Appendix I – Canadian Hardwood Volume Table

Factors for Calculating Hardwood Merchantable Volume (m^3/ha)

Average Merchantable Diameter* (cm)	Average Merchantable Height* (m)							
	8	10	12	14	16	18	20	22
10	2.1	2.6	3.1	3.5	4.0	4.4	4.8	5.2
12	2.7	3.3	3.9	4.5	5.1	5.6	6.2	6.7
14	3.0	3.7	4.3	5.0	5.6	6.2	6.8	7.4
16	3.1	3.9	4.6	5.2	5.9	6.5	7.1	7.7
18	3.2	4.0	4.7	5.4	6.0	6.7	7.3	7.9
20	3.3	4.0	4.8	5.5	6.1	6.8	7.4	8.1
22	3.3	4.1	4.8	5.5	6.2	6.9	7.5	8.2
24	3.3	4.1	4.8	5.6	6.3	6.9	7.6	8.2
26	3.4	4.1	4.9	5.6	6.3	7.0	7.6	8.3
28	3.4	4.1	4.9	5.6	6.3	7.0	7.6	8.3
30	3.4	4.1	4.9	5.6	6.3	7.0	7.7	8.3
32	3.4	4.2	4.9	5.6	6.3	7.0	7.7	8.3
34	3.4	4.2	4.9	5.6	6.3	7.0	7.7	8.3
36	3.4	4.2	4.9	5.7	6.4	7.0	7.7	8.4
38	3.4	4.2	4.9	5.7	6.4	7.1	7.7	8.4
40	3.4	4.2	4.9	5.7	6.4	7.1	7.7	8.4
42	3.4	4.2	4.9	5.7	6.4	7.1	7.7	8.4
44	3.4	4.2	4.9	5.7	6.4	7.1	7.7	8.4
46	3.4	4.2	4.9	5.7	6.4	7.1	7.7	8.4
48	3.4	4.2	4.9	5.7	6.4	7.1	7.7	8.4
50	3.4	4.2	4.9	5.7	6.4	7.1	7.7	8.4
52	3.4	4.2	4.9	5.7	6.4	7.1	7.7	8.4
54	3.4	4.2	5.0	5.7	6.4	7.1	7.8	8.4
56	3.4	4.2	5.0	5.7	6.4	7.1	7.8	8.4
58	3.4	4.2	5.0	5.7	6.4	7.1	7.8	8.4
60	3.4	4.2	5.0	5.7	6.4	7.1	7.8	8.4

* Based on merchantable trees ≥ 9 cm DBHob

To obtain Merchantable Volume (m^3/ha), multiply factor by Merchantable Basal Area (m^2/ha).

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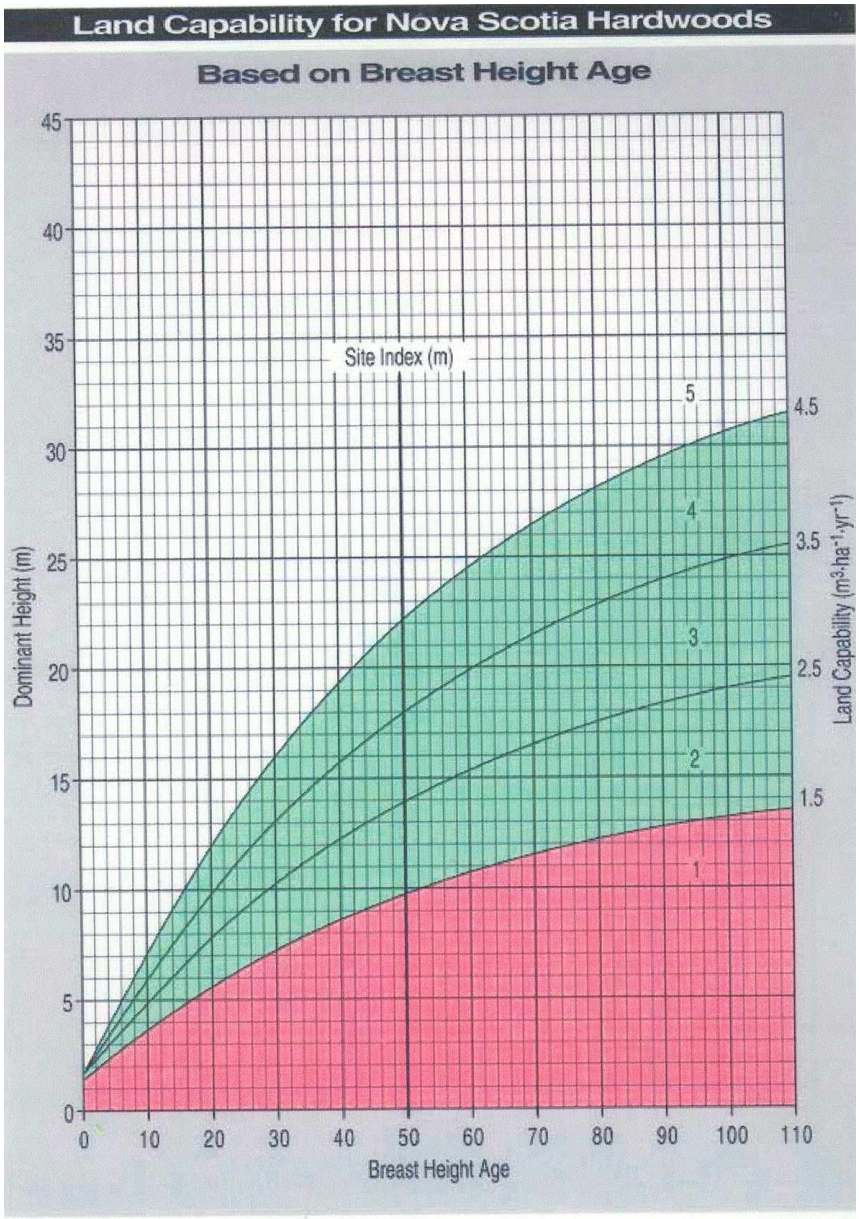
Appendix II – Nova Scotia Land Capability Chart for Hardwoods



