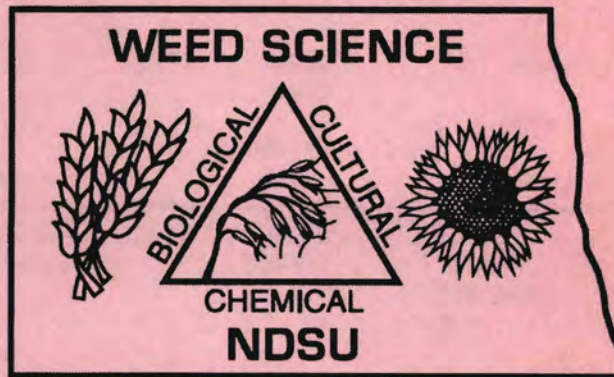




2000

# NORTH DAKOTA WEED CONTROL GUIDE

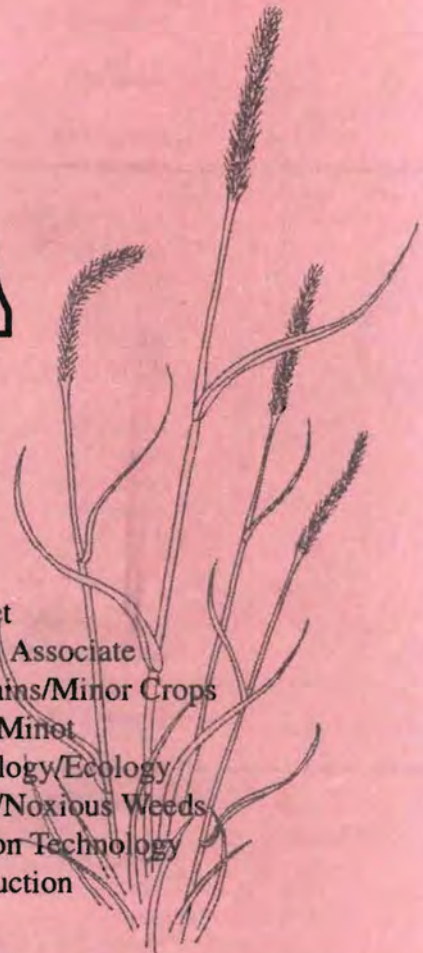


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**NDSU EXTENSION SERVICE**  
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www = world wide web site

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# WEED GUIDE INFORMATION

The information in this guide provides a summary of herbicide uses for many crops grown in North Dakota. The information is based on federal and state herbicide labels, research at North Dakota Agriculture Experiment Stations and other information from the North Dakota Department of Agriculture.

## ALWAYS READ AND FOLLOW LABEL DIRECTIONS

Instructions for registered uses of herbicides are given on container labels. The label is the final guide and should be followed strictly. The information in this guide only applies to North Dakota because many herbicide uses are allowed only by supplemental or specific labeling for North Dakota. Persons are required to have the necessary supplemental or specific labeling in their possession at the time of application.

This bulletin is provided for your information. North Dakota State University or its officers or employees make no claims, representations, or guarantees as to product performance nor accept responsibility for results from using herbicides.

Below is information to aid in using this guide:

**Herbicides.** Herbicides in tables are listed by trade name followed by common name in parentheses. Trade names are usually given except in cases where several brands are available. Restricted use herbicides and combinations are designated by a **RUP** in the lower right corner of each listing under the Herbicide section. Only those products that cannot be applied by aircraft are designated by a symbol in the Herbicide Section. Some new registrations may become available during the year. New information will be provided to NDSU County Extension Agents as changes occur. New information about label changes can be found also in the NDSU Pest and Crop Report, North Dakota Pesticide Quarterly, the Data Transmission Network (DTN) and on the web.

**Rates.** Rates in tables are based on broadcast application and are expressed according to formulated commercial listed as product/A with active ingredient/A or acid equivalent /A given in parenthesis. Commercial formulations of the same herbicide may vary in amount of active ingredient.

For example, a pint of 4-pound acid equivalent per gallon 2,4-D contains 0.5 pound while a pint of 6-pound acid equivalent per gallon contains 0.75 pound. Two pounds of Bladex 90DF (cyanazine) contains 1.8 pounds active ingredient ( $2 \times 0.90 = 1.8$ ) or 2 pounds active ingredient is 2.22 pounds of product ( $2 / 0.90 = 2.22$ ).

**Weed Spectrum.** Weeds in tables are listed individually or combined into major groups (i.e. grass, broadleaf) depending on the spectrum of weeds controlled by individual herbicides or additional weeds controlled through tank mix options.

**Time To Apply.** The best time to apply most herbicides are based on crop and/or weed growth stage. See 'Abbreviation Used' section below for a list of application methods.

**Remarks and Paragraph Sections.** Important information about each herbicide or herbicide combination is given in the "Remarks" section. Additional information is given in the narrative section where each paragraph is numbered and corresponds to the herbicide.

**Herbicide Effectiveness Ratings.** Herbicide effectiveness ratings listed in tables show general comparative ratings based on field observations. Weed control may be equal or greater than what is indicated in the table under favorable conditions. However, weed control may be reduced and unsatisfactory results obtained in unfavorable conditions.

