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Weed Management in Grass Pastures, Hayfields, and Other Farmstead Sites

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Weeds can reduce the quantity and the stand life of desirable forage plants in pastures and hayfields. These unwanted plants are often more aggressive than existing or desired forage species and compete for light, water, and nutrients. Weeds can also diminish the quality and palatability of the forage available for livestock grazing, and certain weed species are potentially poisonous to grazing animals. The aesthetic value of a pasture is also impacted by weeds.

Therefore, it may be desirable to initiate weed management strategies that reduce the impact of weeds on forage production. However, not all weedy plants are detrimental to pastures or hayfields. In fact, some weedy plants provide nutritional value to grazing animals; thus, prudent management decisions are often required to determine when or if weed control should be initiated in a pasture or hayfield.

Effect of Weeds on Pasture Yield and Animal Performance

In general, weedy plants are usually not high yielding and are low in quality. Some weeds are eaten along with the desired forage grasses and legumes. In fact, the dry matter digestibility of several weed species during their early vegetative stage of growth is generally high and comparable to seeded forage species. Crude protein levels are also adequate for consumption by cattle. But, like many cultivated forage grasses, digestibility and crude protein decline as weeds mature. Thus, the greatest benefits in digestibility and crude protein are obtained from weeds and desirable forage species that are grazed during their early growth stages.

On the other hand, other weedy plants are unpalatable compared with the desirable forage species; thus, they are not normally consumed by animals. For example, weeds such as common cocklebur, common ragweed, and tall ironweed are selectively grazed to a greater extent compared with more palatable species such as crabgrass.

Poisonous Plants

One consideration before allowing livestock to graze fields heavily infested with weeds is the potential for exposure to poisonous plants. The potential for livestock poisonings depends on the availability and quantity of the poisonous plant, the stage of plant growth, the time of year, and the kind of animal. Most potentially poisonous plants (but not all plants) must be consumed in large enough quantities to cause animal death. Many plants have an undesirable taste, and animals do not consume them at levels that are toxic unless other forages are limited during periods of drought or long winter seasons. Several plants found in Kentucky that are potentially toxic are listed in Table 1.

Weed Control Methods

The way a pasture is managed can have a major impact on the presence of weedy plants. Production practices that result in overgrazing and low fertility levels favor emergence, propagation, and growth of weeds. The ideal approach is to incorporate practices that are more adaptable to the growth of the desirable forage species and less favorable for unwanted plants.

Although there are exceptions, most weeds do not compete well with a dense stand of desirable forage species. Further, to minimize the effects of weedy plants, pastures and hayfields should be managed to favor the vigorous growth of the desired forage species. Effective pasture management programs include these practices:

- Maintaining proper soil pH and fertility levels
- Using controlled grazing practices
- Mowing at proper timing and stage of maturity
- Allowing new seedings to become well established before use
- Renovating pastures when needed

Herbicides can be another useful tool for weed management in pastures and hayfields. They should be used where appropriate and when cost effective.

A program that integrates several different control strategies is generally more successful than relying on only one method. Weeds present at the time of herbicide application may be controlled, but if the forage stand is not vigorous and actively growing, new weed seedlings will soon emerge and occupy the bare areas that remain. Thus, without proper use of mechanical control methods and good cultural practices, herbicide use will not be beneficial.

Biological Control

Insects and natural plant diseases can sometimes be effective on certain weedy plant species to reduce their population. The most beneficial biological control agent released in Kentucky is the Thistle-head Weevil (*Rhinocyllus conicus*) which feeds on musk thistle seed. The adults of this insect will lay their eggs underneath developing flower buds when plants are bolting during the early spring. When the eggs hatch, the larvae burrow into the flowerhead and feed on the immature seed. Since its release in the mid-1970s, the Thistle-head Weevil has become established throughout much of Central Kentucky. Another

Table 1. Plants found in Kentucky potentially poisonous to livestock.

Risk	Plant	Toxic Parts	Animals Affected
Highest	Ohio Buckeye Horsechestnut (*Aesculus* spp.)	Young shoots, leaves, mature seed	All animals
	Mountain Laurel (*Kalmia latifolia*) Rhododendron (*Rhododendron maxium*)	All parts of plant, particularly the leaves	Cattle, goats, sheep
	Red Maple (*Quercus rubra*)	Leaves, especially when fallen, damaged, or wilted	Horses primarily
	Wild Black Cherry (*Prunus serotina*)	Wilted leaves	Cattle, goats, sheep most often affected, although horses can also be affected
	Yew, Japanese (*Taxus* spp.)	Leaves, bark, wood, seed	Cattle, horse, goats, sheep
Moderate	Castor Bean (*Ricinus communis*)	All parts of the plant	Horses most susceptible, but all animals can be affected
	Larkspur (*Delphinium tricorne*)	Entire plant; young leaves most toxic	Cattle most susceptible; other animals include horses and sheep
	Hemp Dogbane (*Apocynum cannabium*)	All parts of the plant, either green or dried in hay	Cattle, horses
	Horsetail (*Equisetum arvense*)		
	Scouring Rush (*Equisetum hyemale*)	Aboveground foliage of plant	Horses more susceptible than cattle or sheep
	Indian Tobacco (*Lobelia inflata*)	Leaves, stem, fruit	All animals
	Johnsongrass (*Sorghum halepense*)	All plant parts, particularly plants drought stressed, wilted, or after frost	Cattle, horses, goats, sheep
	Oaks (*Quercus* spp.)	Acorns; young shoots, leaves, sprouts; fall buds	Primary risk to cattle; also to other animals
	Perilla Mint (*Perilla frutescens*)	Leaves, stems, seeds	Most often cattle; also other animals
	Poison Hemlock (*Conium maculatum*)	Entire plant, particularly roots and seed	All livestock
Occasional	Black Locust (*Robina pseudoacacia*)	Inner bark, young shoots, leaves, flowers, pods, seed	Horses most susceptible, cattle, sheep
	Bracken Fern (*Pteridium latiusculum*)	All stages of plant growth (green or dry)	Sheep less susceptible than cattle and horses
	Buttercup (*Ranunculus* spp.)	Stem, leaves; the flowering plant contains more toxin than younger plants	All animals
	Common Cocklebur	Seed and young seedlings (cotyledon stage most toxic)	Swine, cattle, sheep
	Kentucky Coffee Tree (*Gymnocladius dioica*)	Leaves, seeds, pulp	Cattle, horses, goats, sheep
	Milkweed (*Asclepias* spp.)	All parts of the plant, either consumed green or dried in hay	Cattle, horses, goats, sheep
	Jimsonweed (*Datura stramonium*)	The entire plant, both green and dried; seed most toxic	Cattle, horses, sheep, swine
	Deadly Nightshade (*Solanum nigrum*)	All parts of the plant	Cattle, horses, goats, sheep, swine
	Pigweeds (*Amaranthus* spp.)	Leaves, stem	Cattle, sheep, and other ruminants are most susceptible
	Pokeweed (*Phytolacca americana*)	All plant parts, especially roots and seed	Cattle, horses, swine
	Common Sneezeweed (*Helenium autumnale*) Bitter Sneezeweed (*Helenium tenuifolium*)	All plant parts, either fresh or cured in hay, particularly bloom stage	Cattle, horses, sheep
	White Snakeroot (*Eupatorium rugosum*)	Leaves, stems, green flower heads	Cattle, horses, sheep; other domestic animals
	Star-of-Bethlehem (*Ornithogalum umbellatum*)	All parts of the plant, especially bulbs	Cattle, horses, sheep
	St. Johnswort (*Hypericum perforatum*)	All plant parts, either fresh or dried hay	Cattle, horses, sheep; goats to a lesser degree

insect that has been released for musk thistle control is the Thistle Rosette Weevil (*Trichosirocalus horridus*), but this insect has become less established.

Other natural enemies to weedy plants that can be occasionally observed in Kentucky include rose rosette disease found on multiflora rose, also known as witches' broom, and the presence of a natural microorganism (*Pseudomonas*) that can turn the upper leaves of Canada thistle a yellow to almost white appearance.

Cultural Practices

Seeding Forages or Renovation

Sometimes pasture and hayfields must be re-seeded or renovated to maintain proper stands. The time of year forage seeding occurs can determine weed species that will be most troublesome during the establishment phase. Seeding in late summer or early fall will enable the crop to become established and compete with weeds such as large crabgrass and yellow foxtail that emerge the following spring; however, a spring seeding is vulnerable to these weeds. Common chickweed, purple deadnettle, henbit, and other cool-season weeds that begin to emerge in late fall and early winter can compete with forages seeded in the fall.

When establishing grass-legume forage mixtures, it may be desirable to seed the grass component in late summer or fall and interseed the legume species the following spring. This would allow flexibility for use of a broadleaf herbicide, if needed, prior to seeding a legume.

Weed-free Seed

It is also important to use weed-free seed to prevent the introduction of weedy plants. The seed tag should be examined to determine the purity of the seed and the potential presence of weed seed contaminants. The state regulations of the Kentucky Seed Law classify certain plants such as Canada thistle, johnsongrass, and quackgrass as noxious weeds and prohibit their presence in commercial seed sold in Kentucky.

