



Options for Clearing Land to Establish Pasture

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You have considered the ramifications of clearing your land (*To Clear or Not To Clear – That Is the Question*, Virginia Cooperative Extension publication 465-340), and you have decided to go forward. Now this publication addresses a question many new landowners ask: How do I clear land?

Land Clearing Methods

Perhaps the most common method of clearing land is to harvest the timber, bulldoze to “grub” or remove

the stumps, and then establish the next cover (yard, pasture, house, driveway, etc.). Leftover trees and brush can be handled in a variety of ways (Table 1). While this method may be the most economical and makes finding operators easy, it can also result in extensive damage to the soil. Additionally, unless the timber is very valuable, using a bulldozer may end up costing more than if the timber value was forfeited for easier stump removal.

Table 1: Pros and cons of various wood waste handling options.

Method	Pro	Con
Pile and burn	<ul style="list-style-type: none"> - Simple, cheap - Removes most material 	<ul style="list-style-type: none"> - Poses fire hazard, hard to get complete burn, wasteful - Releases greenhouse gases, like carbon, into the environment - May require permit (check with local fire department or Virginia Department of Forestry)
Dig, burn, and bury	<ul style="list-style-type: none"> - Simple, cheap - Removes material from sight 	<ul style="list-style-type: none"> - Poses fire hazard, hard to get complete burn, wasteful - Releases greenhouse gases, like carbon, into the environment - Back-filled hole after burning may develop sinkhole properties - May require permit (check with local fire department or Virginia Department of Forestry)
Pile and leave	<ul style="list-style-type: none"> - Very cheap - Some wildlife habitat value 	<ul style="list-style-type: none"> - Unsightly - Not as valuable for wildlife as purposefully constructed wildlife brush piles - Can harbor weeds
Mulch with tub grinder	<ul style="list-style-type: none"> - Results in useable resource (mulch) - Removes all material 	<ul style="list-style-type: none"> - Generally more expensive - Site variables affect cost
Waste-wood utilization	<ul style="list-style-type: none"> - Potential income from firewood* sales, hobby wood custom sawing, wood chip mulch - Maximizes economic value and utilization 	<ul style="list-style-type: none"> - Time consuming - Variety of skill sets needed (sawmilling and marketing) - Variety of equipment needed

*See *Firewood for Home Heating*, Virginia Cooperative Extension publication 420-003.

In some cases, it may actually be cheaper to simply hire a bulldozer operator to clear the land without harvesting the timber. It may be faster to remove high stumps and whole trees than to dig out low-cut stumps which lack leverage. However, economic considerations are not the only factors at play.

While bulldozers and front-end loaders make for quick and relatively easy clearing, it nearly always destroys the topsoil. Leaf decomposition as well as the decomposition of fallen branches and roots helps maintain healthy topsoil. When the roots of a tree are ripped out of the ground, a significant amount of valuable topsoil is often lost. In many areas of Virginia, there are at best a few inches of topsoil to begin with. It is much more difficult to establish grass without the nutrients and organic matter unique to topsoil, the loss of which can prevent successful pasture or lawn establishment. While measures can be taken to remove topsoil and grade it back into an area, this will increase time and cost. It also requires a very skilled operator. Instead of using a bulldozer, an excavator and root rake will result in fewer disturbances, but it will not eliminate the loss of topsoil.

Option 1: Delayed Stump Removal Method

Today's fast-paced society sometimes causes a "blinder" effect; in other words, often all options are not considered before making a decision. In many cases, the reason

In the case of pine-dominated forests, a timber harvest can probably accomplish most of the clearing work. If it's valuable enough, the timber might be traded for the cost of clearing or even competitively sold through the services of a consulting forester for income. Pine-tree stumps, with one exception (shortleaf pine, *Pinus echinata*, which can sprout from the stump), will rot away in three to five years.

In the case of hardwood (deciduous trees) forests, a timber sale can also be the primary tool for land clearing. The main difference is that most hardwood trees vigorously sprout on the stump unless something is done to kill the root system of each tree cut. Appropriately labeled herbicides are the cheapest, easiest, and most effective tool for killing root systems of hardwood trees. Herbicides applied properly on recently (less than 15 minutes for water-based solutions; up to one hour for oil-based solutions) cut stumps will be absorbed by the stump and translocated to the root system, resulting in a complete kill. For more information on herbicide recommendations, contact your local Extension office.

