

# Chapter 3 – Weed Control in Small Grains

This chapter is intended to provide herbicide information for weed control in small grains. To effectively manage weeds, a combination of cultural, chemical, and sometimes even mechanical weed control practices are implemented. Below is a listing of recommendations and considerations that should be followed for effective weed management in small grains. Please be aware that not all herbicides listed in this section can be applied to all the different small grains (**Table 3C**).

## Recommendations and Considerations:

### 1. Cultural practices.

A competitive crop is the first step for effective weed management in small grains. A healthy and vigorous small grain stand can be extremely effective in reducing weed emergence, growth, and competition. Variety selection, planting date, seeding rates and other production practices that increase small grain establishment and vigor can reduce the potential impacts that weeds have on the crop.

### 2. Herbicide-resistant weeds.

Horseweed and common ragweed are the two most common herbicide-resistant weeds that small grain farmers encounter. Group 9 (glyphosate) resistance in horseweed and Group 2 (ALS) resistance in both of these weeds can eliminate normally effective herbicides for control. It is important to know the specific herbicide site of action (SOA) group(s) that a weed is resistant to in order to select the most effective herbicide for control.

### 3. Weed control before or at planting.

Effective weed control in small grains requires that all weeds be controlled prior to small grain emergence. Weed control can be accomplished with tillage or with burndown herbicides. In no-till small grains, vegetation control is accomplished before planting with burndown herbicides. Burndown herbicide options and effectiveness are listed in **Table 3A**. **Table 3C** provides additional information on each burndown herbicide.

### 4. Fall postemergence herbicide applications.

A fall POST herbicide application is one option that growers have for weed control. This application generally takes place after small grains have 2- to 3-leaves and are made to control winter annual weeds that emerge with the crop, especially winter annual grasses. In some cases, fall applications also provide an opportunity to include frost-seeded red clover into the system. One downfall is that fall herbicide applications may not provide enough residual activity to control summer annual weeds. Consult **Table 3A** for herbicide effectiveness and **Table 3C** for more information on which herbicides, and what the benefits and limitations are for these applications.

### 5. Spring postemergence herbicide applications.

Spring POST herbicide applications are the most common method for weed control in small grains. Growers should consider weed species identification, weed size, and most importantly small grain stage of growth before selecting a herbicide. This is particularly important for winter wheat.

**Figure 3.1** outlines the minimum and maximum Feekes stages for herbicide applications in winter wheat. Additional factors that could affect the time of herbicide application and herbicide selection include cold weather conditions, frost-seeded clover, and the use of liquid nitrogen as a herbicide carrier. **Table 3A** provides information on the effectiveness of different small grain herbicides. **Table 3B** outlines the components of herbicide premixtures, and **Table 3C** provides important information that addresses all of these considerations about each herbicide.

### 6. Preharvest herbicide applications (harvest aids).

Though not commonly used, there are five different herbicides labeled as harvest aids for small grains. These herbicides are applied to desiccate or suppress weeds that can hinder small grain harvest. They will not improve wheat yield nor greatly reduce weed seed production. **Table 3D** provides information on the effectiveness, benefits, and limitations of these applications.

### 7. Rotation restrictions.

Prior to herbicide use it is always important to determine if the herbicide application that you make this year may affect your crop rotation plan for the following years. **Table 12** provides a complete listing of crop rotation restrictions for all small grain herbicides.

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## Abbreviations for this chapter:

Herbicide Formulations: Table 14

Herbicide Sites of Action: Pages 14-15

### Application Timings:

POST = postemergence

### Units of Measure:

fl oz = fluid ounces

lb = pounds

oz = ounces

pt = pints

% v/v = % volume/volume

### Additives:

AMS = ammonium sulfate

COC = crop oil concentrate

MSO = methylated seed oil

NIS = non-ionic surfactant

### Traits:

N = no specific trait required

**TABLE 3A – Weed Response to Herbicides in Small Grains\***

Burndown prior to emergence	Site of Action	Small Grain Tolerance**	Grasses						Winter Annual Broadleaves						Summer Annuals					Perennials						
			Bluegrass (Annual) <sup>a</sup>	Bluegrass (Roughstalk) <sup>a</sup>	Cheat	Downy brome	Ryegrass (Annual)	Windgrass	Chickweed (Common)	Deadnettle (Purple)	Henbit	Horseweed (marestalk) <sup>b</sup>	Mayweed (dogfennel)	Mustard species	Pennycress (Field)	Shepherd's-purse	Lambsquarters	Pigweed	Ragweed (Common)	Ragweed (Giant)	Smartweed	Bindweed (Field)	Canada thistle	Sowthistle	Wild garlic	Wild onion
Glyphosate	9	1	<b>E</b>	<b>F</b>	<b>E</b>	<b>E</b>	<b>G</b>	<b>E</b>	<b>E</b>	F	<b>G</b>	N	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>G</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>G</b>	<b>G</b>	<b>G</b>	<b>G</b>	P	P
Gramoxone	22	1	F	F	F	<b>G</b>	F	-	<b>E</b>	F	<b>G</b>	F	<b>G</b>	<b>G</b>	<b>G</b>	<b>G</b>	<b>G</b>	<b>G</b>	<b>G</b>	<b>G</b>	-	P	P	P	P	P
Sharpen	14	1	P	P	P	P	P	P	F	P	P	<b>E</b>	-	<b>E</b>	<b>E</b>	<b>E</b>	<b>G</b>	<b>G</b>	<b>G</b>	F	<b>G</b>	P	P	F	-	-
<b>Postemergence</b>																										
2,4-D amine	4	3	N	N	N	N	N	N	P	F	P	<b>G</b>	P	<b>E</b>	<b>E</b>	<b>E</b>	<b>G</b>	<b>G</b>	<b>G</b>	<b>G</b>	P	P	P	P	P	F
2,4-D ester	4	3	N	N	N	N	N	N	P	F	P	<b>G</b>	P	<b>E</b>	<b>E</b>	<b>E</b>	<b>G</b>	<b>G</b>	<b>G</b>	<b>G</b>	P	F	F	P	F	<b>G</b>
Affinity BroadSpec	2/2	1	N	N	N	N	N	N	<b>E</b>	<b>G</b>	<b>E</b>	N	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	F	P	<b>E</b>	P	F	F	<b>G</b>	F
Axial Bold	1/1	1	N	<b>E</b>	N	N	<b>E</b>	<b>G</b>	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Clarity	4	3	N	N	N	N	N	N	F	P	P	<b>G</b>	F	F	P	<b>G</b>	<b>G</b>	<b>G</b>	<b>G</b>	<b>G</b>	<b>G</b>	F	F	F	F	F
Curtail	4/4	3	N	N	N	N	N	N	P	-	-	<b>G</b>	<b>G</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>G</b>	<b>G</b>	<b>G</b>	<b>G</b>	F	P	F	P	P	P
Express	2	1	N	N	N	N	N	N	<b>E</b>	<b>E</b>	<b>E</b>	N	<b>E</b>	<b>E</b>	<b>E</b>	<b>G</b>	<b>E</b>	F	P	P	F	P	F	F	F	P
Harmony	2	1	N	N	N	N	N	N	<b>G</b>	-	-	N	<b>E</b>	<b>G</b>	<b>G</b>	<b>G</b>	<b>G</b>	<b>E</b>	F	P	<b>E</b>	P	P	P	<b>E</b>	F
Harmony Extra	2/2	1	N	N	N	N	N	N	<b>E</b>	<b>G</b>	<b>E</b>	N	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	F	P	<b>E</b>	P	F	F	<b>E</b>	F
Huskie	6/27	1	N	N	N	N	N	N	<b>G</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>G</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>G</b>	F	P	F	F	N	N
Huskie FX	4/6/27	2	N	N	N	N	N	N	<b>G</b>	<b>E</b>	<b>E</b>	<b>E</b>	F	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>G</b>	F	P	F	F	N	N
MCPA	4	2	N	N	N	N	N	N	P	-	-	F	P	<b>G</b>	<b>G</b>	<b>G</b>	<b>G</b>	<b>G</b>	<b>G</b>	F	P	P	P	P	P	P
Moxy	6	1	N	N	N	N	N	N	P	-	<b>G</b>	P	F	<b>E</b>	<b>G</b>	<b>G</b>	<b>E</b>	P	<b>G</b>	<b>G</b>	<b>G</b>	P	P	N	N	N
Osprey	2	2	<b>G</b>	<b>E</b>	F	F	<b>G</b>	<b>E</b>	P	N	N	N	N	<b>G</b>	<b>G</b>	P	N	P	N	N	N	N	N	N	N	N
Osprey Xtra	2/2	2	<b>G</b>	<b>E</b>	<b>G</b>	<b>G</b>	<b>G</b>	<b>E</b>	P	N	N	N	N	<b>G</b>	<b>G</b>	P	N	P	N	N	N	N	N	N	N	N
Peak	2	2	N	N	N	N	N	N	<b>G</b>	F	F	N	P	<b>E</b>	<b>E</b>	<b>G</b>	F	<b>E</b>	<b>E</b>	F	F	F	F	N	<b>G</b>	N
PerfectMatch	2/4/4	2	<b>G</b>	F	<b>E</b>	<b>G</b>	<b>E</b>	<b>E</b>	<b>G</b>	F	F	<b>E</b>	<b>G</b>	<b>E</b>	<b>E</b>	<b>G</b>	<b>G</b>	<b>G</b>	<b>E</b>	<b>G</b>	F	F	<b>G</b>	F	F	N
PowerFlex HL	2	2	<b>G</b>	F	<b>E</b>	<b>G</b>	<b>E</b>	<b>E</b>	<b>G</b>	F	F	N	-	<b>E</b>	<b>E</b>	<b>G</b>	<b>G</b>	<b>G</b>	N	N	F	N	N	N	F	N
Prowl H <sub>2</sub> O	3	2	-	-	-	-	-	P	N	N	N	N	N	N	-	-	F	F	N	N	N	N	N	N	N	N
Quelex	2/4	2	N	N	N	N	N	N	<b>G</b>	<b>G</b>	<b>G</b>	<b>G</b>	<b>G</b>	<b>G</b>	<b>G</b>	<b>G</b>	<b>G</b>	<b>G</b>	N	N	-	P	P	P	N	N
Starane Ultra	4	2	N	N	N	N	N	N	F	-	-	-	P	F	-	-	P	P	<b>E</b>	<b>E</b>	F	F	P	P	N	N
Stinger	4	2	N	N	N	N	N	N	P	-	-	<b>E</b>	<b>G</b>	-	-	-	P	P	<b>G</b>	<b>G</b>	F	P	<b>G</b>	F	N	N
Talinor	6/27	1	N	N	N	N	N	N	<b>G</b>	F	F	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>G</b>	P	F	<b>E</b>	-	-
Widematch	4/4	2	N	N	N	N	N	N	P	-	-	<b>E</b>	<b>G</b>	<b>G</b>	-	-	P	P	<b>E</b>	<b>G</b>	F	F	<b>G</b>	F	N	N

