

FORAGE CROP AND PASTURE WEED CONTROL

HERBICIDES FOR ALFALFA AND OTHER LEGUME HAY CROPS*

Crop and Application Timing	Herbicide	Rate/Acre Broadcast		Weeds Controlled, Remarks and Precautions
		Active Ingredient	Formulation	
ALFALFA-PREPLANT, NO-TILL	Gramoxone Inteon 2SL (Paraquat)	0.63-1.0 lbs.	2.5-4.0 pts.	Use to control most annual and some perennial weeds prior to seeding. In sod, best results have been obtained with a split application (1.25-2.5 pts./A, 10 days to 3 weeks prior to planting, followed by 1.25 pts./A at planting). Apply in a minimum of 10 gals. of water/A. Add nonionic surfactant at 2 pts. per 100 gal. of spray mix.
	Touchdown/others** (Glyphosate 3ae)	0.75-2.25 lbs. (a.e.)	32-96 ozs. 3ae	For control of most annual weeds and better control of perennial weeds than Gramoxone Inteon. On most perennial weeds, glyphosate performs better in the fall than in the spring. See label for rates on individual weed species.
	Roundup WeatherMax** (Glyphosate 4.5ae)		22-64 ozs. 4.5ae	
Alfalfa, Birdsfoot Trefoil, Ladino or Red Clover - SEEDLING	Butyrac 200 2SC (2,4-DB)	1-1.5 lbs.	4-6 pts.	Controls small seedlings of musk thistle, turnips, cocklebur and ragweed. Does not control chickweed or henbit. Treat before weeds exceed 3 inches tall and when legume has two or more trifoliate leaves.
Alfalfa, Birdsfoot Trefoil, Ladino or Red Clover - SEEDLING or ESTABLISHED	Kerb 50WP (Pronamide)	0.75-1 lb.	1.5-2 lbs.	On pure alfalfa stands, use to control chickweed and several winter grasses such as ryegrass, cheat and annual bluegrass. Apply after legumes have reached the trifoliate stage. Do not apply if temperatures are above 55 F.
Alfalfa, SEEDLING or ESTABLISHED	Pursuit 2AS or 70DG (Imazethapyr)	0.063-0.094 lb.	4-6 ozs. 2AS or 1.44-2.16 ozs. 70DG	Apply overtop in seedling or established alfalfa to control several annual broadleaf weeds and some annual grasses. Higher rate required for grass control. Seedling alfalfa must be in the 2 trifoliate stage or larger. Apply before most weeds exceed 3 inches in height. Good control of pigweed, morningglory, cocklebur, foxtails and seedling johnsongrass. Always add nonionic surfactant at 1 qt./100 gal. of spray mix.
Alfalfa-ESTABLISHED	Butyrac 200 2SC (2,4-DB)	1-1.5 lbs.	4-6 pts.	Controls small seedlings of musk thistle, turnips, cocklebur and ragweed. Does not control chickweed, henbit, plantain or dock. Treat before weeds exceed 3 inches tall.
Alfalfa, Clover, Birdsfoot Trefoil - SEEDLING OR ESTABLISHED	Poast 1.5E (Sethoxydim)	0.19-0.28 lb.	1-2.5 pts. 1.5E	Apply low rate overtop to seedling or established crop for control of crabgrass, goosegrass, foxtails and other annual grasses. Use higher rate for johnsongrass and bermudagrass. A second application may be needed for control of regrowth. Always add crop oil concentrate at 2 pts./A.
Alfalfa, Birdsfoot Trefoil - SEEDLING OR ESTABLISHED	Select Max (Clethodim)	0.07 – 0.12 lb.	9 – 16 ozs.	Apply overtop to control crabgrass, fall panicum, broadleaf signalgrass or other annual grasses and johnsongrass. Use 9 to 16 ozs./A in seedling alfalfa and 12 to 16 ozs./A in established alfalfa for annual grasses. Use 12 ozs./A for johnsongrass or bermudagrass and follow with a second application if needed. See label. Always add crop oil concentrate at 1 qt./A.

Alfalfa - DORMANT FALL-SEEDED ESTABLISHED	Gramoxone Inteon 2SL (Paraquat)	0.19-0.31 lb. 0.25-0.5 lb.	0.75-1.25 pts. 1.0-2.0 pts.	Apply to dormant, pure alfalfa during late fall or winter months for control of chickweed, henbit, bluegrass and downy brome, and suppression of perennial grasses including orchardgrass, timothy, and smooth brome. Use a minimum of 10 gallons of water by ground, or 5 gallons of water by air. Always add a nonionic surfactant at 0.25% (1 qt. per 100 gallons of spray mix.) Application to alfalfa that is not dormant, or has broken dormancy, may result in stand and/or yield reductions. Replanting may be necessary. Green alfalfa foliage present at the time of application will be burned. Make only one application per season.
Alfalfa - DORMANT ESTABLISHED	Sencor or Lexone 4 L or 75 DF (Metribuzin)	0.5-0.75 lb.	1-1.5 pts. 4L, or 0.67-1 lb. 75 DF	Apply to dormant pure alfalfa or alfalfa-grass mixtures to control chickweed, henbit and several other broadleaf weeds. A partial reduction in grass stand may occur. Do not apply after new growth starts.
Alfalfa - ESTABLISHED or FIRST-YEAR, BETWEEN CUTTINGS	Gramoxone Inteon 2SL (Paraquat)	0.31 lb.	1.25 pts.	Apply immediately after alfalfa hay is removed for control of many seedling broadleaf and annual grass weeds. Do not treat more than 5 days after cutting. Add surfactant at 1 pt./100 gal. of spray mix. Alfalfa foliage present at time of application will be burned. First year alfalfa stands and yields may be reduced if alfalfa is allowed to regrow more than 2 inches.

