CIR1475

UF UNIVERSITY of FLORIDA
IFAS Extension

Herbicides Registered for Pine Management in Florida – 2008[1]

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According to Hodges et al. (2005), Florida has one of the largest concentrations of intensively managed plantations of southern pines in the world. Pine plantations comprise approximately 32 percent of the forested land or 15 percent of the total land base in Florida (Carter and Jokela 2002). Vegetation management is an integral part of successful pine plantation management. Following the development and registration of many new forestry herbicides during the 1980s, herbicide use for forest vegetation management increased dramatically. This trend continues because of the introduction of lower-cost generic herbicides, and because the costs of mechanical treatment alternatives are increasing, driven up, for the most part, by increased fuel costs. Herbicides are used to enhance crop tree survival and growth rates, allowing producers to improve return on investment with minimal site disturbance. Their application facilitates many forestry operations, such as pine straw harvest, logging, and plantation reestablishment. They can also reduce the risk of destructive wildfires and improve wildlife habitat, aesthetics, and recreation opportunities. Herbicides are an effective tool in controlling invasive plants and restoring native ecosystems. They can be applied at different stages during pine plantation rotation for:

- Site preparation before planting
- Herbaceous weed control during establishment
- Release of established pines from competing vegetation

Efficient, safe and environmentally sound herbicide use requires an up-to-date knowledge of weed control technology. Landowners must stay aware of developments because new herbicides are constantly being developed and registered for use in Florida, and, just as crucially, in many years some of the older herbicides are discontinued, or their registration in the state of Florida terminated.

1. This document is CIR1475, one of a series of the School of Forest Resources and Conservation, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. First published in April 2005. Revised February 2009. Please visit the EDIS website at http://edis.ifas.ufl.edu.

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The aim of this publication is to provide comprehensive information about the herbicides currently registered for use in Florida pine plantations. All herbicide active ingredients important in pine management in Florida with examples of commercial products are listed in Table 1, and their use characterized in Table 2. Other active ingredients that are registered in Florida but are rather marginally used for pine plantations, like 2,4-D, atrazine, dicamba, paraquat, and simazine, are also included. Since an increasing number of private and public owners manage their forestlands for non-commodity purposes, herbicides that are intended mostly for turf and/or landscape maintenance, but also labeled for conifer plantations (e.g. pendimethalin), have been included as well.

Most of the herbicide active ingredients are available in different formulations from different manufacturers and/or distributors under a variety of trade names. It is beyond the scope of this publication to mention all of the silvicultural herbicide products available on the market. It has to be emphasized that there might be considerable differences even among herbicides with the same concentration of the same active ingredient(s) resulting, for example, from differences in adjuvants or solvents. Therefore, before making any herbicide substitutions, one has to be sure that the selected product is appropriate for the intended application, and one must read and follow all label recommendations. Inclusion of a product trade name or a company name in this publication does not constitute an endorsement of a product or a company, as other products manufactured by different companies might be equally suited for the intended herbicide use.

The examples of herbicides registered for pine management in Florida are listed alphabetically, first by active ingredient and then by trade name (Table 1). Products with the same Environmental Protection Agency (EPA) registration number are grouped together. Herbicides containing more than one active ingredient are placed according to the highest percentage of active ingredient.

Table 2 provides information on basic weed control characteristics and silvicultural applications for listed herbicides. Herbicides can be used for a variety of applications in managing pine forests to control or alter undesirable vegetation. **Site preparation (S)** is one use where the current vegetation can be controlled by herbicides prior to planting pine seedlings. After planting, **herbaceous weed control (H)** with herbicides can aid the survival and growth of the young pine seedlings during the establishment phase. Subsequently, herbicides can be applied to **release (R)** established pine trees from competing woody vegetation, including early and mid-rotation release as well as timber stand improvement later in the rotation. Some truly selective herbicides may be broadcast over pines at recommended rates and timing without significant adverse effects to pines. Directed spray [**(d)**] and understory broadcast [**(u)**] are two release techniques that can be used to obtain selectivity by herbicide placement, minimizing contact with crop trees. **Individual stems (I)** of undesirable vegetation can be treated with herbicides throughout the pine rotation, from site preparation to harvest. Soil-active herbicides can be used for basal soil treatment [**(bs)**] in the immediate vicinity of the individual stems. Some herbicides are labeled for applications in wetlands **(W)** or aquatic **(A)** areas in the forests.