## Abbreviations Used


### Units of Measurement

oz	= ounce (16 oz/lb)
fl oz	= fluid ounce (128 fl oz/gal)
pt	= pint (8 pt/gal)
gal	= gallon
ai	= active ingredient
conc	= concentration
v/v	= volume/volume
lb, lb/gal	= pound, pounds/gallon
gpa	= gallons per acre

### Crop Designation

HRSW = Hard red spring wheat

### Type of Application

EPP	= Early preplant
PPI	= Preplant incorporated
PoPi	= Postplant incorporated
PRE	= Preemergence
EPOST	= Early postemergence
POST	= Postemergence
POST Directed	= Postemergence directed
	= Aerial application prohibited

### Type of Formulation

DF	= Dry flowable
DS	= Dispersible solution
E, EC	= Emulsifiable concentrate
EDF	= Extruded dry flowable
F	= Flowable
G	= Granular
ME	= Micro-encapsulated
MTF	= Multi-temperature formulation
S	= Solution
SG	= Soluble granule
SP	= Soluble powder
W	= Wettable powder
WDG	= Water dispersible granule

### Miscellaneous

AMS	= Ammonium sulfate
CEC	= Cation exchange capacity
DAA	= Days after application
ESOMSO	= Ethylated/Methylated seed oil
NIS	= Nonionic surfactant
OM	= Organic matter
RUP	= Restricted Use Pesticide
SU	= Sulfonylurea herbicides
UAN	= Urea ammonium nitrate

## GENERAL INFORMATION

**THE WEED CONTROL SUGGESTIONS** presented in this guide are based on Federal label clearance and on information obtained from the North Dakota Agricultural Experiment Station and the Research Reports of the North Central Weed Science Society and Western Society of Weed Science.

**CAUTION:** Instructions for registered uses of herbicides are given on container labels. Read and follow label instructions carefully. The weed control suggestions in this circular are based on the assumption that all herbicides mentioned in this guide will continue to have a registered label with the Environmental Protection Agency. **This guide contains recommendations for herbicides that are labeled ONLY for North Dakota.** The user of any pesticide registered as a state label must have a copy of the label in their possession at the time of application. State labels can be obtained from chemical dealers or distributors.

Use herbicides only on registered crops. Some formulations of an active ingredient may not be labeled for certain uses. Federal law makes liable for seizure any raw agricultural commodity that possesses a pesticide residue for which no exemption or tolerance has been established or that exceeds the tolerances established by the Food and Drug Administration. Persons using herbicides in a manner contrary to label instructions are subject to penalty under federal and state laws. North Dakota State University or its officers or employees makes no claims or representations that the chemicals discussed will or will not result in residues on agricultural commodities and assume no responsibility for results from using herbicides

### USE PESTICIDES ONLY AS LABELED.

#### Pesticide Labeling and Registration

No pesticide may be sold or used in the United States until the U.S. Environmental Protection Agency (EPA) has registered the product and approved of the use and the labeling. Canadian and other foreign labeled pesticides may not be used in the United States until registered by the EPA.

#### TYPES OF PESTICIDE REGISTRATIONS

**Federal EPA Registrations**, also known as 3e and 2ee labels, are the most common and widely used type of pesticide registration.

**Special Local Needs Registrations**, also known as 24C or State Local Needs (SLN) labels, allow states to control pesticide usage in their jurisdiction, including registering additional uses or adding limitations for a federally registered pesticide. SLN registrations involve adding application sites, pests, or alternate control methods to those listed on federally registered labeling. SLN labels are initiated by the ND Dept. of Ag (NDDA) and must be approved by EPA. Supplemental labeling must be provided for each SLN registration. Applicators must have the SLN label and federal label in their possession at application. These registrations are legal only in the state or local area specified in the labeling.

**Section 18 "Emergency" and "Crisis" exemptions** from registration are used when an emergency or crisis pest situation arises for which no pesticide is registered. Both types of exemptions from registration allows use of a pesticide for a non-registered purpose for a specified period of time. ND "Emergency" Section 18 exemptions are registrations initiated by the NDDA, are approved by the EPA, and can be declared if both federal and SLN registrations are not or cannot be enacted in time to prevent the condition. This process takes several months to complete. In rare occasions, when time is critical and the emergency is acute, NDDA has the authority to declare a "Crisis" exemption without the written approval of EPA. The NDDA informs EPA of the condition prior to the action and allows EPA to support the state action. This process usually takes 10 to 14 days to complete. The duration of a "Crisis" exemption (14 to 21 days) is shorter than an "Emergency" exemption. If an "Emergency" exemption is being reviewed by the EPA at the time the "Crisis" exemption is declared the EPA may elect to grant the "Emergency" exemption and increase the period of duration. An applicator must have the federal label and the Section 18 exemption labeling in their possession at application.

#### CLASSIFICATION OF PESTICIDES

EPA categorizes pesticides as either unclassified (general use) or restricted. **Restricted-Use Pesticides (RUP)** are pesticides that can cause harm to humans or the environment unless applied safely by certified applicators. Only certified dealers may sell RUPs and only certified applicators may purchase, apply or recommend an RUP. Private and commercial applicators must record certain information for all pesticide applications.