^aCoarse-textured soils ^bMedium-textured soils ^cFine-textured soils

*See Table for Grazing and Hay Cutting Restrictions

**NOTE: Several brands of glyphosate have become available in recent years. Products differ in terms of concentration, rates and addition of surfactant. Always read the label before application.

Grazing and Cutting Restrictions for Alfalfa Herbicides - Lactating Dairy Animals (Days to Wait)

Herbicide	Days before Grazing	Days before Hay Cutting
Butyrac 200		
Seedling	60	60
Established	30	30
Gramoxone Inteon		
Between cuttings	30	30
Dormant	60	60
Kerb	120	120
Poast	7	14
Pursuit	30	30
Roundup WeatherMax and other glyphosate formulations (burndown)	56	56
Select Max	15	15
Sencor/Lexone	28	28

EXPECTED WEED RESPONSE TO AT-PLANTING AND POSTEMERGENCE ALFALFA HERBICIDES

	Butyrac	Pursuit	Poast	Select Max	Gramoxone Between Cuttings
Annual grasses	0	7	9	9	7
Annual ryegrass	0	-----	8*	8*	NA
Chickweed	2	-----	0	0	NA
Cocklebur	8	8	0	0	6
Curly dock	1	-----	0	0	2
Deadnettle	1	-----	0	0	NA
Henbit	1	-----	0	0	NA
Johnsongrass, Rhizome	0	6	7	9	2
Johnsongrass, Seedling	0	7	9	9	6
Lambsquarters	4	5	0	0	6
Morningglory	8	8	0	0	7
Musk thistle	7**	-----	0	0	2
Nutsedge	1	3	0	0	2
Pigweed	6	9	0	0	7
Plantain	2	-----	0	0	2
Ragweed	6	7	0	0	7

*Fall application

**Newly-emerged seedlings

NA = Not applicable

KEY TO RESPONSE RATINGS: 0=No control; 10=100% control; --=Data not available.

Ratings are based on labeled rates of each herbicide, applied at the optimum timing for each weed.

HERBICIDES FOR PASTURES*

Crop and Application Timing	Herbicide	Rate/Acre Broadcast		Weeds Controlled, Remarks and Precautions
		Active Ingredient	Formulation	
Pasture, Bermudagrass - (only) DORMANT	Gramoxone Inteon 2SL (Paraquat)	0.25-0.5 lb.	1.0-2.0 pts.	Apply to dormant bermudagrass for control or suppression of emerged winter annual weeds. For control of little barley, apply before the mid-boot stage. Add nonionic surfactant at the rate of 1 qt./100 gal. of spray mix.
Pasture, Bermudagrass - (only) ESTABLISHED	Metsulfuron 60DF (various brands)	0.0038-0.011 lb.	0.1-0.3 oz.	Bermudagrass should be established at least 60 days prior to application. Apply before weeds are 4 inches tall or in diameter. Use 0.1 to 0.2 ozs./A for control of bitter sneezeweed, buttercup, Carolina geranium, common chickweed, dandelion, horseweed, plantain, spotted spurge, curly dock and several others. For dogfennel, common yarrow, and musk thistle, use 0.2 to 0.3 ozs./A. Add nonionic surfactant at 1 to 2 pts./100 gal. of spray mix. Avoid application during spring green-up.
Pasture - Seedling, GRASS ONLY	Aim 2EC (carfentrazone)	0.016-0.023 lb.	1.0-1.5 oz.	Apply to seedling forage grasses no sooner than 7 days following emergence. Use for control of a limited number of broadleaved weeds, under 4 inches tall, such as pigweeds, black nightshade, lambsquarters, and velvetleaf. Do not make applications less than 7 days apart. Always add nonionic surfactant at the rate of 1 qt./100 gal. of spray mix.
Pasture - Seedling, GRASS ONLY	2,4-D Amine 4L	0.5- 0.75 lb.	1- 1.5 pts.	Can be used on all forage grasses for control of buttercup, thistles, wild turnip, horseweed and plantain. Apply when weeds are less than 4 in. tall and actively growing. This treatment will kill clovers and other legumes in the seedling stage. Do not apply if seedling grasses do not show good vigor. Add nonionic surfactant at the rate of 1 qt./100 gal. of spray mix.
Pasture – Newly Established, GRASS ONLY	ForeFront R&P (Aminopyralid + 2,4-D)	0.06 + 0.5 – 0.11 + 0.87 lbs.	1.5 – 2.6 pts.	During the year of establishment, apply after grasses have begun to tiller, develop a good secondary root system, and show good vigor. Use for control of buttercups, thistles, cocklebur, pigweeds, bitter sneezeweed, horsenettle, tall ironweed, plantains, and several others. See label for individual weed rates. Will kill pasture legumes, but reseeding may be possible one year later (see label). Always add a nonionic surfactant at the rate of 1 qt. /100 gal. of spray mix.
Pasture - Newly Established, GRASS ONLY	Grazon P+D (picloram + 2,4-D) For use only in approved TN counties. See map later in this section	0.14 + 0.5 – 0.2 + 0.75 lb.	2-3 pts.	This is a Restricted Use Pesticide (RUP) which requires a license to purchase and apply. Apply after newly seeded grasses have begun to tiller and develop a secondary root system (usually around the 4-leaf stage of grasses). Use for thistles, horsenettle, ragweed, cocklebur, buttercup and others. Will kill pasture legumes, but reseeding may be possible one year later. On most weeds apply in March to mid-summer when actively growing. Most perennials will require higher rates (see label). Always add nonionic surfactant at the rate of 1 qt./100 gal. of spray mix.
Pasture - Newly Established, GRASS ONLY	Milestone (Aminopyralid)	0.063 - 0.11 lb.	4 - 7 oz.	During the year of establishment, apply after grasses have begun to tiller and develop a secondary root system, and show good vigor. Use for control of buttercups, thistles, cocklebur, pigweeds, bitter sneezeweed, horsenettle, tall ironweed, and several others. Weak on plantains. Control may be improved by tank mixing with 2,4-D. A limited number of weeds such as cocklebur and smartweed may be controlled with 3 oz./A. See label for individual weed rates. Will kill pasture legumes, but reseeding may be possible one year later. Always add a nonionic surfactant at the rate of 1 qt./100 gal. of spray mix.