Fertility

Adjusting the soil pH and nutrient levels according to soil test recommendations helps increase the stand density of desirable forage species. However, such practices as the addition of lime and/or proper fertilization alone are usually not effective in eliminating established weeds. In fact, some weeds such as common chickweed, crabgrass, and curly dock can respond favorably to fertilization and grow well in fertile soils.

Grazing Practices

Grazing can be an effective and economical weed management tool. The greatest benefits are obtained when weeds are small. In the early vegetative stage of growth, many weeds can provide a good source of animal nutrition that would be comparable to desired forages. However, the forage quality of weeds declines rapidly as the plant matures.

Animals tend to selectively graze certain plant species because of differences in the plant's palatability; therefore, weeds such as horsenettle or tall ironweed become more prominent over time in grazed pastures because they are less palatable to the animal.

As grazing pressure increases, animal selectivity decreases; thus, more weeds are consumed by animals regardless of forage quality. Flash grazing (putting a lot of cattle, goats, or other livestock on a small area for a short time period) is one method whereby weedy-type plants could be consumed by the animal. Animals should be rotated off these areas to allow desirable plants to recover. A potential drawback of flash grazing is that the forage stand density may be reduced, allowing the germination and growth of other undesirable plants.

Mowing

Timely mowing or clipping of pastures can be beneficial for control or suppressing growth of erect weedy grasses and many broadleaf weeds. A primary benefit of mowing is to prevent or reduce seed production and spread of undesirable plants; therefore, mowing should begin when weeds are in the stem elongation stage but before flowers or grass seedheads are produced. Fields mowed after weed seed become mature offer little benefit to minimize future weed problems.

Some weeds such as common cocklebur that are mowed when they are small or when clipped high may develop new growth from lateral buds. Ideally, mowing should be done when most weeds reach 12 to 18 inches in height. Although some plants when mowed will produce new shoots and seedheads, the number of flowers and amount of seed produced will be notably less than if the field had not been mowed. Best results are obtained if the vegetation is clipped as close to the soil as possible.

Frequent mowing, repeated over a three- to five-year time span, can deplete root reserves of some perennial weeds such as horsenettle or johnsongrass. This practice will help suppress their growth and reproduction.

Not all weeds are inhibited by mowing. Low-growing plants such as dandelions, crabgrass, and nimblewill tend to be more prevalent in pastures that are frequently mowed.

It is important to mow or clip pastures that have been selectively grazed by animals. This helps to prevent or reduce seed production of weedy plants left by the animals. Timely mowing can also promote regrowth of desirable forage species; in fact, mowing can stimulate the production of tender new forage grasses for livestock to graze.

The benefits of clipping pastures may not be as evident if mowing is not part of a complete pasture management system, particularly if mowing has been delayed until after new weed seed are produced or perennial weeds have been able to build up their root reserves.

Herbicides

It is sometimes necessary to consider the use of a herbicide for control of problem weeds. Herbicide selection is based on the type of forage and weed species present, but the decision to use herbicide treatments will also depend on a variety of other factors. Some of these factors may include stage and severity of weed growth, the intended use of the forage, the time of year, environmental conditions such as temperature and rainfall, potential damage to nearby sensitive crops or plants, waiting

Table 2. Herbicides labeled for use on permanent grass pastures and approximate costs.

Herbicide	Rate	Estimated Cost/Acre*	Type of Weeds Controlled
MSM 60, Patriot, Purestand [*metsulfuron*]	0.1 to 0.4 oz/A	$2.00 - $8.00	Selected broadleaf weeds and certain woody plants. Temporary growth suppression of tall fescue or other pasture grasses may occur.
Chaparral	1.5 to 3 oz/A	$9.60 - $19.20	Herbaceous broadleaf weeds and certain woody plants. Temporary growth suppression of tall fescue or other pasture grasses may occur.
Crossbow	1 to 2 qt/A	$10.00 - $20.00	Woody brush and broadleaf weeds.
2,4-D Ester/Amine (3.8 lb ae/gal. formulations)	1 to 2 qt/A	$4.00 - $8.00	Herbaceous broadleaf weeds.
DuraCor	12 to 20 fl oz/A	$8.90 - $14.85	Herbaceous broadleaf weeds.
GrazonNext HL	1.2 to 2.1 pt/A	$8.25 - $14.44	Herbaceous broadleaf weeds.
PastureGard HL	1.5 to 3 pt/A	$24.38 - $48.75	Woody brush and herbaceous broadleaf weeds.
Prowl H20	1.1 to 2.1 qt/A	$13.20 - $25.20	Selected annual grasses and small-seeded broadleaf weeds
Sharpen	1 to 2 fl oz/A	$5.82 - $11.64	Selected annual broadleaf weeds
Weedmaster, Brash, Rifle-D [*dicamba* + 2,4-D]	2 to 4 pt/A	$6.20 - $12.40	Broadleaf weeds and selected woody brush.
MOWING		$15.00 - $25.00	Broadleaf weeds, weedy grasses, and small brush.

period after treatment to use forage, and cost of treatment. **Always consult the label before using a herbicide product.**

The *type of forage grown* and whether the desirable forage is a new seeding or an established stand can greatly limit the herbicide options available for use in grazed pastures and hay fields. Herbicides currently available for use in established grass pastures are listed in Table 2.

In grass pastures interseeded with clover or other forage legumes, selective herbicide options are not available for use as broadcast treatments. Lack of herbicide options in mixed stands is primarily due to the potential for legume species to be killed or severely injured. Another factor that limits some herbicide options is that the allowed residue levels have not been determined or established by the EPA for some forage species.

Another consideration or limitation when choosing a herbicide product is the *waiting period* after application before livestock are allowed to graze (Table 3). Use of the area as a hayfield can lengthen the waiting period for some products. Also, the kind of animal present, whether beef or lactating dairy animals, can be a factor in determining the waiting period. Since horses are not always specifically mentioned on herbicide labels, the waiting period for beef animals should be applicable. Although some herbicide labels indicate a zero-day waiting period for grazing, a general practice to follow is removal of animals from the treated area for at least 7 to 14 days following application, or longer if necessary, to allow potentially toxic plants to desiccate.

Table 3. Waiting interval following herbicide application before grazing livestock, harvesting for hay, or removing animals for slaughter.

Herbicide	Time Interval (days)				
	Grazing			Removal before Slaughter[2]	Hay Harvest
	Lactating Dairy	Beef	Other Animals[1]		
MSM60, Patriot, Purestand [metsulfuron]	0	0	0	0	0
Chaparral[4]	0	0	0	3	0
Crossbow 1 gal./A or less	Next growing season	0	0	3	14
2,4-D (various products)[3]	0	0	0	0	7
Dicamba (Clarity, etc.) up to 1 pt/A up to 2 pt/A up to 4 pt/A	 7 21 40	 0 0 0	 0 0 0	 30	 37 51 70
DuraCor[4]	0	0	0	0	14
GrazonNext HL[4]	0	0	0	0	7
PastureGard HL	0	0	0	3	14
Prowl H20	0	0	0	0	0
Sharpen	0	0	0	0	0
Weedmaster, Brash, Rifle-D [dicamba + 2,4-D]	7	0	0	30	7

[1] Other animals include horses, goats, and sheep.
[2] For the removal period indicated, animals for slaughter should be withdrawn from treated areas or consumption of hay harvested from treated areas.
[3] Waiting period may vary with some 2,4-D formulations (consult label of specific product used).
[4] Do not transfer grazing animals from areas treated to areas where sensitive broadleaf crops occur without first allowing 3 days of grazing on an untreated pasture OR do not spread manure, hay, or straw if animals have consumed hay or grazed forage from treated areas within the previous 3 days (consult label for guidelines and restrictions).

The *type of weeds* to be controlled is also a major consideration when selecting a herbicide product (see tables 4 and 5). The control option can often depend on the life cycle of the plant (whether it is an annual, biennial, or herbaceous perennial) or on whether it is a woody plant such as multiflora rose. The age and size of the plant can also determine the herbicide rate and its potential effectiveness. Herbicide treatments are most often used for weeds such as musk thistle, multiflora rose, and other broadleaf-type plants in which herbicides are known to be effective. Herbicides that will selectively control broom sedge, purpletop, and other weedy-type grasses in grass pastures and hay fields are not available.

Proper *timing of a herbicide application* should be based on stage of weed growth, potential risk to nearby sensitive crops, and environmental conditions, such as air temperatures and humidity. Newly seeded forage grasses or legumes can be injured if herbicides are applied before or soon after a new seeding or pasture renovation. In general, annual broadleaf weeds are easier to control when herbicides are applied to plants that are small and actively growing. Perennial broadleaf weeds tend to be most susceptible when plants have reached the early bloom to bloom stage of growth.

Since many herbicides are applied to the foliage, the ideal temperatures for most applications is when daytime air temperatures remain above 60°F for several days before and following application. However, applying herbicide products containing dicamba (e.g. Weedmaster, Brash), 2,4-D, and triclopyr (Crossbow, PastureGard, Remedy) when temperatures exceed 85°F may result in off-site movement of herbicide vapors that can injure tobacco fields, grapes, vegetable gardens, and other nearby sensitive crops.