Basic terms used in this and other herbicide publications can be defined as follows:

Active ingredient (a.i.) is the chemical substance in the herbicide that does the work: the a.i. changes plant metabolism and is designed to control the undesirable vegetation. The active ingredient has the greatest influence on the properties and behavior of the herbicide and is the primary reason a given herbicide will be selected for a particular application. The exact **chemical name** of the active ingredient is useful to chemists to ensure precise communication. The **common name** is a simplified, less technical name of an active ingredient, most often used in herbicide recommendations and technical literature. (Common names are used in Tables 1 and 2 of this publication.) For example, imazapyr is a common name for 2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1H-imidazol-2-yl]-3-pyridinecarboxylic acid.

Formulation is the commercial preparation of the herbicide product, including one or more active

ingredients, usually a solvent (for liquid products), and, possibly, adjuvant(s), such as wetting agents (surfactants). Each formulation is registered and marketed under a separate **trade name**. Frequently the same formulation or formulations containing the same concentration of the same form of an active ingredient may be marketed under several trade names by different companies or even the same manufacturer or distributor, which may be quite confusing. Such is the case with Dow s Accord® Concentrate, Glypro® and Rodeo®; all three contain the same salt of glyphosate (53.8% of the isopropylamine salt) and are registered under the same **EPA registration number**. While new forestry herbicide active ingredients are not frequently introduced, new formulations, which are often more effective and safer, are rapidly being developed. Several new herbicide formulations have higher content of active ingredients and are often available in large, returnable, refillable containers, which reduces the need for container disposal. A growing number of products contain two active ingredients, eliminating the need for mixing. Recently introduced Lineage™ Prep and Lineage™ HWC are the first forestry herbicides formulated with three active ingredients. New adjuvants (additives) tend to improve efficacy and the ease of use, often reducing the treatment cost at the same time.

Trade names of herbicides may include numbers and/or letters to further identify the product. The number immediately after the name refers to the concentration of active ingredient. The amount of active ingredient in a herbicide may be expressed as a percentage of volume or mass of the commercial product. For example, MSM 60 contains 60%, by weight, of the active ingredient metsulfuron methyl. Labels may additionally provide an **acid equivalent (a.e.)**, which refers to the theoretical yield of a parent acid from a herbicide active ingredient that has been formulated as a derivative, such as an amine or ester. Acid equivalent content is especially useful when comparing herbicides containing different chemical forms of the same active ingredient. For example, Garlon® 3A contains 44.4% of the triethylamine salt of triclopyr, or 31.8% (3 lb/gal) of the acid equivalent, triclopyr. Garlon® 4 contains 61.6% of butoxyethyl ester of triclopyr, or 44.3% (4 lb/gal) of the acid equivalent, triclopyr. In this case, the numbers in the trade names refer to the weight of the acid equivalent per volume of the product, with the parent acid, triclopyr, being the herbicidal portion of the formulation.

Letter(s) included in a trade name often (but not always) indicate formulation of the product. Not all companies use the same abbreviations, so it may be necessary to refer to the full label text. Also, acronyms found in labeling often differ from the standard two-letter international (CIPAC) formulation codes. Some of the more common acronyms are:

DF dry flowable

DG dry granular

E or EC emulsifiable concentrate

F or FL flowable or flowable liquid

G granular

L liquid

LV low volume concentrate

P or PS pellet

RTU ready to use

S, SL, WS soluble concentrate or ready to use solution

SP soluble powder

ULV ultra low volume concentrate

ULW ultra light weight

W or WP wettable powder

WDG water dispersible granule (similar to dry flowable)

