



# Extension FactSheet

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## Herbicides Commonly Used for Controlling Undesirable Trees, Shrubs, and Vines in Your Woodland

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The removal or deadening of less desirable trees, shrubs, and vines is an important management tool used by many woodland owners to help achieve their management objectives. Once ownership objectives are identified, the less desirable woody plants can be removed to favor the growth of those that better satisfy the owner's objectives (e.g., quality timber, wildlife habitat, fall color, etc.). At the same time, shrubs and vines that pose a threat to human health or safety, such as poison ivy, can be eliminated. OSU Extension fact sheet F-45-97 describes stand improvement techniques commonly used to eliminate undesirable vegetation including girdling, frilling, injecting, basal spraying, and cut stump applications.

This fact sheet, F-45 Supplement-06, presents the commonly used herbicides labeled for use with each technique, example brand names and manufacturers, and a brief summary of label recommendations for use. The list of brand names is not exhaustive, but includes those commonly encountered. For many of the herbicides there are other brands and manufacturers similarly labeled. The brief summaries of label recommendations are not intended to be 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. Consult OSU Extension fact sheet F-51-02, "Relative Effectiveness of Herbicides Commonly Used to Control Woody Vegetation in Forest Stands," for discussion of relative herbicide effectiveness.

Herbicides, like all pesticides, are approved (labeled) for specific uses by the Environmental Protection Agency. 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 2005-06). Because pesticide labeling may change at any time, you should verify that a particular herbicide is still labeled for your intended use. At the time of this writing, copies of most herbicide labels and MSDS could be obtained online at the Crop Data Management System web site <http://www.cdms.net/manuf/manuf.asp>. Others are available through the individual manufacturer's web site.

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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	EXAMPLE BRAND NAMES (MANUFACTURER OR DISTRIBUTOR)	ABBREVIATED LABEL RECOMMENDATIONS
Glyphosate	<p>Accord Concentrate, Glypro, Rodeo (Dow Agro.); AquaNeat (Nufarm Turf &amp; Spec.); Aquamaster (Monsanto); Touchdown Pro (Syngentia)</p> <p>Accord SP, Glypro Plus (Dow Agro.); Roundup Original II, Roundup Pro, Roundup Pro Concentrate, Honcho, Honcho Plus (Monsanto); Glyfos, Glyfos X-tra (Chemnova); Razor Pro (Nufarm Turf &amp; Spec.); Mirage, Mirage Plus (Platte); Rattler (Helena)</p> <p>Other Glyphosates</p>	<p>Spray or paint product on the cut surface of girdle or frill at a rate of 1 ml of actual herbicide 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 apply during active growth after full leaf expansion.</p> <p>Spray or paint product on the cut surface of girdle or frill at rate of 1 ml of actual herbicide 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.</p> <p>Similar recommendations.</p>
Imazapyr	<p>Arsenal (BASF)</p> <p>Arsenal Applicators Concentrate (BASF)</p> <p>Stalker (BASF)</p>	<p>Mix 8 to 12 ounces of Arsenal with one gallon of water and spray or brush the solution on frill or girdle (thoroughly wet). If a discontinuous frill is used, there should be no more than 2 inches between cut edges. Or, mix 2 quarts of Arsenal with no more than 1 quart of water and spray or brush the solution on frill or girdle (thoroughly wet). If a discontinuous frill is used, there should be at least 1 cut for every 3 inches DBH.</p> <p>Mix 6 ounces of Arsenal Applicators Concentrate with one gallon of water and spray or brush the solution on frill or girdle (thoroughly wet). If a discontinuous frill is used, there should be no more than 2 inches between cut edges. Or, use Arsenal Applicators Concentrate undiluted or diluted with water at a concentration of no less than 25 percent Arsenal AC and spray or brush the solution on frill (thoroughly wet). If a discontinuous frill is used, there should be at least 1 cut for every 3 inches DBH.</p> <p>Mix 8 to 12 ounces of Stalker in one gallon of water, diesel oil, or penetrating oil. Make cuts through bark completely around tree with no more than 2-inch intervals between cut edges (depending on species) and spray or brush solution into each cut until thoroughly wet.</p>
Picloram + 2,4-D	<p>Tordon RTU or Pathway (Dow Agrosciences)</p> <p>Tordon 101 Mixture (Dow Agrosciences)</p>	<p>Spray or paint a complete girdle or frill with undiluted Tordon RTU or Pathway. Apply enough herbicide to wet the cut surface completely.</p> <p>Restricted Use Pesticide. Spray or paint a complete girdle or frill with Tordon 101 Mixture diluted 1:1 with water. Apply enough of the spray mixture to completely wet the cut surface.</p>
Triclopyr	<p>Garlon 3A (Dow Agrosciences); Tahoe 3A (Nufarm Turf &amp; Spec.)</p>	<p>Wet the cut surface of a complete girdle or frill with Garlon 3A or Tahoe 3A, undiluted or diluted 1:1 with water.</p>
2,4-D + 2,4-DP Ester	<p>Patron 170 (Nufarm Turf. &amp; Spec.); Turf Weed &amp; Brush Control (Nufarm Turf &amp; Spec.); Others</p>	<p>See label of specific herbicide. As example, for Patron 170, fill continuous frill with herbicide-oil mixture consisting of 3 to 4 gallons of Patron 170 in 100 gallons of oil (3.8 to 5.1 ounces of Patron 170 in 1 gallon of oil).</p>
2,4-D Amine	<p>DMA 4 IVM (Dow AgroSciences) &amp; Others</p>	<p>See label of specific herbicide. For example, for DMA 4 IVM, fill frill with 2.6 fl. oz. DMA 4 IVM in 1 gallon of water.</p>
2,4-D + 2,4-DP Ester + Dicamba	<p>SuperBrush Killer (Gordon's Agric. Prod.)</p> <p>Brushmaster Herbicide (Gordon's Agric. Prod.)</p>	<p>Fill frill with mixture equivalent to 3.8 to 5.1 ounces of SuperBrush Killer in 1 gallon of diesel or mineral oil.</p> <p>Fill frill with mixture equivalent to 10 ounces of Brushmaster in 1 gallon of oil (diesel, No. 1 or No. 2 fuel oil, kerosene, mineral oil, or other oil suitable for basal applications).</p>