One final consideration before selecting a herbicide is the cost of treatment. The estimated cost associated with weed management by herbicides can range from approximately $8.00 per treated acre to nearly $40.00 per acre (Table 2). Treatment costs are determined by the herbicide used, the application rate, and cost of making the application. Some herbicide treatments may provide few benefits compared with other control options or management strategies.

Pasture Renovation or Replacement of Endophyte-infected Tall Fescue

It is sometimes necessary to renovate pastures and hayfields to improve the overall quality of the forage or to replace an endophyte-infected tall fescue stand. Renovation practices generally involve either: 1) killing the existing vegetation with herbicides and then re-seeding a forage crop with a no-tillage drill or 2) rotating the pasture to corn or other crops.

In a crop rotation approach, a grain crop is often grown for one or two years, or a summer annual forage crop is seeded the year before re-seeding back to a perennial forage species. Depending on the field situation, field corn or other crops can be grown in a conventional seedbed by plowing or by no-tillage methods into the old sod. In a crop rotation system, select herbicides that do not have the potential to persist in the soil and injure fescue or other forages that will be seeded. Crop replanting and rotation guidelines for corn and soybean herbicide applications are listed in University of Kentucky Cooperative Extension publication AGR-6: *Chemical Control of Weeds in Kentucky Farm Crops*.

Replacement of endophyte-infected tall fescue or other forage grasses without the benefit of tillage depends entirely on herbicides for control. Complete control of the undesirable vegetation may not be obtained under conditions of environmental stress or poor application. Therefore, proper timing, herbicide application, and good management are essential to achieve optimum control. It is also important that existing tall fescue not be allowed to go to seed prior to and during the year of re-establishment.

The preferred time of year to use a herbicide for controlling tall fescue and certain other perennials is in **mid- to late summer or early fall**. Apply when forage grasses are actively growing. Allow at least 4 to 6 weeks between first herbicide application and when grass seeding is desired; this allows the treated grasses to decay and not interfere with emergence of the newly seeded grasses. Herbicides labeled for use in pasture renovations contain either glyphosate (i.e., Roundup and various other products) or paraquat (Gramoxone,etc.).

Glyphosate

For renovation of a tall fescue pasture, glyphosate should be applied to kill the existing tall fescue in the late summer or fall approximately 3 to 4 weeks before reseeding. Apply glyphosate when tall fescue has 6 to 12 inches of new growth and is actively growing. Forage grasses should be mowed or grazed to obtain the recommended height.

Application rates for glyphosate products are summarized in the following table:

	Tall Fescue/Grass Pasture Renovation		
Glyphosate Formulation	**Fall Application**	**Spring Application**	**Sequential Application**
3 lb ae/gal. Buccaneer, Glyphosate, GlyStar Mad Dog, etc.	1-1.5 qt/A	3 qt/A	1-2 pt/A
4 lb ae/gal. Credit 5.4 Extra, Duramax, Durango	1.5-2 pt/A	4.5 pt/A	0.75-1.5 pt/A
4.5 lb ae/gal. Abundit Edge, Honcho K6, Roundup PowerMAX	22-32 fl. oz/A	2 qt/A	11-22 fl. oz/A
4.8 lb ae/gal. Roundup PowerMAX 3	20-24 fl. oz/A	1.9 qt/A	10-16 fl. oz/A

Apply the recommended rate using a spray volume of 10 to 15 gallons of water per acre. Before reseeding the desired forage grass, a second application or sequential treatment of glyphosate will help improve long-term control and provide control of undesirable seedling grasses and broadleaf weeds that germinate after the initial treatment.

Renovating fields containing orchardgrass can be more difficult; therefore, apply glyphosate at a higher rate. For control or suppression of orchardgrass in pastures and hayfields, apply

to actively growing orchardgrass when most plants are 4 to 12 inches tall.

Remove domestic livestock before treatment and keep them out of the field for at least eight weeks after application before grazing or harvesting the newly established forage grasses.

Paraquat

Paraquat should be applied as two separate treatments. Make the first application when tall fescue is growing and no more than 4 inches tall. A second application should be timed to spray regrowth, which usually occurs 10 to 21 days after the first application. Add a nonionic surfactant to the spray mixture at 0.25% v/v (2 pt/100 gal. of water) or a crop oil concentrate at 1% v/v (1 gal. COC/100 gal. of water). Broadcast the spray mixture at a minimum of 15 gallons of water per acre. Application rates for paraquat products are summarized in the following table:

Do not seed tall fescue or other forage crops into treated areas with green vegetation. Remove domestic livestock before the first application, and keep them out of the field until new forage growth is at least 6 inches tall.

Paraquat Formulation	Tall Fescue/Grass Pasture Renovation	
	First Application	Second Application (10-21 days apart)
2 lb ai/gal. Gramoxone SL 2.0	2 pt/A	1-2 pt/A
3 lb ai/gal. Gramoxone SL 3.0 Parazone 3S	1.3 pt/A	0.75-1.3 pt/A

Herbicides for Use in Established Grass Pastures and Hayfields

Chaparral

Chaparral contains a mixture of aminopyralild (62%) + metsulfuron (9.45%) per lb of product. For use on permanent grass pastures, CRP acres, and other designated non-cropland sites. Do not use on timothy or other cool-season grasses grown for hay. Use special precautions when applying to tall fescue, since temporarily crop stunting, yellowing, and suppression of growth may occur.

Use Rate

Apply Chaparral at 1.5 to 3 oz/A for post emergence control of annual, biennial, and perennial broadleaf weeds.

Additives

Apply with either a Crop Oil Concentrate at 1% v/v (1 gal per 100 gal spray solution) or a Nonionic Surfactant at 0.25% (1 qt per 100 gal spray solution). In addition, an ammonium nitrogen fertilizer such as UAN or AMS can be used unless prohibited by a tank mix partner labeling.

Weeds Controlled

For herbaceous control of susceptible broadleaf weeds such as cocklebur, spiny amaranth, curly dock, biennial thistles (bull, musk, plumeless), Canada thistle, horsenettle, and tall ironweed.

General Comments

Apply as a foliar treatment when susceptible broadleaf weeds are actively growing. Consult label for specific rates recommended depending on weeds to be controlled. Spot treatments may be applied at rates equivalent to broadcast rates. Chaparral may stunt tall fescue, cause it to turn yellow, or cause seed head suppression. To minimize symptoms on tall fescue do not use more than 2 oz/A, apply with a non-ionic surfactant at a reduced rate, and tank mix with 2,4-D (consult label). For optimum uptake and translocation of herbicide, avoid mowing, haying, or soil disturbance in treated areas for at least 14 days following application. On grasses seeded in the spring and early summer wait until grass has been planted at least 4 months prior to the application; with fall applications do not plant grasses the following spring. The total amount of Chaparral applied per year must not exceed 3.3 oz per acre.

Precautions

Do not use on Timothy hay or other cool-season grasses grown for hay. Do not use Chaparral on pastures or other areas if loss of legume species or other broadleaf plants cannot be tolerated. Do not plant forage legumes following treatment until a soil bioassay has been conducted to determine if aminopyralid and metsulfuron concentrations in the soil will not adversely affect legume establishment. Do not rotate to cropland within one year following treatment, and do not plant a broadleaf crop until an adequate field bioassay has been conducted. Avoid applications under conditions that may allow spray drift, particularly in areas where sensitive broadleaf crops or other desirable vegetation is growing nearby.

Grazing and Hay Restrictions

No restrictions on grazing or grass hay harvest following application. However, do not transfer grazing animals from areas treated to areas where sensitive broadleaf crops occur without first allowing 3 days of grazing on an untreated pasture (urine and manure may contain enough aminopyralid to cause injury to sensitive broadleaf plants). Do not spread manure, hay, or straw if animals have grazed forage or consumed hay harvested from treated areas within the previous 3 days.

Tank Mixes

Chaparral may be tank-mixed with other herbicides approved for grass pastures unless prohibited by the products label and the tank-mixture is physically compatible.

Crossbow

Crossbow contains a mixture of triclopyr (1 lb ae/gal.) + 2,4-D ester (2 lb ae/gal.). Similar products include Candor and Crossroads. For use on permanent grass pastures, hayfields, fence rows, and other farmstead (non-cropland sites). May also be applied as a spot treatment on dormant stems and basal bark areas and as a cut-surface (stump) treatment on selected woody species.

Table 4. Relative response or susceptibility of herbaceous broadleaf weeds to herbicides and mowing.