Herbicide Site of Action: The site of action key is located on pages 14-15. Herbicide Effectiveness: P=Poor; F=Fair; G=Good; E=Excellent; N=None; - = Not enough information to rank

\* The above ratings are a relative comparison of herbicide effectiveness. Weather conditions greatly influence the herbicide's effectiveness, and weed control may be better under favorable conditions or poorer under unfavorable conditions.

\*\* Crop Tolerance: 1=Minimal risk of crop injury; 2=Crop injury can occur under certain conditions (cold, wet); 3=Severe crop injury can occur. Follow precautions under Remarks and Limitations and on the label; 4=Risk of severe crop injury is high.

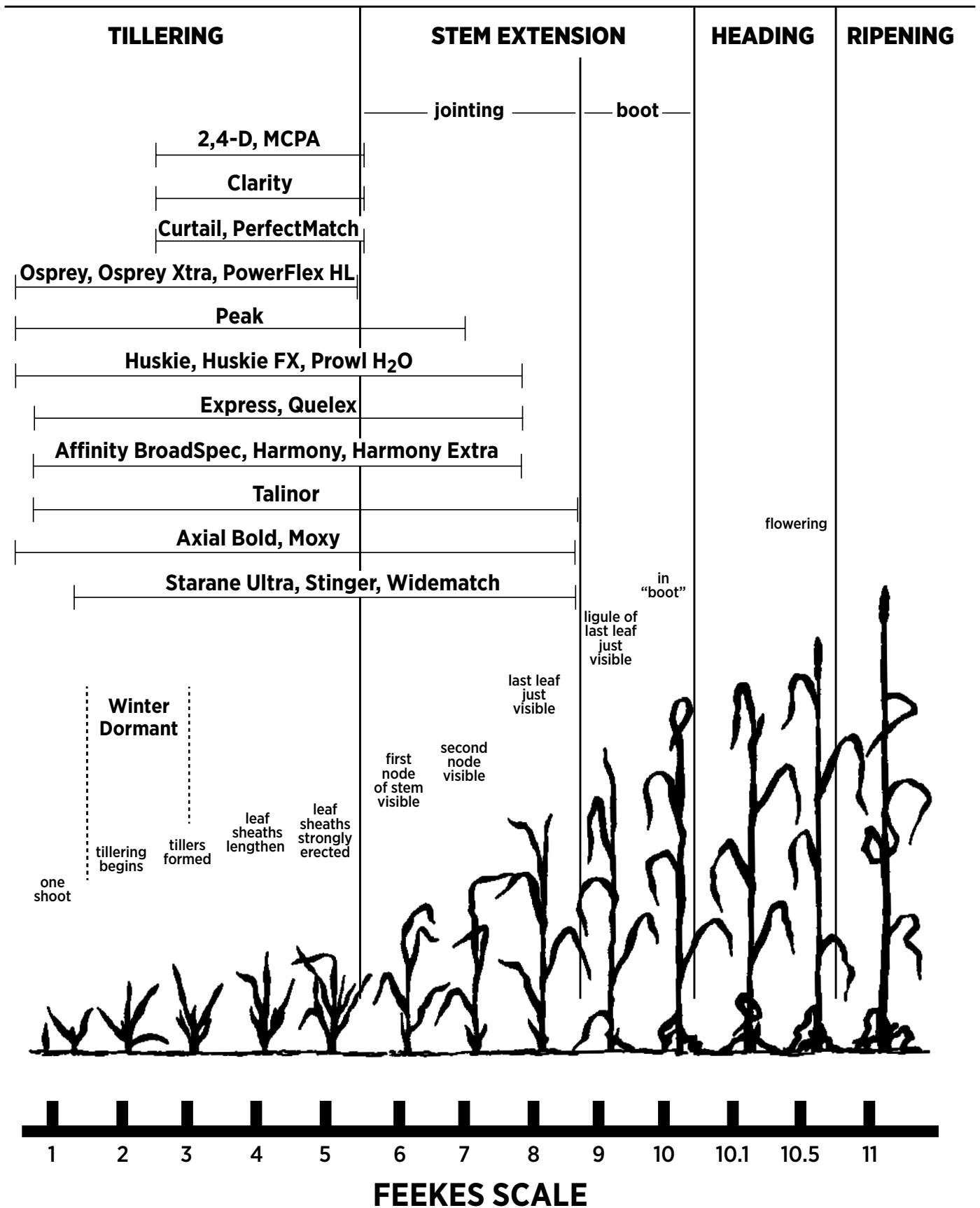
<sup>a</sup> Herbicides need to be applied prior to bluegrass flowering or control will be poor.

<sup>b</sup> Most horseweed populations in Michigan are resistant to ALS-inhibiting herbicides (Group 2) and glyphosate (Group 9). Herbicides that have these site of action groups will not control these resistant horseweed populations and therefore are rated as no control.