**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	EXAMPLE BRAND NAMES (MANUFACTURER OR DISTRIBUTOR)	ABBREVIATED LABEL RECOMMENDATIONS
Glyphosate	Accord Concentrate, Glypro, Rodeo (Dow Agro.); AquaNeat (Nufarm Turf & Speciality); Aquamaster (Monsanto); Touchdown Pro (Syngentia)  Accord SP, Glypro Plus (Dow Agro.); Roundup Original II, Roundup Pro, Roundup Pro Concentrate, Honcho, Honcho Plus (Monsanto); Glyfos, Glyfos X-tra (Cheminova); Razor Pro (Nufarm Turf & Spec.); Mirage, Mirage Plus (Platte); Rattler (Helena)  Other Glyphosates	Inject the equivalent of 1 ml of product for each 2 inches of trunk diameter, full strength or diluted with water to a concentration of not less than 25 percent. Injections should be evenly spaced around the tree. With larger trees, a continuous frill or girdle 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.  Inject the equivalent of 1 ml of product for each 2 to 3 inches of trunk diameter, full strength or diluted with water to a concentration of not less than 50 percent. Injections should be evenly spaced around the tree. With larger trees, a continuous frill or girdle is more effective than spaced injections. For best results, avoid applications during peak sap flow in spring.
Hexazinone	Velpar L (Dupont)	Similar recommendations.  Inject 1 ml of undiluted Velpar L at 4-inch intervals around trunk circumference. Most effective if used during summer.
Imazapyr	Arsenal (BASF)  Arsenal Applicators Concentrate (BASF)	Mix 8 to 12 ounces of Arsenal with one gallon of water and inject 1 ml of solution at each injection site around the tree with no more than 1 inch intervals between cut edges. <b>Or</b> , mix 2 quarts of Arsenal with no more than 1 quart of water and inject 1 ml of solution at each injection site with at least one injection cut for every 3 inches of tree diameter at breast height (4½ feet above ground).  Mix 6 ounces of Arsenal Applicators Concentrate with one gallon of water and inject 1 ml of solution at each injection site around the tree with no more than 1 inch between cut edges. <b>Or</b> , use Arsenal Applicators Concentrate undiluted or diluted with water at a concentration of no less than 25 percent Arsenal AC and inject 1 ml of solution at each injection site with at least one injection cut for every 3 inches of tree diameter at breast height (4½ feet above ground).
Triclopyr	Stalker (BASF)  Garlon 3A (Dow Agrosciences) Tahoe 3A (Nufarm Turf & Spec.)	Mix 8 to 12 ounces of Stalker in one gallon of water, and inject 1 ml of solution in each cut with no more than one inch between cut edges.  Inject ½ ml of undiluted or 1 ml of diluted (1:1 with water) product through the bark at intervals with 3 to 4 inches between centers of the injector cut.
Picloram + 2,4-D	Tordon RTU or Pathway (Dow Agrosciences)  Tordon 101 Mixture (Dow Agrosciences)	Inject 1 ml of undiluted Tordon RTU or Pathway around the tree trunk at intervals of 2 to 3 inches between edges of the injector cuts. Treatment can be done any time during the year except for species which have a spring sap flow. Those species, such as the maples and grapevines, 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.  <i>Restricted Use Pesticide.</i> Inject ½ ml of undiluted or 1 ml of diluted (1:1 with water) Tordon 101 Mixture through the bark at intervals with 3 inches between edges of the injector cut. Injections should completely surround the tree.
2,4-D Amine	Weedar 64 (Nufarm); DMA 4 IVM (Dow AgroSciences);  Weedestroy AM 40, (Nufarm Turf & Spec.)  Others	Inject 1 to 2 ml of undiluted product evenly around tree trunk, with one injection for each inch of trunk diameter (measured 4½ feet above ground). For best results, injections should be made during the growing season, May 15 through October 15. Difficult to control species, such as red maple, dogwood, and white ash may require edge-to-edge injections, while other species, such as white oak, may be controlled with wider than recommended injections or the use of a dilute solution (one part product to nineteen parts water).  In injections spaced 2 inches apart (edge to edge) around the tree trunk, inject 1 to 2 ml of undiluted Weedestroy Am 40. Difficult to control species, such as hickory, dogwood, red maple, and blue beech may require closer or even edge to edge species. For best results, injections should be made during the growing season. Easy to control species may be controlled with a dilute solution of one part herbicide to nineteen parts water.
2,4-D Ester	2,4-D L.V. 4 Ester, 2,4-D L.V. 6 Ester ( Nufarm Turf & Spec.); and some other 2,4-D esters	Similar Recommendation—See Label  See label of specific herbicide. For example, for 2,4-D LV 4 Ester, 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 to 1½ inches apart or closer. Note: may be diluted with water when desirable. For best results, injections should be made during the growing season, May 15 through October 15.

