

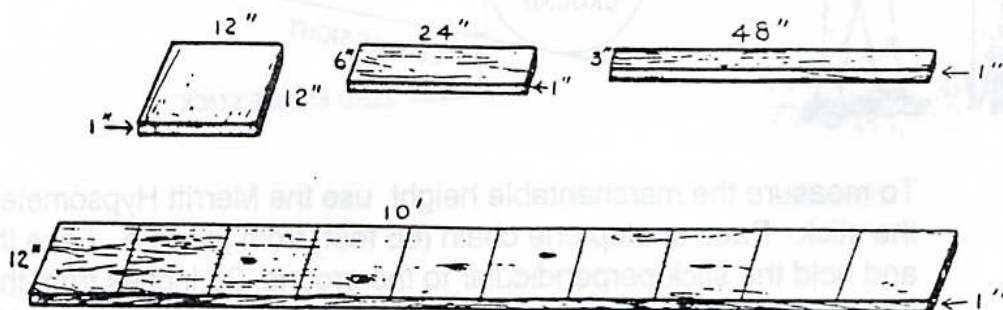
TREE MEASUREMENTS

FOREST UNITS OF MEASUREMENT

1. Log - a section of the trunk of a tree, usually a minimum of eight (8) feet in length with a minimum diameter of six (6) inches, inside the bark, at the small end.
2. Pulpwood and excelsior bolt - a section of the trunk or larger limbs of a tree five (5) feet in length, with a minimum diameter of four (4) inches, inside the bark, at the small end.
3. Board foot - unit of measure for lumber; equivalent to a board one inch thick and 12 inches square. A board one (1) inch thick, 12 inches wide, and 10 feet long contains 10 board feet.

$$\text{Bd. Ft.} = \frac{\text{thickness (inches)} \times \text{width (inches)} \times \text{length (feet)}}{12}$$

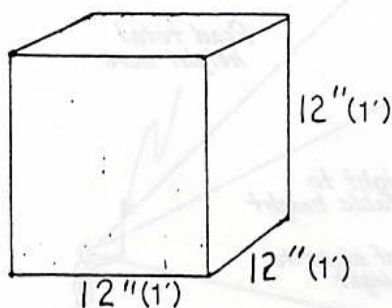
Each piece of lumber contains one board foot.



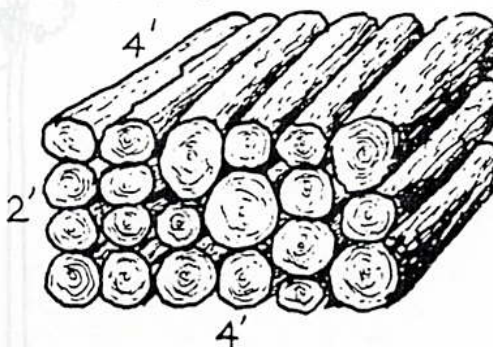
This piece of lumber contains 10 board feet.

4. Cubic foot - unit of measure 12 inches wide, 12 inches thick, and 12 inches long or it equivalent, used to measure cord wood volume.

$$\text{Cu. ft.} = \text{thickness (feet)} \times \text{width (feet)} \times \text{length (feet)}$$



$$\text{Cubic foot} = 12'' (1') \times 12'' (1') \times 12'' (1')$$



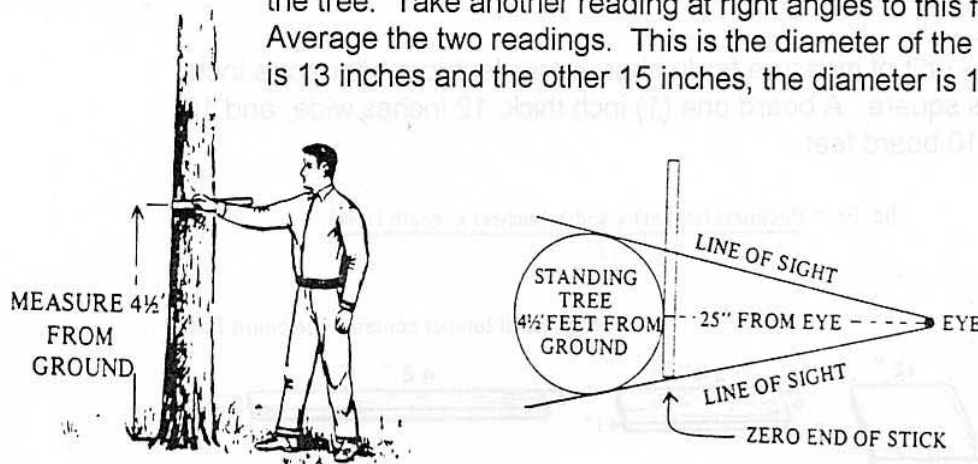
$$2' \times 4' \times 4' = 32 \text{ cubic feet}$$