	Rage D-Tech (Carfentrazone + 2,4-D ester)	0.008 +0.25 – 0.033+1.0	0.5 – 2.0 pts.	Broader spectrum control than Carfentrazone (Aim) applied alone. May be applied to newly established grasses beginning at the 5-leaf stage. Add non-ionic surfactant at the rate of 1qt./100 gal. of spray mix.
	Redeem R&P (triclopyr + clopyralid)	0.56 + 0.19 - 0.84 + 0.28 lb.	2-3 pts.	For use when products containing 2,4-D are not an option. Apply after newly seeded grasses have begun to tiller and develop a secondary root system (usually around the 4-leaf stage of grasses). Use for thistles, ragweed, cocklebur, buttercup and others. Will kill pasture legumes, but reseeding is usually possible the next growing season. On most weeds apply in March to mid-summer when actively growing. Most perennials will require higher rates (see label). Always add nonionic surfactant at the rate of 1 qt./100 gal. of spray mix.
Pasture - Established, GRASS and WHITE CLOVER	2,4-D Amine 4L OR 2,4-D Low Volatile Ester 4EC	0.75-1.0 lb.	1.5-2 pts.	Can be used on all established mixtures of grass and white clover. Apply in March to early April for control of buttercup, musk thistle, dandelion and plantain. Apply in June for control of cocklebur, bitter sneezeweed, pigweed, spiny amaranth and ragweed. NOTE: The amine formulation is less volatile than low volatile ester formulations, but is less effective on hard-to-control species such as thistles, plantain and other perennials. Add nonionic surfactant at the rate of 1 qt./100 gal. of spray mix.
Pasture - Established, GRASS and ANNUAL LESPEDAZA	2,4-D Amine 4L	0.5-0.75 lb.	1-1.5 pts.	Can be applied when lespedeza is 3 to 7 inches tall (normally mid-June). Earlier applications will result in more severe injury. Add nonionic surfactant at the rate of 1 qt./100 gal. of spray mix.
Pasture – Established GRASS ONLY	Aim 2EC (carfentrazone)	0.023 – 0.031 lb.	1.5 - 2 oz.	Use for control of a limited number of broad leaved weeds, under 4 inches tall, such a pigweeds, black nightshade, and velvetleaf. Do not make applications less than 7 days apart. Always add nonionic surfactant at the rate of 1 qt./100 gal. of spray mix.
Pasture - Established, GRASS ONLY	2,4-D Ester 4EC	2.0 lbs.	2 qts.	For wild garlic control, apply in October to mid-November or March to mid-April when daytime temperature is at least 65 F. Repeat twice annually for 2 years to eliminate wild garlic. This same programs is effective on buckhorn plantain. This rate of 2,4-D will kill all legumes, including established white clover. Add nonionic surfactant at the rate of 1 qt./100 gal. of spray mix.
Pasture –Established, GRASS ONLY	ForeFront R&P (Aminopyralid + 2,4-D)	0.06 + 0.5 – 0.11 + 0.87 lbs.	1.5 – 2.6 pts.	Use for control of buttercups, thistles, cocklebur, pigweeds, bitter sneezeweed, horsenettle, tall ironweed, plantains, beggarweed, and several others. See label for individual weed rates. Will kill pasture legumes, but reseeding may be possible one year later (see label). Always add a nonionic surfactant at the rate of 1 qt. /100 gal. of spray mix.
	Grazon P+D (picloram + 2,4-D) For use only in approved TN counties. See map later in this section.	0.14 + 0.5 – 0.2 + 0.75	2-3 pts.	This is a Restricted Use Pesticide (RUP) which requires a license to purchase and apply. Use for thistles, horsenettle, ragweed, cocklebur, buttercup and others. Will kill pasture legumes, but reseeding may be possible one year later. On most weeds apply in March to mid-summer when actively growing. Most perennials will require higher rates (see label). Always add nonionic surfactant at the rate of 1 qt./100 gal. of spray mix.