Glossary of Forestry Terms

As with any profession, forestry has its own vocabulary. This fact sheet is designed to help the reader better understand some of the terminology associated with woodland management.

A

all-aged stand - See uneven-aged stand.

allegany hardwood forest type - a portion of Maryland's northern hardwood forest in which black cherry, white ash, and red oak are dominant species.

annual rings - see growth rings.

aspect - the compass direction toward which a slope faces.

association - a collection of plants with ecologically similar requirements, including one or more dominant species from which the group derives a definite character.

B

basal area (of a tree) - the cross-sectional area of the trunk 4 1/2 feet above the ground; **(per acre)** the sum of the basal areas of the trees on an acre; used as a measure of forest density.

Biltmore stick - a tool calibrated to measure the diameter of a tree at breast height. Biltmore sticks are calibrated with different scales depending on the users' arm length.

biological diversity or biodiversity - the variety of life in all its forms and all its levels of organization. Biodiversity refers to diversity of genetics, species, ecosystems, and landscapes.

blaze - to mark a tree, usually by painting or cutting the bark. Forest properties often are delineated by blazing trees along the boundary lines.

blowdown - see windthrow.

board foot - a unit for measuring wood volume in a tree, log, or board. A board foot is commonly 1 foot by 1 foot by 1 inch, but any shape containing 144 cubic inches of wood equals one board foot.

bole - the trunk of a tree.

boots - Firefighters wear all leather boots to protect their feet on the fireline and rugged terrain.

breast height - 41/2 feet above ground level. See diameter at breast height.

browse - parts of woody plants, including twigs, shoots, and leaves, eaten by forest animals.

buck - to cut trees into shorter lengths, such as logs or cordwood.

butt log - a log cut from the bole immediately above the stump.

C

caliper - a tool to measure the diameter of a tree.

canopy - the continuous cover formed by tree crowns in a forest.

carrying capacity - the maximum number of individuals of a wildlife species that an area can support during the most unfavorable time of the year.

clearcut - the harvest of all the trees in an area. Clearcutting is used to aid species whose seedlings require full sunlight to grow well.

clinometer - an instrument used to determine the height of a tree.

codominant tree - a tree that extends its crown into the canopy and receives direct sunlight from above but limited sunlight from the sides. One or more sides of a codominant tree are crowded by the crowns of dominant trees.

commercial clearcut - a harvest cut that removes all merchantable timber from the area.

commercial forestland - any area capable of producing 20 cubic feet of timber per acre per year that has not been protected from such use by law or statute.

commercial treatments - timber stand improvements, such as thinning, that generate income from the sale of the trees removed.

community - A collection of living organisms thriving in an organized system through which water, energy, and nutrients cycle.

conifer - any tree that produces seeds in cones. See softwood.

consulting forester - an independent professional who manages forests and markets forest products for private woodland owners. Consulting foresters do not have direct connections with firms that buy wood products, but are retained by woodland owners as their agents.

