

Timber Stand Improvement – Chemical Treatments

Timber stand improvement is the removal or deadening of undesirable vines, shrubs and trees in a forest stand. It is a major forest management tool to help woodland owners achieve their management objectives. Once ownership objectives are identified, the less desirable trees can be removed to favor the growth of those that better satisfy the owner's objectives (e.g., quality timber, wildlife habitat, etc.). At the same time, woody plants that pose a threat to human health or safety, such as poison ivy, can be eliminated. Several timber stand improvement techniques can also be used to develop standing dead trees to provide various types of wildlife habitat such as perches, dens and foraging trees for animals and birds.

Timber stand improvement can be accomplished by cutting the less desirable woody vegetation or by killing it in place. Undesirable trees with commercial value can be sold, making the timber stand improvement operation an income-generating forest management activity. Some undesirable trees may be used for lumber, firewood or other products. Grapevines might be used for wreaths. In most timber stand improvement operations, however, the undesirable vegetation is of little economic value or use. Although it can be cut and left in the woods, the safest and most efficient way to remove undesirable vegetation is often to kill the trees, shrubs or vines and leave them standing.

The most effective method for killing standing trees, shrubs and vines will usually involve the use of an herbicide. For those who prefer not to use pesticides, cutting, frilling or girdling can be used without herbicides. However, physical methods of deadening standing trees that do not use herbicides are generally less dependable (particularly with hard-to-kill species such as red maple, hickories and dogwoods) and require longer to be effective than those that incorporate herbicides into the treatment.

Selected Timber Stand Improvement Techniques

The remainder of this fact sheet discusses when and how to use four commonly applied timber stand improvement techniques: frilling or girdling, spaced cuts or injection, basal bark spraying, and cut stump application. Tables 1-5 present herbicides commonly used with each method, along with brief recommendations for their use. These recommendations are not complete instructions; they are provided to help you select among the herbicides. It is essential that you read the entire label before using any herbicide. The label contains complete instructions for use, along with other valuable information such as personal and environmental safety considerations and procedures. Many of the labels also list information about the effectiveness of the herbicide in controlling different species of trees, shrubs and vines. All herbicides are not equally effective in controlling different species.

Herbicides, like all pesticides, are approved (labeled) for specific uses by the Environmental Protection Agency. These approved uses are listed and described on the pesticide's label. The herbicides listed in Tables 1-5 were appropriately labeled at the time of publication (Winter 1993-94). Because pesticide labeling may change at any time, you should verify that a particular herbicide is still labeled for your intended use.

Frilling or Girdling

Girdling and frilling are methods of killing standing trees that may be done with or without an herbicide. Girdling involves cutting a groove or notch into the trunk of a tree to interrupt the flow of sap between the roots and crown of the tree (Figure 1). The groove must completely encircle the trunk and should penetrate into the wood to a depth of at least 1/2 inch, preferably 1 to 1 1/2 inches on larger trees. Girdling can be done with an ax, hatchet or chainsaw. When done with an ax or hatchet, the girdle is made by striking from above and below along a line around the trunk so that a notch of wood and bark is removed. The width of the notch varies with the size of the tree. Effective girdles may be as narrow as 1 or 2 inches on small-diameter trees, and as wide as 6 or 8 inches on very large-diameter trees. When a chain saw is used to girdle, usually two horizontal cuts between 2 and 4 vertical inches apart are made completely around the tree (Figure 2).

Frilling is a variation of girdling in which a series of downward angled cuts are made completely around the tree, leaving the partially severed bark and wood anchored at the bottom (Figure 3). Frilling is done with an ax or hatchet.

By themselves, girdling and frilling are physical methods to deaden trees that require very little equipment and may be done without herbicides. Both techniques require considerable time to carry out, particularly with an ax or hatchet. Girdling with a chain saw is much faster. The effectiveness of girdling and frilling depends on the tree species and on the size and completeness of the girdle or frill. To be effective, girdles and frills must completely encircle the tree. Because frills can heal-over more easily, girdling is usually more effective.

The effectiveness of both girdling and frilling can be increased by using herbicides (Table 1). With frilling and girdling, water soluble forms of herbicides are most commonly used to get maximum movement of herbicide within the plant. When using water-soluble herbicides, the herbicide/water mixture is commonly applied by squirting it on the girdle or frill until the cut surface is wet. Hand-held, pint or quart spray bottles, such as those available at local garden stores, are ideal for applying herbicide to the girdle (Figure 4). Exceptions to the above recommendations are the commonly-used forestry herbicides that contain the ester formulation of 2,4-D + 2,4-DP, such as Weedone 170 and Acme Super Brush Killer. They are labeled for use with frilling in an oil carrier, and the recommendation is to fill the frill with the mixture. They are commonly applied with a backpack or hand-held, hand-pumped sprayer.