Milestone (Aminopyralid)	0.063 - 0.11 lb.	4 - 7 oz.	Use for control of buttercups, thistles, cocklebur, pigweeds, bitter sneezeweed, horsenettle, tall iron weed, and several others. Weak on plantains. Control may be improved by tank mixing with 2,4-D. A limited number of weeds such as cocklebur and smartweed may be controlled with 3 oz./A. See label for individual weed rates. Will kill pasture legumes, but reseeding may be possible one year later. Always add a nonionic surfactant at the rate of 1 qt./100 gal. of spray mix.	
Rage D-Tech (Carfentrazone + 2,4-D ester)	0.008 +0.25 – 0.033+1.0	0.5 – 2.0 pts.	Broader spectrum control than Carfentrazone (Aim) applied alone. Applications to the established grasses may be made up to the boot stage. Add non-ionic surfactant at the rate of 1qt./100 gal. of spray mix.	
Redeem R&P (triclopyr + clopyralid)	0.56 + 0.19 - 0.84 + 0.28	2-3 pts.	For use when products containing 2,4-D are not an option. Use for thistles, ragweed, cocklebur, buttercup and others. Will kill pasture legumes, but reseeding is usually possible the next growing season. On most weeds apply in March to mid-summer when actively growing. Most perennials will require higher rates (see label). Always add nonionic surfactant at the rate of 1 qt./100 gal. of spray mix.	
Surmount (picloram + fluroxypyr) For use only in approved TN counties. See map later in this section.	0.13 + 0.13- 0.5 + 0.5	1.5 – 6 pts.	This is a Restricted Use Pesticide (RUP) which requires a license to purchase and apply. Use for brush control plus residual broadleaf weed control. Especially good on blackberry, ironweed, horsenettle, thistles, etc. For woody plant control, apply in summer after plants have fully leafed out. For blackberry, apply in summer after fruit drop when good moisture is available. Usual broadcast rates for woody plant control: 3-4 pints/acre. Always add nonionic surfactant at the rate of 1 qt./100 gal. of spray mix.	
PastureGard (triclopyr + fluroxypyr)	0.38 + 0.13 - 1.5 + 0.5	2-8 pts.	Use when brush or woody plants have begun to establish in pasture. May be tank-mixed with other products to improve control of herbaceous weeds. Excellent control of serecia lespedeza. Especially good on blackberry and other woody plants. For woody plant control, apply in summer after plants have fully leafed out. For blackberry, apply in summer after fruit drop when good moisture is available. Usual broadcast rates for woody plant control: 3-4 pints/acre. May be used on fencerows and for individual plant treatments of trees and brush. Always add nonionic surfactant at the rate of 1 qt./100 gal. of spray mix.	
Weedmaster 3.87SL (Dicamba + 2,4-D Amine)	(0.125 + 0.36) to (0.5 + 1.4 lbs.)	1-4 pts.	Will usually give control of a wider range of weeds than either herbicide alone. Only partially effective on difficult-to-control perennials such as dock, brambles and horsenettle. High rates (see label) required for difficult-to- control species. Will kill all pasture legumes. Add nonionic surfactant at the rate of 1 qt./100 gal. of spray mix.	
Sorghum-Sudangrass Hybrids - POSTEMERGENCE	AAtrex 4L or 90WDG (Atrazine)	2.0 lbs.	2 qts. or 2.2 lbs.	Apply overtop once a stand is obtained and before weeds exceed 1.5 inches in height. Do not apply after crop is 12 inches in height. See label for surface and groundwater protection measures. Atrazine is not labeled on sweet sorghum.

*See Table for Grazing, Hay Cutting and Slaughter Restrictions.

Pasture and Grass Hay Herbicide Residues – Precautions and Reminders

Certain pasture herbicides (ForeFront R&P, Grazon P+D, Milestone and Surmount) contain active ingredients which may persist in treated soil, grass, harvested hay, and in cattle manure and urine. Numerous broadleaf crops, garden vegetables and ornamentals are very sensitive to minute amounts of these active ingredients. Because of this, careful planning is required regarding use of treated pastures and hay, in the movement of animals which have been grazing in treated pastures or which have been fed treated hay, and in the use of manure from animals which have been grazing in treated pastures or which have been fed treated hay. These herbicides are for use in permanent grass pastures and grass hay fields only. They should not be used in fields which will be rotated to broadleaf crops.

Manure from animals which have been grazing treated pastures or which have been fed treated hay should not be used to fertilize broadleaf crops or home gardens unless the animals have been withdrawn from treated pastures or hay (3 days for ForeFront R&P and Milestone, 7 days for Grazon P+D and Surmount). Likewise, treated hay should not be used for mulch in vegetable production, gardens or landscape beds. Do not transfer animals which have been grazing treated pastures or which have been fed treated hay to fields which will be rotated to sensitive crops unless they have been withdrawn from treated pastures or hay (3 days for ForeFront R&P and Milestone, 7 days for Grazon P+D and Surmount).

EXPECTED WEED RESPONSE TO PASTURE HERBICIDES

	LATE WINTER TO EARLY SPRING APPLICATIONS							FALL (NOVEMBER TO EARLY DECEMBER) APPLICATIONS					
	2,4-D Ester	2,4-D Amine	ForeFront R&P	Grazon P+D*	Milestone	Redeem R&P	Weedmaster	2,4-D Ester	2,4-D Amine	Grazon P+D*	Milestone	Redeem R&P	Weed Master
Bedstraw	3	3	9	9	9	----	3	2	2	9	9	----	2
Broadleaf plantain	8	7	8	8	2	8	9	8	7	8	2	8	9
Buckhorn plantain	7	6	7	8	2	8	8	7	6	8	2	8	8
Bull thistle	8	7	9	9	9	9	8	9	7	9	9	9	9
Buttercups	9	8	9	9	8	9	9	9	8	9	8	9	9
Carolina geranium	5	4	9	9	9	----	7	4	3	9	9	----	6
Common chickweed	2	1	----	8	----	8	5	3	2	9	----	9	8
Curly dock	4	3	9	9	9	----	4	5	3	9	9	----	6
Dandelion	9	8	9	9	9	8	8	9	8	9	9	8	8
Henbit	2	1	----	8	----	8	4	3	2	8	----	8	7
Horseweed	9	8	9	9	9	9	9	9	8	9	9	9	9
Musk thistle	8	7	9	9	9	9	7	9	8	9	9	9	8
Prickly lettuce	8	7	9	9	9	8	8	8	6	9	9	8	8
Red sorrel	3	3	----	8	----	7	5	3	3	8	----	8	6
Sowthistle	8	8	9	9	9	----	9	7	7	9	9	----	8
Wild garlic	8	6	6	5	4	----	6	8	6	5	5	----	6

Key to Response Ratings: 0=No control; 10=100% Control; -- = Data not available

Ratings are based on labeled rates of each herbicide, applied at the optimum time for each weed.