STANDING TREE VOLUME DETERMINATION

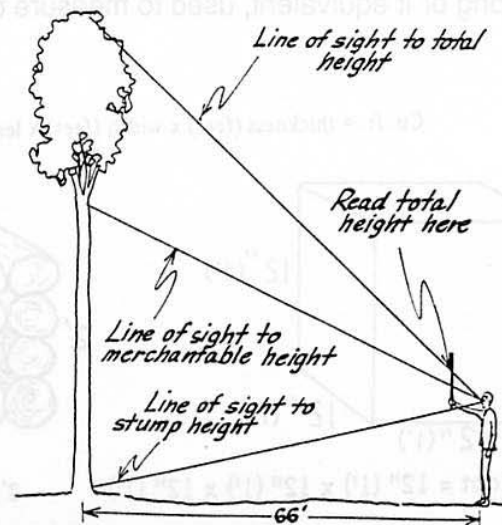
To determine the volume of a standing tree, two measurements must be determined. The first is the diameter at breast height, and the second is the merchantable height of the tree to the nearest one-half log. Merchantable height is usually up to a six-inch top diameter for pine and eight-inch diameter for hardwood. A log is 16 feet long, and one-half log is eight feet long.

To measure diameter, hold the Biltmore stick horizontally, 25 inches from the eye. With stick against tree, 4 1/2 feet from the ground, line up left end of stick with the outer edge of the bark. Without moving anything but the eyes, read the nearest graduation on the stick to the other edge of the tree. Take another reading at right angles to this first reading.

Average the two readings. This is the diameter of the tree. If one reading is 13 inches and the other 15 inches, the diameter is 14 inches.



To measure the merchantable height, use the Merritt Hypsometer side of the stick. Pace or step one chain (66 feet) from the tree. Face the tree and hold the stick perpendicular to the ground, 25 inches from the eye. Line up the bottom of the stick with approximate stump height. Moving only the eyes, read the merchantable height of the nearest one-half log (eight feet). A tree having 2 1/2 logs of height would have 40 feet of merchantable length.





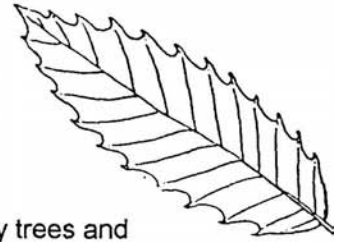
HARDWOOD MANAGEMENT CHART

MANAGEMENT METHOD	TIMBER BENEFITS	WILDLIFE BENEFITS
EVEN-AGED Management	→ Favors shade in-tolerant species (oak, tulip poplar, cherry, ash, etc.)	→ The mosaic created by regeneration cuts surrounded by stands of older trees creates a diverse environment which fulfills the habitat requirements of a wide array of wildlife species.
Shelterwood	→ Becomes necessary when adequate advance regeneration (> 1000 stems per acre of the desirable species greater than 4.5 feet tall) is not available in the stand. → Provides economic return in two to three stages. → Provides firewood and specialty products. → Uses wood lost to natural competition.	→ Encourages vigorous growth of understory vegetation necessary for wood production, brood cover, and escape cover. → Results in new forest of desirable fruit and seed mast-producing trees (oaks, cherry, ash, walnut, and tulip poplar).
Clearcut	→ Used when advanced regeneration is present. → Provides economic return all at once. → Allows efficient and cost-effective harvest (especially when managing large land parcels).	→ Encourages vigorous growth of understory vegetation necessary for food production, brood cover, and escape cover. → Results in new forest of desirable mast-producing trees (oaks, cherry, ash, walnut, and tulip poplar).
UNEVEN-AGED Management	→ Favors shade-tolerant species (beech, maple, basswood). → Provides a regular economic return from timber sales.	→ On small land parcels, a mix of shade-tolerant and intolerant mast-producing trees (oak, walnut, cherry, maple, beech, hickory, tulip poplar, and ash) and shrubs (dogwood, greenbrier, blackberry, sassafras, viburnum, and spicebush) can be provided within the same stand.
Single Tree Selection	→ Provides effective regeneration of shade-tolerant species (beech, maple, basswood). → Maintains continuous forest canopy at all times. → Increases control of forest species, size, and distribution. → Uses wood lost to natural competition. → Provides firewood and specialty products.	→ Provides habitat for species desiring continuous forested environment. → Provides specific den trees, snags, and fruit-producing trees. → Tops of harvested trees provide cover.
Group Selection	→ Regenerates small patches of shade-intolerant species within a stand composed primarily of shade-tolerant trees. → Increases control of forestry species composition.	→ Provides needed browse, nesting cover, food, and escape cover in heavily forested areas. → Provides habitat for a wide range of wildlife species. → Tops of harvested trees provide cover.