Spaced Cuts - Tree Injection

Tree injection involves introducing an herbicide into the undesirable tree through spaced cuts made around the trunk of the tree with an ax, hatchet or tree injector (Figure 5). The procedure can be visualized as a discontinuous frill with a small amount of herbicide placed in each cut. With an ax or hatchet, non-overlapping horizontal cuts penetrating into the sapwood (the outer area of lighter-colored wood in the stem cross section) are made completely around the tree. Cuts are approximately 2 inches long and are spaced 1 to 3 inches apart, depending on tree species and specific herbicide being used. A small amount of herbicide is then placed in each cut (Table 2). This can be done conveniently with a pint or quart spray bottle (such as those available at garden stores). The amount of herbicide to be placed in the cut is specified on the herbicide label, but is generally 1 to 2 milliliters. There are also various tree injectors available including the "hypo-hatchet," which is a hatchet constructed to inject herbicide when it is struck into the tree.

Tree injection is generally more effective than mechanical girdling or frilling without herbicide because of the use of the herbicide. However, on difficult-to-control species, such as red maple, hickories and dogwoods, a continuous frill or girdle with herbicide may be necessary to obtain acceptable control. For this reason, many commercial TSI (timber stand improvement) contractors routinely use a single chainsaw girdle with herbicide on all species to maximize effectiveness.

As with most of the herbicides suggested for use with girdling and frilling, the herbicides for tree injection are mostly water-soluble materials that move vertically and horizontally within the tree to complete a chemical girdle.



Figure 1.



Figure 2.

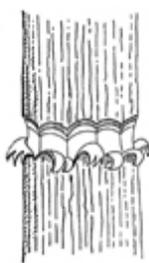


Figure 3.

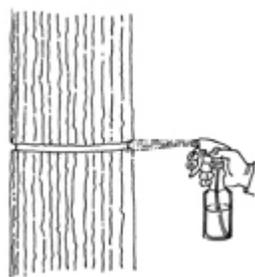


Figure 4.

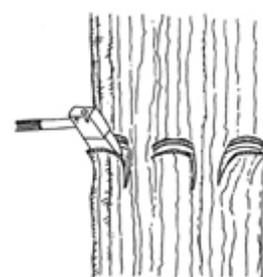


Figure 5.

Table 1. Herbicides commonly used when girdling or frilling undesirable trees in a timber stand improvement operation. Column one contains the common names of frequently used herbicides; column two contains one or more examples of commonly used brands along with their manufacturers or distributors; and column three contains a brief summary of use recommendations.

COMMON NAMES	BRAND NAMES (MANUFACTURER OR DISTRIBUTOR)	RECOMMENDATIONS
Dicamba	Banvel CST (Sandoz or Riverdale)	Spray or paint cut surface of girdle with undiluted Banvel CST.
Glyphosate	Accord (Monsanto)	Spray or paint Accord on the cut surface of girdle or frill at a rate of 1 ml for each 2 inches of trunk diameter, either undiluted or mixed with water at a concentration of no less than 25 percent. For best results, application should be made during periods of active growth and full leaf expansion.
	Roundup (Monsanto)	Spray or paint Roundup on the cut surface of girdle or frill at a rate of 1 ml for each 2 to 3 inches of trunk diameter, either undiluted or mixed with water at a concentration of no less than 50 percent. For best results, application should be made during periods of active growth and full leaf expansion.
Imazapyr	Chopper (American Cyanamid)	Mix 8-12 oz. of Chopper in one gallon of water, diesel oil, or penetrating oil (such as Cide-Kick, Cide-Kick II, or ArborChem Basal Oil) and spray or paint mixture on cut surface of girdle or frill. Apply enough of the spray mixture to completely wet the cut surface.
Picloram + 2,4-D	Pathway, Tordon RTU (DowElanco)	Spray or paint the girdle or frill with undiluted Pathway or Tordon RTU. Apply enough herbicide to wet the cut surface completely.
	Tordon 101*, Forestry Tordon 101* (DowElanco)	Spray or paint the cut surface of the girdle with Tordon 101 or Forestry Tordon 101 diluted 1:1 with water. Apply enough of the spray mixture to completely wet the cut surface.
Triclopyr	Garlon 3A (DowElanco)	Wet the cut surface of a single girdle that completely encircles the tree with Garlon 3A, undiluted or diluted 1:1 with water.
2,4-D + 2,4-DP Ester	Weedone 170 (Rhone-Poulenc)	Fill frill with mixture of Weedone 170 or Brush Killer 2D + 2DP and oil mixed at a rate of 3.8 to 5.1 ounces of herbicide in 1 gallon of oil.
	Brush Killer 2D + 2DP (Riverdale)	
2,4-D + 2,4-DP Amine	Riverdale 2D +2DP Amine (Riverdale)	Fill fresh frill with mixture equivalent to 3.8-5.1 oz. of Riverdale 2D + 2DP Amine in 1 gallon of water.
2,4-D + 2,4-DP Ester + Dicamba	Acme Super Brush Killer, BK 800 (pbi/Gordon)	Fill fresh frill full with mixture equivalent to 3.8-5.1 oz. of Acme Super Brush Killer or BK 800 in 1 gallon of diesel oil or mineral oil.