*For use only in approved TN counties. See map later in this section

EXPECTED WEED RESPONSE TO PASTURE HERBICIDES: LATE-SPRING TO SUMMER APPLICATIONS

	2,4-D Ester	2,4-D Amine	ForeFront R&P	Grazon P+D*	Milestone	Redeem R&P	Weedmaster
Beggarweed	3	2	8	9	9	-----	4
Bitter sneezeweed	8	7	9	9	9	-----	8
Brambles	4	2	4	6	3	6	5
Chicory	5	4	-----	8	-----	8	8
Common cocklebur	9	9	9	9	9	9	9
Common lambsquarters	9	9	9	9	9	8	9
Cudweed	3	2	9	9	9	-----	6
Dogfennel	6	6	7	8	4	7	7
Goldenrod	6	4	5	8	4	6	7
Horsenettle	3	2	8	9	8	5	4
Jimsonweed	8	7	8	4	8	9	8
Maypop passionflower	0	0	4	4	3	0	0
Milkweed	3	2	-----	5	3	-----	6
Oxeye daisy	5	4	9	8	9	-----	8
Pigweeds	9	9	8	7	8	4	9
Pokeweed	5	4	8	4	8	2	6
Prickly pear	0	0	0	6	0	0	0
Prickly sida	4	4	8	5	8	-----	5
Purple (perilla) mint	8	7	8	7	8	-----	8
Ragweeds	9	8	9	9	9	9	9
Smartweed	7	5	9	-----	9	-----	8
Spiny amaranth	9	7	9	7	8	4	9
Sumpweed	9	8	-----	7	-----	8	9
Tall ironweed	7	6	8	6	8	6	7
Trumpet creeper	0	0	0	0	0	0	0
White heath aster	7	5	-----	8	-----	-----	7
White snakeroot	6	6	9	8	9	-----	7
Wild carrot	7	7	8	8	6	8	7
Wingstem	8	7	9	8	9	-----	8

Key to Response Ratings: 0=No control; 10=100% Control; -- = Data not available

Ratings are based on labeled rates of each herbicide, applied at the optimum time for each weed.

*For use only in approved TN counties. See map later in this section

SPOT TREATMENTS FOR SPECIFIC WEEDS IN PASTURES*

Weed	Herbicide	Amount of Formulation Per		Remarks
		1 gal.	100 gal.	
Bermudagrass	Roundup Ultra 4L (Glyphosate)	5 Tbsp.	2 gal.	Apply a 2% mixture of Roundup Ultra in water to actively growing bermudagrass when seed heads are present. Retreatment may be required. See labels for other glyphosate formulations.
Brambles	Metsulfuron 60DF (various brands)	0.01 oz.	1 oz.	Apply as a foliar spray to runoff in the spring after brush is fully leafed. Complete coverage of all foliage and stems is required for control. On tall, dense stands it is often necessary to spray from both sides to get adequate coverage. Add a nonionic surfactant at the rate of 1 to 2 qts./100 gal. of spray mix.
	Crossbow 3EC (2,4-D ester+ Triclopyr ester)	2.5 to 4 Tbsp.	1 to 1.5 gal.	Apply as a foliar spray to runoff in the spring after brambles are fully leafed. Complete coverage of leaves and green stems is needed.
	PastureGard (triclopyr + fluroxypyr) + surfactant	1.3 to 2 oz. + 4 tsp.	1 to 1.5 gal. + 2 qt.	Apply as a foliar spray after fruit drop in summer. Apply when moisture is adequate. Spray to wet, avoiding runoff. Spray all leaves and branches
	Remedy 4EC (Triclopyr) + surfactant	4 tsp. + 4 tsp.	2 qt. + 2qt.	Apply as a foliar spray to thoroughly cover all leaves and green stems in the spring after brambles are fully leafed.
	Roundup Ultra 4L (Glyphosate)	2.5 to 4 Tbsp.	1 to 1.5 gal.	Apply as a foliar spray in late summer or early fall after berries have set or dropped. See labels for other glyphosate formulations.
Buckbrush	Metsulfuron 60DF (various brands)	0.01 oz.	1 oz.	University of Tennessee demonstrations have shown good performance of Metsulfuron on buckbrush. See Remarks for Metsulfuron under Brambles section.
Honeysuckle	2,4-D Amine 4L	2 Tbsp.	3 qts.	Apply as a foliar spray when plants are actively growing, prior to bloom stage. Thorough coverage is needed. Add a nonionic surfactant at the rate of 2 qts./100 gal. of spray mix (2 Tbsp./1 gal.).
	Remedy 4EC (Triclopyr) + surfactant	4 tsp. + 4 tsp.	2 qt. + 2qt.	Apply as a foliar spray when plants are actively growing, prior to bloom stage. Complete coverage is necessary.
	Roundup Ultra 4L (Glyphosate)	2.5 to 4 Tbsp.	1 to 1.5 gal.	Apply as a foliar spray when plants are actively growing, at or beyond the bloom stage. Use the higher rate for plants that have reached the woody stage. Thorough spray coverage is needed. See labels for other glyphosate formulations.
Ironweed	Crossbow 3EC (2,4-D ester+ Triclopyr ester)	2.5 to 4 Tbsp.	1 to 1.5 gal.	Apply as a foliar spray in late spring to early summer when plants are actively growing. Thorough coverage is needed.
	PastureGard (triclopyr + fluroxypyr) + surfactant	1.3 oz. + 4 tsp.	1 gal. + 2 qt.	Apply as a foliar spray in late spring through early summer when plants are actively growing.

