

Herbicide Application Techniques for Woody Plant Control¹

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The progression of trees and other woody plants into pastures, fencerows, ditch banks, rights-of-way, and other areas is a common occurrence. These woody species can be particularly troublesome and require control since they will compromise fence integrity, impede canal drainage, interfere with transmission of electricity, and some species (such as cherry trees) are highly poisonous to livestock. The aim of this publication is to detail the techniques for the removal of woody plants. For information on controlling similar species in natural areas or in forestry settings, consult UF/IFAS publications SP242 *Integrated Management of Nonnative Plants in Natural Areas of Florida* (<http://edis.ifas.ufl.edu/wg209>) and Circular 1477 *Primer on Chemical Vegetation Management in Florida Pine Plantations* (<http://edis.ifas.ufl.edu/fr160>).

Control of woody perennials can be difficult, but several control techniques are available. Mowing is a commonly used control procedure for small brush because the equipment is readily available and the results are immediate. However, this method generally provides only short-term success because it leaves live stumps and root-stocks that re-sprout. Mowing some species, like Chinese tallow, worsens the situation by replacing a single stemmed plant with a stump with multiple re-sprout stems. Another strategy that can reduce some troublesome species is fire. However, fire

can be tricky to manage and it is difficult to generate a fire with sufficient heat capacity to kill most hardwood species along fencerows, ditch banks and other sites with low plant density.

Herbicides are often the most effective and inexpensive means of controlling woody plants. There are several application techniques that can be used to control trees and brush of various sizes. Not all brush species are equally susceptible to herbicides. Therefore, results may vary for any of these application methods, relative to brush size and species. Each application technique is discussed below.

Foliar Application

Foliar application directs a herbicide/water mixture directly onto the leaves of a plant (Figure 1). This technique can be highly effective on smaller species (6 to 8 feet in height). Auxin-type herbicides (such as triclopyr) are generally most effective early in the season while enzyme-inhibiting herbicides (imazapyr and others) are most effective in the late summer or fall. Glyphosate is most effective in late summer or fall — after blooming, but prior to change in leaf color.

Adequate control with foliar applications can be difficult to accomplish. This is because complete coverage of all

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Figure 1. Foliar application with a backpack sprayer.
Credits: James Miller, U.S. Department of Agriculture, Forest Service, <http://www.forestryimages.org>

foliage is essential for control, but over-application (that leads to spray runoff) will reduce effectiveness. Therefore, foliar applications commonly require multiple follow-up treatments before control is accomplished. It is important to control spray drift when making foliar applications. Certain desirable hardwood and crop species are highly sensitive to spray drift and can be inadvertently damaged. It is also advisable to include a tracer dye with the spray solution to ensure that some individuals are not sprayed twice while others are missed entirely.

What about mowing before treatment? Mowing decreases foliage while maintaining a large root mass, making control even more difficult. If plants have been mowed, it is important to allow them to regrow to a height of 3 or 4 feet before herbicide application.

Basal Application

Basal application combines the herbicide with a penetrant oil and applies the mixture directly to the bark of a standing tree. For trees that are less than 6-inches in diameter and have smooth bark, this method is frequently successful. However, it is important that the lower 12 to 18 inches of the stem be treated on all sides with the herbicide/oil mixture (Figure 2). Adequate coverage is essential, since treating only one side of the stem will result in controlling only half of the tree. Basal applications can be made any

time of the year, but are most effective during the dormant season when leaves are not present.

Basal applications will not provide rapid control. Herbicide injury is often not observed for several weeks after treatment and total control may require several months. Additionally, basal treatment is not effective on older trees with thick bark. For older trees, other application techniques should be employed.



Figure 2. Basal bark application with herbicide/oil mixture.
Credits: Courtesy of BASF

Hack and Squirt

The hack-and-squirt technique is ideal for control of large trees that cannot be managed with basal applications. This method requires that you use a small ax, machete, or hatchet to cut through the thick bark and into the sapwood. When hacking, it should be done in a downward motion, leaving a “cup” to hold the herbicide solution. If the cut does not hold herbicide solution, it will leak out and become ineffective. After hacking the entire circumference of the tree, 1 squirt (approximately 1 ml) should be placed in each cut (Figure 3). The addition of a basal oil is not required for this procedure.

This method of application is advantageous because it is highly selective and injury to surrounding species is not common. It can also be done at any time during the year, but treatment of some species in the spring can be reduced because of heavy sap flow pushing the herbicide from the

cut surfaces. Rainfall soon after application will also wash the herbicide away and limit uptake.



Figure 3. Hack-and-squirt application technique.
Credits: James Miller, U.S. Department of Agriculture, Forest Service, <http://www.forestryimages.org>

Cut Stump

This technique is employed after cutting a tree to eliminate, or greatly reduce, resprouts from the cut surface. The herbicide should be applied to the cut surface as quickly as possible after the sawdust has been removed. If applied immediately, a herbicide/water solution is sufficient. If herbicide treatment is delayed and the cut surface has begun to dry, a herbicide/basal oil mixture must be used and applied to the top and around the collar of the stump.