**TABLE 3B – Herbicide Premixes in Small Grains**

<b>Trade Name</b>	<b>Company</b>	<b>Formulation</b>	<b>Typical Use Rate/A</b>	<b>=</b>	<b>Equivalent Rates</b>
Affinity BroadSpec	FMC	50WG	0.75 oz	=	0.375 oz Harmony SG + 0.375 oz Express
Axial Bold	Syngenta	0.685EC	15 fl oz	=	16.3 fl oz Axial XL + 0.42 oz ai fenoxaprop
Curtail	BASF	2.38L	2 pt	=	0.25 pt Stinger + 1 pt 2,4-D amine
Harmony Extra	FMC	50SG	0.75 oz	=	0.5 oz Harmony SG + 0.25 oz Express
Huskie	Bayer CropScience	2.06EC	15 fl oz	=	0.82 pt Moxy + 0.037 lb ai pyrasulfotole
Huskie FX	Bayer CropScience	2.3EC	15 fl oz	=	0.2 pt Starane Ultra + 0.675 pt Moxy + 0.031 lb ai pyrasulfatole
Osprey Xtra	Bayer CropScience	6WDG	4.75 oz	=	4.75 oz Osprey + 0.0045 lb ai thiencarbazone
PerfectMatch	Corteva Agriscience	1.61L	1 pt	=	4 fl oz Stinger + 0.27 pt Starane Ultra + 1.7 oz PowerFlex HL
Quelex	Corteva Agriscience	20WDG	0.75 oz	=	0.0046 lb ae halauxifen + 0.0046 lb ai florasulam
Talinor	Syngenta	1.77EC	13.7 fl oz	=	0.62 pt Moxy + 0.033 lb ai bicyclopyrone
Widematch	Corteva Agriscience	1.5EC	1.33 pt	=	5.3 fl oz Stinger + 0.29 pt Starane Ultra

**Figure 3.1 – Wheat growth stages according to the Feekes scale. Management inputs are indicated.**



## TABLE 3C – Small Grain Herbicides – Remarks and Limitations

Herbicide	Common Name	Site of Action Number	Application Timing	Rate/A	Trait
<b>2,4-D amine 4L</b> <b>2,4-D ester 4L</b>	2,4-D	4	POST (Spring only)	1 pt	N

- **2,4-D amine and 2,4-D ester can be applied to wheat, barley, rye, and oats (reduced rate).**
- Refer to Table 3A for postemergence weed control and crop tolerance ratings.
- **Winter wheat, barley, and rye:** apply 2,4-D amine or 2,4-D ester at 1 pt/A in the spring to actively growing grain following tillering (usually about 6-8 inches tall) but prior to jointing, between Feekes stages 3 and 6 (Figure 3.1).
- **Oats:** apply 2,4-D amine at 0.75 pt/A or 2,4-D ester at 0.67 pt/A when oats are at full tiller but prior to jointing, between Feekes stages 3 and 6. Some yield reduction may occur, but is it generally less than caused by weeds.
- DO NOT treat any small grains in the boot to dough stage. The boot stage is when the upper sheath is beginning to swell with the enlarging head.
- Most effective when weeds are small (less than 4 inches).
- DO NOT frost-seed red clover if 2,4-D is applied.
- 2,4-D ester will provide suppression of wild garlic and wild onion.
- For wheat only, liquid nitrogen fertilizer solutions can be used as the carrier in place of water. 2,4-D ester mixes easier with 28% liquid nitrogen.
- DO NOT make more than one postemergence application.
- DO NOT permit dairy animals or meat animals being finished for slaughter to forage treated grain fields within 14 days after treatment. DO NOT feed treated straw to livestock if a preharvest or emergency treatment is used (see label).
- Preharvest interval (PHI): 14 days
- Refer to Table 12 and the label for crop rotation restrictions.

<b>Affinity BroadSpec</b> <b>50SG</b>	thifensulfuron + tribenuron	2 2	POST (Fall, Spring)	0.75 oz + NIS 0.25% v/v	N
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- **Affinity BroadSpec can be applied to wheat, triticale, barley, and oats (reduced rate).**
- Refer to Table 3A for postemergence weed control and crop tolerance ratings.
- See Table 3B for individual product rate equivalents for the premix.
- **Winter wheat, triticale, and barley:** apply Affinity BroadSpec at 0.75 oz/A after the crop is in the 2-leaf stage but before the flag leaf is visible, between Feekes stages 1.2 and 7.9 (Figure 3.1).
- **Oats:** apply Affinity BroadSpec at 0.4 oz/A when oats are in the 3-leaf stage but prior to jointing, between Feekes stages 1.3 and 6. In oats, Affinity BroadSpec must be tank-mixed with an approved tank-mix partner (i.e., 2,4-D) to broaden the spectrum of weed control. Some oat varieties can differ in their response to Affinity BroadSpec. Consult your local seed dealer for information.
- Most effective if weeds are small, 4 inches or less.
- Large fluctuations in temperature or frost the night prior to or two days after application increases crop injury. DO NOT make Affinity BroadSpec applications if the daily high temperature is less than 50 F.
- Red clover can be frost-seeded after fall applications of Affinity BroadSpec. DO NOT apply Affinity BroadSpec in the spring if red clover is frost-seeded.
- Affinity BroadSpec may be tank-mixed with 2,4-D, MCPA or Moxy for improved control of common ragweed.
- Tank-mixtures with 2,4-D may improve Canada thistle control but also carry a greater risk of crop injury. To reduce this risk, apply 2,4-D at no more than 0.5 pt/A (0.25 lb ai/A) and reduce surfactant concentration to 0.125%. For severe Canada thistle infestation in wheat, triticale or barley the Affinity BroadSpec rate can be increased to 1 oz/A.
- **Caution:** In wheat, if liquid nitrogen fertilizer is used as the herbicide carrier, leaf burn, yellowing, and stunting are likely. Crop injury is greatly reduced if the spray carrier is a 50:50 mixture of liquid nitrogen to water compared with 100% liquid nitrogen as the carrier. With favorable growing conditions the symptoms are temporary, but this practice is not recommended.
- DO NOT make more than two applications totaling 1 oz/A/year in wheat, triticale, and barley; or one application totaling 0.4 oz/A/year in oats.
- Preharvest interval (PHI): 7 days (forage); 30 days (hay); and 45 days (grain and straw)
- Refer to Table 12 and the label for crop rotation restrictions.

## TABLE 3C – Small Grain Herbicides – Remarks and Limitations

Herbicide	Common Name	Site of Action Number	Application Timing	Rate/A	Trait
<b>Axial Bold 0.685EC</b>	pinoxaden + fenoxaprop	1 1	POST (Fall, Spring)	15 fl oz	N

- **Axial Bold can only be applied to wheat and barley.**

- Refer to Table 3A for postemergence weed control and crop tolerance ratings.
- See Table 3B for individual product rate equivalents for the premix.
- **Winter wheat:** apply from emergence to the preboot stage, Feekes stage 8 (Figure 3.1).
- **Barley:** apply from emergence to prior to jointing, Feekes stage 6.
- Axial Bold will control windgrass, roughstalk bluegrass, wild oat, and ryegrass (1- to 5-leaf stage).
- Axial Bold can be tank-mixed with other herbicides to control broadleaf weeds. See label for tank-mix partners.
- Red clover can be frost-seeded, as long as it is not used as a forage.
- Axial Bold may be mixed in a spray solution containing up to 50% liquid nitrogen fertilizer.
- DO NOT make more than one application.
- Preharvest interval (PHI): 30 days (grazing and hay); and 70 days (grain and straw)
- Refer to Table 12 and the label for crop rotation restrictions.

<b>Clarity 4L</b>	dicamba	4	POST (Spring only)	4 fl oz	N
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- **Clarity can be applied to wheat, triticale, barley, and oats.**

- Refer to Table 3A for postemergence weed control and crop tolerance ratings.
- **Winter wheat, triticale, and barley:** apply in spring to actively growing plants with a well established secondary root system or following tillering but prior to jointing, between Feekes stages 3 and 6 (Figure 3.1). Some wheat varieties can differ in their response to Clarity. Consult your local seed dealer for information.
- **Oats:** apply before oats exceeds the 5-leaf stage. DO NOT tank-mix Clarity with 2,4-D in oat.
- Most effective when weeds are small, less than 4 inches.
- Dicamba provides some control of bindweed, thistles, wild garlic and wild onion and is more effective than 2,4-D on smartweed, wild buckwheat, and perennials.
- DO NOT frost-seed red clover if dicamba is applied.
- CAUTION should be taken to avoid vapor and particle spray drift.
- DO NOT make more than one postemergence application.
- If small grains are used for pasture or hay, consult the label for harvesting restrictions.
- Preharvest interval (PHI): 7 days
- Refer to Table 12 and the label for crop rotation restrictions.