Multiflora Rose	Metsulfuron 60DF (various brands)	0.01 oz.	1 oz.	See remarks under brambles section for Cimarron.
	Crossbow 3EC (2,4-D ester+ Triclopyr ester)	2.5 to 4 Tbsp.	1 to 1.5 gal.	Apply as a foliar spray to runoff in spring when plants are at the early to mid-flower stage. Complete coverage of leaves and green stems is needed.
	PastureGard (triclopyr + fluroxypyr) + surfactant	1.3 to 2.6 oz. + 4 tsp.	1 to 2 gal. + 2 qt.	Apply as a foliar spray after plants have complete foliage. Apply when moisture is adequate. Spray to wet, avoiding runoff. Spray all leaves and branches.
	Remedy 4EC (Triclopyr) + surfactant	4 tsp. + 4 tsp.	2 qt. + 2qt.	Apply as a foliar spray to runoff in spring when plants are at the early to mid-flower stage. Complete coverage of leaves and green stems is needed.
	Roundup Ultra 4L (Glyphosate)	2.5 Tbsp.	1 gal.	Apply as a foliar spray in the summer after full bloom stage. Apply before Japanese beetles or other leaf-feeding insects damage leaves. Complete leaf coverage is needed. See labels for other glyphosate formulations.
Osage orange (bois d'arc) Locust, Sassafras, Sumac, Sweetgum	Remedy 4EC (Triclopyr) + surfactant	4 tsp. + 4 tsp.	2 qt. + 2qt.	Apply as a foliar spray following full leaf development. Thorough coverage of all foliage is necessary for control.
Thistle, Canada	Metsulfuron 60DF (various brands)	0.01 oz.	1 oz.	Apply as a foliar spray in the spring when plants are at least 6 to 10 inches tall and before flowering. Thorough coverage is needed. Add a nonionic surfactant at the rate of 1 to 2 qts./100 gal. (2 to 4 tsp./gal).
Thistle, Musk	2,4-D Ester 4EC OR 2,4-D Amine 4L	2 Tbsp.	3 qts.	Apply ester formulation as a foliar spray to the point of runoff to small plants, less than 6-8 inches tall in late winter to early spring, or in the fall. If treating regrowth following mowing in the summer, use the amine formulation to reduce vapor drift.
Yucca	Remedy 4EC (Triclopyr) in diesel or fuel oil	5 Tbsp.	2 gal.	Prepare a 2% (by volume) solution of Remedy in diesel or fuel oil. Thoroughly wet the center of the plant including growing point and leaf bases to the soil surface. Complete coverage of leaves is not necessary.

*See Table for Grazing, Hay Cutting and Slaughter Restrictions

Grazon P+D and Surmount Guidelines for Tennessee

Grazon P+D and Surmount are marketed in a limited number of counties in Tennessee. These counties were chosen because they have little or no acreage of cotton, tobacco, and certain other sensitive crops or because the counties have had a history of Grazon P+D use without non-target problem. The University of Tennessee does not recommend the use of Grazon P+D or Surmount outside of these counties. See figure on page 83 of this manual.

Grazon P+D and Surmount are safe on established cool-and warm-season grasses used for pasture and hay production. They provide good control of a number of broadleaf weeds. Both provide some residual control. The residual effect will depend on temperature, soil type, moisture and plant sensitivity. These products will kill all pasture legumes and re-seeding should not be attempted within one year of application.

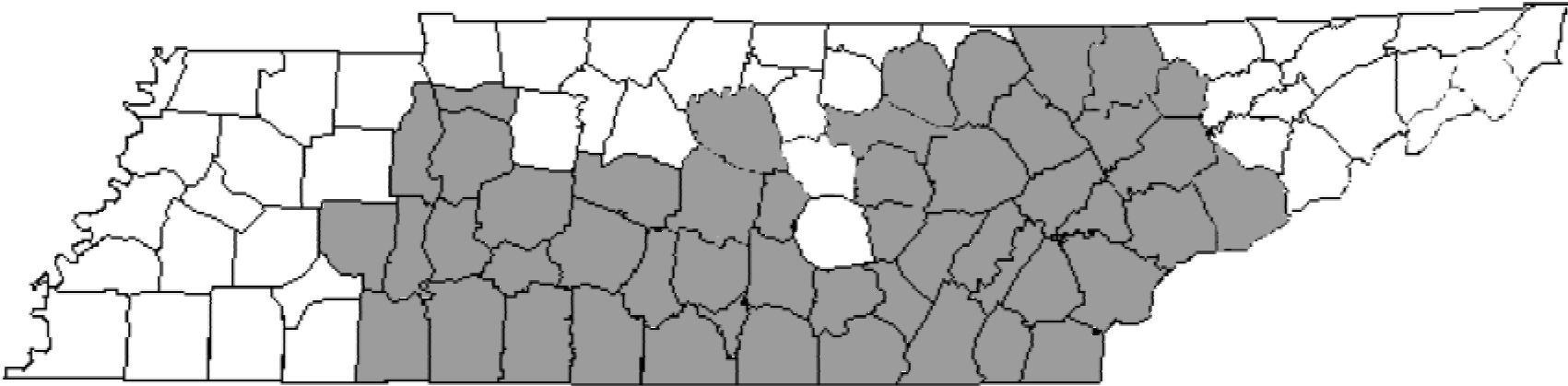
Grazon P+D and Surmount are restricted use pesticides, requiring applicators to have a commercial pesticide applicator certification card. They are restricted use due to the risk of injury to susceptible, non-target plants. Broadleaf crops, like cotton, tobacco, tomatoes and others, are very sensitive to both herbicides. Care must be taken in use of hay from fields treated with Grazon P+D or Surmount. Do not spread manure from animals which have grazed on, or have been fed hay on fields where picloram sensitive crops will be grown. Due to this sensitivity, it is recommended to use a sprayer dedicated to pasture applications only. Read and understand the label restrictions before use of this product.

Check List for Grazon P+D and Surmount Use

If all of the following are answered as “satisfactory,” then an application of Grazon P+D or Surmount may be recommended.