Cooperative Extension Service (CES) - the educational arm of the USDA that links university research to people who can benefit from it.

cord - a unit of wood cut for fuel that is equal to a stack 4 x 4 by 8 feet or 128 cubic feet. A cord is the legal measure of fuelwood volume in Maryland.

cordwood - small diameter or low quality wood suitable for firewood, pulp, or chips. Cordwood is not suitable for sawlogs.

critical area -land in Maryland that lies within 1,000 feet of the Chesapeake Bay and its tributaries and is subject to forestry and other land use regulations.

crook - a tree defect characterized by a sharp bend in the main stem.

crop tree - a young tree of a desirable species with certain characteristics desired for timber value, water quality enhancement, or wildlife or aesthetic uses.

crown - the uppermost branches and foliage of a tree.

crown classes - see codominant, dominant, intermediate, overtopped, and suppressed.

crown cover or crown closure - the percentage of a given area covered by tree crowns.

crown ratio or live-crown ratio - the ratio of the leaved portion of a tree's height to its total height.

cruise - a forest survey used to obtain inventory information and develop a management plan.

cull - a sawtimber sized tree that has no timber value as a result of poor shape or damage from injury, insects or disease.

cutting cycle - the period of time between major harvests in a stand.

D

deciduous - shedding or losing leaves annually; the opposite of evergreen. Trees such as maple, ash, cherry, and larch are deciduous.

defects - characteristics of an individual tree that reduce its quality and utility.

den tree - a tree with cavities suitable for birds or mammals to nest in.

diameter at breast height (dbh) - standard measurement of a tree's diameter, usually taken at 4 1/2 feet above the ground.

diameter-limit scale - a timber sale in which all trees over a specified dbh may be cut. Diameter-limit sales often result in high grading.

dimension lumber - hardwood dimension lumber is processed to be used whole in the manufacture of furniture or other products. Softwood dimension lumber consists of boards more than 2 inches thick but less than 5 inches thick. This wood is used in construction and is sold as 2 by 4s, 4 by 8s, or 2 by 10s.

dominant trees - trees that extend above surrounding individuals and capture sunlight from above and around the crown.

drip torch - Firefighters use these torches, that drip a flaming liquid mixture of diesel fuel and gasoline, to ignite fires in burnout operations.

E

ecology - the study of interactions between organisms and their environment.

ecosystem - organisms and the physical factors that make up their environment.

ecotone - a transition area between two distinct, but adjoining, communities.

edge - the boundary between two ecological communities, for example, field and woodland. Edges provide wildlife habitat. Consideration of an edge can reduce the impact of a timber harvest.

endangered species - any species or subspecies in immediate danger of becoming extinct throughout all or a significant portion of its range.

epicormic branching - branches that grow out of the main stem of a tree from buds produced under the bark. Severe epicormic branching increases knottiness and reduces lumber quality.

even-aged stand - a stand in which the age difference between the oldest and youngest trees is minimal, usually no greater than 10 to 20 years. Even-aged stands are perpetuated by cutting all the trees within a relatively short period of time.

evergreens - plants that retain foliage year round.

extension forester - a Cooperative Extension Service professional who educates woodland owners on how they can effectively manage their forests.

F

Farm Services Agency (FSA) - The branch of the U.S. Department of Agriculture (USDA) that administers cost-sharing programs for such forestry practices as tree planting and timber stand improvement.

felling - the cutting of standing trees.

fire Pack - Firefighters use these to carry tools, equipment, and supplies on their backs.

fire Resistant Clothing - These yellow shirts and green pants are the trademarks of wildland firefighters.

fire shelter - Firefighters use this personal protection as a last resort if a wildfire traps them and they cannot escape. Firefighters can get into the tent-like shelter, made of heat reflective material, in about 25 seconds.

fire Shovel - These shovels, specifically designed for constructing a fireline, feature a tapered blade with both edges sharpened for scraping, digging, grubbing, cutting, and throwing dirt.

forest - a biological community dominated by trees and other woody plants.

forest fragmentation - the subdivision of large natural landscapes into smaller, more isolated fragments. Fragmentation affects the viability of wildlife populations and ecosystems.

forest types - associations of tree species that have similar ecological requirements. Maryland forest types include Allegany hardwood, loblolly-shortleaf, northern hardwood, oak-gum-cypress, oak hickory, and oak-pine.

forested wetland - an area characterized by woody vegetation taller than 20 feet where soil is at least periodically saturated or covered by water.

forester - a degreed professional trained in forestry and forest management. In Maryland, all foresters must be registered with the state.

forestry - the science of tending woodlands.