WSP water soluble powder

XP extruded pellet

Labeling associated with each herbicide includes one or more product labels, a **Material Safety Data Sheet (MSDS)**, and possibly additional publications. These documents are the primary method of

communication between a herbicide manufacturer or distributor and a herbicide user. They contain detailed information about the herbicide product, including trade name, common name(s), chemical name(s), active ingredient(s), concentration(s) and EPA registration number. Product labels provide information about the herbicide application and safety, whereas the MSDS focuses on chemical and physical properties of the herbicide and personal and environmental safety. Because the MSDSs include emergency medical information and information physicians need to deal with accidental exposure to herbicide products, the MSDS for each herbicide used should be available on site wherever herbicides are used (and wherever they are stored or transported). Information and instructions contained in the labeling must be strictly followed when purchasing, transporting, storing, mixing, applying or disposing of herbicides. It is a violation of federal law to use any herbicide in a manner inconsistent with its labeling.

Full text labels and MSDSs for most herbicides are accessible through manufacturers' or distributors' web sites and dedicated databases such as those of **Crop Data Management Systems (CDMS)** at http://www.cdms.net/LabelsMsds/LMDefault.aspx, or Greenbook® at http://www.greenbook.net/. Registered users can perform advanced searches of either database by various criteria, including trade name, common name, manufacturer, crop tree species, weed species, state, and (only Greenbook®) by EPA Registration number . Both databases provide extracted important product information in abbreviated format. Greenbook® allows for side-by-side comparison of up to three products and for setting product E-Alerts. All information contained in the Greenbook® reference books and CDs is accessible on-line. Registration is currently available free of charge for Greenbook® at the home page and for CDMS at http://premier.cdms.net/webapls/formsloginRef.asp?/webapls. The latter replaces ChemSearch, which was a paid service of CDMS. One has to keep in mind that, while these and other databases are very useful tools, they cannot be expected to be always completely up-to-date, because of the very rapidly changing herbicide market. CDMS contains a more complete list of forestry herbicides.

Selection of herbicides registered for use in pine management differs from state to state. Only products registered by the **Florida Department of Agriculture and Consumer Services (FDACS)** can be legally purchased in the state of Florida. The general public can search the FDACS web site at http://www.flpesticide.us or the National Pesticide Information Retrieval System (NPIRS) at http://state.ceris.purdue.edu/ for active Florida registrations. The latter is more user-friendly, can be searched by one of several criteria and provides concise information about each product.

It has to be emphasized that the effectiveness and safety of use of a particular herbicide in a given situation greatly depends on several factors including formulation, pine species, age and stage of growth, weeds to be controlled, and timing, technique and conditions during application. Therefore, one has to refer to the manufacturer's product label for details and consult other literature and qualified professionals regarding the appropriate approach and best products to use. Several publications related to herbicides can be found on the **EDIS** web site (EDIS - Electronic Data Information Source - UF/IFAS Extension). Another good source of herbicide-related information (including relevant links) is the **Pesticide Information Office (PIO)** at the University of Florida, IFAS, accessible through http://pested.ifas.ufl.edu. The PIO has the responsibility for assembling, maintaining and disseminating current pesticide information in the state of Florida. County Extension Agents can be contacted at County Extension Offices located throughout the state of Florida (http://solutionsforyourlife.ufl.edu/map/index.html).

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Table 1. Herbicides registered for use in pine plantations in Florida - 2008.