A practical challenge associated with herbicide application is the need for close proximity so that chemical can be applied before the stump loses its uptake capacity. A suitable alternative may be to leave stumps high enough that a follow-up cut can be made to lower the stump at a time when the herbicide can be applied. Rates of hardwood stump decomposition vary with size, environmental conditions, and species. Decomposition rates for hardwood species can be anywhere from a few years to decades. Larger and denser species rot more slowly. Once a stump is dead, increasing its surface area by drilling, chopping, or cross cutting will accelerate decomposition.

Though the idea of using herbicides is often discounted, agriculture and natural resource professionals generally agree that the benefits of soil retention outweigh the potential risks of chemical damage when appropriately used. Additionally, many of the approved herbicides are relatively low in toxicity and have minimal to no lasting impacts on soil (McNabb, 1997). <https://extension.psu.edu/herbicides-and-forest-vegetation-management>.

Option 2: Tree and Stump Mulching

This alternative preserves soil integrity and quickly removes stumps and other woody debris. Machines can now be equipped with mulching/chipping implements (Figure 1) that chip vegetation while incorporating it into the soil. Mulching heads can be mounted on large or small tracked and wheeled equipment and used to push down and mulch stems up to 6 to 8 inches in size and grind out a wide range of stump sizes.



Figure 1: Large rotary mulcher. Photograph by Adam Downing

Mulching is an excellent method to help maintain and even increase soil organic matter, reduce erosion, and prepare sites for planting into pasture. One drawback is cost. Land clearing/mulching fees can start anywhere from \$200 to \$400 per hour and can be as high as \$1,200 per hour, and though larger equipment costs more, it also works faster. A 2008 research project (Teutsch, 2008 – personal records) at the Southern Piedmont Agricultural Research and Extension Center compared the costs of mulching and conventional clearing and found mulching to be cheaper (\$850 per acre for mulching compared to \$1,650 per acre for conventional clearing). Other factors include particulars such as the type of vegetation being processed (pine is easier), site size (smaller is faster), soil characteristics (very rocky sites are not conducive to mulching), terrain, and landowner preferences for “cleanliness.” Depending on these aspects, an acre may take anywhere from one to eight hours to clear.

Option 3: Goats

Goats can be used to harvest and clear underbrush and smaller trees in designated areas before cutting, and then sold. The role of goats as biological control agents in forested areas may become increasingly important in the future due to environmental concerns and elevated costs associated with mechanical cutting and herbicide application. Vines constitute a significant portion of a goat’s diet. During drier weather, however, the goat’s diet becomes more diverse. They increasingly consume other plants and with the increasing severity of winter, more acorns, dead leaves, and pine needles. In a recent study of goats grazing in a power line right of way for five years in West Virginia, they reduced the brush cover from 45 percent down to 15 percent in one year. Sheep, on the other hand, took three years to achieve the same results (Magadlela *et al.*, 1995). After five years of grazing, goats reduced brush cover to 2 percent.

Goats will not eat through the hard bark of mature trees, but may girdle younger, thinly barked trees if better forage is unavailable. The mature tree can remain unharmed as long as the goats have other forage to graze. Three to five goats per acre (more if you want to clear the area in reduced time) should be kept contained by solar or battery-powered or electric mesh fences. A guardian llama or livestock dog should accompany the herd to discourage predation on the goats. You also need to frequently monitor fence integrity, animal health and welfare, and vegetation and water levels.

Using goats to clear land before clearing is time consuming but allows one to harvest value from

undergrowth and reduce debris before trees are removed. Goats can also be used post-clearing sprout and weed control.

Goats provide the following benefits:

- Men and machines cannot work between rocks and down steep embankments or rocky cliffs; goats can.
- Goats don’t GET poison oak; in fact, they love to EAT it!
- Eliminating undesirable vegetation is usually not a one-step process. Goats can perform this spot work consistently and inexpensively.
- Goats naturally eliminate ladder fuels as they work, seeking out those little green sprigs that occur on the sides of trees, between rocks, and regrowth on roots.
- Goats don’t need worker’s insurance or lunch breaks! They do require fresh water, though, and may need supplemental feed.
- Goats are relatively quiet and able to work on small acreage without attracting the negative attention often accompanying machinery and herbicides.
- Goats are cheap and provide entertainment.
- Goats will require good fencing, especially in an urban setting or an urban-rural interface.