Forestry Incentives Program (F.I.P.) - a Federal cost-sharing program that reimburse part of the costs landowners incur in completing certain forestry practices. The F.I.P. is administered by the NRCS.

fork - a tree defect characterized by the division of a bole or main stem into two or more stems.

frilling - the method of killing trees by inflicting a series of cuts around the bole and applying an herbicide to the wounds. Frilling

or girdling can be used to reduce the density of a stand or to kill individual undesirable trees.

fusee - Firefighters also use these colored flares to ignite fires in burnout operations.

G

girdling - a method of killing trees by cutting through the stem, thus interrupting the flow of water and nutrients.

group selection - a process of harvesting patches of trees to open the forest canopy and encourage the reproduction of unevenaged stands.

growth rings - the layers of wood a tree adds each season; also called annual rings. These rings frequently are visible when a tree is cut and can be used to estimate its age and growth rate.

H

habitat -the ecosystem in which a plant or animal lives and obtains food and water.

hardwoods - a general term encompassing broadleaf, deciduous trees.

harvest - the cutting, felling, and gathering of forest timber.

headlamp - Firefighters who work on the fireline at night wear these flashlights on the front of their helmets.

herbaceous vegetation - low-growing, non-woody plants, including wildflowers and ferns, in a forest understory.

high grading - to remove all mature, good quality trees from a stand and leave inferior species and individuals. High grading should be distinguished from even-aged management in which mature and immature trees are removed to aid regeneration.

hypsometer - any of several tools or instruments designed to measure the height of trees. The clinometer is such a tool.

I

improvement cut -a weeding done in stands of pole-size or larger trees.

industrial forester - a professional employed by a wood-using industry, usually a sawmill, who purchases timber from private woodland owners. Many industrial foresters offer free forest management or marketing services to the landowners who sell timber to the forester's employer.

increment borer - an augerlike tool with a hollow bit designed to extract cores from tree stems for the determination of age and growth rate.

intermediate crown class - trees with crowns that extend into the canopy with dominant and codominate trees. These trees receive little direct sunlight from above and none from the sides. Crowns generally are small and crowded on all sides.

intermediate tolerance - a characteristic of certain tree species that allows them to survive, though not necessarily thrive, in relatively low light conditions.

intolerance - a characteristic of certain tree species that does not permit them to survive in the shade of other trees.

introduced species - a nonnative species that was intentionally or unintentionally brought into an area by humans.

J
K
L
landing - a cleared area within a timber harvest where harvested logs are processed, piled, and loaded for transport to a sawmill or other facility.

loblolly-shortleaf forest type - an association of tree species common to the southeastern United States that includes loblolly and shortleaf pines and oaks.

logger - an individual who harvests timber for a living.

log rule - a method for calculating wood volume in a tree or log by using its diameter and length. The international 1/4-inch rule is the legal rule in Maryland.

lopping - cutting tree tops to a maximum specified height above the ground after a tree is felled.

lump-sum sale - a timber sale in which an agreed-on price for marked standing trees is set before the wood is removed (as opposed to a unit sale).

M

marking timber - indicating by paint or other means which trees are to be cut or otherwise treated. It is advisable to mark trees to be harvested twice-once at eye level and once on the stump.

mast - nuts and seeds, such as acorns, beechnuts, and chestnuts, of trees that serve as food for wildlife.

mcleod - Firefighters also use this combination hoe, rake and scraping tool and rake to remove plants and shrubs when building a fireline.

merchantable height - the point on a tree stem to which the stem is salable. Limits are: the point at which a sawlog tree is less than 8 inches in diameter, measured inside the bark (dib); the point at which a pulpwood tree is less than 4 inches dib; or the point on any tree where a defect is found that cannot be processed out.