For stumps greater than 3 inches in diameter, thoroughly wet the outer edge while avoiding herbicide runoff (Figure 4). This is because the only living tissue in larger trees is around the outer edge. Covering the entire cut surface will require more herbicide, most of which will provide little effect. For smaller stems it is appropriate to cover the entire cut surface (Figure 5). For this procedure, herbicides can be applied using a backpack sprayer, squirt bottle, or paint brush. Regardless of how the herbicide is applied, a tracer dye should be included to ensure treatment of all individual stumps.

Soil Spots

This procedure is particularly useful when attempting to reclaim an area with a high density of small stems. This practice can also be used to remove individual specimens, but soil spotting is not as selective as other techniques and must be done with caution if desirables are in the vicinity of the application.



Figure 4. Application of herbicide to larger cut stumps only requires treatment of the outer edge.
Credits: James Miller, U.S. Department of Agriculture, Forest Service, <http://www.forestryimages.org>



Figure 5. Application of herbicide to smaller stumps requires complete coverage.
Credits: James Miller, U.S. Department of Agriculture, Forest Service, <http://www.forestryimages.org>

In areas with high stem density, herbicides should be applied as thin streams (not broadcast) on a grid pattern. The application rate and size of the grid depend on the soil texture and species composition. For fencerows, a single band may be applied, but larger stems should be treated individually to ensure control. See individual herbicide labels for instructions.

Soil spotting requires that the herbicide be taken up by the roots in order to be effective. Therefore, only soil active herbicides (imazapyr, hexazinone, tebithiuron) can be used for this type of application. In Florida, treatments should be made in mid-summer, when rainfall events are common, to ensure root uptake. Soil spotting is often a slow process that may require multiple years to fully control some species. Highly susceptible species will be removed quickly, but those with higher tolerance can often endure several defoliation cycles before complete control is realized.

Table 1. Recommended herbicides for each application procedure.

Herbicide	Application Rate	Comments
Foliar Application		
Imazapyr (Arsenal, others)	1 - 3%	Excellent control of sweetgum and maples. Use higher rates for oaks and cherry. A non-ionic surfactant is required.
Glyphosate (Several)	5 - 8%	Cover as much of the foliage as possible and spray until wet. If the brush has been cut, delay application for approximately 1 year. Retreatment is commonly required control.
triclopyr + 2,4-D (Crossbow)	1 - 1.5%	For control of various herbaceous and woody species. This product contains 2,4-D ester; precautions to manage drift must be employed. Repeat applications are often required.
Triclopyr ester (Remedy Ultra, others)	0.5 - 2%	Best when applied in late spring or early summer. If the brush has been cut, delay application for approximately 1 year. Thoroughly wet all leaves, but not to the point of runoff.
Triclopyr + fluroxypyr (Pasturegard HL)	2-4 qt/100 gal of spray	
Basal Bark		
Imazapyr (Stalker, others)	8-12 oz/gal	Best for trees less than 4 inches DBH (diameter at breast height). Be aware that imazapyr is highly active in the soil. If desirables are near to a treated individual, it is possible for the herbicide to wash off into the soil and injure or kill the desirable. Make sure to choose a imazapyr product that is soluble in basal oils.
Triclopyr ester (Pathfinder)	100%	Pathfinder is a "ready to use" product that is formulated and dosed correctly for this type of application. Apply Pathfinder at 100% strength as directed.
Triclopyr ester (Remedy Ultra or others)	25% + 75% basal oil	Best for trees less than 6 inches DBH. Generally most effective 6 weeks prior to leaf expansion, until 2 months after. Most effective on trees with smooth bark. Thick bark trees may require retreatment. These herbicides have little or no soil activity.
Triclopyr + fluroxypyr (Pasturegard HL)	25% + 75% basal oil	
Hack-and-Squirt		
Imazapyr 4 lb/gal (Arsenal AC)	6 oz/gal	One hack per 3 inches DBH.
Triclopyr amine (Garlon 3A, others)	50%	One hack per 3 or 4 inches DBH. Apply 0.5 ml undiluted herbicides or 1 ml of 50% solution in water.
Hexazinone (Velpar)	100%	One hack per 4 inches DBH. Use undiluted herbicide.
Glyphosate (several)	50%	1 ml per 2 or 3 inches DBH, applied below the branches. For larger trees, best results are observed from applying glyphosate in a continuous frill around the stem.
Cut Stump		
Imazapyr (Arsenal AC or Stalker)	6 oz/gal (for Arsenal AC) or 8-16 oz/gal (for Stalker)	Apply to the top and side of a freshly cut stump. Garlon 3A is excellent for this use. If surface of stump has began to dry prior to herbicide treatment, apply Chopper or triclopyr ester product in basal oil - or recut the stump and apply the freshly cut surface. Garlon 3A will not effectively mix with basal oils.
Triclopyr amine (Garlon 3A)	50 - 100% in water	
Triclopyr ester (Remedy Ultra or others)	25% solution in water or basal oil	
Triclopyr + fluroxypyr (Pasturegard HL)	25% solution in water or basal oil	
Glyphosate (several)	50-100%	Apply to cut stumps immediately after cutting. Glyphosate is not effective on stumps that have started to dry after cutting. If immediate treatment is not possible, other herbicides should be selected since glyphosate will not mix with basal oils.