Active Ingredient (A.I.) (Common Name)	Trade Name	A.I. Concentration	Formulation[1]	Registrant	EPA Registration No.
2,4-D, 2-ethylhexyl ester	Barrage® HF	78.10%	EC	Helena Chemical Company	5905-529
2,4-D, dimethylamine salt	DMA® 4 IVM	46.30%	SL	Dow AgroSciences LLC	62719-3
2,4-D, dimethylamine salt	Weedar® 64	46.80%	SL	Nufarm, Inc.	71368-1
2,4-D, 2-ethylhexyl ester	Weedone® LV4 EC	67.20%	EC	Nufarm, Inc.	228-139-71368
2,4-D, 2-ethylhexyl ester	Weedone® LV4 Solventless	62.60%	EC	Nufarm, Inc.	71368-14
Atrazine	AAtrex® 4L [2]	42.60%	L	Syngenta Crop Protection, Inc.	100-497
Atrazine	AAtrex® Nine-O® [2]	88.20%	WP	Syngenta Crop Protection, Inc.	100-585
Atrazine	Agrisolutions Atrazine 4L[2]	40.80%	L	Winfield Solutions, LLC	1381-158
Atrazine	Atrazine 4L[2]	42.20%	L	Loveland Products, Inc.	34704-69
Atrazine	Agrisolutions Atrazine 90DF[2]	88.00%	DF	Winfield Solutions, LLC	9779-253
Atrazine	Atrazine 90WDG[2]	88.50%	WDG	Loveland Products, Inc.	34704-622
Clethodim	Envoy®	12.60%	EC	Valent U.S.A. Corporation	59639-78
Clopyralid	Clean Slate™	40.90%	EC	Nufarm Americas Inc.	228-491
Clopyralid	Clopyralid 3	40.90%	EC	Alligare	81927-14
Clopyralid	Transline®	40.90%	EC	Dow AgroSciences LLC	62719-259
Dicamba, diglycolamine salt	Vanquish®	56.80%	SL	Syngenta Crop Protection, Inc.	100-884
Fluazifop-P-butyl	Fusilade® DX	24.50%	EC	Syngenta Crop Protection, Inc.	100-1070
Flumioxazin	SureGuard®	51.00%	WDG	Valent U.S.A. Corporation	59639-120

Table 1. Herbicides registered for use in pine plantations in Florida - 2008.

Active Ingredient (A.I.) (Common Name)	Trade Name	A.I. Concentration	Formulation[1]	Registrant	EPA Registration No.
Fluroxypyr	Vista®	26.20%	EC	Dow AgroSciences LLC	62719-308
Fluroxypyr	Vista® XRT	45.52%	EC	Dow AgroSciences LLC	62719-586
Fosamine	Krenite® S	41.50%	SL	E. I. du Pont de Nemours and Co.	352-395
Glyphosate	Accord® Concentrate	53.80%	SL	Dow AgroSciences LLC	62719-324
Glyphosate	Glypro®	53.80%	SL	Dow AgroSciences LLC	62719-324
Glyphosate	Rodeo®	53.80%	SL	Dow AgroSciences LLC	62719-324
Glyphosate	Accord® SP	41.00%	SL	Dow AgroSciences LLC	62719-322
Glyphosate	Glypro® Plus	41.00%	SL	Dow AgroSciences LLC	62719-322
Glyphosate	Accord® XRT	53.60%	SL	Dow AgroSciences LLC	62719-517
Glyphosate	Accord® XRT II	50.20%	SL	Dow AgroSciences LLC	62719-556
Glyphosate	Foresters'®	53.80%	SL	Nufarm Americas Inc.	228-381
Glyphosate	Razor® Pro	41.00%	SL	Nufarm Americas Inc.	228-366
Glyphosate Imazapyr	OneStep®	22.13% 8.36%	SL	BASF Corporation	241-414
Hexazinone	Pronone® Power Pellet	75.00%	P	Pro-Serve, Inc.	33560-41
Hexazinone	Velpar® DF	75.00%	DF	E. I. du Pont de Nemours and Co.	352-581
Hexazinone	Velpar® L	25.00%	SL	E. I. du Pont de Nemours and Co.	352-392
Hexazinone	Velpar® ULW	75.00%	ULW	E. I. du Pont de Nemours and Co.	352-450
Hexazinone Sulfometuron methyl	Oustar®	63.20% 11.80%	WDG	E. I. du Pont de Nemours and Co.	352-603
Imazapic	Plateau®[3]	23.60%	SL	BASF Corporation	241-365

Table 1. Herbicides registered for use in pine plantations in Florida - 2008.