<b>Curtail 2.38L</b>	clopyralid + 2,4-D amine	4 4	POST (Spring only)	2 pt	N
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- **Curtail can only be applied to wheat and barley.**

- Refer to Table 3A for postemergence weed control and crop tolerance ratings.
- See Table 3B for individual product rate equivalents for the premix.
- Apply to wheat and barley in the spring following tillering but prior to jointing, between Feekes stages 3 and 6 (Figure 3.1).
- Canada thistle is best controlled after the majority of the leaves have emerged from the soil up to the bud stage.
- DO NOT treat a field with Curtail that has been treated previously with 2,4-D or dicamba.
- DO NOT frost-seed red clover if Curtail is applied.
- DO NOT make more than one postemergence application.
- DO NOT permit dairy animals or meat animals being finished for slaughter to forage or graze treated grain fields within 1 week after treatment. DO NOT harvest hay from treated fields.
- Preharvest interval (PHI): 14 days
- Rotation interval for soybeans and dry beans is extended to 18 months if soils contain less than 2% organic matter and natural precipitation is less than 15 inches during the 10.5 months following treatment. Refer to Table 12 and the label for additional crop rotation restrictions.

## TABLE 3C – Small Grain Herbicides – Remarks and Limitations

Herbicide	Common Name	Site of Action Number	Application Timing	Rate/A	Trait
<b>Express 50SG</b>	tribenuron	2	POST (Fall, Spring)	0.5 oz + NIS 0.25% v/v	N

- **Express can be applied to wheat, triticale, barley, and oats (reduced rate).**
- Refer to Table 3A for postemergence weed control and crop tolerance ratings.
- **Winter wheat, triticale, and barley:** apply Express at 0.5 oz/A after the crop is in the 2-leaf stage but before the flag leaf is visible, between Feekes stages 1.2 and 7.9 (Figure 3.1).
- **Oats:** apply Express at 0.2 oz/A when oats are in the 3-leaf stage but prior to jointing, between Feekes stages 1.3 and 6. In oats, Express must be tank-mixed with an approved tank-mix partner (i.e., 2,4-D) to broaden the spectrum of weed control. Some oat varieties can differ in their response to Express. Consult your local seed dealer for information.
- Large fluctuations in temperature or frost the night prior to or two days after application increases crop injury. DO NOT make Express applications if the daily high temperature is less than 50 F.
- Red clover can be frost-seeded after fall applications of Express. DO NOT apply Express in the spring if red clover is frost-seeded.
- Most effective if weeds are small, 4 inches or less. Express provides some suppression of Canada thistle and sowthistle when thistles are actively growing (4-8 inches tall).
- Express may be tank-mixed with 2,4-D, MCPA or Moxy for improved control of common ragweed.
- Tank-mixtures with 2,4-D may improve Canada thistle control but also carry a greater risk of crop injury. To reduce this risk, apply 2,4-D at no more than 0.5 pt/A (0.25 lb ai/A and reduce surfactant concentration to 0.125%.
- Caution: In wheat, if liquid nitrogen fertilizer is used as the herbicide carrier, leaf burn, yellowing, and stunting are likely. Crop injury is greatly reduced if the spray carrier is a 50:50 mixture of liquid nitrogen to water compared with 100% liquid nitrogen as the carrier. With favorable growing conditions the symptoms are temporary, but this practice is not recommended.
- DO NOT make more than two applications totaling 0.5 oz/A/year in wheat, triticale, and barley; or one application totaling 0.2 oz/A/year in oats.
- Preharvest interval (PHI): 7 days (forage); 30 days (hay); and 45 days (grain and straw)
- Refer to Table 12 and the label for crop rotation restrictions.

<b>glyphosate (see Table 10)</b>	glyphosate	9	Burndown (prior to emergence)	0.75-1.13 lb ae (see Table 10) + AMS 17 lb/100 gal	N
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- **Glyphosate can be applied prior to planting no-till small grains - wheat, triticale, barley, rye, and oats.**
- Glyphosate can be applied anytime prior to small grain emergence to control emerged weeds. Tank-mixtures with Sharpen will help to control glyphosate-resistant horseweed.
- Glyphosate does not have residual activity and will only control existing vegetation.
- Spray coverage is important - apply in a minimum of 10 gallons of water per acre (20 gal/A is recommended).
- DO NOT apply after small grain emergence or crop injury will occur.

<b>Gramoxone SL 3.0L</b>	paraquat	22	Burndown (prior to emergence)	2 pt + NIS 0.25% v/v	N
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- **Gramoxone can be applied prior to planting no-till small grains - wheat and barley only.**
- **Gramoxone is a restricted-use pesticide.** Certified applicators are required to complete a paraquat specific training prior to use of Gramoxone. The paraquat training course can be found at: [www.epa.gov/pesticide-worker-safety/paraquat-dichloride-training-certified-applicators](http://www.epa.gov/pesticide-worker-safety/paraquat-dichloride-training-certified-applicators).
- Gramoxone can be applied anytime prior to small grain emergence to control emerged weeds. Gramoxone can be tank-mixed with Sharpen for additional weed control.
- Gramoxone does not have residual activity and will only control existing vegetation.
- Apply at 1.7 to 2 pt/A for weeds less than 3 inches tall and 2 to 2.7 pt/A for weeds from 3 to 6 inches tall.
- Always add surfactant at 0.25% v/v or a crop oil concentrate at 1% v/v.
- Spray coverage is important - apply in a minimum of 10 gallons of water per acre (20 gal/A is recommended).
- DO NOT apply after small grain emergence or crop injury will occur.
- DO NOT apply more than 2.7 pt/A in a single application or 8.0 pt/A/year for all uses.

## TABLE 3C – Small Grain Herbicides – Remarks and Limitations

Herbicide	Common Name	Site of Action Number	Application Timing	Rate/A	Trait
<b>Harmony SG 50SG</b>	thifensulfuron	2	POST (Fall, Spring)	0.75 oz + NIS 0.25% v/v	N

- **Harmony SG can be applied to wheat, triticale, barley, and oats (reduced rate).**
- Refer to Table 3A for postemergence weed control and crop tolerance ratings.
- **Winter wheat, triticale, and barley:** apply Harmony SG at 0.75 oz/A after the crop is in the 2-leaf stage but before the flag leaf is visible, between Feekes stages 1.2 and 7.9 (Figure 3.1).
- **Oats:** apply Harmony SG at 0.6 oz/A when oats are in the 3-leaf stage but prior to jointing, between Feekes stages 1.3 and 6. In oats, Harmony SG must be tank-mixed with an approved tank-mix partner (i.e., 2,4-D) to broaden the spectrum of weed control.
- Large fluctuations in temperature or frost the night prior to or two days after application increases crop injury. DO NOT make Harmony SG applications if the daily high temperature is less than 50 F.
- Red clover can be frost-seeded after fall applications of Harmony SG. DO NOT apply Harmony in the spring if red clover is frost-seeded.
- Most effective if weeds are small, 4 inches or less.
- Reduce the Harmony SG rate to 0.45 oz/A for mayweed (dogfennel) control.
- Increase the Harmony SG rate to 0.9 oz/A for severe weed infestations.
- For wild garlic control apply Harmony SG at 0.75 to 0.9 oz/A + NIS when plant are less than 12 inches tall with 2 to 4 inches of regrowth.
- Harmony SG may be tank-mixed with 2,4-D, MCPA or Moxy for improved control of common ragweed.
- Tank-mixtures with 2,4-D may improve Canada thistle control but also carry a greater risk of crop injury. To reduce this risk, apply 2,4-D at no more than 0.5 pt/A (0.25 lb ai/A) and reduce surfactant concentration to 0.125%.
- **Caution:** In wheat, if liquid nitrogen fertilizer is used as the herbicide carrier, leaf burn, yellowing, and stunting are likely. Crop injury is greatly reduced if the spray carrier is a 50:50 mixture of liquid nitrogen to water compared with 100% liquid nitrogen as the carrier. With favorable growing conditions the symptoms are temporary, but this practice is not recommended.
- DO NOT make more than two applications totaling 1.5 oz/A/year in wheat, triticale, and barley; or one application totaling 0.6 oz/A/year in oats.
- Preharvest interval (PHI): 7 days (forage); 30 days (hay); and 45 days (grain and straw)
- Refer to Table 12 and the label for crop rotation restrictions.