Weed Species	Life Cycle[1]	Preferred Time for Herbicide Treatment[2]	2,4-D	dicamba (Clarity, etc.)	dicamba+ 2,4-D (Weedmaster etc.)	Crossbow	PastureGard	DuraCor	GrazonNext	Chaparral[3]	metsulfuron[3] (MSM60, Patriot, etc.)	Sharpen	MOWING[4]
Amaranth, Spiny (Pigweed)	A	May-July	F/G	F/G	**G**	**G**	F/G	**G**	**G**	**G**	**G**	-	X
Aster spp. (White Heath Aster)	A	July-Sept	F/G	**G**	**G**	**G**	-	-	-	-	F	P	R
Burdock, Common	B	Feb-Mar	**G**	F	**G**	**G**	**G**	**G**	**G**	**G**	F	P	R
Buttercup spp.	A	Feb-Apr	**G**	F/G	**G**	**G**	F	**G**	**G**	**G**	**G**	P/F	X
Carrot, Wild (Queen Anne's Lace)	B	May-June	F/G	F/G	F/G	F/G	F	**G**	**G**	**G**	**G**	P	R
Chickweed, Common	A	Nov or Feb-Mar	P	F/G	**G**	F	**G**	**G**	**G**	**G**	**G**	P/F	X
Chicory	P	Feb-Mar or Aug-Nov	F/G	F/G	**G**	**G**	**G**	**G**	**G**	**G**	F/G	P	R
Clover, White	P	May-Aug	F	**G**	**G**	**G**	**G**	**G**	**G**	**G**	**G**	P	X
Cocklebur, Common	A	May-July	**G**	**G**	**G**	**G**	**G**	**G**	**G**	**G**	**G**	**G**	R
Dandelion	P	Oct-Nov or Mar-Apr	**G**	**G**	**G**	**G**	F/G	**G**	**G**	**G**	**G**	P	X
Deadnettle,Purple / Henbit	A	Feb-Mar	P	F/G	**G**	F	F/G	**G**	**G**	**G**	**G**	-	X
Dock, Curly or Broadleaf	P	Feb-Apr	P/F	F	F/G	**G**	F/G	**G**	**G**	**G**	**G**	P	X
Dogbane, Hemp	P	May-Aug	P/F	F	F	**G**	**G**	P/F	P/F	P/F	P	P	S
Garlic, Wild	P	Nov or Mar-Apr	F	F	F	F	P	F	F	F/G	**G**	P	X
Goldenrod spp.	P	June-Aug	F	F/G	F/G	**G**	F	F	F/G	F/G	P	P	S
Hemlock, Poison	B	Nov or Mar-Apr	F/G	F/G	F/G	F/G	P	F/G	F/G	-	F	P	R
Horsenettle	P	July-Aug	P	P/F	F	F	P/F	**G**	**G**	F/G	F	P	X
Ironweed, Tall	P	June-Aug	P	F	F	**G**	**G**	**G**	**G**	**G**	P	P	S
Jimsonweed	A	May-July	F	**G**	**G**	**G**	-	**G**	**G**	**G**	-	-	R
Lespedeza, Sericea	P	June-July	P	P/F	P/F	**G**	**G**	P/F	P/F	F/G	F/G	P	X
Marshelder (Sumpweed)	A	May-July	F/G	F/G	**G**	**G**	F	**G**	**G**	**G**	F	-	R
Milkweed, Common	P	July-Sept	P	F	P/F	F	P/F	P/F	P/F	P/F	P	P	S
Mint, Perilla	A	May-July	F	F	F/G	**G**	F/G	**G**	**G**	**G**	-	-	S
Multiflora Rose	P	Apr-June or Sept	P	P	F	**G**	**G**	F	F	F/G	**G**	P	X
Mustard spp. / Yellow Rocket	A	Feb - Mar	**G**	**G**	**G**	**G**	**G**	-	-	-	F	-	R
Passionflower, Maypop	P	May-July	P	P	P	P/F	F	P	P	P	-	P	X
Plantain, Broadleaf or Buckhorn	P	Oct-Nov or Mar-Apr	F/G	F	F/G	**G**	F	**G**	F/G	F/G	F/G	P	X
Pokeweed, Common	P	May-July	F	F/G	F/G	F/G	P	F/G	F/G	F	P	P	S
Ragweed, Common	A	May-July	F/G	**G**	**G**	**G**	**G**	**G**	**G**	**G**	P	**G**	R
Ragweed, Lanceleaf	A	May-July	F/G	**G**	**G**	**G**	-	**G**	**G**	-	P	-	R
Sida, Arrowleaf	A	May-July	P	P	P	-	-	F	F	F	-	-	R
Sneezeweed, Bitter	A	May-July	F/G	F/G	**G**	**G**	**G**	**G**	**G**	**G**	-	-	R
Sorrel, Red (Sheep Sorrel)	P	Sept-Nov or Mar	P	F	F/G	F/G	F	-	-	F/G	F/G	P	X
Spurge, Nodding	A	June-July	P	P	P	P/F	-	P/F	P/F	**G**	**G**	-	R
Thistle, Bull	B	Oct-Nov or Feb-Mar	**G**	**G**	**G**	**G**	F/G	**G**	**G**	**G**	F/G	P	R
Thistle, Canada	P	Prebud or Oct-Nov	P	P/F	F	F	P/F	**G**	**G**	**G**	F	P	S
Thistle, Musk (Nodding)	B	Oct-Nov or Feb-Mar	**G**	**G**	**G**	**G**	F/G	**G**	**G**	**G**	F/G	P	R
Tickclover (*Desmodium* spp.)	P	June-Aug	P	-	F	F/G	F/G	F/G	F/G	-	-	P	R
Trumpetcreeper	P	Aug-Sept	P	P	P/F	F	F	P	P	-	P	P	X

Control:
G = Good or Excellent; F = Fair (suppression or partial control); P = Poor; – = No Information.

[1] Life Cycle: A = Annuals; P = Perennials; B = Biennials.
[2] The preferred time for herbicide treatment will depend on environmental conditions and other factors.
[3] May cause temporary yellowing, stunting and seedhead suppression of tall fescue (consult label).
[4] Mowing: R = Timely mowing reduces top growth and seed production; S = Suppression of top growth; X = Not very effective.

This table should be used only as a guide for comparing the relative effectiveness of herbicides to a particular weed. The herbicide may perform better or worse than indicated in the table depending on the species, weed size, time of application and/or extreme weather conditions. Consult herbicide label for weed height or growth stage and product amount. Read and follow all label directions and precautions before herbicide application.

Use Rate

- **Foliar Broadcast Treatment:** Apply Crossbow at 1 to 2 qt/A for annuals and biennial broadleaf weeds; 2 to 4 qt/A for perennials and woody brush, depending on weed species and stage of growth.
- **Spot Treatment:** Mix Crossbow as a 1 to 1.5% v/v solution with water. See Table 6 for mixing spot treatments.
- **Dormant Stem Treatment:** Mix 1 to 4 gallons of Crossbow with a commercial basal oil (consult label) to make 100 gallons of spray solution. Apply to dormant upper and lower stems including root collar and any ground sprouts.
- **Thinline Basal (for control of small multiflora rose):** Apply a horizontal thin line of undiluted Crossbow across stems at a height where stems are less than ½ inch in diameter.
- **Cut Surface Treatment:** Mix 4 gallons of Crossbow with a commercial basal oil (consult label) to make 100 gallons of spray mixture. Apply immediately to surface area of freshly cut stumps.

Additives

None required.

Weeds Controlled

Controls or suppresses growth of selected broadleaf weeds such as bull thistle, curly dock, musk thistle, and tall ironweed and certain woody brush such as blackberry and multiflora rose.

General Comments

Apply as a broadcast treatment on annual, biennial, and perennial broadleaf weeds when plants are actively growing. Spot treatments may be used on individual plants or small areas of undesirable vegetation. For multiflora rose, Crossbow can be applied when plants are dormant or breaking dormancy using an undiluted thinline basal application or Lo-Oil dormant stem treatment. For control of susceptible trees and prevention of sprouts of cut trees, apply Crossbow to freshly cut surfaces as a stump treatment.

Consult label for specific rates to use depending on vegetation to be controlled.

Precautions

Do not apply to pastures seeded with forage legumes such as clover, as severe injury to the forage can result. Avoid applications of Crossbow when sensitive broadleaf crops such as tobacco, vegetable crops, or other desirable plants and trees are growing nearby. Do not apply near sensitive crop areas if conditions on day of treatment are favorable for off-site spray drift such as when wind speed exceeds 5 mph, air temperature is expected to exceed 85°F, and/or temperature inversions exist. Do not reseed pastures within a minimum of 3 weeks after treatment.

Grazing and Hay Restrictions

There are no grazing restrictions following application of Crossbow except for lactating dairy animals. Do not allow lactating dairy animals to graze treated areas until the next growing season following application. Animals for slaughter should be withdrawn from treated grass at least 3 days before slaughter. Do not harvest hay for 14 days after application.

2,4-D (Various Products)

Most commercial products contain 3.8 lb ae/gal. of 2,4-D acid. Similar products include Freelexx which contains 3.8 lb 2,4-D choline per gallon. Other product formulations can range from 2.8 to 5.6 lb ae/gal. For use on grass pastures, fencerows, and other farmstead sites.

Use Rate

Consult label rates for specific product used. In general, for products containing 4 lb ai/gal. of 2,4-D (3.8 lb ae/gal.), use 1 to 1.5 qt/A for annual weeds and 1 to 2 qt/A for biennial and perennial broadleaf weeds.

Additives

Generally not required.

Weeds Controlled

Controls or suppresses growth of broadleaf weeds such as dandelions, thistles (bull, musk, and plumeless), mustards, and pigweeds.

General Comments

Apply as a broadcast treatment on annual, biennial, and perennial broadleaf weeds when plants are small and actively growing. Spray musk thistle or other biennial weeds when plants are in the seedling to rosette stage and before flower stalks are initiated. Consult label for specific rates to use depending on vegetation to be controlled. See Table 6 on the back page for mixing spot treatments.