Table 3. Herbicides commonly used when basal spraying 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	EXAMPLE BRAND NAMES (MANUFACTURER OR DISTRIBUTOR)	ABBREVIATED LABEL RECOMMENDATIONS
Imazapyr	Chopper or Stalker (BASF)	Mix 8 to 12 ounces of Chopper or Stalker in one gallon of diesel oil or penetrating oil. To control woody plants with stems up to 4 inches DBH spray to wet the lower 12 to 18 inches of the plant stem with the mixture (include the root collar area). Do not overapply causing dripping or puddling.
Triclopyr	Pathfinder II, Remedy RTU (Dow Agrosciences)  Garlon 4, Forestry Garlon 4 (Dow Agrosciences); Tahoe 4E (Riverdale) are labeled for conventional or low volume treatments.  Remedy (Dow Agrosciences) is labeled for low volume, but not conventional treatments.	Spray undiluted product on the basal (lower) stem(s) of the brush or trees to be controlled in such a way as to thoroughly wet the entire circumference of the lower 12 to 15 inches of the stems, including the root collar area, but not to the point of runoff. Application may be made at any time, including the winter months, except when snow or water prevent spraying to the ground line.  Conventional Basal Bark Treatment: For trees up to 6 inches in basal diameter, mix 1.3 to 6.4 ounces of product with enough basal oil, diesel fuel, No. 1 or No. 2 fuel oil, or kerosene to make a gallon of mixture, and spray the entire circumference of the bottom 12 to 15 inches of the woody stems until runoff is noted at the ground line using a low pressure (20 to 40 psi) backpack or power sprayer. Application may be made at any time, including the winter months, except when snow or water prevent spraying to the ground line.  Low Volume Basal Bark Treatment: For trees up to 6 inches in basal diameter, mix 26 to 38 ounces of product with enough oil to make a gallon and spray to wet the entire circumference of the bottom 12 to 15 inches of the woody stems, including the root collar area, with a backpack or knapsack sprayer using low pressure (20 to 40 psi) and a solid cone or flat fan nozzle. Do not spray to the point of runoff. Application may be made at any time, including the winter months, except when snow or water prevent spraying to the ground line.
Triclopyr + 2,4-D Ester	Crossbow (Dow Agrosciences) Crossbow L (Loveland Products Inc.)	Spray to runoff the entire circumference of the lower 15 to 20 inches of the plant stem with a mixture of 5.1 ounces of Crossbow and enough oil to make a gallon (#1 or #2 fuel oil, diesel oil, kerosene). Spray runoff should visibly wet the ground surface at the base of the trunk. Best results will be obtained with winter or early spring treatments.
2,4-D + 2,4-DP Ester	Patron 170 (Nufarm Turf & Spec.); Turf Weed & Brush Control (Nufarm Turf & Spec.) & Others	See label of specific herbicide. For example, for Patron 170, thoroughly wet the entire circumference of the base of the stems and root collars until spray collects around the root collar at ground line using a mixture of 3.8 to 5.1 ounces of herbicide added to 1 gallon of oil.
2,4-D + 2,4-DP + Dicamba	SuperBrush Killer (Gordon's Agric. Prod)  Brushmaster Herbicide (Gordon's Agric. Prod)	High Volume Basal Spray: Spray the entire circumference of the lower 18 to 24 inches of the stems and root collar with a spray mixture of 4.0 to 6.7 ounces of SuperBrush Killer in enough oil (diesel, #1 or #2 fuel oil, kerosene, mineral) to make a gallon. Spray each stem until runoff and pooling at the ground line is noticed.  Low Volume Basal Spray: Spray the entire circumference of the lower 18 to 24 inches of the stems with a spray mixture of 42 ounces of SuperBrush Killer, 60 to 73 ounces of oil (diesel, basal blend), and 13 to 26 ounces of a surfactant (such as Cide-Kick, Cide-Kick II, or other surfactants/penetrants appropriate for oil soluble herbicides). Note: the spray mixture should total 1 gallon (128 ounces).  Spray the entire circumference of the lower 18 to 24 inches of the stems and root collars with a spray mixture equivalent to 10 ounces of Brushmaster Herbicide in 1 gallon of oil (diesel oil, No. 1 or No. 2 fuel oil, kerosene, mineral oil, or oil blends formulated for basal bark applications). Total coverage of the stems and root collars is essential. Spray until runoff and pooling at the ground line is noticed.