Establishing the Pasture

Establishing a productive pasture requires more than just putting down seed and straw. Soil tests will help determine the proper amount of lime and fertilizer. These amendments, along with proper seeding rates, should be applied at the right time of year, usually spring or fall, for optimal growth. It can take a year or more to establish a pasture. Pasture management after establishment is also important, and includes mowing, dragging, and maintaining proper stocking rates. In general, in order to maintain a healthy sod and good groundcover you should have a minimum of two acres of pasture for each horse. Keeping more horses on less pasture requires an increased level of management of both horses and grounds in order to maintain the health of both.

More information on establishing and renovating pastures for horses, forage selection, and grazing

management can be found in the Virginia's Horse Pastures series, Virginia Cooperative Extension publications 418-101, 418-102, 418-103, and 418-104.

Trees and Horses

Trees in pastures are beneficial for a variety of reasons. They provide protection from sun, wind, and rain, and are a beautiful scenic addition. Orienting a row of trees from east to west will result in appropriate turf light and encourage pasture forage. However, horses and trees are not always a good mix. Turning out too many horses on small acreage results in denuded pastures or debarked trees, which is neither attractive nor environmentally friendly. Also, the presence of a large number of livestock can result in soil compaction around trees, which reduces the oxygen available to tree roots and negatively impacts tree growth. Nevertheless, some tree species deal with soil compaction better than others. The compaction tolerant tree list includes many native trees such as sycamore, red maple, hackberry, eastern red cedar, sweetgum, black gum, loblolly pine, oak, black locust, willow, bald cypress and slippery elm (Coder, 2000).

Regardless of the trees you choose for your pasture, it is best to fence around them to protect the roots and bark while allowing horses to benefit from their shelter. At a minimum, the trunk should be secured with fencing 2 to 4 feet away. Better protection requires a fence 10 to 20 feet away from the trunk, or ideally out to the drip line (picture the tree top as an umbrella, the edge of the umbrella is the drip line) of a mature tree. However, this may decrease the horses' use of the tree as shelter. The Virginia Urban Street Tree Selector at <https://dendro.cnre.vt.edu/treeselector/index.cfm> provides a tool to determine mature crown width on certain species.

Finally, some species should be avoided in horse pastures.

- **Cherry** – Many varieties of cherry contain compounds toxic to horses. When the tree is stressed, its compounds can break down into cyanide. When ingested, cyanide prevents oxygen from being released by red blood cells. Consumption of wilted leaves is worst, but leaves eaten directly from the tree can also cause poisoning. Death can occur in less than an hour due to asphyxiation.
- **Red Maple** – The consumption of leaves contains an unknown toxin that can cause symptoms similar to cyanide poisoning: hemolytic anemia, rapid breathing

and heart rate, cyanosis, brown urine, and death. Dried leaves can remain toxic for 30 days.

- **Black Walnut** – An unknown toxin in black walnut shavings causes laminitis in horses. Very few problems have been noted in horses pastured with black walnut trees, as the toxin is associated with the heartwood of the tree, but precautions should still be taken.
- **Oak** – Consumption of a large amount of young leaves, sprouts, and acorns from oak trees can occasionally cause gastrointestinal and kidney problems in livestock, though horses are less susceptible. This can result in colic, anorexia, jaundice, and death.
- **Buckeye** – Sprouts, leaves, and seeds contain several toxins that can cause depression, incoordination, and colic. Treated animals usually survive.

For help in identifying trees, bring samples to your local extension office or try your hand at identifying the species with the help of an online tree identification tool at <https://dendro.cnre.vt.edu/dendrology/ident.htm>

Summary

If your objectives involve land clearing, it is important to familiarize yourself with the pros and cons. Planning and attention to detail during the land-clearing process will help protect water and soil resources while keeping costs to a minimum. This publication provides some practical considerations of costs, regulatory issues, biological and environmental factors, and covers effective methods and easily avoided pitfalls.

For more assistance and information, contact the following public agencies:

Virginia Cooperative Extension

Additional printed educational resources and free subject matter newsletters, soil test kits and interpretation, forage management education, pesticide safety and education, and more at www.ext.vt.edu.

Soil and Water Conservation Districts

Technical assistance, information, and education on the conservation of natural resources, soil, water, and related resources, www.vaswcd.org/.

Natural Resources Conservation Services

Federal agency providing both technical and financial assistance related to conserving key natural resources such as soil, water and wildlife, www.nrcs.usda.gov.

Virginia Department of Forestry

Offering Consulting Foresters list, timber buyers list, timber selling advice, and forest management planning, www.dof.virginia.gov.

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