#### RESTRICTED USE HERBICIDES:

Atrazine	Gramoxone Extra
Amitrole-T, Cytrole	Judge, Judge MT
Balance	Kerb 50W (pronamide)
Basis Gold	Laddok S-12
Bicep/Bicep II/Bicep Lite	Lariat
Bladex (cyanazine)	Lasso (alachlor)
Bronco	Marksman
Buctril + Atrazine	Micro-Tech (alachlor)
Bullet	Moxy AT
Contour	Paraquat
Cropstar (alachlor)	Pardner (alachlor)
Cy-Pro, Cy-Pro AT	Ramrod+Atrazine
Detail	Readymaster ATZ
Degree (acetochlor)	Saddle
DoublePlay	Shotgun
Epic	Stall, Stall MT
Extrazine II	Starfire
Freedom	Surpass (acetochlor)
FulTime	Surpass 100
Harness (acetochlor)	Sutazine +
Harness Xtra	Sulfuric acid
Hoelon (diclofop)	TopNotch (acetochlor)
Guardsman	Tordon (picloram)

All premixes and/or combinations containing the above herbicides are also restricted use pesticides.

# CHEMICAL WEED CONTROL FOR FIELD CROPS

## Hard Red Spring and Durum Wheat, Winter Wheat and Barley

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
Roundup Ultra/RT RU Original/RT Glyfos Private labels (glyphosate)	0.5 to 2 pt of a 3 lb ae/gal conc. (0.19 to 0.75)	Emerged grass and broadleaf weeds, and volunteer crops.	Preplant or any time prior to crop emergence.	A nonselective, translocated, foliar herbicide. No soil activity. Apply with AMS fertilizer. Combinations of 2,4-D or Clarity with glyphosate increase spectrum of broadleaf weeds controlled. Commercial mixtures of 2,4-D + glyphosate (Landmaster BW) and dicamba + glyphosate (Fallow Master) are available. A4 B1 B2 Q1 Q4
Touchdown (glyphosate - tms)	1.2 to 4.8 pt of a 3.43 lb ae/gal conc. (0.51 to 2)			
Roundup Custom (glyphosate)	0.38 to 1.5 pt of a 4 lb ae/gal conc. (0.19 to 0.75)			
Banvel Clarity (dicamba) + Glyphosate (See above) (glyphosate)	2 fl oz Banvel Clarity + 0.75 to 1 pt of a 3 lb ae/gal conc. (0.0625 + 0.28 to 0.38)			Residual activity of Banvel/Clarity may control or suppress weed flushes that may germinate after application. Refer to label for adjuvant use. User must possess label at application. A4 B1 B2
Gramoxone Extra (paraquat)  RUP	1.5 to 3.0 pt (0.47 to 0.94)	Emerged annual grass and broadleaf weeds.		A nonselective, foliar herbicide. No soil activity. Apply with NIS at 0.12 to 0.25% v/v. Good plant coverage is essential. B1 B2 Q5
Far-Go (triallate)  Far-Go EC = 	<b>WINTER WHEAT</b> 1.25 qt 12.5 lb 10G (1.25)  <b>HRSW &amp; DURUM:</b> 1 qt 12.5 lb 10G (1 as liquid or 1.25 as granular)  <b>BARLEY:</b> 1.25 qt 12.5 to 15 lb 10G (1.25 as liquid or 1.25 to 1.5 as granular)	Wild oat	Fall: For winter wheat. Apply just before or soon after seeding.	Incorporate immediately after application. When applied after seeding, shallow incorporate with spike or spring tooth harrows. A1 B16
	<b>HRSW &amp; DURUM:</b> 1 qt 10 lb 10G (1) <b>BARLEY:</b> 1.25 qt 12.5 lb 10G (1.25)		Fall: For HRSW, Durum and Barley.  Apply within 3 weeks of freeze-up.	Apply and incorporate with recommended equipment in the fall. Second incorporation should be delayed in fall or performed in spring. Granules can be surface applied in the fall with a delayed two-pass incorporation performed in the spring prior to seeding. However, incorporation in spring may not provide wild oat control equivalent to fall incorporation. For most reliable wild oat control incorporate within 48 hours after application. B18 B19
			Spring: For HRSW, Durum and Barley, apply before or after seeding.	PPI with field cultivator set 4 inches deep. PPI 3 or more days before seeding HRSW/durum Two pass incorporation is recommended. For application after seeding, apply before kernel sprouts exceed 0.5 inch in length with harrows set more shallow than seed. A1 A3 B18 B19
Buckle (triallate + trifluralin)  	<b>DURUM &amp; BARLEY:</b> 10 to 12.5 lb G (1 to 1.25 + 0.3 to 0.4)  <b>Spring: For HRSW and Durum</b> 10 lb G (1 + 0.3)	Wild oat and foxtails.	Fall: Apply within 3 weeks of freeze up.  Spring: For Barley. Prior to or after seeding.	<b>Do not apply to HRSW.</b> Incorporate within 24 hours after application. Second incorporation should be more shallow than first. Stand reduction may occur. Do not apply on soil treated with trifluralin the previous year. A1 A3 B18 B19 B33 X1 Y20 Y24
			Spring: For HRSW and Durum. PPI only.	Use in North Dakota only in designated counties. Apply only to fields fallowed the previous year. Do not apply to soil treated with trifluralin the previous year. B18 B19