Active Ingredient (A.I.) (Common Name)	Trade Name	A.I. Concentration	Formulation[1]	Registrant	EPA Registration No.
Imazapyr	Arsenal® AC	53.10%	SL	BASF Corporation	241-299
Imazapyr	Chopper®	27.60%	SL	BASF Corporation	241-296
Imazapyr	Chopper® Gen2™	26.70%	SL	BASF Corporation	241-430
Imazapyr	Imazapyr 4SL	52.60%	SL	Vegetation Management, LLC	74477-5
Imazapyr	Rotary 2SL	27.80%	SL	Alligare, LLC	81927-6
Imazapyr Metsulfuron methyl	Lineage™ Clearstand™	63.20% 9.50%	WDG	E. I. du Pont de Nemours and Co.	352-766
Imazapyr Sulfometuron methyl Metsulfuron methyl	Lineage™ Prep	54.50% 15.30% 4.10%	WDG	E. I. du Pont de Nemours and Co.	352-767
Imazapyr Sulfometuron methyl Metsulfuron methyl	Lineage™ HWC	37.50% 28.10% 7.50%	WDG	E. I. du Pont de Nemours and Co.	352-765
Metsulfuron methyl	Escort® XP	60.00%	XP	E. I. du Pont de Nemours and Co.	352-439
Metsulfuron methyl	MSM 60	60.00%	WDG	Alligare, LLC	81927-7
Metsulfuron methyl	Patriot®	60.00%	WDG	Nufarm Americas Inc.	228-391
Oryzalin	Surflan® A.S.	40.40%	EC	Dow AgroSciences LLC	70506-43
Paraquat	Gramoxone Inteon™	30.10%	EC	Syngenta Crop Protection, Inc.	100-1217
Pendimethalin	Pendulum® 2G	2.00%	G	BASF Corporation	241-375
Pendimethalin	Pendulum® 3.3 EC	37.40%	EC	BASF Corporation	241-341
Pendimethalin	Pendulum® AquaCap	38.70%	SL	BASF Corporation	241-416
Simazine	Sim-Trol® 90DF	90.00%	DF	Sipcam Agro USA, Inc.	35915-12-60063

Table 1. Herbicides registered for use in pine plantations in Florida - 2008.

Active Ingredient (A.I.) (Common Name)	Trade Name	A.I. Concentration	Formulation[1]	Registrant	EPA Registration No.
Sulfometuron methyl	Oust® XP	75.00%	XP	E. I. du Pont de Nemours and Co.	352-601
Sulfometuron methyl	SFM 75	75.00%	WDG	Vegetation Management, LLC	72167-11-74477
Sulfometuron methyl	Spyder™	75.00%	WDG	Nufarm Americas Inc.	228-408
Sulfometuron methyl Metsulfuron methyl	Oust® Extra	56.25% 15.00%	XP	E. I. du Pont de Nemours and Co.	352-622
Sulfometuron methyl Metsulfuron methyl	SFM Extra	56.25% 15.00%	WDG	Alligare, LLC	81927-5
Triclopyr, triethylamine salt	Garlon® 3A	44.40%	SL	Dow AgroSciences LLC	62719-37
Triclopyr, butoxyethyl ester	Garlon® 4	61.60%	EC	Dow AgroSciences LLC	62719-40
Triclopyr, butoxyethyl ester	Forestry Garlon® 4	61.60%	EC	Dow AgroSciences LLC	62719-40
Triclopyr, butoxyethyl ester	Forestry Garlon® XRT	83.90%	EC	Dow AgroSciences LLC	62719-553
Triclopyr, butoxyethyl ester	Garlon® 4 Ultra	60.45%	EC	Dow AgroSciences LLC	62719-527
Triclopyr, butoxyethyl ester	Pathfinder® II	13.60%	RTU	Dow AgroSciences LLC	62719-176
Triclopyr, triethylamine salt	Tahoe™ 3A	44.40%	SL	Nufarm Americas Inc.	228-518
Triclopyr, butoxyethyl ester	Tahoe™ 4E	61.60%	EC	Nufarm Americas Inc.	228-517
Triclopyr, triethylamine salt	Triclopyr 3SL	44.40%	SL	Vegetation Management, LLC	72167-49-74477
Triclopyr, butoxyethyl ester	Triclopyr 4EC	61.60%	EC	Vegetation Management, LLC	72167-53-74477
Triclopyr, triethylamine salt Aminopyralid	Milestone® VM Plus[3]	16.22% 2.22%	SL	Dow AgroSciences LLC	62719-572