**Table 4. Water soluble herbicides commonly used when treating cut stumps to prevent sprouting. 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	EXAMPLE BRAND NAMES (MANUFACTURER OR DISTRIBUTOR)	ABBREVIATED LABEL RECOMMENDATIONS
Glyphosate	Accord SP, Accord Concentrate, Rodeo, Glypro, Glypro Plus, Glyphomax, Glyphomax Plus (Dow Agrosciences); Roundup Original, Original II, Pro, Pro Concentrate, UltraMax, UltraMax II, Custom, WeatherMax (Monsanto); Honcho, Aquamaster (Monsanto); Glyphos X-tra (Cheminova); Razor Pro, AquaNeat (Nufarm Turf & Spec.); Touchdown Pro (Syngentia); Mirage, Mirage Plus (Platte); Rattler (Helena); and others	Apply a 50 to 100 percent solution of product to the freshly cut stump immediately after cutting. Delays in application will result in reduced performance. Best results during periods of active growth and full leaf expansion.
Imazapyr	Arsenal, Stalker, or Chopper (BASF)  Arsenal Applicators Concentrate (BASF)	Mix 8 to 12 ounces of Arsenal or 8 to 16 ounces of Stalker or Chopper in a gallon of water and spray or brush the mixture onto the cambium area of a freshly cut stump surface.  Mix 6 ounces of Arsenal Applicators Concentrate with a gallon of water and spray or brush the mixture onto the cambium area of a freshly cut stump.
Picloram + 2,4-D	Tordon RTU or Pathway (Dow Agrosciences)  Tordon 101 Mixture (Dow Agrosciences)	Spray or paint the cut surfaces of freshly cut stumps and stubs with undiluted Tordon RTU or Pathway. The cambium area next to the bark is the most important area.  <i>Restricted Use Pesticide.</i> Spray or paint to wet the cut surfaces of freshly cut stumps or stubs with Tordon 101 Mixture undiluted or diluted 1:1 with water.
Triclopyr	Garlon 3A (Dow Agrosciences); Tahoe 3A (Riverdale)	Spray or paint the cut surfaces of freshly cut stumps and stubs with undiluted Garlon 3A.
2,4-D Amine	DMA 4 IVM (Dow AgroSciences) & Others	See label of specific herbicide. For example, for DMA 4 IVM, mix 2.6 fluid ounces in one gallon of water and soak cut surface, bark, and exposed roots as soon after cutting as possible.