# Hard Red Spring and Durum Wheat, Winter Wheat and Barley

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
Far-Go (trilalate) + trifluralin  <b>NOT FOR WINTER WHEAT</b>	<b>1 qt + 1 pt 4E</b> (1 + 0.5)	Wild oat and foxtail.	SPRING: Immediately after seeding.	Shallow incorporate twice with flex-tyne or diamond harrows to depth of 1 to 1.5 inches and above crop seed. Seed deeper if incorporate shallow or seed shallow if incorporate deeper. A1 B18 B33 X1 Y20 Y24
Trifluralin  <b>NOT FOR WINTER WHEAT</b>	<b>1 pt 4E</b> <b>5 lb 10G</b> <b>0.83 lb 60DF (0.5)</b>	Foxtail	SPRING: PPI	Incorporate twice 2 to 3 inches deep. <b>FOR BARLEY ONLY.</b> A1 B18 B33 X1 Y20 Y24
	<b>4 lb 10G</b> (0.4)			Incorporate twice 2 to 3 inches deep. For foxtail suppression only. <b>FOR DURUM WHEAT ONLY.</b> A3 B33 Y20 Y24
	<b>3.5 to 4 lb 10G</b> (0.35 to 0.4)			For suppression of foxtail only. For west of Hwy 3 only. <b>FOR HRSW ONLY.</b>
	<b>1 pt 4E</b> (0.5)		SPRING: After seeding.	Plant 2 to 2.5 inches deep. Incorporate shallowly twice with flex-tyne or diamond harrow 1 to 1.5 inches deep. B18 B33 Y1 Y20 Y24
	<b>1 pt 4E</b> <b>5 lb 10G</b> <b>0.83 lb 60DF</b> (0.5)		FALL: After September 1 until freeze-up.	Incorporate once in fall within 24 hours after application. Keep spring incorporation depth more shallow than fall. Stand reduction may occur. A1 A3 B18 B33 X1 Y1 Y20 Y24
	<b>3.5 to 5 lb 10G</b> (0.35 to 0.5)			For foxtail suppression only. <b>FOR HRSW AND DURUM ONLY.</b>
MCPA amine or MCPA ester	<b>0.5 to 1.33 pt of 4 lb/gal conc.</b> (0.25 to 0.66)	Broadleaf weeds.	Crop: Emergence until prior to boot.  Winter wheat: In spring from 4-leaf until prior to boot.	Apply 0.5 to 1 pt/A from emergence to tiller stage. Use 1 pt/A for volunteer sunflower and kochia. Use high rate for large or perennial weeds. B1 B2 S3 S5 S6 S7
2,4-D amine or 2,4-D ester	<b>0.5 to 1 pt of 4 lb/gal conc.</b> (0.25 to 0.5)		Crop: 5-leaf until prior to boot. Winter wheat: Well tillered until prior to boot.	Do not apply from early boot to dough stage. Do not apply to winter wheat in fall. B1 B2 S3 S5 S6 S7
<b>Banvel Clarity</b> (dicamba) + MCPA	<b>0.125 to 0.25 pt + 0.5 to 0.75 pt of 4 lb/gal conc.</b> (0.06 to 0.12 + 0.25 to 0.38)	Most broadleaf weeds including wild buckwheat, sunflower and ALS resistant kochia and Russian thistle.	HRSW & Durum: Up to 5-leaf stage.  Winter Wheat: Spring after dormancy but before jointing.	Proper timing of application is important to avoid crop injury. Banvel/Clarity must be applied before 6-leaf stage. Use low dicamba rate and high MCPA rate on 4-leaf HRSW or durum. Barley is relatively susceptible to injury from dicamba. B9 S3 S5 S6 S7 X1 Y15 Y24
<b>Banvel Clarity</b> (dicamba) + 2,4-D	<b>0.125 pt + 0.5 pt</b> (0.06 + 0.25)		HRSW & Durum: 4 to 5-leaf.  Winter Wheat: 4-leaf to jointing in spring.	Must be applied only at the 4 to 5-leaf stage to avoid crop injury. Do not use on barley. Dicamba may give short-term residual weed control and/or weed suppression. B9 S3 S5 S6 S7 X1 Y15 Y24
<b>Tordon 22K</b> (picloram) + 2,4-D or MCPA <b>NOT FOR DURUM WHEAT RUP</b>	<b>1 to 1.5 fl oz + 0.5 to 0.75 pt of a 4 lb/gal conc.</b> (0.0156 to 0.0234 + 0.25 to 0.38)	Most broadleaf weeds including wild buckwheat and sunflower.	HRSW & Barley: 3-leaf to jointing. Winter wheat: Spring	Use only on land to be planted the following year to grass, small grains, or flax. Apply to winter wheat prior to early boot stage. B27 S4 S5 S6 S7 X1 Y22 Y24