FOREST HEALTH



INSECTS, DISEASE AND FIRE

Silviculture and tree health are closely linked. To maintain healthy trees and forests:

- **Match Species To The Site**

Establishing a tree outside its normal range or site conditions is likely to cause stress, and increase its vulnerability to pests and weather extremes. On the other hand, many species are grown successfully far from their place of origin. Extensive research is needed to be successful.

- **Regulate Spacing To Favor Crop Trees**

Ample growing space gives tree crowns enough sunlight, and tree roots enough soil and water, to keep expanding. This ensures the food, water and nutrients necessary for healthy growth and development. It also enables the tree to produce secondary substances for defenses against pest organisms. Defensive chemicals are not always produced when trees are under stress.

- **Remove Trees In Poor Condition**

Trees with defective boles or poor crowns are likely to be colonized by insects, fungi and other pests and should be removed whenever practical. They act as reservoirs of infestation which can affect other trees adversely.

- **Avoid Injuring Residual Stems**

Of all the agents that lead to losses of merchantable volume and value, it is the decay fungi - heart and butt rots - that have the greatest single impact. Fungi commonly gain entrance to trees through wounds, and injury to residual trees is a major risk of silvicultural practices, particularly in hardwoods. Thinning operations should be planned so that injured trees can be removed as the job progresses.

- **Harvest At Maturity**

After trees have reached maturity their growth and vigor decline, particularly in unmanaged stands where competition for limited resources can be severe. Well managed stands will stay healthy longer.

Forests of mixed species and ages are far less likely to sustain pest outbreaks than are pure, evenaged stands. Mixed stands should be encouraged wherever they meet management objectives.

FOREST FIRES IN VIRGINIA

Forest fires are also called wildfires or outdoor fires. In Virginia, most forest fires are caused by human actions. The largest number of fires and forestland burned occurs in February, March, April and May. This is known as spring fire season. There is also a fall fire season in October, November and December. Fire causes and the percentage of the totals for Virginia are as follows:

CAUSE	PERCENT
Open Burning	30
Arson	20
Smokers	14
Miscellaneous (house, vehicle, aircraft, etc. that spread to the forest)	11
Children	9
Equipment Use	7
Railroads	5
Lightning	3
Campfires	1



During an average year, the forest and woodland homes of Virginia are threatened and burned by 1,500 to 2,500 fires. These fires burn an average of 8,000 to 10,000 acres. Each year people are injured or killed, buildings are destroyed, and significant damage to the forest and environment occurs.

The Virginia Department of Forestry is responsible for the control of forest fires in counties and some cities. Fire departments, forest industry, and many volunteers work together with the Department of Forestry wardens to save life, property, and forest resources. Forest wardens investigate all forest fires to find the person responsible, collect suppression costs, or issue a summons to court for forest fire law violations.

Most fires are caused by human actions. They can be prevented by using common sense, following fire safety rules, and obeying fire laws.

OPEN BURNING

- A safety zone should be cleared that is wide enough to prevent the escape of the fire.
- Burn after **4 PM** (State Law - February 15 - April 30) and when the wind has calmed.
- Obey forest fire laws and air pollution regulations.
- Do not leave the fire unattended (state law year round).

ARSON

- Report acts of arson to the fire department, police, sheriff, or forest warden.
- Report details such as: description of suspect, car, license number, etc.