Precautions

Do not apply to pastures seeded with forage legumes such as clover as severe injury to the forage can result. Do not apply to newly seeded areas until grass becomes well established. Avoid applications of 2,4-D when sensitive broadleaf crops such as tobacco, vegetable crops, or other desirable plants and trees are growing nearby. Do not apply near sensitive crop areas if conditions on day of treatment are favorable for off-site spray drift such as when wind speed exceeds 5 mph, air temperature is expected to exceed 85°F, and/or temperature inversions exist. Do not reseed pastures immediately after application (delay reseeding at least 30 days following application is commonly recommended).

Grazing and Hay Restrictions

No specific grazing restrictions indicated on most labels. The preharvest interval for cutting forage for hay is 7 days.

Dicamba (Various Products)

- **Product Names:** Clarity, Clarifier, Clash, Dicamba HD, Sterling Blue, and Strut contain 4 lb ae dicamba (diglycolamine salt). Dicamba DMA, Rifle, and Vision contain 4 lb ai dicamba (dimethylamine salt) per gallon. For use on established grass pastures, hayfields, fencerows, and other farmstead sites; as a dormant stem treatment for multiflora rose, or as a cut-surface treatment on selected tree species.

Table 5. Relative response or susceptibility of woody plants to herbicides.

		Foliage or Foliar Surface Spray									Thin-Line Basal or Stem Treatment				Cut Stump or Surface				Soil
	MECHANICAL	BrushMaster	Chaparral	Crossbow	2,4-D	dicamba (Clarity, etc.)	metsulfuron (MSM60, Patriot, Purestand)	PastureGard	Remedy Ultra	glyphosate	dicamba (Clarity, etc.)	Crossbow	PastureGard	Remedy RTU	glyphosate	Crossbow	PastureGard	Remedy RTU	Spike 20P
Labeled Sites																			
Pastures/Grazing Land		U	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
Grass Hayfields		U	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	U
Fencerow/Pasture Fields		U	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
Fencerow (not grazed)		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
Non-Cropland (not grazed)		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
Woody Plants																			
Blackberry	M	F	**G**	**G**	N	F	**G**	**G**	**G**	**G**	F	**G**	**G**	**G**	**G**	N	N	**G**	**G**
Buckbrush (Coralberry)	M	F	**G**	F	F	N	**G**	N	N	F	N	N	N	N	N	N	N	N	**G**
Cherry, Wild Black	CT	**G**	N	F	N	**G**	N	F	N	**G**	N	N	F	F	-	N	F	F	F
Hackberry	CT	-	N	N	N	N	N	**G**	N	-	N	N	F	**G**	-	N	**G**	**G**	-
Honeylocust	CT	**G**	**G**	F	N	F	N	**G**	F	F	N	N	N	F	F	F	**G**	**G**	**G**
Honeysuckle, Bush	CT	-	N	F	N	F	N	F	F	F	N	F	N	N	F	F	F	F	-
Honeysuckle, Japanese	M	**G**	**G**	**G**	F	F	F	**G**	F	**G**	N	F	N	N	N	N	N	N	**G**
Kudzu	-	**G**	**G**	F	N	F	F	F	N	**G**	N	F	N	N	N	N	N	N	**G**
Locust, Black	CT	**G**	**G**	**G**	N	F	N	**G**	**G**	F	N	N	N	F	-	**G**	**G**	F	F
Mulberry	CT	N	N	F	N	F	N	N	F	F	N	N	N	N	F	N	N	F	**G**
Multiflora Rose	M	**G**	**G**	**G**	F	F	**G**	**G**	F	**G**	**G**	**G**	**G**	N	N	N	N	N	F
Osage Orange	CT	F	N	N	N	N	N	**G**	F	N	N	N	N	N	F	F	N	N	**G**
Olive, Autumn	CT	N	N	F	N	F	N	F	F	F	N	N	N	N	-	F	F	F	-
Poison Ivy	-	**G**	N	**G**	F	F	N	F	**G**	**G**	N	F	F	N	N	N	N	N	N
Red Cedar, Eastern	C	F	N	N	N	F	N	N	N	N	N	N	N	F	F	N	N	F	N
Sumac	CT	F	-	**G**	F	F	N	**G**	**G**	F	N	F	F	F	F	F	**G**	F	**G**
Trumpetcreeper	M	-	N	F	N	F	N	F	N	**G**	N	F	**G**	F	N	N	**G**	N	F

Labeled sites:
L labeled;
U unapproved application site.

Mechanical controls:
M mow;
C cut below green growth;
CT cut and treat freshly cut surface.

Herbicide treatment:
G good control, susceptible or recommended by product label.
F fair to partial control or growth suppression.
N not recommended, not listed on the label, or poor performance expected.
- no information available.

Foliar Surface Spray: Foliage is usually sprayed after plants have fully leafed out and foliage is tender; early summer tends to be the preferred time of year. Ideally trees and brush should be less than 6 feet in height. Apply with a high-volume sprayer at 40 to 80 gallons of spray solution per acre.

Thin-line Basal: A low volume of herbicide applied as a solid stream across the base of stems (6 to 12 inches above ground line). Basal spray applications consist of using the undiluted product or a 1:1 mixture of the product with a commercial basal oil (consult label).
This type of method may not be effective when stem diameter exceeds 3 inches or when plants have thick, rough bark. Treat when stems are dry and rain is not anticipated.

Cut Stump or Surface: Method consists of treating the live tissue beneath the bark. This method includes such as: 1) spraying fresh cuts made in the trunk, 2) immediately treating the outer surface of fresh cut stumps, or 3) injecting with specialized tools. These types of treatments are often used for woody plants that are beyond the brush stage of growth.
Soil Treatment: Method consists of treating soil beneath plant canopy. Herbicide must be leached into the root zone for plant uptake.

Use Rate

- **Foliar Broadcast Treatment:** Apply dicamba products (e.g., Clarity, etc.) at 0.5 to 2.0 pt/A for annual broadleaf weeds, depending on size and stage of growth; 0.5 to 4 pt/A for biennials; and 2 to 4 pt/A for perennials. For woody brush and vines, apply at 1 to 2 qt/A. Consult label for susceptible broadleaf weeds and woody species and specific use rates.
- **Spot Treatment:** See Table 6 for mixing spot treatments.
- **Dormant Treatment (Spot Concentrate and Lo-Oil Basal Bark):** For control of multiflora rose as a Spot-Concentrate, the use rate will depend on the canopy diameter of the stems. Apply ¼, 1, to 2¼ fl. oz of an undiluted dicamba product (e.g., Clarity, etc.) on plants with a 5-, 10-, or 15-foot canopy diameter, respectively. As a Lo-Oil Basal Bark Treatment, apply dicamba in a Lo-Oil spray solution mixture. To make a 2-gallon spray mixture, combine 1½ gallons water plus 1 oz emulsifier plus 1 pt of a dicamba product (e.g., Clarity, etc.) plus 2½ pts of commercial basal oil (consult label).
- **Cut Surface Treatment:** Mix 1 part dicamba (e.g., Clarity, etc.) per 1 to 3 parts water. Spray or freshly paint cut stumps, or frill or girdle the tree trunk and apply the dicamba/water mixture. Use the lower dilution rate for difficult-to-control species.

Additives

None required for foliar treatments but may be added. Consult product label for directions on mixing Lo-Oil basal bark treatments.

Weeds Controlled

Controls or suppresses growth of selected broadleaf weeds such as bull thistle, curly dock, musk thistle, ragweed, and spiny amaranth and certain woody brush such as multiflora rose.

General Comments

- **Broadcast Foliar Treatment:** Apply as a broadcast treatment on an- nual, biennial, and perennial broadleaf weeds when plants are actively growing.
- **Dormant Treatment:** For control of multiflora rose using an undiluted spot-concentrate treatment, dicamba applications should be applied directly to the lower stems and soil area as close to the root crown as possible but within 6 to 8 inches of the crown. For Lo-Oil basal bark treatments, dicamba should be applied to the basal stem region from the ground line to a height of 12 to 18 inches. Apply before bud break and before plants are showing signs of active growth.
- **Cut Surface Treatment:** For control of susceptible trees and prevention of sprouts of cut trees, dicamba may be applied as a cut-surface treatment. Consult label for specific rates to use depending on vegetation to be controlled.

Precautions

Do not apply to pastures seeded with forage legumes such as alfalfa, clover, or lespedeza as severe injury to the forage can result. Avoid applications of dicamba when sensitive broadleaf crops such as tobacco, vegetable crops, or other desirable plants and trees are growing nearby. Do not apply near sensitive crop areas if conditions on day of treatment are favorable for off-site spray drift such as when wind speed exceeds 5 mph, air temperature is expected to exceed 85°F, and/or temperature inversions exist.

Grazing and Hay Restrictions

For non-lactating animals, there is no waiting period between application and grazing or harvesting grass grown for hay; the waiting period for lactating dairy animals depends on the amount of dicamba (e.g., Clarity, etc.) applied. For use rates up to 1 pt/A, the waiting interval is 7 days for grazing and 37 days for hay harvest after application; for rates up to 2 pt/A, the interval is 21 days for grazing and 51 days for hay harvest; and for rates up to 4 pt/A, the interval is 40 days for grazing and 70 days for hay harvest. Animals cannot be removed for slaughter prior to 30 days after last application.