[1] See text; [2] Restricted use pesticide in the state of Florida; [3] Supplemental labeling for forestry use

Table 2. Forestry herbicide applications

Active Ingredient (A.I.) (Common Name)	Trade Name	Labeled for Application [1]	Labeled for Controlling	Application Pre/post Emergence	Herbicide Activity
2,4-D, 2-ethylhexyl ester	Barrage® HF	S, H (d), R (d, u), I	Annual & perennial broadleaf weeds; woody plants	Post	Foliar
2,4-D, dimethylamine salt	DMA® 4 IVM	S, H (d), R (d, u), I	Annual & perennial broadleaf weeds; woody plants	Post	Foliar
2,4-D, dimethylamine salt	Weedar® 64	I	Woody plants	Post	Foliar
2,4-D, isooctyl ester	Weedone® LV4 EC	S, H (d), R, I	Annual & perennial broadleaf weeds; woody plants	Post	Foliar
2,4-D, isooctyl ester	Weedone® LV4 Solventless	S, H (d), R	Annual & perennial broadleaf weeds; woody plants	Post	Foliar
Atrazine	AAtrex® 4L	S, H	Annual broadleaf weeds & grasses	Pre- & early post	Soil
Atrazine	AAtrex® Nine-O®	S, H	Annual broadleaf weeds & grasses	Pre- & early post	Soil
Atrazine	Agrisolutions Atrazine 4L	S, H	Annual broadleaf weeds & grasses	Pre- & early post	Soil
Atrazine	Atrazine 4L	S, H	Annual broadleaf weeds & grasses	Pre- & early post	Soil
Atrazine	Agrisolutions Atrazine 90DF	S, H	Annual broadleaf weeds & grasses	Pre- & early post	Soil
Atrazine	Atrazine 90WDG	S, H	Annual broadleaf weeds & grasses	Pre- & early post	Soil
Clethodim	Envoy®	H	Annual & perennial grasses	Post	Foliar
Clopyralid	Clean Slate™	S, H, R (d)	Annual & perennial broadleaf weeds; woody plants	Post	Foliar
Clopyralid	Clopyralid 3	S, H, R (d)	Annual & perennial broadleaf weeds; woody plants & vines	Post	Foliar
Clopyralid	Transline®	S, H, R (d)	Annual & perennial broadleaf weeds; woody plants	Post	Foliar

Table 2. Forestry herbicide applications

Active Ingredient (A.I.) (Common Name)	Trade Name	Labeled for Application [1]	Labeled for Controlling	Application Pre/post Emergence	Herbicide Activity
Dicamba, diglycolamine salt	Vanquish®	S, I	Annual & perennial broadleaf weeds; woody plants (incl. conifers) & vines	Pre- & post	Foliar & soil
Fluazifop-P-butyl	Fusilade® DX	H	Annual & perennial grasses	Post	Foliar
Flumioxazin	SureGuard®	H	Broadleaf weeds & annual grasses	Pre- & early post	Soil & foliar
Fluroxypyr	Vista®	S, R (d), I	Annual & perennial broadleaf weeds; woody plants	Post	Foliar
Fluroxypyr	Vista® XRT	S, R (d), I	Annual & perennial broadleaf weeds; woody plants	Post	Foliar
Fosamine	Krenite® S	S	Woody plants (including conifers) & vines	Post	Foliar
Glyphosate	Accord® Concentrate	S, H, R (d, u), I, A	Annual & perennial broadleaf weeds & grasses; woody plants	Post	Foliar
Glyphosate	Glypro®	S, H, R (d, u), I, A	Annual & perennial broadleaf weeds & grasses; woody plants	Post	Foliar
Glyphosate	Rodeo®	S, H, R (d, u), I, A	Annual & perennial broadleaf weeds & grasses; woody plants	Post	Foliar
Glyphosate	Accord® SP	S, I	Annual & perennial broadleaf weeds & grasses; woody plants	Post	Foliar
Glyphosate	Glypro® Plus	S, I	Annual & perennial broadleaf weeds & grasses; woody plants	Post	Foliar
Glyphosate	Accord® XRT	S, R (d, u), I	Annual & perennial broadleaf weeds & grasses; woody plants	Post	Foliar
Glyphosate	Accord® XRT II	S, R (d, u), I	Annual & perennial broadleaf weeds & grasses; woody plants	Post	Foliar
Glyphosate	Foresters'®	S, H, R (d, u), I	Annual & perennial broadleaf weeds & grasses; woody plants	Post	Foliar

