



Herbicides for Small Scale Forestry Operations

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1st Edition

A large number of herbicides are by small-scale forestry operations in Kentucky. The majority of these chemicals are applied with hand-held equipment such as backpack sprayers or with small ground equipment such as ATVs and small farm tractors. As with most types of herbicide use, forestry applicators come in close proximity to these chemicals when loading, mixing, and cleaning. However, due to the techniques used to apply herbicides in forestry operations in Kentucky many users also come into close proximity and potential contact during application. The following table provides information on the common herbicides used in forestry operations in Kentucky including safety information and precautions which should be taken to avoid injury. Herbicide users should be aware that formulations, trade names, and ingredients are constantly changing and the label provides the best source of safety and application information.

Low and High Volume Foliar Spray

Foliar spraying is the most common method of applying herbicides. Low volume (10-60 gallons solution/treated acre) and/or foam applications are preferable to high volume techniques (60-400 gallons solution/treated acre). High volume techniques have been commonly used for maintaining rights-of-way, particularly those associated with highways, railroads, and power lines. The majority of small-scale forestry operations use low volume techniques. Hand-held sprayers can be used to treat individual plants, spray spots or strips in plantations, as well as to achieve total kill in small areas.

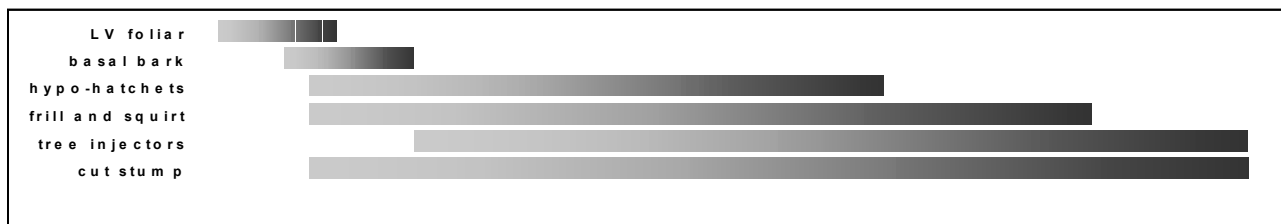
Regardless of the application procedure used, proper calibration of foliar spray equipment is needed. Lack of proper calibration leads to poor application technique and often leads to over application. Calibration techniques for vehicle operated sprayers can be obtained by contacting your county cooperative extension agent. Hand-held sprayers must also be calibrated. Most commonly available herbicides are labeled for application with hand-held sprayers and provide label information for mixing and applying. See forestry fact sheet FORFS 99-06 "A Simple Technique for the Application of Forestry Herbicides with a Backpack Sprayer" for a simple procedure to aid in calibration.

While foliar spraying is the common technique for applying herbicides, it is also the technique resulting in the greatest potential to harm non-target plants. This can occur through: poor directional spraying, drift due to wind, volatilization, drip from over spraying of target plants, and poor timing. Foliar herbicides can also be wiped onto leaf surfaces using sponge or wick applicators which are commercially available. While this technique is often slower than spraying, it allows more accurate delivery of herbicides compared to most spraying techniques.

Basal Bark Application

Many woody species including shrubs, trees, and vines can quickly grow to sized which make foliar application difficult, dangerous, or impossible. Spe-