Prescribed Burning - Benefits to Wildlife



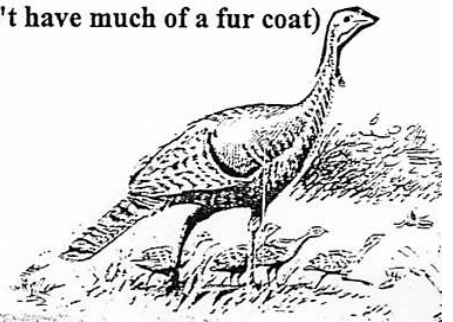
1. Prescribed burning is used to modify the habitat or change a plant community
 - a) Set back plant succession, or
 - b) Develop a fire maintained (dependent) ecosystem, favoring plants that are fire adapted
2. Most wildlife species spend the vast majority of their time on the ground!
3. What does fire do to the HABITAT?
 - a) Fire kills or sets back many woody plants (plants with growing points at the tips of plants or plants with thin bark - grasses, legumes, and some woody plants have their growth point at the root crown and are stimulated by fire)
 - b) Fire removes duff and ground litter
 - c) Fire recycles nutrients back into the soil
 - d) Fire can improve grazing forage quality
 - e) Fire can remove standing dead plant material (ie. goldenrod, teasel, etc.) to make herbicides more effective
 - f) Fire can produce more tender, succulent growth and stimulate seed set
4. What fire does not do!
 - a) Fire won't kill a dormant plant (ie. most plants in winter, with nutrients in roots)
 - b) Most wildlife can easily escape fires: few, if any, animals are killed by fire
 - c) Fire may not be able to restore severely abused plant communities, especially if there has not been adequate time for the community to rest or recover
5. How does fire benefit WILDLIFE?
 - a) In pines, fire keeps the understory open, suppresses hardwoods, and stimulates grasses and legumes
 - b) Fire increases succulent new growth on grasses/legumes; improves forage value; and increases the protein and potassium content
 - c) Insect populations increase in newly burned cover
 - d) Fire removes built-up duff/leaf litter providing greater movement for quail chicks and more palatability for insects -- these result in improved brood habitat
 - e) Nesting cover for quail and other grassland dependent birds improves, especially the year after the burn
 - f) Fire keeps hardwood vegetation from invading open lands; and keeps meadows as meadows

OVER...



6. Considerations in the use of fire to BENEFIT WILDLIFE!

- a) A three year burning rotation is best for maintaining meadows -- only burn about 1/3 to 1/2 of the area each year. Annual burning is not desirable or necessary, and fuel (leaf litter/duff) is often not adequate for annual burns.
- b) On large fires, protect some acreage within the fire boundaries -- ring arounds! This will increase habitat diversity.
- c) For increased oak regeneration burn 3 years after a shelterwood - oak will increase from around 15% to 35% in the understory
- d) For small game (rabbit, quail, etc) a 2 to 3 year burning rotation is best
- e) For improving deer habitat a burning rotation of 5+ years in good -- especially in hardwood stands
- f) Prescribed burning in wetland habitats is beneficial for:
 1. making herbicide more effective in phragmites control
 2. controlling nutria -- burn in winter before very cold temps for several days are forecast (nutria are not burrowers and don't have much of a fur coat)
 3. making needlerush more palatable to geese



MANAGED PINE FORESTS PROVIDE FOR WILDLIFE NEEDS

FOOD, COVER, WATER, AREAS TO BARE AND RAISE YOUNG

MATURING PINE FOREST

PRODUCES PULPWOOD, SAWTIMBER, POLES. UNDERSTORY GROWTH PROVIDES FOOD AND COVER

CLEARCUTTING

ALLOWS FULL SUNLIGHT TO GROUND. STIMULATES GROWTH OF SPROUTS / SEEDLINGS. CREATES EDGES / ABUNDANT INSECTS.

CONTROLLED BURNING

BURN IN WINTER, SO NESTING ACTIVITY IS NOT DISTURBED. INCREASES GROWTH OF SPROUTS.

ADJACENT HARDWOODS

PROVIDE HABITAT DIVERSITY FOR A VARIETY OF WILDLIFE SPECIES

BUFFER STRIPS

RETAINS MAST, DEN TREES / PERCHES. MAINTAINS STREAM TEMPERATURE / WATER QUALITY.

REFORESTATION

PINE SEEDLINGS ARE PLANTED TO BEGIN A NEW, MORE PRODUCTIVE FOREST. WITHIN A YEAR COVER IS PROVIDED BY STUMP SPROUTS AND NATURAL SEEDLINGS.

YOUNG GROWTH

SHRUBS, SPROUTS, BERRIES PROVIDE COVER / FOOD.

THINNING

REMOVES LOW QUALITY TREES USED FOR PULPWOOD. IMPROVES PRODUCTION OF BROWSE, WEEDS, BERRIES / INSECTS.