N

Natural Resources Conservation Service (NRCS) - the branch of the USDA that coordinates and implements soil conservation practices on private lands. The NRCS can provide woodland owners with detailed information on his or her soil.

niche - the physical and functional "address" of an organism within an ecosystem; or, where a living thing is found and what it does there.

nongame wildlife - wildlife species that are protected by state wildlife laws and can not be hunted. Examples include songbirds, eagles, etc.

nonindustrial private forestland (NIPF) - forestland owned by a private individual, group, or corporation not involved in wood processing. Eighty-five percent of Maryland's forests are in this category.

nontidal wetlands - wetlands not affected by ocean tides. Nontidal wetlands are subject to special regulations.

northern hardwood forest type - an association of tree species common to the Northeastern United States that includes sugar maple, red maple, yellow birch, hemlock, and American beech.

O

oak-gum-cypress forest type - an association of tree species common to the bottom lands of the Southeastern United States.

oak-hickory forest type - an association of tree species common to the Northeastern United States that includes oak, hickory, yellow poplar, and red maple.

oak-pine forest type - an association of tree species common to the Southeastern United States that includes loblolly pine, Virginia pine, northern red oak, and white ash.

old-growth forest - a wooded area, usually greater than 200 years of age, that has never been altered or harvested by humans. An old-growth forest often has large individual trees, a multi-layered crown canopy, and a significant accumulation of coarse woody debris including snags and fallen logs.

overmature - a quality exhibited by trees that have declined in growth rate because of old age and loss of vigor.

overstocked - the situation in which trees are so closely spaced that they compete for resources and do not reach full growth potential.

overstory - the level of forest canopy that includes the crowns of dominant, codominant, and intermediate trees.

overtopped - the situation in which a tree cannot sufficiently extend its crown into the overstory and receive direct sunlight. Overtopped trees that lack shade tolerance lose vigor and die.

P

patch cut - a clearcut on a small area.

pole stand - a stand of trees whose average dbh is between 4 and 10 inches.

pole timber - trees 4 to 10 inches dbh.

precommercial operations - cutting in forest stands to remove wood too small to be marketed. Precommercial operations improve species composition and increase the quality, growth, and vigor of remaining trees.

precommercial treatments - forestry operations that require landowner investment, such as cleaning or weeding stands to remove trees that have little or no cash value. See commercial treatments.

prospectus - a document that describes the location of a property, indicates trees marked for cutting, and states that the timber will be sold in accordance with a suitable contact. A prospectus includes the number of trees marked, their diameter classes, and a volume estimate for each species.

pruning - the act of sawing or cutting branches from a living tree. In forest management, pruning is done to promote the growth of clear, valuable wood on the tree bole.

pulaski - Firefighters use this tool, which combines a single-bitted axe blade for chopping with a narrow blade for trenching, to clear vegetation when constructing a fireline.

pulpwood - wood suitable for use in paper manufacturing.

Q

R

regeneration - the process by which a forest is reseeded and renewed. Advanced regeneration refers to regeneration that is established before the existing forest stand is removed.

regeneration cut - a timber harvest designed to promote natural establishment of trees.

release - to remove overtopping trees that compete with understory or suppressed trees.

residual stand - the trees remaining intact following any cutting operation.

rot -a tree defect characterized by woody decay in a standing tree or log.

rotation - the number of years required to grow a stand to a desired size or maturity.

S

salvage cut - the removal of dead, damaged, or diseased trees to recover maximum value prior to deterioration.

sapling - a tree at least 4 1/2 feet tall and up to 4 inches in diameter.

sapling stand - a stand of trees whose average dbh is between 1 and 4 inches.

sawlog - a log large enough to be sawed economically on a sawmill. Sawlogs are usually at least 8 inches in diameter at the small end.

sawlog tree - a tree at least 11 inches dbh and suitable for conversion to lumber. Sometimes, trees 11 to 14 inches dbh are called small sawlog trees, and trees larger than 18 inches dbh are called large sawlog trees.

sawtimber - trees from which sawlogs can be made.

sawtimber stand - a stand of trees whose average dbh is greater than 11 inches.

scale stick - a calibrated stick used to estimate wood volume in a log.

sealed-bid sale - a timber sale, usually offered through a consulting forester, in which buyers submit secret bids.

seed tree - a mature tree left uncut to provide seed for regeneration of a harvested stand.

seed-tree harvest - the felling of all the trees in an area except for a few desirable individuals that provide seed for the next forest.

selection harvest - the harvest of all individual trees or small groups at regular intervals to maintain an uneven-aged forest. Selection harvests are used to manage species that do not need sunlight to survive.

service forester - a professional forester employed by the Maryland Department of Natural Resources Forest Service. Service foresters help private woodland owners develop and implement forest management plans. There is at least one service forester in each Maryland county.