DuraCor

DuraCor contains a mixture of aminopyralid (0.667 lb ai/gal.) + florpyrauxifen-benzyl (0.067 lb ai/gal.). For use on permanent grass pasture, grass hay (consult label), CRP acres, and other designated non-cropland sites.

Use Rate

Apply DuraCor at 12 to 20 fl oz/A depending on weed species and stage of growth.

Additives

Addition of Methylated Seed Oil at 1% v/v (1 gal/100 gal) or Non-Ionic Surfactant at 0.25 to 0.5% v/v (1 to 2 qt/100 gal. of spray solution) is allowed to enhance herbicide activity.

Weeds Controlled

For control of susceptible annual, biennial, and perennial herbaceous broadleaf weeds such as cocklebur, curly dock, biennial thistles (bull, musk, plumeless), Canada thistle, horsenettle, tall ironweed, ragweeds (common, lanceleaf), and plantains.

General Comments

Apply as a foliar broadcast when susceptible broadleaf weeds are actively growing. Consult label for specific rates recommended depending on weeds to be controlled. Spot treatments may be applied at rates equivalent to broadcast rates. For optimum uptake and translocation of herbicide, avoid mowing, haying, or soil disturbance in treated areas for at least 14 days following application. During the season of grass establishment, DuraCor should be applied only after perennial grasses are well established (i.e. have developed a good secondary root system and show good vigor). Tall fescue, orchardgrass, timothy, and annual ryegrass are tolerant of 12 fl oz/A of DuraCor once plants have developed 3-collared leaves. The total amount of DuraCor applied per growing season must not exceed 20 fl. oz per acre per year.

Precautions

Do not use DuraCor on pastures or other areas if loss of legume species or other broadleaf plants cannot be tolerated. Do not plant forage legumes following treatment until a soil bioassay has been conducted to determine if aminopyralid and florpyrauxifen-benyzl concentrations in the soil will adversely affect legume establishment. Tall fescue, orchardgrass, timothy, and annual ryegrass can be reseeded after a minimum of 15 days

following application of 12 fl oz/A DuraCor; sorghum-sudangrass, teff, and pearl millet can be seeded a minimum of 30 days following application at 12 fl oz/A. With higher rates or on other grass species wait a minimum of 45 days after an application of DuraCor. Do not plant other intended rotational crops until an adequate field bioassay has been conducted. Avoid applications under conditions that may allow spray drift, particularly in areas where sensitive broadleaf crops or other desirable vegetation is growing nearby.

Grazing and Hay Restrictions

No restrictions for grazing. After application wait 14 days prior to cutting grass for hay. Do not transfer grazing animals from areas treated with DuraCor to areas where sensitive broadleaf crops occur without first allowing 3 days of grazing on an untreated pasture (urine and manure may contain enough aminopyralid and florpyrauxifen-benzyl to cause injury to sensitive broadleaf plants). Do not spread manure, hay, or straw if animals have grazed forage or consumed hay harvested from treated areas within the previous 3 days (*consult label for additional guidelines and restrictions*).

Glyphosate (Various Products)

Glyphosate is the active ingredient contained in Roundup and in numerous other products. Products such as Abundit Extra, Buccaneer, ClearOut 41, Cornerstone, Glyphomate 41, Glyphomax, Glyphosate 4, Gly Star, Gly-4 Plus, Credit 41, Honcho, and various other products contain glyphosate at 3 lb ae/gal.; Durango, Duramax, and Glyphomax XRT contain 4 lb ae/gal.; Abundit Edge, Credit Xtreme, Roundup PowerMAX, and Roundup WeatherMAX contain 4.5 lb ae/gal.

Use Rate

- **Spot Treatment:** In general, as a spot treatment apply as a 1 to 2% solution. See Table 6 for mixing spot treatments.
- **Wick Applicators:** For rope or sponge wick applicators, use a 33 to 75% concentration of the glyphosate product mixed with water.

Additives

Generally not required for most products, but consult label of product used.

Weeds Controlled

For non-selective control of annual and perennial grasses, broadleaf weeds, and certain woody species. Desirable grasses within the area treated are likely to be killed.

General Comments

Apply as a spot treatment or wiper application for control of many annual, biennial, and perennial weeds in grass and legume pastures containing bluegrass, fescue, orchardgrass, timothy, alfalfa, and/or clover. Apply in areas where the movement of livestock can be controlled. Treat no more than one-tenth of any acre at one time if application rate exceeds 3 qt/A for a glyphosate product that contains 3 lb ae/gal. and 2 qt/A for a glyphosate product that contains 4.5 lb ae/gal. Applications can be made in the same area at 30-day intervals.

Precautions

This herbicide treatment will kill all desirable grasses and plants in the area treated except when used with rope or wick applicators. Do not apply near sensitive crop areas if conditions on day of treatment are favorable for off-site spray drift, such as when wind speed exceeds 5 mph.

Grazing and Hay Restrictions

Remove domestic livestock before application, and wait 7 days after application before grazing livestock or harvesting.

GrazonNext HL

GrazonNext HL contains a mixture of aminopyralid (0.41 lb ai/gal.) + 2,4-D (3.33 lb ai/gal.). For use on permanent grass pasture, grass hay (consult label), CRP acres, and other designated non-cropland sites.

Use Rate

Apply GrazonNext HL at 1.2 to 2.1 pt/A (19 to 34 fl oz/A) depending on weed species and stage of growth.

Additives

Mix with a non-ionic surfactant at 0.25 to 0.5% v/v (1 to 2 qt/100 gal. of spray solution).

Weeds Controlled

For control of susceptible annual, biennial, and perennial herbaceous broadleaf weeds such as cocklebur, curly dock, biennial thistles (bull, musk, plumeless), Canada thistle, horsenettle, tall ironweed, and plantains.

General Comments

Apply as a foliar broadcast when susceptible broadleaf weeds are actively growing. Consult label for specific rates recommended depending on weeds to be controlled. Spot treatments may be applied at rates equivalent to broadcast rates. For optimum uptake and translocation of herbicide, avoid mowing, haying, or soil dis- turbance in treated areas for at least 14 days following application. Grasses may be reseeded in the fall following an application of GrazonNext HL applied in the spring or early summer. During the season of grass establishment, GrazonNext HL should be applied only after perennial grasses are well established [consult Special 2ee Label for additional guidelines for pre-plant and post planting applications for tall fescue, orchardgrasss, timothy, and annual ryegrass]. The total amount of GrazonNext HL applied per growing season must not exceed 2.1 pt (34 fl. oz) per acre per year.

Precautions

Do not use GrazonNext HL on pastures or other areas if loss of legume species or other broadleaf plants cannot be tolerated. Do not plant forage legumes following treatment until a soil bioassay has been conducted to determine if aminopyralid residues remaining in the soil will adversely affect legume establishment. Do not rotate to cropland within one year following treatment (cereals and corn can be planted one year after treatment). Most broadleaf crops are more sensitive and require at least two years depending on crop and environment (do not plant a broadleaf crop until an adequate field bioassay has been conducted).

Avoid applications under conditions that may allow spray drift, particularly in areas where sensitive broadleaf crops or other desirable vegetation is growing nearby.

Grazing and Hay Restrictions

No restrictions for grazing. Do not harvest forage for hay within 7 days of GrazonNext HL application. Do not transfer grazing animals from areas treated with GrazonNext HL to areas where sensitive broadleaf crops occur without first allowing 3 days of grazing on an untreated pasture (urine and manure may contain enough aminopyralid to cause injury to sensitive broadleaf plants). Do not spread manure, hay, or straw if animals have grazed forage or consumed hay harvested from treated areas within the previous 3 days (*consult label for additional guidelines and restrictions*).

Metsulfuron (Various Products)

MSM60, Patriot, and Purestand, contain 0.6 lb metsulfuron methyl per lb product. These products may be applied to established pasture grasses and CRP land that contain bermudagrass, bluegrass, fescue, orchardgrass, timothy, and native grasses such as bluestems. Use special precautions when applying to tall fescue, timothy, or early growth stages of orchardgrass since temporarily crop stunting, yellowing, and suppression of growth may occur.

Use Rate

Apply 1/10 to 4/10 oz/A for broadcast applications on established grasses; use precaution and lower rates for applications on fescue or timothy. For spot applications, use 1 oz per 100 gallons of water.

Additives

Add a non-ionic surfactant at 2 pt per 100 gallons of spray solution (0.25% v/v) or crop oil concentrate at 1 gallon per 100 gallons of spray solution (1% v/v) unless otherwise directed. For fescue, use only a non-ionic surfactant at 0.5 to 1 pt per 100 gallons water; for timothy, use only 0.5 pt surfactant per 100 gallons of spray solution.

Weeds Controlled

Controls or suppresses growth of certain broadleaf weeds such as buttercup, curly dock, musk thistle, wild garlic, wild carrot, and common yarrow and certain woody plants such as buckbrush and multiflora rose.