Table 2. Forestry herbicide applications

Active Ingredient (A.I.) (Common Name)	Trade Name	Labeled for Application [1]	Labeled for Controlling	Application Pre/post Emergence	Herbicide Activity
Glyphosate	Razor® Pro	S, H, R (d, u), I	Annual & perennial broadleaf weeds & grasses; woody plants	Post	Foliar
Glyphosate Imazapyr	OneStep®	S	Annual & perennial broadleaf weeds & grasses; woody plants & vines	Post	Foliar & soil
Hexazinone	Pronone® Power Pellet	S, R	Woody plants	Pre- & post	Soil
Hexazinone	Velpar® DF	S, H, R, I (bs)	Woody plants; annual & perennial broadleaf weeds & grasses	Pre- & post	Soil & some foliar
Hexazinone	Velpar® L	S, H, R, I, I (bs)	Woody plants; annual & perennial broadleaf weeds & grasses	Pre- & post	Soil & some foliar
Hexazinone	Velpar® ULW	S, R, H	Woody plants; annual & perennial broadleaf weeds & grasses	Pre- & post	Soil
Hexazinone Sulfometuron methyl	Oustar®	S, H	Annual & perennial broadleaf weeds & grasses	Pre- & post	Soil & foliar
Imazapic	Plateau® [2]	S	Annual & perennial broadleaf weeds & grasses; vines	Pre- & post	Foliar & soil
Imazapyr	Arsenal® AC	S, H, R, I	Annual & perennial broadleaf weeds & grasses; woody plants & vines	Mainly post	Foliar & soil
Imazapyr	Chopper®	S, I, R (d, u)	Annual & perennial broadleaf weeds & grasses; woody plants & vines	Mainly post	Foliar & soil
Imazapyr	Chopper® Gen2™	S, R (d, u)	Annual & perennial broadleaf weeds & grasses; woody plants & vines	Mainly post	Foliar & soil
Imazapyr	Imazapyr 4SL	S, H, R, I	Annual & perennial broadleaf weeds & grasses; woody plants & vines	Mainly post	Foliar & soil
Imazapyr	Rotary 2SL	S, I, R (d, u)	Annual & perennial broadleaf weeds & grasses; woody plants & vines	Mainly post	Foliar & soil
Imazapyr Metsulfuron methyl	Lineage™ Clearstand™	S, H, R, I	Annual & perennial broadleaf weeds & grasses; woody plants & vines	Mainly post	Foliar & soil
Imazapyr Sulfometuron methyl Metsulfuron methyl	Lineage™ Prep	S, H, R, I	Annual & perennial broadleaf weeds & grasses; woody plants & vines	Mainly post	Foliar & soil