shelterwood harvest - the harvest of all mature trees in an area in a series of two or more cuts, leaving enough trees of other sizes to provide shade and protection for forest seedlings.

silviculture - the art and science of growing forest trees.

site - the combination of biotic, climatic, topographic, and soil conditions of an area.

site index - a measure of the quality of a site based on the height of dominate trees at a specified age (usually 25 or 50 years), depending on the species.

site preparation - treatment of an area prior to reestablishment of a forest stand. Site preparation can include mechanical clearing, burning, or chemical (herbicide) vegetation control.

skidder - a rubber-tired machine with a cable winch or grapple used to drag logs out of the forest.

skidding - the act of moving trees from the site of felling to a leading area or landing. Tractors, horses, or specialized logging equipment can be used for skidding. Skidding methods vary in their impact on soils and the remaining stands.

slash - branches and other woody material left on a site after logging.

snag - a dead tree that is still standing. Snags provide important food and cover for a wide variety of wildlife species.

softwood - any tree in the gymnosperm group, including pines, hemlocks, larches, spruces, firs, and junipers. Softwoods often are called conifers although some, such as junipers and yews do not produce cones.

sprout - a tree growing from a cut stump or previously established root system.

stand - a group of forest trees of sufficiently uniform species composition, age, and condition to be considered a homogeneous unit for management purposes.

stand density - the quantity of trees per unit area, usually evaluated in terms of basal area, crown cover and stocking.

stocking - the number and density of trees in a forest stand. Stands are often classified as understocked, well-stocked or overstocked.

stratification - division of a forest, or any ecosystem, into separate layers of vegetation that provide distinct niches for wildlife. See canopy, understory, and herbaceous vegetation.

stumpage - the value of standing trees in a forest.

stumpage price - the price paid for standing forest trees.

stump height - the distance from the ground to the top of the stump. Good logging practice dictates that stumps be as low as possible (preferably as low as 12 inches) to reduce waste, to minimize visual impact on the logging site, and to promote resprouting of trees.

succession - the natural replacement of one plant (or animal) community by another over time in the absence of disturbance.

suppressed - a tree condition characterized by low growth rate and low vigor as a result of competition with overtopping trees. See overtopped.

sustained yield - an ideal forest management objective in which the volume of wood removed equals growth within the total forest.

sweep - a tree defect characterized by a gradual curve in the main stem.

T

thinning - a partial cut in an immature, overstocked stand of trees used to increase the stand's value growth by concentrating on individuals with the best potential.

threatened species - a species or subspecies whose population is so small or is declining so rapidly that it may become endangered in all or a significant portion of its range.

timber cruise - see cruise.

timber stand improvement (t.s.i.) - any practice that increases the value or rate of value growth in a stand of potential sawtimber trees. Pruning and thinning are considered t.s.i.

tolerance - a tree species' capacity to grow in shade

tree farm - a privately owned forest managed on a multiple use basis with timber production as an important management goal.

trim allowance - the extra 2 or 3 inched left on a bucked log to allow logs with end checks, pulls, or slanting buck cuts to be trimmed to standard lumber lengths.

U

understocked - a stand of trees so widely spaced, that even with full growth potential realized, crown closure will not occur.

understory - the level of forest vegetation beneath the canopy.

uneven-aged stand - a group of trees of a variety of ages and sizes growing on a uniform site; also called all-aged stand.

unit sale - a timber sale in which the buyer makes regular (weekly, monthly) payments based on mill receipts. Unit sales are useful when the amount of timber sold is so large that a preharvest, lump-sum payment would be prohibitive.

V

veneer log - a high-quality log of a desirable species suitable for conversion to veneer. Veneer logs must be large, straight, of minimum taper, and free from defects.

virgin forest - an area of old-growth trees that never has been harvested by humans.

W

watershed - a region defined by patterns of stream drainage. A watershed includes all the land that contributes water to a particular stream or river.

well-stocked - the situation in which a forest stand contains trees spaced widely enough to prevent competition yet closely enough to utilize the entire site.

wildlife habitat - the native environment of an animal. Habitats ideally provide all the elements needed for life and growth: food, water, cover and space.

windthrow - a tree felled by wind. Windthrows, also known as blowdowns, are common among shallow-rooted species and in areas where cutting has reduced stand density.

wolf tree - a large older tree with a spreading crown and little or no timber value, but often great value for wildlife.

woodland - see forest.

X
Y
Z

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