General Comments

Foliar Broadcast Treatment: For best results, apply as a broadcast application or spot treatment when weeds are young and actively growing in the spring, summer, or fall. Some pasture grass species such as fescue and timothy are sensitive to metsulfuron (see label for specific details); therefore, treated fescue pastures may be temporarily stunted, and the first cutting of fescue may be lost. The minimum time from grass establishment until metsulfuron application is 6 months for bluegrass and orchardgrass; 12 months for timothy; and 24 months for fescue.

Spot Treatments: Spot applications may be made using equipment such as backpack or other sprayers. Apply to actively growing foliage of plants from full leaf expansion in the spring until the development of fall coloration. Thorough coverage of the foliage and stems is necessary to optimize results.

Precautions

Legume pasture species such as alfalfa and clover are highly sensitive to metsulfuron and will be severely injured or killed. Do not use on soils having a pH above 7.9, as extended soil residual activity may limit crop rotation intervals. Alfalfa, clover, bluegrass, ryegrass, and tall fescue may be planted 4 months; wheat 1 month; or barley and oats 10 months after application when applied at 1/10 to 3/10 oz/A. Minimum rotation interval for orchardgrass, timothy, and selected native grasses is 2 months after treatment when applied at less than 4/10 oz/A. Other crops not listed may require the completion of a field bioassay before planting as a rotational crop. Immediately after application, thoroughly clean all mixing and spraying equipment to avoid subsequent injury of desirable crops.

Grazing and Hay Restrictions

No grazing or haying restrictions indicated.

Tank Mixtures

2,4-D, dicamba (e.g., Clarity, etc.), dicamba + 2,4-D (e.g., Weedmaster, etc.).

PastureGard

PastureGard contains a mixture of triclopyr (1.5 lb ai/gal.) + fluroxypyr (0.5 lb ai/gal.). Similar products include ClearGraze. For use on permanent grass pastures, fencerows, and other farmstead (non-cropland) sites. May also be applied as a spot treatment or as a basal bark or cut-surface (stump) treatment on individual plants.

Use Rate

- **Foliar Broadcast Treatment:** Apply PastureGard at 1.5 to 3 pt/A for broadleaf weeds, and 3 to 8 pt/A for selected woody plant species (consult label).
- **Spot Treatment:** Mix PastureGard with water as a 1 to 2% v/v solution (1 to 2 gal. PastureGard per 100 gal.) plus a surfactant at 0.25% v/v. See Table 6 for mixing spot treatments.
- **Low Volume Stem Spray Method:** Mix 50% PastureGard plus a 50% commercial basal oil (consult label). Apply to stems less than 6 inches in diameter at any time during the year except when snow or water prevent spraying to ground line. Thoroughly wet the base and root collar of all stems to a height of 12 to 15 inches. For best results on certain woody plants, treat thin juvenile bark above rough, thickened bark.
- **Thinline Basal Bark:** Apply a horizontal thin line of undiluted PastureGard for control of susceptible woody plants (consult label) that have stems less than 6 inches in diameter. A narrow band of herbicide should be directed horizontally to all sides of the stems about 6 inches above the base of the plant. For single stems, apply 2 to 15 ml of product and 25 to 100 ml to treat clumps of stems.

- **Cut Stump Treatment:** Mix 50% PastureGard plus a 50% commercial basal oil (consult label). Apply immediately to surface area of freshly cut stumps. Spray the sides of the stump and the outer portion of the cut surface, including the cambium, to thoroughly wet the stem and root collar area but not to the point of runoff.

Additives
Mix with a non-ionic surfactant or liquid fertilizer at 0.25 to 0.5% v/v (1 to 2 qt/100 gal. of spray solution).

Weeds Controlled
Controls or suppresses growth of selected woody plants including blackberry, multiflora rose, locust, Osage orange, and herbaceous broadleaf weeds such as tall ironweed and sericea lespedeza.

Apply as a foliar broadcast treatment for control or suppression of selected herbaceous broadleaf weeds and susceptible woody species. Spot treatments may be used on individual plants or small areas of undesirable vegetation. For some woody shrubs such as blackberry brambles and multiflora rose, PastureGard can be applied as a basal bark treatment using small amounts of the undiluted product or on susceptible woody plants as a thinline basal treatment using a 50% herbicide mixture with a commercial basal oil. For control of susceptible trees and prevention of sprouts of cut trees, apply PastureGard to freshly cut surfaces as a stump treatment.

Precautions
Do not apply to pastures seeded with forage legumes such as clover unless injury or loss of such plants can be tolerated. Avoid applications of PastureGard when sensitive broadleaf crops such as tobacco, soybeans, vegetable crops, or other desirable plants and trees are growing nearby. Do not apply if conditions on day of treatment are favorable for off-site spray drift or surface runoff. When PastureGard is applied before seeding, do not reseed pastures within a minimum of three weeks after treatment; when applied following seeding, do not apply until after grass seedlings are well established. Legumes may be replanted a month or more after PastureGard application. Only wheat, barley, oats, or perennial forage grasses may be planted in treated fields within 120 days following application.

Grazing and Hay Restrictions
There are no grazing restrictions for livestock or dairy animals on treated areas. Animals for slaughter should be withdrawn from grazing treated grass or consumption of treated hay at least 3 days before slaughter. Do not harvest hay for 14 days after application.

Prowl H20
Prowl H20 contains 3.8 lb ai/gal of pendimethalin. Similar products include Satellite Hydrocap. For use on established forage grasses (selected cool-season and warm-season species).

Use Rate
Broadcast at 1.1 to 2.1 qt/A. Do not exceed 4.2 qt/A in a single application or sequential applications made 30 or more days apart.

Additives
Not required.

Weeds Controlled
Controls or partial control of selected annual grasses and such as crabgrass, foxtail, goosegrass, and small-seeded broadleaf weeds such as lambsquarters and pigweeds.

General Comments
Apply uniformly as a broadcast treatment before target weeds germinate on established perennial cool-season or selected warm-season forage grasses. Apply a higher rate when higher weed pressure is anticipated or when a longer duration of residual weed control is desired.

Precautions
May cause temporary injury to grass stands. Do not apply more than a maximum total of 4.2 qt/A per acre per year.

Grazing and Haying Restrictions
There is no pre-harvest or pre-grazing interval for treated grass forage, green-chop, silage, hay, or pasture.

Sharpen
Sharpen contains 2.85 lb ai/gal of saflufenacil. For use on perennial cool-season and warm-season forage grasses grown in pastures and CRP land. Sharpen may also be applied in the fall or spring for establishment of cool-season forage grasses.

Use Rate
Broadcast 1 to 2 fl oz/A for burndown and postemergence control of selected broadleaf weeds. Can be applied at 3 to 4 fl oz/A during the dormant season for additional residual control. Do not apply more than 1 fl oz/A on forage bermudagrass.

Additives
A Methylated Seed Oil (MSO) at 1% v/v is required as an adjuvant. Do not add a nitrogen-containing fertilizer when applying to warm-season grasses and for some cool-season grass species such as timothy (consult label).

Weeds Controlled
For control of selected broadleaf weeds such as cocklebur, and common ragweed (consult label). Sharpen does not effectively control perennial weed species.

General Comments
Apply uniformly as a broadcast treatment before target weeds reach maximum size (3 to 6 inches tall). Apply Sharpen postemergence to established stands of perennial cool-season and warm-season forage grasses. Sharpen may be applied on preplant or preemergence in the fall or spring while establishing stands of cool-season grasses. On new grass seedings apply only to established stands (defined as planted in the fall or spring which has gone through a first cutting/mowing). Sharpen can also be applied to emerged broadleaf weeds during the dormant season (i.e. when grasses are not actively growing in the fall, during winter dormancy, or in early spring before greenup).

Precautions

Sharpen may cause transitory injury to forage grasses (leaf necrosis) under certain conditions, but new growth is normal and vigor is not reduced. Do not apply more than a maximum cumulative amount of 6 fl oz/A of Sharpen per cropping season. Do not apply Sharpen to mixed stands of cool-season grasses and forage legumes.

Grazing and Haying Restrictions

There is no pre-harvest or pre-grazing interval for treated for Sharpen treated grass forage, hay, or pasture.

Tank Mixes

Sharpen may be tank mixed or applied sequentially with other herbicide products.

Weedmaster

Weedmaster contains a mixture of dicamba (1 lb ai/gal) + 2,4-D (2.87 lb ai/gal). Similar products include Banvel+2,4-D, Brash, Outlaw, Rifle-D. For use on established grass pastures and other general farmstead (non-cropland) sites.

Use Rate

Broadcast at 1 to 4 pt/A depending on weed species and stage of growth. For spot treatment, mix 1 oz product per 1 gallon of water.

Additives

Add a non-ionic surfactant at 2 to 4 pt per 100 gallons of spray solution (0.25 to 0.5% v/v).

Weeds Controlled

Controls or suppresses growth of several broadleaf weeds such as bull thistle, buttercup, cocklebur, curly dock, red sorrel, and musk thistle and certain woody brush such as multiflora rose. Apply as a broadcast treatment on annual, biennial, and perennial broadleaf weeds when plants are young and actively growing. Spot treatments may be used on individual plants or small areas of undesirable vegetation.