- Is the site located within one of the approved counties for this herbicide?
- Does the applicator have a restricted use applicator certification or use a custom applicator?
- Is the site properly buffered from sensitive crops and other off-target species, including ornamentals?
- Is there surface water (ponds or streams) on site? If so, does the applicator know to keep a 50 foot buffer?
- Has the required personal protective equipment been prepared?
- Are the wind conditions calm enough to prevent drift?
- Is rain in the forecast? If so, the application should be delayed.
- Does the applicator / land manager understand the grazing, haying and manure restrictions (see label)?
- Is there a risk of surface runoff of the herbicide, including erosion? (e.g., does the site contain steep slopes with bare soil?) If so, the application is not recommended.
- Is the site a permanent pasture? (If there is intention to rotate to any field crops, ornamentals, tobacco, vegetables or other vegetation, application is not recommended.)
- Does the applicator understand the sprayer clean out requirements?

**Tennessee Counties Approved for
Grazon P+D and Surmount Application***



*Shaded counties are approved for Grazon P+D and Surmount application.

Anderson	Cannon	Grundy	Knox	Maury	Polk	Sevier	Wilson
Bedford	Coffee	Hamilton	Lawrence	McMinn	Putnam	Scott	
Benton	Cumberland	Hardin	Lewis	Meigs	Overton	Union	
Bledsoe	Decatur	Henderson	Lincoln	Monroe	Rhea	Van Buren	
Blount	Fentress	Hickman	Loudon	Moore	Roane	Wayne	
Bradley	Franklin	Houston	Marion	Morgan	Rutherford	White	
Campbell	Giles	Humphreys	Marshall	Perry	Sequatchie	Williamson	

Grazing, Hay Cutting and Animal Slaughter Restrictions for Pasture Herbicides (Days to Wait, Withdraw Animals)

Herbicide	Beef cattle, Non-lactating dairy cattle and other livestock			Lactating Dairy Cattle		
	Grazing	Hay Cutting	Slaughter	Grazing	Hay Cutting	Slaughter
Aim	0	0	**N	0	0	**N
Metsulfuron	0	0	0	0	0	0
Crossbow*	0	7	3	14	1 yr.	3
ForeFront R&P	0	7	3	0	7	**N
Gramoxone Inteon (dorm. bermudagrass)	40	40	**N	40	40	**N
Grazon P+D (picloram + 2,4-D)	0	30	3	7	30	3
Milestone	0	0	3	0	0	3
PastureGard (triclopyr + fluroxypyr)	0	14	3	Next growing season	14	3
Rage D-Tech	0	30	3	7	30	3
Redeem R&P	0	7	3	14	1 yr.	3
Remedy	0***	7***	3	14***	1 yr.	3
Roundup WeatherMax (spot treatment)	14	14	**N	14	14	**N
Surmount (picloram + fluroxypyr)	0	30	3	Next growing season	30	3
2,4-D	0	30	3	7	30	3
Weedmaster	0	37	30	7	37	30

*2 gals./A or less

**N = no information on label

*** = 2 qt./A or less

Weed Control in Switchgrass Grown for Biofuel Feedstock

The Tennessee Biofuels Initiative is a unique partnership among the State of Tennessee, The University of Tennessee, Oak Ridge National Laboratory (ORNL), and DuPont Danisco Cellulosic Ethanol LLC. The centerpiece of the program is a 250 thousand gallon per year cellulosic ethanol pilot research plant under construction in Vonore. One of the feedstocks which will be used for ethanol production at this plant will be switchgrass, and the University of Tennessee has contracted with area producers to grow it. The following weed control suggestions are intended for those producers who are growing switchgrass for biofuel production.

Weed Competition during establishment. Our previous experience with switchgrass establishment for wildlife food plots and subsequent experience with switchgrass grown for biofuel has shown that the stand is slow to establish, and weed problems during the first two years, particularly during year one, can be severe. While it was found that most broadleaf weeds can be effectively managed with existing herbicides used in grass pastures and hay fields, grass weeds such as large crabgrass, broadleaf signalgrass, goosegrass and johnsongrass are more challenging.

Site selection and planning. As with other crops, one of the first steps in a well-planned weed management program begins with site selection and preparation. Because switchgrass is not a strong competitor with weeds during the first two years of growth, producers are encouraged, if possible, to avoid planting switchgrass into fields which have a history of heavy weed pressure. If this is not possible, a number of steps can be taken during the year prior to switchgrass planting to reduce weed pressure. For converted crop fields, producers are encouraged to consider planting these fields to Roundup Ready soybeans during the year prior to switchgrass. This will allow the use of sequential applications of glyphosate to control weeds. For converted pastures with a history of broadleaf weed pressure, several effective herbicide options are available to control broadleaf weeds and still utilize these pastures for grazing during the year prior to switchgrass.

Plant no-till if possible. Because many candidate switchgrass fields in East Tennessee are rolling and subject to soil erosion, producers are encouraged to establish switchgrass using no-till. In converted cropland, apply at least one burndown application of glyphosate or Gramoxone Inteon in the spring prior to planting. As with other no-till crops, make the burndown choice based upon weeds present. Use the burndown table of this publication in the selection process (see table of contents for page number). For converted pastures where no fall grazing is planned, consider making an application of glyphosate in the fall prior to planting switchgrass. Research at the University of Tennessee has shown that tall fescue is much easier to kill in the fall than in the spring. Also, this same research has shown that soil erosion over the winter is not a problem where a dense tall fescue sod has been killed during the previous fall. Orchardgrass is more difficult to kill than is tall fescue. A follow-up application of glyphosate will likely be needed. Gramoxone Inteon is weak on orchardgrass. Also, a follow-up application may be required the next spring to control winter weeds which can emerge after the fall glyphosate application.