<b>Harmony Xtra SG 50SG</b>	thifensulfuron + tribenuron	2 2	POST (Fall, Spring)	0.75 oz + NIS 0.25% v/v	N
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- **Harmony Xtra SG can be applied to wheat, triticale, barley, and oats (reduced rate).**
- Refer to Table 3A for postemergence weed control and crop tolerance ratings.
- See Table 3B for individual product rate equivalents for the premix.
- **Winter wheat, triticale, and barley:** apply Harmony Xtra SG at 0.75 oz/A after the crop is in the 2-leaf stage but before the flag leaf is visible, between Feekes stages 1.2 and 7.9 (Figure 3.1).
- **Oats:** apply Harmony Xtra SG at 0.6 oz/A when oats are in the 3-leaf stage but prior to jointing, between Feekes stages 1.3 and 6. In oats, Harmony Xtra SG must be tank-mixed with an approved tank-mix partner (i.e., 2,4-D) to broaden the spectrum of weed control. Some oat varieties can differ in their response to Harmony Xtra SG. Consult your local seed dealer for information.
- Large fluctuations in temperature or frost the night prior to or two days after application increases crop injury. DO NOT make Harmony Xtra SG applications if the daily high temperature is less than 50 F.
- Red clover can be frost-seeded after fall applications of Harmony Xtra SG. DO NOT apply Harmony in the spring if red clover is frost-seeded.
- Most effective if weeds are small, 4 inches or less.
- Reduce the Harmony Xtra SG rate to 0.45 oz/A for mayweed (dogfennel) control.
- Increase the Harmony Xtra SG rate to 0.9 oz/A for severe weed infestations.
- Harmony Extra is the best herbicide option for controlling wild garlic — increase the rate to 0.9 oz/A and apply when wild garlic is less than 12 inches tall with 2-4 inches of new growth. Harmony Extra will provide some control of wild onion.
- Harmony Xtra SG may be tank-mixed with 2,4-D, MCPA or Moxy for improved control of common ragweed.
- Tank-mixtures with 2,4-D may improve Canada thistle control but also carry a greater risk of crop injury. To reduce this risk, apply 2,4-D at no more than 0.5 pt/A (0.25 lb ai/A) and reduce surfactant concentration to 0.125%.
- **Caution:** In wheat, if liquid nitrogen fertilizer is used as the herbicide carrier, leaf burn, yellowing, and stunting are likely. Crop injury is greatly reduced if the spray carrier is a 50:50 mixture of liquid nitrogen to water compared with 100% liquid nitrogen as the carrier. With favorable growing conditions the symptoms are temporary, but this practice is not recommended.
- DO NOT make more than two applications totaling 1.5 oz/A/year in wheat, triticale, and barley; or one application totaling 0.6 oz/A/year in oats.
- Preharvest interval (PHI): 7 days (forage); 30 days (hay); and 45 days (grain and straw)
- Refer to Table 12 and the label for crop rotation restrictions.



## TABLE 3C – Small Grain Herbicides – Remarks and Limitations

Herbicide	Common Name	Site of Action Number	Application Timing	Rate/A	Trait
<b>Huskie 2.06EC</b>	pyrasulfotole + bromoxynil	27 6	POST (Fall, Spring)	15 fl oz + NIS 0.25% v/v + AMS 1 lb	N

- **Huskie can only be applied to wheat, triticale, and barley.**
- Refer to Table 3A for postemergence weed control and crop tolerance ratings.
- See Table 3B for individual product rate equivalents for the premix.
- Apply Huskie between 1 leaf and up to flag leaf emergence, between Feekes stages 1 and 7.9 (Figure 3.1).
- Apply to actively growing weeds with 1 to 4 leaves at 13.5 to 15 fl oz/A. The higher use rate is needed when conditions are cool early in the spring.
- In wheat, Huskie can be tank-mixed with Osprey or PowerFlex HL to control grass species. Tank-mixtures may cause some temporary yellowing, leaf burn, and stunting.
- Red clover can be frost-seeded after fall applications of Huskie – some initial leaf margin bleaching may occur. DO NOT apply Huskie in the spring if red clover is frost-seeded.
- **Wheat only:** Liquid nitrogen fertilizer solutions can be used as the carrier in place of water. For fall applications, DO NOT apply more than a 50:50 mixture of liquid nitrogen to water as the spray carrier. In the spring, crop injury is greatly reduced if the spray carrier is a 50:50 mixture of liquid nitrogen to water compared with 100% liquid nitrogen as the carrier.
- DO NOT make more than one application of Huskie per season.
- Preharvest interval (PHI): 25 days (forage and hay); and 60 days (grain and straw)
- Refer to Table 12 and the label for crop rotation restrictions.

<b>Huskie FX 2.3EC</b>	pyrasulfotole + bromoxynil + fluroxypyr	27 6 4	POST (Fall, Spring)	15 fl oz + NIS 0.25% v/v + AMS 1 lb	N
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- **Huskie FX can only be applied to wheat, triticale, and barley.**
- Refer to Table 3A for postemergence weed control and crop tolerance ratings.
- See Table 3B for individual product rate equivalents for the premix.
- Apply Huskie FX between 1 leaf and up to flag leaf emergence, between Feekes stages 1 and 7.9 (Figure 3.1).
- Apply Huskie FX to actively growing weeds no larger than 4 to 6 leaves at 15 to 18 fl oz/A. Under cool conditions higher Huskie FX rate should be applied.
- Huskie FX may be tank-mixed with most other herbicides. Consult labels for tank-mix partners.
- DO NOT apply Huskie FX in the spring if red clover is frost-seeded.
- **Wheat only:** Liquid nitrogen fertilizer solutions can be used as the carrier in place of water. For fall applications, DO NOT apply more than a 50:50 mixture of liquid nitrogen to water as the spray carrier and do not exceed more than 30 pounds of actual nitrogen. In the spring, crop injury is greatly reduced if the spray carrier is a 50:50 mixture of liquid nitrogen to water compared with 100% liquid nitrogen as the carrier.
- DO NOT spray if night temperatures go below 40 F the night before or after application.
- DO NOT make more than one application of Huskie FX per season.
- DO NOT use treated plant material or manure from animals that have grazed or consumed forage from areas treated with this product for compost or mulch for 30 days after application.
- Preharvest interval (PHI): 25 days (forage and hay); and 60 days (grain and straw)
- Refer to Table 12 and the label for crop rotation restrictions.

<b>MCPA 4L</b>	MCPA	4	POST (Spring only)	0.5 pt	N
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- **MCPA can be applied to wheat, barley, rye, and oats.**
- Refer to Table 3A for postemergence weed control and crop tolerance ratings.
- Apply MCPA at 0.5 to 1 pt/A to actively growing grain following tillering (usually about 6-8 inches tall), but prior to jointing, between Feekes 3 and 6 (Figure 3.1). DO NOT apply to grain in the boot to the dough stage. The boot stage is when the upper sheath is beginning to swell with the enlarging head.
- MCPA at 0.38 to 0.5 pt/A (0.5 pt/A maximum) is the only broadleaf herbicide that can be applied in the spring to small grains underseeded with certain legumes (e.g., red clover). However, not all legumes are tolerant to MCPA. DO NOT underseed sweet clover or hairy vetch since they are very sensitive to MCPA.
- A canopy of grain and weeds over the seeding will reduce the possibility of injury to the legume.
- Apply in 5 to 6 gallons of water/A to minimize crop injury.
- DO NOT apply more than 1.67 pt/A/year.
- Preharvest interval (PHI): 7 days (forage or graze)
- Refer to Table 12 and the label for crop rotation restrictions.