## Hard Red Spring and Durum Wheat, Winter Wheat and Barley

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
<b>Curtail M</b> (clopyralid + MCPAe)	<b>1.75 to 2.33 pt</b> (0.09 to 0.12 + 0.5 to 0.68)	Most broadleaf weeds and Canada thistle.	3-leaf to jointing or to boot if risk of injury is acceptable.	See narrative for crop rotational restrictions. Apply to Canada thistle at the rosette to early bolting stage. Dew at application may reduce weed control. Do not harvest hay from treated fields. B13 T6 Y21 Y24
<b>Curtail</b> (clopyralid + 2,4-D)	<b>2 to 2.33 pt</b> (0.09 to 0.11+ 0.5 to 0.58)		Crop: 4-leaf to jointing.	
<b>Starane</b> (fluroxypyr)	<b>0.5 to 0.67 pt</b> (1.5 to 2 oz)	Kochia (including ALS resistant), volunteer flax and a few other broadleaf weeds.	Crop: 2-leaf through flag leaf emergence. Weeds: 4 to 6 inches tall.	Refer to Starane label and label of tank-mix partner for registered tank-mix options and rates. See narrative for additional information. Commercial premixes available: Starane + Salvo = 1 to 1.33 pt/A Starane + Sword = 1.125 to 1.5 pt/A B30 S3
<b>Bromoxynil</b>	<b>1 to 2 pt</b> (0.25 to 0.5)	Most broadleaf weeds including buckwheat, sunflower, ALS resistant kochia and Russian thistle.	Crop: Emergence until prior to boot.	Contact type herbicide. Apply when weeds are small. Controls ALS resistant kochia. See label for tank-mix options. B1 B2 B10 X1
<b>Bromoxynil + MCPA ester</b>	<b>0.75 to 2 pt</b> (0.19 to 0.5 + 0.19 to 0.5)		Crop: 3-leaf until prior to boot.	
<b>Aim + (carfentrazone) + 2,4-D amine or MCPA amine Barley Registration Pending</b>	<b>1/3 to 0.67 oz DF+ 0.5 to 0.75 pt of a 4 lb/gal conc. (0.128 to 0.24 oz + 0.25 to 0.38)</b>		Crop: Up to jointing stage. Weeds: Up to 4 inches tall.	

## Short Residual Sulfonylurea (SU) Herbicides

<b>Express</b> (tribenuron)	<b>1/6 to 1/3 oz DF</b> (0.125 to 0.25 oz)	Most broadleaf weeds. Weak on wild buckwheat.	Crop: 2-leaf until prior to flag leaf emergence.	Apply with another broadleaf herbicide to reduce weed resistance. The addition of MCPA or 2,4-D enhances weed control and crop safety. Apply with a NIS at 0.125% v/v except when adding 2,4-D or MCPA at 0.75 pt/A. See narrative for list of registered tank-mixes. Only Harmony GT may be tank-mixed with Hoelon or Hoelon + bromoxynil. See section on herbicide resistance. No crop rotation restrictions the following year. B17 B21 B22 S3 X1
<b>Harmony GT</b> (thifensulfuron) Registration pending	<b>3/10 to 6/10 oz DF</b> (0.225 to 0.45 oz)			
<b>Harmony Extra</b> (thifensulfuron + tribenuron)	<b>3/10 to 6/10 oz DF</b> (0.225 to 0.45 oz)	Most broadleaf weeds including wild buckwheat, cocklebur, and lanceleaf sage.		

## Long Residual SU Herbicides

<b>Ally</b> (metsulfuron)	<b>1/10 oz DF</b> (0.06 oz)	Most broadleaf weeds with partial control of wild buckwheat.	Crop: 2-leaf until prior to boot.	Apply with another broadleaf herbicide to reduce weed resistance. The addition of 2,4-D or MCPA enhances weed control and crop safety. Apply with a NIS at 0.125% except when adding 2,4-D or MCPA at 0.75 pt/A. See label for crop rotation restrictions. Canvas at 5 A/pack contains 1/10 oz Ally + 3/10 oz Harmony Extra. Do not apply within 22 months of last metsulfuron treatment. Do not apply to soils above pH 7.9. See section on herbicide resistance. B5 B11 X1 Y3 Y7 Y24
<b>Canvas</b> (metsulfuron + thifensulfuron + tribenuron)	<b>2/10 to 4/10 oz DF or 5 to 10 A/pack</b> (0.03 to 0.06 oz mets + 0.113 to 225 oz thifensulf+tribenuron)	Most broadleaf weeds and improved control of wild buckwheat.	Crop: 2-leaf stage until prior to flag leaf emergence.	
<b>Peak</b> (prosulfuron)	<b>1/2 oz DF</b> (0.29 oz)	Most broadleaf weeds.	Crop: 3-leaf until 2nd node is detectable.	See label for application information, herbicide and crop rotation restrictions. B25 X1 Y7 Y19 Y24

## Hard Red Spring and Durum Wheat, Winter Wheat and Barley

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
<b>Very Long Residual SU Herbicides</b>				
Amber (triasulfuron)	0.28 to 0.56 oz DF (0.21 to 0.42 oz)	Most broadleaf weeds.	Crop: 2-leaf until prior to boot stage.	Add NIS at 0.125 to 0.25%v/v. See label for application timings, tank-mix options, weeds controlled, soil pH restrictions, resistance weeds, and crop rotation restrictions. B6 X1 Y3 Y24
Rave (triasulfuron + dicamba)	HRSW = 4 oz DF (0.352 oz + 2 oz) Barley = 2 oz DF (0.176 oz + 1 oz)		HRSW = Up to 5-leaf stage. Barley = Up to 4-leaf stage.	
Finesse (chlorsulfuron + metsulfuron)	2/10 to 4/10 oz DF (0.15 to 0.3 oz)	Most broadleaf weeds and suppression of foxtail and Canada thistle.	Crop: 2-leaf until prior to flag leaf emergence.	Do not apply within 22 months of last treatment. Apply with a NIS at 0.125% except when adding 2,4-D or MCPA at 0.75 pt/A. See sections on herbicide resistance and crop rotation restrictions. Do not apply to soils above pH 7.9. B20 X1Y3 Y24
Maverick (sulfosulfuron)	2/3 oz DF (0.5 oz)	Downy brome, quackgrass, mustard sp. and vol. sunflower.	Crop: Emergence to prior to jointing.  Brome: 2 to 3 tillers.  Wild oat: 1- to 4-leaf stage.	Add NIS at 0.5%v/v. Do not add adjuvants that alter spray solution pH below 5. See label or narrative for application timings, tank-mix options, weeds controlled, resistance weeds, and crop rotation restrictions. Fall applications provide greater brome and cheatgrass control than spring applications. Spring applications may control wild oat. B24 X1 Y3 Y24
Spring and Winter Wheat Only				