Conventional tillage situations. Certain weeds such as bermudagrass, dallisgrass and broomsedge cannot be effectively controlled in no-till. These are warm season perennial grasses which will be strong competitors with switchgrass seedlings. **Avoid fields which are heavily infested with bermudagrass.** Producers are encouraged to consider tillage in the fall prior to planting switchgrass in fields infested with dallisgrass and broomsedge. Producers are also strongly advised to sow a wheat cover crop following fall tillage so as to reduce soil erosion over the winter. The wheat cover crop may be easily killed with an application of glyphosate the following spring prior to planting switchgrass.

Herbicides for use in switchgrass. Currently there are no labeled preemergence herbicides for use in switchgrass grown for biofuel in Tennessee, but there are a number of postemergence options. Because of this, producers are encouraged to closely monitor newly-planted fields for weed emergence. While weeds should be controlled while they are small, care must be taken regarding use of most herbicides on small, seedling switchgrass so as to minimize the chances of crop injury. In certain situations, clipping weeds at a height above the switchgrass may be an option to open the canopy and allow sunlight to reach the crop. This will allow the switchgrass to grow to a stage where it will be more tolerant of herbicides such as Accent. As with other perennial grasses, herbicide tolerance of switchgrass is related to the plant's developmental stage. Plants which have developed a healthy secondary root system and which have begun to tiller are tolerant of most labeled herbicides. The following table contains suggested postemergence herbicides for use in switchgrass.

HERBICIDES for USE IN SWITCHGRASS GROWN FOR BIOFUELS

Herbicide	Rate/Acre Broadcast		Weeds Controlled, Remarks and Precautions
	Active Ingredient	Formulation	
AAtrex 4L (atrazine) Restricted use herbicide Special Local Need 24 (c) Label for the following Tennessee counties only: Anderson, Blount, Bradley, Cumberland, Gibson, Greene, Hamilton, Knox, Loudon, Meigs, McMinn, Monroe, Morgan, Polk, Rhea, Roane and Sevier.	1-2 lb.	1-2 qts.	For use only in the year of establishment or the year following establishment. Apply overtop to control small broadleaf weeds and a limited number of grasses. Use 1 qt./A on soils containing from 1-2% organic matter, and 2 qt./A on soils with 2% or more organic matter. Use only on loam, silt loam, silty clay loam, clay loam, and silty clay soils with at least 1% organic matter. Add crop oil concentrate at the rate of 1 gal./100 gal. of spray mix. Do not feed treated switchgrass for hay or allow cattle to graze on areas that have been treated.
Accent 75DF (nicosulfuron) Special Local Need 24 (c) Label for Tennessee.	0.031 lb.	0.67 oz.	Apply overtop to control barnyardgrass, broadleaf signalgrass, foxtails, fall panicum, ryegrass and johnsongrass. Does not control crabgrass, bermudagrass, nor dallisgrass. Expect to see some crop injury, but this usually is temporary. Applications can be made any time after the switchgrass has reached the 2-leaf stage. Delaying applications can reduce crop injury but may result in poor control of large weeds. Do not make more than 2 applications per year. Always add nonionic surfactant at the rate of 1 qt./100 gal. of spray mix. Do not apply with crop oil concentrate. Do not apply if switchgrass does not show good vigor. Do not feed treated switchgrass for hay or allow cattle to graze on treated areas.

2,4-D Amine 4L	0.5- 0.75 lb.	1- 1.5 pts.	Can be used on seedling switchgrass for control of cocklebur, ragweed, pigweed, sicklepod and a few other summer annual weeds. Apply when weeds are less than 4 in. tall and actively growing. Do not apply if seedling switchgrass does not show good vigor. Add nonionic surfactant at the rate of 1 qt./100 gal. of spray mix.
ForeFront R&P (Aminopyralid + 2,4-D)	0.06 + 0.5 – 0.11 + 0.87 lbs.	1.5 – 2.6 pts.	During the year of establishment, apply after switchgrass has begun to tiller and develop a good secondary root system. Do not apply if switchgrass does not show good vigor. Use for control of thistles, cocklebur, pigweeds, ragweed, sicklepod, horsetail, tall ironweed, and several others. See label for individual weed rates. Always add a nonionic surfactant at the rate of 1 qt. /100 gal. of spray mix.
Metsulfuron 60DF (various brands)	0.004 lb.	0.1 oz.	Apply at 0.1 oz./A anytime after emergence of switchgrass during the year of establishment. Higher rates can be used once switchgrass is established (second or later years after planting). See label. Very effective for control of spotted spurge. Add nonionic surfactant at the rate of 1-2 pt./100 gal. of spray mix. Do not apply with crop oil concentrate. There are no grazing or hay cutting restrictions for Metsulfuron.
Milestone (Aminopyralid)	0.063 - 0.11 lb.	4 - 7 oz.	For use primarily in areas where 2,4-D drift is of concern. During the year of establishment, apply after grasses have begun to tiller and develop a secondary root system, and show good vigor. Use for control of thistles, cocklebur, pigweeds, ragweed, sicklepod, horsetail, tall ironweed, and several others. A limited number of weeds such as cocklebur and smartweed may be controlled with 3 oz. /A. See label for individual weed rates. Always add a nonionic surfactant at the rate of 1 qt. /100 gal. of spray mix.
PastureGard (triclopyr + fluroxypyr)	0.38 + 0.13 - 0.57 + 0.195	2- 3pts.	For use in converted pastures or other fields where serotia lespedeza, brambles and woody plants are troublesome. Apply in summer after plants have fully leafed out. During the year of establishment, apply after switchgrass has begun to tiller and develop a good secondary root system. Always add nonionic surfactant at the rate of 1 qt. /100 gal. of spray mix. For spot sprays, mix at the rate of 1 gal. of PastureGard + 1 qt. of nonionic surfactant / 100 gal. of spray mix and spray to thoroughly wet the foliage.

NOTE: Do not feed switchgrass treated with atrazine or Accent for hay or allow cattle to graze on areas that have been treated with atrazine or Accent.