## TABLE 3C – Small Grain Herbicides – Remarks and Limitations

Herbicide	Common Name	Site of Action Number	Application Timing	Rate/A	Trait
<b>Moxy 2EC (others)</b>	bromoxynil	6	POST (Fall, Spring)	1.5 pt	N
<ul style="list-style-type: none"> <li>• <b>Moxy can be applied to wheat, triticale, barley, rye, and oats.</b></li> <li>• Refer to Table 3A for postemergence weed control and crop tolerance ratings.</li> <li>• Apply from emergence to the boot stage of growth, between Feekes stages 1 and 9 (Figure 3.1). Moxy provides very good crop safety.</li> <li>• Bromoxynil must be applied to small weeds for effective control.</li> <li>• Moxy may be applied to small grains seeded with ALFALFA only. Alfalfa needs to have at least 4 trifoliolate leaves prior to application and air temperatures should not exceed 70°F at and 3 days following application.</li> <li>• Good coverage is essential.</li> <li>• Redroot pigweed and mustard must be controlled when very small (refer to label for details).</li> <li>• DO NOT exceed a total cumulative Moxy rate of 2 pt/A/year.</li> <li>• Preharvest interval (PHI): 45 days (graze)</li> <li>• Refer to Table 12 and the label for crop rotation restrictions.</li> </ul>					
<b>Osprey 4.5WDG</b>	mesosulfuron	2	POST (Fall, Spring)	4.75 oz + NIS 0.5% v/v + AMS 3 lb	N
<ul style="list-style-type: none"> <li>• <b>Osprey can only be applied to wheat and triticale.</b></li> <li>• Refer to Table 3A for postemergence weed control and crop tolerance ratings.</li> <li>• Apply in the fall after emergence, or in the spring prior to jointing (Feekes 6) (Figure 3.1).</li> <li>• Osprey will control windgrass (3 inches or less), annual bluegrass (prior to seed head development), roughstalk bluegrass, cheat, and annual ryegrass (1-leaf to 2-tiller).</li> <li>• Osprey can be tank-mixed with other herbicides to control a broader spectrum of broadleaf weeds. See label for tank-mix partners.</li> <li>• Large fluctuations in temperature or frost the night prior to or two days after application increases crop injury.</li> <li>• Red clover can be frost-seeded after fall applications of Osprey – some initial injury may occur. DO NOT apply Osprey in the spring if red clover is frost-seeded.</li> <li>• Osprey should be applied using water as the spray carrier, but up to 15% of the spray solution can be nitrogen fertilizer solution.</li> <li>• DO NOT use spray additives that alter the spray solution below 6.0 pH.</li> <li>• DO NOT make more than one application or apply a total of 4.75 oz/A per year.</li> <li>• Preharvest interval (PHI): 30 days (forage); and 60 days (hay, grain, and straw)</li> <li>• Refer to Table 12 and the label for crop rotation restrictions.</li> </ul>					
<b>Osprey Xtra 6WDG</b>	mesosulfuron + thiencarbazon	2 2	POST (Fall, Spring)	4.75 oz + NIS 0.5% v/v + AMS 3 lb	N
<ul style="list-style-type: none"> <li>• <b>Osprey Xtra can only be applied to wheat and triticale.</b></li> <li>• Refer to Table 3A for postemergence weed control and crop tolerance ratings.</li> <li>• See Table 3B for individual product rate equivalents for the premix.</li> <li>• Apply in the fall after emergence, or in the spring prior to jointing (Feekes 6) (Figure 3.1).</li> <li>• Osprey Xtra will control windgrass (3 inches or less), annual bluegrass (prior to seed head development), roughstalk bluegrass, cheat, wild oat, and annual ryegrass (1-leaf to 2-tiller).</li> <li>• Osprey Xtra can be tank-mixed with other herbicides to control a broader spectrum of broadleaf weeds. See label for tank-mix partners.</li> <li>• Large fluctuations in temperature or frost the night prior to or two days after application causes severe crop injury that can impact yield. Applications when temperatures are less than 50 F have caused significant injury that has impacted wheat yield.</li> <li>• DO NOT frost-seed red clover if Osprey Xtra was or will be applied.</li> <li>• Osprey Xtra should be applied using water as the spray carrier, but up to 15% of the spray solution can be nitrogen fertilizer solution.</li> <li>• DO NOT make an independent liquid nitrogen fertilizer application within 7 days before or after an Osprey Xtra application.</li> <li>• DO NOT use spray additives that alter the spray solution below 6.0 pH.</li> <li>• DO NOT make more than one application or apply a total of 4.75 oz/A per year.</li> <li>• Preharvest interval (PHI): 30 days (forage); and 60 days (hay, grain, and straw)</li> <li>• Refer to Table 12 and the label for crop rotation restrictions.</li> </ul>					

## TABLE 3C – Small Grain Herbicides – Remarks and Limitations

Herbicide	Common Name	Site of Action Number	Application Timing	Rate/A	Trait
<b>Peak 57WDG</b>	prosulfuron	2	POST (Fall, Spring)	0.38 oz + COC1% v/v	N

- **Peak can be applied to wheat, triticale, barley, rye, and oats.**
- Refer to Table 3A for postemergence weed control and crop tolerance ratings.
- Apply from small grain emergence to before the second node is detectable in stem elongation, between Feekes stages 1 and 7 (Figure 3.1).
- Peak is most effective when weeds are between 2 to 3 inches tall. Peak also provides good control of wild garlic.
- For severe weed infestations, increase the Peak rate to 0.5 oz/A.
- Peak may be tank-mixed in the spring with 2,4-D, dicamba, Moxy or MCPA to improve control of other broadleaf weeds.
- NIS (0.25% v/v) should replace COC when applied with liquid fertilizer as the carrier.
- DO NOT apply when the crop is under stress due to drought, cold weather or other factors, or if cold, wet conditions are expected within one week after application.
- DO NOT frost-seed red clover if Peak was or will be applied.
- DO NOT apply more than a 0.5 oz/A in a single application or a total of 1 oz/A per year.
- Preharvest interval (PHI): 30 days (grazing or forage); and 60 days (grain)
- Rotation restrictions are 22 months for several crops, including soybeans. Refer to Table 12 and the label for additional crop rotation restrictions.

<b>PerfectMatch 1.61L</b>	clopyralid + fluroxypyr + pyroxsulam	4 2 2	POST (Spring only)	1 pt + NIS 0.25% v/v + AMS 3 lb	N
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- **PerfectMatch can only be applied to wheat and triticale.**
- Refer to Table 3A for postemergence weed control and crop tolerance ratings.
- See Table 3B for individual product rate equivalents for the premix.
- Apply in the spring from the 3 leaf stage to jointing, between Feekes stages 1.3 and 6 (Figure 3.1).
- PerfectMatch will control windgrass; annual bluegrass (prior to seed head development); roughstalk bluegrass and downy brome (Fall only); cheat and Italian ryegrass.
- Most effective when grass weeds are at the 2 leaf stage and broadleaf weeds are less than 2 inches tall.
- If needed, PerfectMatch can be tank-mixed with other herbicides. See label for tank-mix partners.
- DO NOT tank-mix with dicamba, 2,4-D amine, or MCPA - grass control will be reduced.
- DO NOT apply to crops suffering from drought, water-logged soils, nutrient deficiency, or exposure to frost.
- DO NOT apply PerfectMatch if the crop is underseeded with a legume.
- **Wheat only:** PerfectMatch may be applied with no more than 50% of the spray carrier as liquid nitrogen (<30 lb actual nitrogen), reduce the rate of surfactant to 0.25% - foliar leaf burn, yellowing, and reduced growth may occur.
- DO NOT make an independent liquid nitrogen fertilizer application within 7 days before or after PowerFlex HL application.
- DO NOT use spray additives that alter the spray solution below 6.0 pH.
- DO NOT make more than one application or apply a total of 1pt/A per year.
- Preharvest interval (PHI): 7 days (grazing); 28 days (hay); and 60 days (grain)
- Refer to Table 12 and the label for crop rotation restrictions.

<b>PowerFlex HL 13WDG</b>	pyroxsulam	2	POST (Fall, Spring)	2 oz + NIS 0.5% v/v + AMS 3 lb	N
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- **PowerFlex HL can only be applied to wheat and triticale.**
- Refer to Table 3A for postemergence weed control and crop tolerance ratings.
- Apply in the fall or spring from the 3 leaf stage to jointing, between Feekes stages 1.3 and 6 (Figure 3.1).
- PowerFlex HL will control windgrass; annual bluegrass (prior to seed head development); roughstalk bluegrass and downy brome (Fall only); cheat and Italian ryegrass.
- Most effective when grass weeds are at the 2 leaf stage and broadleaf weeds are less than 2 inches tall.
- PowerFlex HL can be tank-mixed with other herbicides to control a broader spectrum of broadleaf weeds. See label for tank-mix partners.
- DO NOT tank-mix with dicamba, 2,4-D amine, or MCPA - grass control will be reduced.
- DO NOT apply to crops suffering from drought, water-logged soils, nutrient deficiency, or exposure to frost.
- Red clover can be frost-seeded after fall applications of PowerFlex HL – some initial injury may occur. DO NOT apply PowerFlex HL in the spring if red clover is frost-seeded.
- PowerFlex HL may be applied with no more than 50% of the spray carrier as liquid nitrogen (<30 lb actual nitrogen), reduce the rate of surfactant to 0.25% - foliar leaf burn, yellowing, and reduced growth may occur.
- DO NOT make an independent liquid nitrogen fertilizer application within 7 days before or after PowerFlex HL application.
- DO NOT use spray additives that alter the spray solution below 6.0 pH.
- DO NOT make more than one application or apply a total of 2 oz/A per year.
- Preharvest interval (PHI): 7 days (grazing); 28 days (hay); and 60 days (grain)
- Refer to Table 12 and the label for crop rotation restrictions.