Suggested Diameters for Individual Tree Applications



Common Herbicides Used in Forestry Operations ¹

Active Ingredient	Brand Names	Primary Application	Application and Effectiveness	Environmental and Personal Protection
Bromacil	Hyvar X, Hyvar XL	soil (X) and basal application (XL)	Broad range of annual and perennial grasses and broadleaf weeds.	Can leach into soils and persist. Warning²: eye irritant.
Clopyralid	Stinger, Reclaim, Transline, Curtail	low volume foliar	Members of the sunflower, buckwheat and pea families.	Can leach into soils and persist in the environment
Fluazifop-butyl	Fusilade	low volume foliar	Selective annual and perennial grass killer.	Low mobility and rapid breakdown in moist soils.
Glyphosate	Roundup, Roundup Pro, Accord (forest use label), Rodeo (aquatic use).	low volume foliar, injection, cut stump	Roundup and Accord: Annual and perennial grasses and broadleaf weeds; Rodeo: above surface weeds in aquatic areas	Non-selective and can kill beneficial species. Warning²: eye irritant.
Imazapyr	Arsenal, Chopper	basal bark cut stump low volume foliar	Controls a wide variety of annual and perennial weeds, trees, vines and brambles. Not effective on legumes.	Drift or "leakage" from roots of treated plants can damage non-target plants. Persistent in soils, will kill seedlings.
Imazameth	Plateau	soil and with surfactant low volume foliar	Selectively controls annual and perennial broadleaves and grasses. Can be used for native prairie grass renovation.	High rates can injure native prairie grasses
Hexazinone	Velpar L, Pronone	Soil and low volume foliar formulations.	Annual and biennial weeds, woody vines, and most perennial weeds and grasses.	Persistent in soils. Danger: eye irritant.
MCPA	Rhomene, Rhonox, (Weedone)	low volume foliar	Selective broadleaf weeds, similar to 2,4-D but more selective on cereals, legumes, and flax.	Drift can damage other nearby desirable broadleaf plants; cotton, grapes and tomatoes are particularly sensitive.
Metsulfuron	Escort	low volume foliar	Many broadleaf weeds, brambles, and some annual grassy weeds are susceptible.	Drift can cause damage to non-target broad leaved weeds and woody plants.
Picloram	Tordon, Pathway, Grazon	injection and cut stump	Kills broadleaf weeds, woody plants. Grasses are resistant at normal rates.	Water soluble and very persistent in the environment. Warning: eye irritant.
Sethoxydim	Poast, Vantage	low volume foliar	Selective control of annual and perennial grass weeds.	
Simazine	Princep	soil application	Broad pre-emergent for control of broadleaf weeds and grasses	Can be washed with soil particles.
Sulfometuron	Oust	Primarily soil, secondarily low volume foliar	Broad spectrum pre-and post emergence control of many annual and perennial grasses and broadleaf weeds.	Application rates should be closely watched. Non-target plants are at risk under high rates.

Active Ingredient	Brand Names	Primary Application	Application and Effectiveness	Environmental and Personal Protection
Tebuthiuron	Spike	liquid and granular soil application	Non-selective control of brush, grasses and broadleaf weeds.	Non-selectivity can injure or kill non-target plants.
Triclopyr	Garlon 3A, Garlon 4, Turflon, (Crossbow, Access)	low volume foliar, cut stump, injection (3A), basal spray (4)	Woody brush, annual and perennial broadleaf weeds and root sprouting of deciduous broadleaved tree species.	Leachable in soil; Garlon 3A and other amine formulations: Danger: eye irritant.
2,4-D	Weedar, Weedon, Weed-b-Gon (Tordon, Crossbow)	low volume foliar	Kills broadleaf weeds, woody plants	Can damage other nearby desirable broadleaf plants; cotton, grapes and tomatoes are particularly sensitive

¹ Information on application and effectiveness and environmental and personal cautions adapted from Weed Science Society of American (1989) and Randall and Marinelli (1995).

² Danger and Warning are specific signal words used in pesticide labeling to alert users to potential health effects. The following signal words are in order of decreasing severity: Danger, Warning, Caution. In the case of the majority of the herbicides used in forestry operations warning and danger signal words relate to the potential for eye injury. Wear appropriate protection, specifically approved eye protection during application, filling, and mixing.

cific herbicides and application techniques have been developed to effectively kill trees up to 3 to 4 inches in diameter. The advantage to these treatments is that they all deliver herbicide specifically to the target plant with little chance of non-target species being directly effected. For full basal bark applications herbicides in combination with the recommended adjuvant (additive) is sprayed around the outside circumference of the basal 1 - 2 feet on the stem. The adjuvant helps the herbicide spread around the stem and penetrate the bark of young trees and brush species. The herbicide is then translocated throughout the plant. Specific herbicides and formulations, such as Garlon 4™, have been developed for this technique. Spraying can be accomplished using a typical hand-held or backpack sprayer wand. A variant of this technique is called thin-lining or stream-lining. Rather than spraying a wide band of herbicide to the stem, a narrow concentrated band is applied. A specific gun has been developed for use with backpack sprayers to deliver a stream of herbicides over a relatively long distance. Basal bark treatments can also be used on cut stumps as discussed below.