Table 2. Forestry herbicide applications

Active Ingredient (A.I.) (Common Name)	Trade Name	Labeled for Application [1]	Labeled for Controlling	Application Pre/post Emergence	Herbicide Activity
Imazapyr Sulfometuron methyl Metsulfuron methyl	Lineage™ HWC	S, H, R, I	Annual & perennial broadleaf weeds & grasses; woody plants & vines	Mainly post	Foliar & soil
Metsulfuron methyl	Escort® XP	S, H, R	Annual & perennial broadleaf weeds & grasses; woody plants	Mainly post	Foliar & soil
Metsulfuron methyl	MSM 60	S, H, R	Annual & perennial broadleaf weeds & grasses; woody plants	Mainly post	Foliar & soil
Metsulfuron methyl	Patriot®	S, H, R	Annual & perennial broadleaf weeds & grasses; woody plants	Mainly post	Foliar & soil
Oryzalin	Surflan® A.S.	H	Annual grasses & certain broadleaf weeds	Pre	Soil
Paraquat	Gramoxone Inteon™	S	Annual broadleaf weeds & grasses	Post	Foliar
Pendimethalin	Pendulum® 2G	S, H	Annual grasses & certain broadleaf weeds	Pre	Soil
Pendimethalin	Pendulum® 3.3 EC	S, H	Annual grasses & certain broadleaf weeds	Pre	Soil
Pendimethalin	Pendulum® AquaCap	S, H	Annual grasses & certain broadleaf weeds	Pre	Soil
Simazine	Sim-Trol® 90DF	S, H	Annual broadleaf weeds & grasses	Pre	Soil
Sulfometuron methyl	Oust® XP	S, H	Annual & perennial broadleaf weeds & grasses	Pre- & early post	Soil & foliar
Sulfometuron methyl	SFM 75	S, H	Annual & perennial broadleaf weeds & grasses	Pre- & early post	Soil & foliar
Sulfometuron methyl	Spyder™	S, H	Annual & perennial broadleaf weeds & grasses	Pre- & early post	Soil & foliar
Sulfometuron methyl Metsulfuron methyl	Oust® Extra	S, H, R	Annual & perennial broadleaf weeds & grasses; woody plants & vines	Pre- & post	Soil & foliar
Sulfometuron methyl Metsulfuron methyl	SFM Extra	S, H, R	Annual & perennial broadleaf weeds & grasses; woody plants & vines	Pre- & post	Soil & foliar

Table 2. Forestry herbicide applications

Active Ingredient (A.I.) (Common Name)	Trade Name	Labeled for Application [1]	Labeled for Controlling	Application Pre/post Emergence	Herbicide Activity
Triclopyr, triethylamine salt	Garlon® 3A	S, R (d), I, W	Woody plants; annual & perenial broadleaf weeds	Post	Foliar
Triclopyr, butoxyethyl ester	Garlon® 4	S, R (d, u), I	Woody plants; annual & perenial broadleaf weeds	Post	Foliar
Triclopyr, butoxyethyl ester	Forestry Garlon® 4	S, R (d, u), I	Woody plants; annual & perenial broadleaf weeds	Post	Foliar
Triclopyr, butoxyethyl ester	Forestry Garlon® XRT	S, R (d, u), I	Woody plants; annual & perenial broadleaf weeds	Post	Foliar
Triclopyr, butoxyethyl ester	Garlon® 4 Ultra	S, R (d, u), I	Woody plants; annual & perenial broadleaf weeds	Post	Foliar
Triclopyr, butoxyethyl ester	Pathfinder® II	R (d), I	Woody plants	Post	Foliar
Triclopyr, triethylamine salt	Tahoe™ 3A	S, R (d), I	Woody plants & vines; annual & perenial broadleaf weeds	Post	Foliar
Triclopyr, butoxyethyl ester	Tahoe™ 4E	S, R (d, u), I	Woody plants; annual & perenial broadleaf weeds	Post	Foliar
Triclopyr, triethylamine salt	Triclopyr 3SL	S, R (d), I, W	Woody plants & vines; annual & perenial broadleaf weeds	Post	Foliar
Triclopyr, butoxyethyl ester	Triclopyr 4EC	S, R (d, u), I	Woody plants; annual & perenial broadleaf weeds	Post	Foliar
Triclopyr, triethylamine salt Aminopyralid	Milestone® VM Plus [2]	S, R (d, u), I	Woody plants; annual & perenial broadleaf weeds	Pre- & post	Foliar

[1] S=Site preparation; H=Herbaceous weed control; R=Conifer release, (d) directed spray, (u) understory broadcast; I=Individual stems, (bs) basal soil; W=Wetlands; A=Aquatic areas;

[2] Supplemental labeling for forestry use