## TABLE 3C – Small Grain Herbicides – Remarks and Limitations

Herbicide	Common Name	Site of Action Number	Application Timing	Rate/A	Trait
<b>Prowl H<sub>2</sub>O 3.8CS</b>	pendimethalin	3	POST (Fall, Spring)	2 pt	N
<ul style="list-style-type: none"> <li>• <b>Prowl H<sub>2</sub>O can only be applied to wheat and triticale.</b></li> <li>• Refer to Table 3A for weed control and crop tolerance ratings.</li> <li>• Apply between 1 leaf and flag leaf emergence, between Feekes stages 1 and 7.9 (Figure 3.1).</li> <li>• Prowl H<sub>2</sub>O has limited effectiveness against windgrass.</li> <li>• Prowl H<sub>2</sub>O should be applied before target weed emergence. Prowl H<sub>2</sub>O will not control emerged weeds.</li> <li>• Wheat seed must be planted 1/2 to 1 inch deep to avoid crop injury.</li> <li>• Preharvest interval (PHI): 11 days (forage); 28 days (hay); and 60 days (grain and straw)</li> <li>• Refer to Table 12 and the label for crop rotation restrictions.</li> </ul>					
<b>Quelex 20WDG</b>	halauxifen + florasulam	4 2	POST (Fall, Spring)	0.75 oz + COC 1% v/v	N
<ul style="list-style-type: none"> <li>• <b>Quelex can only be applied to wheat, barley, and triticale.</b></li> <li>• Refer to Table 3A for weed control and crop tolerance ratings.</li> <li>• See Table 3B for individual product rate equivalents for the premix.</li> <li>• Apply between 2 leaf and up to flag leaf emergence, between Feekes stages 1.2 and 7.9 (Figure 3.1).</li> <li>• Apply to actively growing weeds less than 4 inches tall.</li> <li>• DO NOT frost-seed red clover if Quelex is applied.</li> <li>• Liquid nitrogen fertilizers can be used as a carrier in place of water. However, NIS (maximum rate 0.25% v/v) needs to be used instead of COC if nitrogen fertilizers are the carrier. Temporary crop injury can occur when liquid nitrogen is used as a carrier.</li> <li>• Extreme growing conditions (drought or freezing) prior to, at, or following the time of application may reduce weed control and the risk of crop injury.</li> <li>• DO NOT compost any plant material from treated areas.</li> <li>• DO NOT apply more than 0.75 oz/A per growing season.</li> <li>• Preharvest interval (PHI): 7 days (grazing); 21 days (hay); and 60 days (grain)</li> <li>• Refer to Table 12 and the label for crop rotation restrictions.</li> </ul>					
<b>Sharpen 2.85SC</b>	saflufenacil	14	Burndown (prior to emergence)	1 fl oz + MSO 1% v/v + AMS 8.5 lb/100 gal	N
<ul style="list-style-type: none"> <li>• <b>Sharpen can be applied prior to planting no-till small grains - wheat, triticale, barley, rye, and oats.</b></li> <li>• Apply Sharpen prior to small grain emergence to control winter annual weeds (i.e., horseweed). Tank-mix Sharpen with glyphosate or Gramoxone to broaden the spectrum of weed control.</li> <li>• Sharpen can be applied at rates up to 2 fl oz/A. The 2 fl oz/A rate provides limited residual control of broadleaf weeds.</li> <li>• Spray coverage is important - apply in a minimum of 10 gallons of water per acre (20 gal/A is recommended).</li> <li>• DO NOT apply after small grain emergence or crop injury will occur.</li> <li>• DO NOT apply more than a maximum cumulative amount of 4 fl oz/A per cropping system.</li> <li>• Ensure the seed row is sufficiently covered with soil to prevent high concentrations of herbicide in the seed zone.</li> <li>• Refer to Table 12 and the label for crop rotation restrictions. DO NOT include time in the rotation interval when the ground is frozen.</li> </ul>					
<b>Starane Ultra 2.8EC</b>	fluroxypyr	4	POST (Fall, Spring)	0.4 pt	N
<ul style="list-style-type: none"> <li>• <b>Starane Ultra can be applied to wheat, triticale, barley, rye, and oats.</b></li> <li>• Refer to Table 3A for weed control and crop tolerance ratings.</li> <li>• Apply Starane Ultra from 2 leaf small grains up to and including flag leaf emergence, between Feekes stages 1.2 and 9 (Figure 3.1).</li> <li>• Apply to actively growing weeds up to 8 inches tall. Starane Ultra provides excellent control of hemp dogbane.</li> <li>• For volunteer potato control, increase the rate of Starane Ultra to 0.7 pt/A and apply before potatoes are 8 inches tall.</li> <li>• DO NOT frost-seed red clover if Starane Ultra is applied.</li> <li>• DO NOT apply more than 0.7 pt/A per growing season.</li> <li>• Preharvest interval (PHI): 7 days (grazing and forage); 14 days (hay); and 40 days (grain and straw)</li> <li>• Refer to Table 12 and the label for crop rotation restrictions.</li> </ul>					

## TABLE 3C – Small Grain Herbicides – Remarks and Limitations

Herbicide	Common Name	Site of Action Number	Application Timing	Rate/A	Trait
<b>Stinger HL 5EC</b>	clopyralid	4	POST (Spring only)	0.15 pt	N
<b>Stinger 3EC</b>	clopyralid	4	POST (Spring only)	0.25 pt	N

- **Stinger can be applied to wheat, barley, and oats.**

- Refer to Table 3A for weed control and crop tolerance ratings.
- Apply from 3 leaf small grains up to the early boot stage of growth, between Feekes stages 1.3 and 9 (Figure 3.1).
- Apply to actively growing broadleaf weeds up to the 5 leaf stage.
- For Canada thistle and sowthistle control, increase the rate of Stinger HL (5EC) to 0.2 pt/A or Stinger (3EC) to 0.33 pt/A and apply when thistles are between the rosette and bud stage.
- DO NOT frost-seed red clover if Stinger is applied.
- DO NOT apply more than 0.2 pt/A/year of Stinger HL (5EC) or 0.33 pt/A/year of Stinger (3EC).
- DO NOT permit dairy animals or meat animals being finished for slaughter to forage or graze treated grain fields within 1 week after treatment. DO NOT harvest hay from treated fields.
- Preharvest interval (PHI): none listed
- Rotation interval for soybeans and dry beans is extended to 18 months if soils contain less than 2% organic matter and natural precipitation is less than 15 inches during the 10.5 months following treatment. Refer to Table 12 and the label for additional crop rotation restrictions.

<b>Talinor 1.77EC</b>	bromoxynil + bicyclopyrone	6 27	POST (Fall, Spring)	13.7 fl oz + CoAct+ 2.75 fl oz + COC 1% v/v	N
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- **Talinor can only be applied to wheat and barley.**

- Refer to Table 3A for weed control and crop tolerance ratings.
- See Table 3B for individual product rate equivalents for the premix.
- Apply Talinor between 2 leaf and up to the preboot stage, Feekes stage 1.2 and 8 (Figure 3.1).
- Apply to actively growing weeds with 1 to 4 leaves at rates ranging from 13.7 to 18.2 fl oz/A.
- CoAct+ must be applied with Talinor and with either COC or NIS, depending on tank-mix partner. CoAct+ rates are dependent on the Talinor use rate. Talinor applied at 16 fl oz/A needs 3.2 fl oz/A of CoAct+ and Talinor applied at 18.2 fl oz/A needs 3.6 fl oz/A of CoAct+.
- DO NOT add AMS or nitrogen products or severe crop injury can occur.
- In wheat, Talinor can be tank-mixed with Osprey or PowerFlex HL to control grass species. Tank-mixtures may cause some temporary yellowing, leaf burn, and stunting.
- DO NOT apply Talinor in the spring if red clover is under-seeded.
- DO NOT apply to a crop that is stressed by frost, drought, flooding, or other conditions.
- Talinor may be tank-mixed with certain fungicides, consult label.
- DO NOT make more than one application of Talinor per season.
- Preharvest interval (PHI): 30 days (grazing, forage, and hay); and 60 days (grain and straw)
- Rotation restrictions are increased for alfalfa, dry beans, soybean, and sugarbeet if the Talinor rate used is greater than 13.7 fl oz/A. Refer to Table 12 and the label for crop rotation restrictions.