Cut Stump Treatment

This treatment along with injection application presented below can be used to kill large trees. Herbicides are applied to the freshly cut surface of the stump. Application should occur not more than one hour after cutting. Herbicides should be sprayed from a hand-held sprayer or squirt bottle around the outside 3 to 4 inches of the top cut surface of the stump. Soaking the cut surface in the center of large trees is unnecessary. If stumps are more than one hour old, a basal bark treatment, as discussed above can be used. In this instance apply the herbicide to the bark around the entire circumference of the stump.

Tree Injection

Several herbicides are labeled for injection directly into woody plants. This technique is commonly used to kill large trees but can be used to kill woody plants of all sizes. Injection has the advantage of delivering the herbicide directly to the target plant. Per acre rates of chemical use are low. Since the herbicide is being administered to the inside of the tree, it is contained and broken down within the tree with little or no chance for movement to non-target plants. Several techniques have been developed for administering the herbicide inside the bark of trees. Tree injectors are devices made from a long metal tube which is used as a herbicide reservoir. At one end of the tube a pump mechanism is located directly atop a 1 to 2 inch wide blade. Injections are made by plunging the blade into the base of the tree at a comfortable height, usually 1 to 2 feet above the ground. The blade passes through the bark and enters the underlying wood. The applicator then triggers the pump which squirts a calibrated amount of herbicide into the slit. Slits are made around the circumference of a tree at a spacing specified on the label. A tree injector has also been developed to inject a dry “pellet” of herbicide through the bark of the tree. Regardless of whether you use a liquid or dry methods labels provide information on the herbicide dose per inch of stem diameter. The most common method of tree injection is called frill and squirt where a hatchet can be used to cut a grill through the bark of trees in a continuous ring around the circumference. Herbicide, in a hand-held spray bottle, is then applied in the frill. Dosage rates will be provided on the label as discussed above. A chain saw can also be used to create a chainsaw girdle which can be sprayed with

herbicide. However, it is sometimes difficult to properly apply the herbicide to the inside of the girdle and walking through the woods with a chainsaw can be hazardous. A cross between tree injection and frill and squirt methods can be obtained by using a device commonly called by their trade names Hypo-Hatchet™ or Silaxe™. These devices have a pump mechanism built into the head of a hatchet connected with a plastic tube to a reservoir designed to be carried on your belt or back. When the hatchet hits the tree, the pump mechanism administers a calibrated amount of herbicide into the individual hatchet slit. Eye protection should always be worn when using this device. Occasionally the strike will not penetrate the bark and herbicide may splatter on the outside of the tree and into unsuspecting eyes.

Soil Application

Several herbicides are labeled for application directly to the soil surface to kill unwanted species. Some for example hexazinone (Velpar L™), are designed to be absorbed by the roots of established plants. Others are termed *pre-emergent* herbicides. These

chemicals interfere with seed germination prior to emergence of the plant above the ground. They are particularly useful in situations where existing annual species have seeded and regeneration potential the following year is high. However, some of these soil applied chemicals do have the ability to be washed or moved from their application point. Many pre-emergent herbicides can affect non-target plants. Proper timing the application can help reduce non-target plant injury. As with foliar sprays, an accurate calibration of spray equipment is required. Because of these concerns, the use of soil-applied herbicides should generally be carefully considered.

The proper and safe use of chemicals involves care in the selection and implementation of the herbicide treatment. While many variables need to be considered the following guideline developed by the Connecticut Department of Transportation should be considered: “Apply the least amount of the safest chemical to specific species of plants in a specific area at the appropriate time to obtain a desired 90 percent control.”

Mention of trade names does not constitute endorsement by the author or the University of Kentucky Department of Forestry or Cooperative Extension Service.

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