**Table 5. Oil soluble herbicides commonly used when treating cut stumps to prevent sprouting. 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	EXAMPLE BRAND NAMES (MANUFACTURER OR DISTRIBUTOR)	ABBREVIATED LABEL RECOMMENDATIONS
Imazapyr	Chopper or Stalker (BASF)	Mix 8 to 16 ounces of Chopper or Stalker in one gallon of diesel oil or penetrating oil and spray or brush mixture onto the cambium area of the freshly cut stump surface.
Triclopyr	Pathfinder II, Remedy RTU (Dow Agrosciences)  Garlon 4, Forestry Garlon 4, Remedy (Dow AgroSciences); Tahoe 4E (Nufarm Turf & Spec.)	Apply undiluted product on area adjacent to the cambium and bark around the entire circumference of the cut surface and down the sides of the stump to the root collar area. Apply to the point of wet, but not to the point of runoff. Treatments can be made any time of year except when snow or water prevents spraying to the ground line. Control may be less effective during periods of moisture stress in the late summer.  Mix 26 to 38 ounces of product with enough oil to make one gallon and apply the mixture to the outer portion of the cut surface, the sides of the stump, and the root collar area. Thoroughly wet, but do not apply to the point of runoff. Treatments can be made any time of year except when snow or water prevents spraying to the ground line.
Triclopyr + 2,4-D Ester	Crossbow (Dow Agrosciences) Crossbow L (Loveland Products Inc.)	Mix 5.1 ounces of Crossbow with enough oil (No. 1 or No. 2 fuel oil, diesel oil, or kerosene) to make a gallon and apply to the outer portion of the cut stump surface, the sides of the stump, and the root collar area. Spray runoff should visibly wet the ground surface at the base of the stump. Best results have been obtained with winter to early spring applications.
2,4-D + 2,4-DP Ester	Patron 170 (Nufarm Turf & Spec.), Turf Weed & Brush Control (Nufarm Turf & Spec.), & Others	For Patron 170 thoroughly drench the entire stump, including the cut surface, the bark, and the exposed roots, with a mixture of 3.8 to 5.1 ounces of herbicide in 1 gallon of oil. Small stumps, 3 inches or less in diameter, may be cut close to the ground and treated by applying undiluted Patron 170 to the cut surface. See label recommendations for other products.
2,4-D + 2,4-DP Ester + Dicamba	SuperBrush Killer (Gordon's Agric. Prod.)  Brushmaster Herbicide (Gordon's Agric. Prod.)	Thoroughly spray (drench) the entire stump including the cut surface, bark, and exposed roots with a mixture equivalent to 2.6 to 5.1 ounces of SuperBrush Killer in 1 gallon of oil (diesel, basal, mineral, penetrant). For painting freshly cut stumps, mix 2 quarts of SuperBrush Killer with 1 gallon of basal oil and thoroughly paint all surfaces of the stump.  Thoroughly spray (drench) the entire stump including the cut surfaces, bark, and exposed roots with a mixture equivalent to 10 ounces of Brushmaster Herbicide in 1 gallon of oil (diesel oil, No. 1 or No. 2 fuel oil, kerosene, mineral oil, or other blend formulated for basal applications). Drench to runoff. May be done any time of year except when snow, ice, or water prevents complete spray coverage.