### Herbicides that can be tankmixed with SU herbicides.

MCPA or 2,4-D	0.5 to 0.75 pt of 4 lb/gal conc. (0.25 to 0.38)	Many broadleaf weeds.	MCPA: Same as SU herbicides applied alone.  2,4-D: Not prior to tiller but not later than SU herbicide applied alone.	MCPA and 2,4-D enhances crop safety. Ester formulation provides greater SU safening than amine. Apply with NIS except when adding MCPA or 2,4-D at 0.75 pt/A. Do not apply to durum wheat prior to 4-leaf stage. No crop restrictions the following year. Tank-mix with Finesse gives season long Canada thistle control. B5 B6 B17 B21 B25 S3 X1 Y3
MCPA or 2,4-D + Banvel Clarity (dicamba)	0.5 pt + 3 to 4 fl oz (0.25 + 0.09 to 0.125)	Broadleaf weeds including ALS resistant weeds and season long control of Canada thistle.	Crop: Tillering through 5-leaf stage.	<b>Do not use 2,4-D + dicamba on barley.</b> Apply when ALS resistance is suspected. Express rate can be reduced to 1/12 oz DF/A. Peak can be reduced to 1/4 to 3/8 oz DF/A. Tank-mixes with Ally gives season long control of field bindweed. Tank-mixes with Finesse gives season long control of Canada thistle. B5 B6 B17 B20 B21 B25 S3 X1 Y3 Y24
Starane (fluroxypyr)	0.5 to 0.67 pt (1.5 to 2 oz)	Kochia (including ALS resistant), volunteer flax, and a few other broadleaf weeds.	Crop: 2-leaf through flag leaf emergence. Weeds: 4 to 6 inches tall.	No residual weed control. May be tank-mixed with most small grain grass and broadleaf herbicides except Cheyenne. Refer to Starane label and label of tank-mix partner for registered tank-mix options and rates. Allow a 40 day PHI. B30 S3 X1
Bromoxynil	0.75 to 1.5 pt (0.188 to 0.375)	Most broadleaf weeds including wild buckwheat, sunflower, lanceleaf sage, and ALS resistant weeds.	Same as SU herbicides applied alone but not later than SU herbicide applied alone.	Apply when weeds are small and less than 4 inches tall. Express rate can be reduced to 1/12 oz DF/A. Apply with NIS at 0.25% v/v. B10 S3 S5 S6 S7 X1
Bromoxynil + MCPA			3-leaf but not later than SU herbicide applied alone.	