<b>WideMatch 1.5EC</b>	fluroxypyr + clopyralid	4 4	POST (Spring only)	1.33 pt	N
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- **WideMatch can be applied to wheat, barley, and oats.**

- Refer to Table 3A for weed control and crop tolerance ratings.
- See Table 3B for individual product rate equivalents for the premix.
- Apply from 3 leaf small grains up to and including flag leaf emergence, between Feekes stages 1.3 and 9 (Figure 3.1).
- Apply to actively growing weeds up to 8 inches tall. WideMatch provides excellent control of hemp dogbane, sowthistle, and Canada thistle and suppression of volunteer potato.
- For Canada thistle and sowthistle control, apply when thistles are between the rosette and bud stage.
- DO NOT use WideMatch on small grains frost-seeded with red clover.
- DO NOT apply more than 1.33 pt/A of WideMatch per growing season.
- Preharvest interval (PHI): 7 days (grazing and forage); 14 days (hay); and 40 days (grain and straw)
- Rotation interval for soybeans and dry beans is extended to 18 months if soils contain less than 2% organic matter and natural precipitation is less than 15 inches during the 10.5 months following treatment. Refer to Table 12 and the label for additional crop rotation restrictions.

## TABLE 3D – Small Grains – Preharvest Applications

Herbicide	Common Name	Site of Action Number	Application Timing	Rate/A	Trait
<b>2,4-D amine 4L 2,4-D ester 4L</b>	2,4-D	4	Preharvest	1 pt	N
<ul style="list-style-type: none"> <li>• <b>2,4-D can be used as a harvest aid in all small grains - wheat, barley, triticale, rye, and oats.</b></li> <li>• Apply when the small grain is in the hard-dough stage and the green color is gone from the nodes of the stem.</li> <li>• 2,4-D can be used to suppress broadleaf weeds; however perennial weeds or hard-to-control annual or biennial weeds may not be controlled at this rate.</li> <li>• Caution should be taken to avoid vapor and particle spray drift.</li> <li>• 2,4-D can be applied with other preharvest herbicides including glyphosate to broaden the spectrum of weed control over 2,4-D alone.</li> <li>• It generally takes 14 days to reach maximum control.</li> <li>• Spray coverage is important - apply in a minimum of 15 gallons of water per acre (20 gal/A is recommended).</li> <li>• Only one preharvest application is allowed (1 pt/A), make sure not to exceed the rate of 3.6 pt/A for all applications per crop cycle.</li> <li>• DO NOT permit dairy animals or meat animals being finished for slaughter to forage treated grain fields within 14 days after treatment. DO NOT feed treated straw to livestock if a preharvest or emergency treatment is used (see label).</li> <li>• Preharvest interval (PHI): 14 days.</li> <li>• DO NOT double crop soybean unless 7 days have occurred between 2,4-D ester application and planting or 15 days between 2,4-D amine application and planting. Refer to Table 12 and the label for additional crop rotation restrictions.</li> </ul>					
<b>Aim 2EC</b>	carfentrazone	14	Preharvest	1.5 fl oz + MSO 1% v/v + AMS 2 lb	N
<ul style="list-style-type: none"> <li>• <b>Aim can be used as a harvest aid in all small grains - wheat, barley, triticale, rye, and oats.</b></li> <li>• Apply when the small grain is in the hard-dough stage and the green color is gone from the nodes of the stem.</li> <li>• Aim is effective at desiccating velvetleaf.</li> <li>• Aim is not as effective as glyphosate or Sharpen on most weeds.</li> <li>• Aim at 1 fl oz/A can be applied with other preharvest herbicides including glyphosate to broaden the spectrum of weed control over Aim alone.</li> <li>• It generally takes 7-10 days to reach maximum desiccation.</li> <li>• Spray coverage is important - apply in a minimum of 15 gallons of water per acre (20 gal/A is recommended).</li> <li>• Preharvest interval (PHI): 7 days</li> </ul>					
<b>Clarity 4L (others)</b>	dicamba	4	Preharvest	8 fl oz	N
<ul style="list-style-type: none"> <li>• <b>Dicamba can be used as a harvest aid in wheat and barley only.</b></li> <li>• Apply when the small grain is in the hard-dough stage and the green color is gone from the nodes of the stem.</li> <li>• Dicamba can be used to suppress annual broadleaf weeds; however perennial weeds or hard-to-control annual or biennial weeds will not be controlled at this rate.</li> <li>• Caution should be taken to avoid vapor and particle spray drift.</li> <li>• Dicamba can be applied with other preharvest herbicides including glyphosate to broaden the spectrum of weed control over dicamba alone.</li> <li>• It generally takes 14 days to reach maximum control.</li> <li>• DO NOT apply to wheat or barley grown for seed, unless a germination test is performed with an acceptable result of 95% germination or better.</li> <li>• Only one preharvest application is allowed.</li> <li>• If small grains are used for pasture or hay, consult the label for harvesting restrictions.</li> <li>• Preharvest interval (PHI): 7 days.</li> <li>• DO NOT double crop soybean unless 1-inch of rainfall and 14 days have occurred between dicamba application and planting. Refer to Table 12 and the label for additional crop rotation restrictions.</li> </ul>					

## TABLE 3D – Small Grains – Preharvest Applications

Herbicide	Common Name	Site of Action Number	Application Timing	Rate/A	Trait
<b>glyphosate</b> (see Table 10)	glyphosate	9	Preharvest	0.75 lb ae (see Table 10) + AMS 17 lb/100 gal	N

- **Glyphosate can be used as a harvest aid in wheat and feed barley only.**

- See Table 10 for a list of glyphosate products, formulations, and rates.
- Apply after the hard-dough stage and when wheat grain contains 30% moisture or less and feed barley grain contains 20% moisture or less, to avoid illegal residues of glyphosate that exceed the established maximum residue levels (MRLs).
- Some buyers will not purchase grain treated with glyphosate, consult your buyer prior to using glyphosate as a preharvest herbicide treatment.
- Glyphosate can be applied to desiccate grass and broadleaf weeds.
- DO NOT apply to wheat grown for seed.
- Stubble may be grazed immediately after harvest.
- It generally takes 10-14 days to reach maximum desiccation.
- Spray coverage is important - apply in a minimum of 10 gallons of water per acre (20 gal/A is recommended).
- Preharvest intervals (PHI): 7 days (harvest or grazing)

<b>Sharpen 2.85SC</b>	saflufenacil	14	Preharvest	1 fl oz + MSO 1% v/v + AMS 8.5 lb/100 gal	N
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- **Sharpen can be used as a harvest aid in all small grains - wheat, feed barley, and triticale only.**

- Apply when wheat is in the hard-dough stage when grain contains 30% moisture or less. Sharpen can be applied at rates up to 2 fl oz/A.
- Sharpen is effective at desiccating glyphosate-resistant broadleaf weeds (i.e., horseweed, pigweeds, and common ragweed).
- It generally takes 7-10 days to reach maximum desiccation.
- Spray coverage is important - apply in a minimum of 10 gallons of water per acre (20 gal/A is recommended).
- DO NOT apply to barley grown for malting purposes.
- Harvest aid uses DO NOT contribute to the maximum cumulative seasonal use rates of Sharpen.
- Desiccation-treated barley, wheat, and triticale straw may be grazed for fed to livestock.
- Preharvest interval (PHI): 3 days.
- Refer to Table 12 and the label for crop rotation restrictions. DO NOT include time in the rotation interval when the ground is frozen.