Precautions

Use only on established stands of perennial grasses. Do not apply to pastures seeded with forage legumes such as alfalfa, clover, or lespedeza as severe injury to the forage can result. On newly seeded areas, grasses may be injured if this product is applied at rates >2pt/A. Avoid applications of Weedmaster (dicamba+2,4-D) when sensitive crops such as tobacco, vegetable crops, or other desirable plants and trees are growing nearby. For pasture renovation areas, wait 3 weeks per quart (2 pt/A) before interseeding grasses or injury may occur. For other situations, the minimum rotational interval is 120 days for Weedmaster applied at 6 pt/A or less (consult label).

Grazing and Haying Restrictions

There is no waiting period between treatment and grazing for non-lactacting animals. Do not permit meat animals for slaughter to graze treated fields within 30 days of slaughter. For lactating dairy animals, do not graze within 7 days of treatment. Treated grasses may be harvested for dry hay or silage, but do not harvest within 7 days of application.

Other Herbicides for Non-Grazed Areas, Fencerows, Buildings, and Similar Farmstead Sites

Some herbicide products are not registered for use in grazed pastures and hayfields (e.g., BrushKiller, Brush-No-More, BrushMaster, Tordon RTU, etc.). These products are labeled for control of unwanted vegetation around buildings, farm structures, non-grazed fencerows, or other non-cropland areas. Since these products are designed for use only in non-cropland sites, they often do not indicate grazing restrictions for livestock. Fencerows surrounding a pasture or hayfield represent part of the pasture area; therefore, **herbicide products labeled only for non-cropland sites should not be applied to fencerows adjacent to pastures, around buildings, or other areas accessible to domestic animals**.

BrushMaster

BrushMaster is a mixture containing 2,4-D (1.05 lb ai/gal.), 2,4-DP (1.05 lb ai/gal.), and dicamba (0.25 lb ai/gal.). For control of un- wanted vegetation in fencerows, farmsteads, and other similar non-crop areas not grazed by domestic animals.

Use Rate

- **Foliar Broadcast Treatment:** 1 to 2 gallons per 100 gallons of water or 4 to 8 oz per 3 gallons of water (1 to 2% v/v).
- **Basalor Cut Surface:** Mix 10 oz product with 1 gallon of oil (i.e., diesel oil, fuel oil, kerosene, etc.).

Weeds Controlled

Controls or suppresses growth of selected woody brush and other herbaceous broadleaf weeds.

General Comments

- **Foliar Broadcast Treatment:** Apply as a full cover spray wetting all leaves, stems, and root collars of woody plants.
- **Basal Bark Treatment:** Apply a coarse spray as a drench treatment to the base of stems and trunks up to a height of 18 to 24 inches.
- **Cut Surface or Stump Treatment:** Apply a coarse spray on newly cut surfaces.

Precautions

Avoid applications of BrushMaster when sensitive crops such as tobacco, vegetables, fruit crops, or other desirable plant and trees are growing nearby. Do not apply if conditions are favorable for off-site spraydrift such as when wind speed exceeds 5 mph, air temperature is expected to exceed 85°F, and/or temperature inversions exist.

Grazing and Hay Restrictions

Do not apply to areas that will be grazed by domestic animals.

Remedy Ultra or Remedy RTU

Remedy contains 4 lb triclopyr per gallon. Similar products include Vastlan which contains 4 lb triclopyr choline per gallon. For use on woody plants and broadleaf weeds in permanent grass pastures, fencerows, and other non-cropland sites. (Note: Remedy RTU is a ready-to-use formulation that contains triclopyr at 0.75 lb/gal.for use on cut stumps and basal bark applications)

General Comments

- **Foliar Broadcast Treatment:** For broadcast treatments of Remedy, apply at 2 pt/A for broadleaf weeds; apply up to 4 pt/A for susceptible woody brush and trees.
- **Spot Treatment:** Mix 2 to 4 qt Remedy per 100 gallons of water (0.5 to 1% v/v solution). Foliar spray applications should be made when woody plants and weeds are actively growing. See Table 6 on the back page for mixing spot treatments.
- **Dormant Treatment:** Mix 4 to 6 qt of Remedy with a commercial basal oil to make 100 gallons of spray solution (1 to 1.5% v/v). Apply with a backpack or power spraying equipment using low pressure (consult label). Treat anytime when brush is dormant and most of the foliage has dropped except when snow or water prevent spraying to the ground level. Thoroughly wet the upper parts of the stems, and wet the lower portion of the plant 12 to 15 inches above the ground to the point of runoff.
- **Low Volume Stem Spray Method:** Mix 20 to 30 gallons of Remedy in enough oil to make 100 gallons of total spray mixture (consult label). Apply with a backpack sprayer to stems less than 6 inches in basal diameter. Wet the base and root collar of all stems to a height of 12 to 15 inches.
- **Basal Bark Treatment:** Apply a horizontal narrow band of undiluted Remedy for control of susceptible woody plants such as blackberry and dogwood with stems less than 6 inches in diameter (consult label). Apply in a thin stream to all sides of the stems about 6 inches above the base of the plant. For single stems, apply 2 to 15 ml of product and 25 to 100 ml to treat clumps of stems.
- **Cut Stump Treatment:** Mix 20 to 30 gallons of Remedy in enough oil to make 100 gallons of spray mixture. Apply immediately to surface areas of freshly cut stumps. Spray the sides of the stump and the outer portion of the cut surface, including the cambium, to thoroughly wet the stem and root collar area but not to the point of runoff.

Additives

Not specifically required for all application methods, but a nonionic surfactant may be added to foliar treatments at 0.25% v/v.

Weeds Controlled

Controls or suppresses growth of selected woody plants such as blackberry, multiflora rose, poison ivy, and trumpetcreeper and herbaceous annual, biennial, and perennial broadleaf weeds.

General Comments

For brush or woody plant control, various application methods can be used depending on plant species, the size of vegetation, and time of year (consult label). Foliar broadcast and spot treatments should be applied during the season when plants are actively growing. Consult label for specific rates to use depending on vegetation to be controlled.

Precautions

Established grasses are tolerant to Remedy, but newly seeded grasses may be injured until they become well established; do not reseed pastures within a minimum of 3 weeks after treatment. Do not apply to pastures seeded with forage legumes such as clover unless injury or loss of such plants can be tolerated. Avoid applications of Remedy when sensitive broadleaf crops such as tobacco, soybeans, grapes, vegetable crops, or other desirable plants and trees are growing nearby. Do not apply if conditions on day of treatment are favorable for off-site spray drift.

Grazing and Haying Restrictions

When Remedy is applied at less than 2 quants/acre, except for lactating dairy animals, there are no restrictions for livestock grazing or for harvest of green forage following application. For lactating dairy animals, do not graze or harvest green forage from treated areas for 14 days after treatment. Do not harvest hay for 7 days after treatment when fed to non-lactating animals; do not harvest hay until the next growing season for lactating dairy animals. When Remedy is applied at more than 2 quarts to 4 quarts/acre, grazing and haying are more restrictive (consult label). Animals for slaughter should be withdrawn from treated grass forages or consumption of hay harvested from treated areas at least 3 days before slaughter.

Spike 20P

Spike 20P contains 0.2 lb ai tebuthiuron per lb product. For use in pastures, fencerows, and other farmstead (non-cropland) sites.

Use Rate

For individual plants, multistem clumps, or small stands of woody vegetation, apply at a rate of 3/8 to 3/4 oz per 100 sq. ft. (equivalent to a broadcast rate of 10 to 20 lb/A).

Weeds Controlled

For control of woody plants and brush such as multiflora rose.

General Comments

Spike 20P is a pellet formulation of a surface-applied soil-active herbicide. Apply as a spot treatment around woody vegetation anytime throughout the year except when the soil is frozen or is saturated with moisture. For optimum results, apply prior to active seasonal growth in the spring or before expected seasonal rainfall.

Precautions

May cause injury to herbaceous vegetation in area treated. Avoid applications near desirable trees, shrubs, etc. Spike-treated soil may be moved from application areas by flowing water or mechanical means. Allow two years after application before reseeding.

Grazing and Haying Restrictions

Grazing is allowed in areas treated with 20 lb/A or less. Do not cut hay for livestock feed for one year after a Spike treatment.

Table 6. Mixing for spot spraying with hand-held or small tank sprayers.

Spray Concentration (percent)	Amount of Product to Add for Desired Volume:		
	1 gal.	3 gal.	25 gal.
0.5%	0.67 fl. oz	2 fl. oz	1 pt
1.0%	1.33 fl. oz	3.75 fl. oz	1 qt
1.5%	2 fl. oz	5.75 fl. oz	1.5 qt
2.0%	2.67 fl. oz	0.5 pt	2 qt
3.0%	3.75 fl. oz	0.75 pt	3 qt
5.0%	6.5 fl. oz	1.25 pt	5 qt

2 tablespoons = 1 fluid ounce.

Additional Resources

For more information, see AGR-219: *Practicing Good Stewardship When Applying Herbicides for Pasture Weed Control.*

Listing of specific pesticide products implies no endorsement by the University of Kentucky or its representatives. Criticism of products not listed is neither implied or intended.

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