# Hard Red Spring and Durum Wheat, Winter Wheat and Barley

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
<b>POST Grass Herbicides</b>				
<b>Assert</b> <b>Assert SG</b> (imazamethabenz)	1 to 1.5 pt 7.5 to 11.2 oz DG (0.31 to 0.47)	Wild oat, wild mustard, and winter annual mustards.	Crop: 2-leaf to jointing.  Wild oat: 1- to 4-leaf stage.	See narrative for crop rotation restrictions. Do not tank-mix with Stampede, Banvel/Clarity, Tordon, MCPA amine, or 2,4-D amine. Use an MSO type adjuvant or use NIS + petroleum oil adjuvant. See label for additional adjuvant information. B7 Y2 Y6 Y24
<b>Avenge</b> (difenzoquat)	2.5 to 4 pt (0.62 to 1)	Wild oat	Crop: Prior to flag leaf emergence.  Wild oat: 3- to 5-leaf stage.	Use high rate on 3-leaf wild oat. Refer to narrative for herbicide tank-mix options and registered wheat varieties. Injury may occur when crop is under stress. Labeled on 2375 at only 2.5 to 3 pt/A. Labeled on all barley varieties. B8
<b>Avenge</b> (difenzoquat) + <b>Assert</b> (imazamethabenz)	2 pt + 0.75 pt (0.5 + 0.23)	Wild oat, wild mustard and winter annual mustards.	Crop: 2- to 4-leaf. Wild oat: 2- to 4-leaf.	Apply with NIS. See Avenge label for HRSW variety restrictions. B1 B2 B7 B8 Y2 Y6 Y24
<b>Achieve</b> (tralkoxydim)	40 acres/box or 7 oz WDG (0.18)	Green and yellow foxtail, wild and volunteer oat, Persian darnel, and annual ryegrass.	Crop: 2-leaf to boot. Foxtails: 1 to 5 leaf. Persian darnel: 1 to 4 leaf. Wild oat: 1 to 6 leaf.	Packaged as one box containing product and adjuvant in separate containers for 40 acres. Add AMS at 7 to 15 lb/100 gal water. Apply in 10 to 15 GPA by ground or 3 to 5 GPA by air. Add Bronate at a maximum of 1 pt/A or Curtail M at 2 pt/A. See label or narrative for tank-mix information. B3 X1
<b>Discover</b> (clodinafop) <b>HRS and Winter Wheat Only.</b> <b>Registration Pending</b>	40 to 50 A/box or 3.2 and 4 fl oz (0.05 to 0.06)	Wild and vol. oat, barnyardgrass, green and yellow foxtail, Persian darnel, and annual ryegrass.	Crop: 2-leaf to emergence of 4 <sup>th</sup> tiller. Wild oat: 1- to 6-leaf. Foxtails: 1- to 5-leaf.	Packaged as one box containing product and DSV adjuvant in separate containers for 40 to 50 acres/box. Apply 3.2 fl oz/A for wild oat and barnyardgrass and 4 fl oz/A for foxtails, Persian darnel, and ryegrass. See label for tank-mix information. B15 X1
<b>Everest</b> (flucarbazone)  <b>Wheat Registration Pending</b>	0.4 to 0.6 oz WDG (0.28 to 0.42 oz)	Wild oat, green foxtail, and suppression of yellow foxtail.	Crop: Up to 6-leaf stage. Grass weeds: Up to 4 leaves.	Add NIS at 0.25% v.v. Apply 0.4 oz for green foxtail and 0.6 oz for wild oat and suppression of yellow foxtail. Will control most mustard species. May tank-mix with 2,4-D, Ally, bromoxynil, or bromoxynil+MCPA. Do not tank-mix with MCPA or dicamba. B16 X1 Y24
<b>Puma</b> (fenoxaprop-P + safener)	0.33 to 0.66 pt (0.04 to 0.08)	Green and yellow foxtail, millets, corn, barnyardgrass, and wild oat.	Crop: 2-leaf to 6-leaf.  Grass weeds: 2 leaf to 2 tiller.	Do not apply after jointing begins. Apply 0.33 pt/A for green foxtail, volunteer corn and millets. Apply 0.4 pt/A for yellow foxtail and proso millet. Apply 0.66 pt/A for barnyardgrass and wild oat. See label for tank-mixing information. B27 X1
<b>Dakota</b> (fenoxaprop-P + MCPA)  <b>HRS and Winter Wheat Only</b>	16 to 21.3 fl oz or 1 to 1.33 pt (0.029 to 0.039 + 0.36 to 0.47)	Green foxtail, foxtail millets and several broadleaf weeds.	Crop: 3-leaf to end of tillering (6-leaf). Grass weeds: 2-leaf to 2-tiller. Broadleaf weeds: Up to 4 inches.	<b>Do not apply to durum wheat, barley or oat.</b> Do not apply to wheat after jointing begins. Tank-mixing with dicamba at 2 fl oz/A increases kochia and Russian thistle control. Refer to narrative for tank-mix information. B14 X1
<b>Tiller</b> (fenoxaprop-P + 2,4-D + MCPA)  <b>Do not apply to Durum Wheat</b>	1 to 1.7 pt (0.047 to 0.08 + 0.073 to 0.12 + 0.22 to 0.37)	Green and yellow foxtail, millet, wild oat, barnyardgrass and several broadleaf weeds.	Crop: 3- to 4-leaf up to 6-leaf.  Grass weeds: 2-leaf to 2-tiller.  Broadleaf weeds: Up to 4 inches.	<b>Do not apply to durum wheat or oat.</b> Do not apply to spring or winter wheat after jointing begins. Dicamba at 2 fl oz/A increases kochia and Russian thistle control. Tank-mixing with some broadleaf herbicides will reduce yellow foxtail and wild oat control. Refer to narrative for rates and tank-mix options. B31 X1

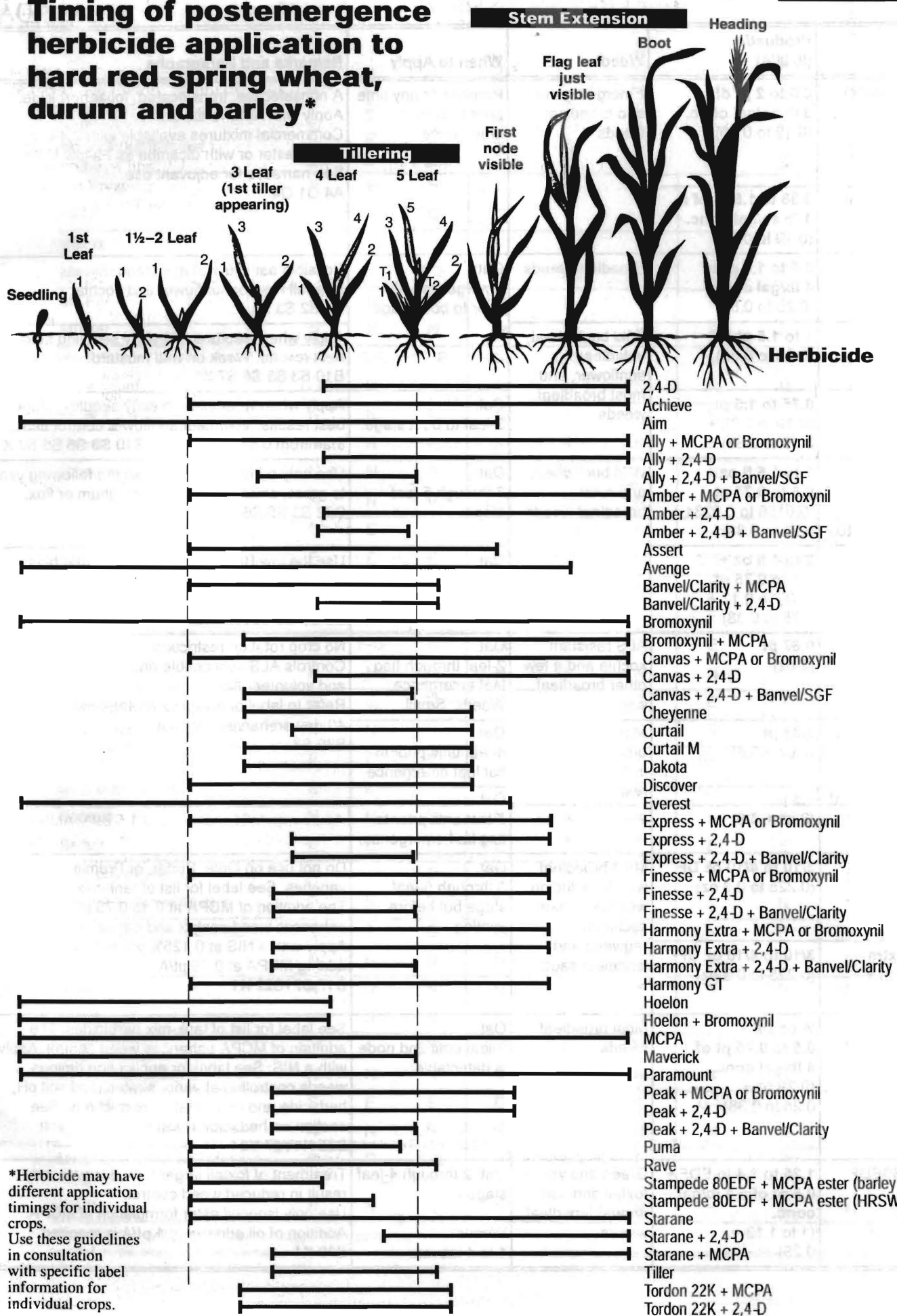
## Hard Red Spring and Durum Wheat, Winter Wheat and Barley