* Restricted Use Pesticide, must be certified applicator to purchase and use.

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Table 2. Herbicides commonly used when injecting undesirable trees in a timber stand improvement operation. Column one contains the common names of frequently used herbicides; column two contains one or more examples of commonly used brands along with their manufacturers or distributors; and column three contains a brief summary of use recommendations.

COMMON NAMES	BRAND NAMES (MANUFACTURER OR DISTRIBUTOR)	RECOMMENDATIONS
Glyphosate	Accord (Monsanto)	Inject the equivalent of 1 ml of Accord for each 2 inches of trunk diameter full strength or diluted with water to a concentration of not less than 25%. Injections should be evenly spaced around tree. With larger trees, a continuous frill is more effective than spaced injections. Best results will be obtained if treatment is made during periods of active growth and after full leaf expansion.
	Roundup (Monsanto)	Inject the equivalent of 1 ml of Roundup for each 2-3 inches of trunk diameter full strength or diluted with water to a concentration of not less than 50%. Injections should be evenly spaced around tree. With larger trees, a continuous frill is more effective than spaced injections. Best results will be obtained if treatment is made during periods of active growth and after full leaf expansion.
Imazapyr	Chopper (American Cyanamid)	Mix 8 to 12 ounces of Chopper in 1 gallon of water, diesel oil, or a penetrating oil such as Cide-Kick, Cide-Kick II, or ArborChem Basal Oil. Inject 1 ml of the solution at each injection site completely around the tree with no more than 1-inch intervals between cut edges.
Picloram + 2,4-D	Pathway, Tordon RTU (DowElanco)	Inject 1 ml of undiluted Pathway solution around the tree trunk at intervals of 2 to 3 inches between edges of the injector wounds. Treatment can be done any time during the year except for species which have a spring sap flow. Those species, such as the maples, should not be treated during the flow period. Difficult to control species, such as dogwood, hickory, and sugar maple, may require edge to edge injections, essentially a complete frill.
	Tordon 101*, Forestry Tordon 101* (DowElanco)	Inject 1/2 ml of undiluted or 1 ml of diluted (1:1 with water) through the bark at intervals of 3 inches between edges of the injector wound. Injections should completely surround the tree.
2,4-D Amine	Weedar 64 (Rhone-Poulenc)	In one injection per inch of trunk diameter (measured 4 1/2 feet above the ground), inject 1 to 2 ml of undiluted Weedar 64. Injections must penetrate the bark. For best results, injections should be made during the growing season, May 15 through October 15.
	Weedestroy AM-40 (Riverdale)	In injections spaced 2 inches apart (edge to edge) around the tree trunk, inject 1 ml of undiluted Weedestroy AM-40. Injections must penetrate the bark. For difficult to control species, such as hickory, dogwood, red maple, and blue beech, space injections 1 1/2 inches apart. For best results, injections should be made during the growing season, May 15 through October 15.
	Solution Water Soluble (Riverdale)	Dissolve a 2 lb. 13 oz. packet of Solution Water Soluble in 1 1/2 gallons of water. Inject 3/4 ml of the solution in each injection. For most species, space injections 2 inches apart, edge to edge. For hard to kill species, such as hickory, dogwood, red maple, blue beech, and ash, space injections 1 1/2 inch apart, edge to edge. For best results, injections should be made during the growing season, May 15 through October 15.
2,4-D Ester	2,4-D L.V. 4 Ester (Riverdale)	In injections spaced 2 inches apart (edge to edge) around the tree trunk, inject 1 ml of undiluted 2,4-D L.V. 4 Ester. Injections must penetrate the bark. For difficult to control species, such as hickory, dogwood, red maple, and blue beech, space injections 1 1/2 inches apart. For best results, injections should be made during the growing season, May 15 through October 15.

* Restricted Use Pesticide, must be certified applicator to purchase and use.