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
<b>Cheyenne</b> (fenoxaprop-P + MCPA + X-tra (thifensulfuron + tribenuron)) <b>HRS or Winter Wheat Only</b> 	<b>40 acres/box or 1.4 pt + 3/10 oz of X-tra DF</b> (0.08 + 0.38 + 0.225 oz)	Green foxtail, foxtail millets, wild proso millet, wild oat, and most broadleaf weeds.	Crop: 3-leaf stage to end of tillering (6-leaf). Wild oat: 1- to 4-leaf stage. Green foxtail: 2-leaf to 2-tiller. Broadleaf weeds: Less than 4 inches tall or in diameter.	<b>Do not apply to durum wheat, barley or oat.</b> Do not apply to spring or winter wheat after jointing begins. Contents of each container must be added to tank to insure crop safety and weed control. Can be tank-mixed with bromoxynil at 0.38 to 0.5 pt/A, Stinger at 2 fl oz/A, or Tordon at 0.5 to 0.75 fl oz/A. B12 X1
<b>Stampede 80EDF</b> (propanil) + MCPA ester	<b>1.25 to 1.4 lb EDF + 0.5 pt</b> (1 to 1.13 + 0.25)	Green and yellow foxtail and some annual broadleaf weeds including wild buckwheat.	HRSW: 2-5 leaf. Durum; 2-4 leaf. Barley: 2-4 leaf. Foxtail: 1-3 leaf. Broadleaf weeds: 1-4 leaves.	Petroleum oil must be added at 1 pt/A. Do not apply when a soil applied systemic insecticide was used at seeding. Fields with Maneb/Lindane seed dressings may be treated. Malathion or pyrethroids may be used 14 days before or after application. B29
<b>Hoelon</b> (diclofop)  RUP	<b>2 to 2.66 pt</b> (0.75 to 1.0)	Green and yellow foxtail and wild oat.	Crop: Up to 4-leaf.  Grass weeds: 1 to 4 leaves.	Use higher rate for dry conditions or to grass weeds with 3 to 4 leaves. Oil adjuvant enhances weed control under dry conditions. Mix only with bromoxynil or bromoxynil plus the low rate of MCPA ester. B23 X1
<b>Hoelon</b> (diclofop) + Bromoxynil  RUP	<b>2 to 2.66 pt + 1.0 to 1.5 pt EC</b> (0.75 to 1.0 + 0.25 to 0.38)	Green and yellow foxtail, wild oat, and broadleaf weeds.	Grass weeds: 2 to 3 leaves.  Broadleaf weeds: Small.	Use higher rate for dry conditions. Oil additive at 1 to 2 pt/A may increase weed control and risk of crop injury. Do not add oil additive when tank-mixing Hoelon and applying to barley. Do not add oil to Hoelon + bromoxynil + MCPA ester.
<b>Hoelon</b> (diclofop) + Bromoxynil + MCPA ester  RUP	<b>2.66 pt + 1.0 pt to 1.5 pt EC or 3.33 to 5 A/pack + 1.5 fl oz</b> (1+0.25to0.38+0.05)		Grass weeds: 1 to 3 leaves.  Broadleaf weeds: Small.	Do not tank-mix with any other herbicide. Drought conditions at application may result in poor grass control. B10 B23 S2 S8 X1
<b>Paramount</b> (quinclorac)  <b>HRS, Durum, and Winter Wheat Only</b>	<b>0.33 lb DF</b> (0.25)	Field bindweed: Runners at least 4 inches long.	Postharvest but before frost or in the spring prior to seeding of wheat including durum.	Apply with MSO adjuvant at 1.5 pt/A. AMS at 2.5 lb/A or UAN at 1 ga/A may also be added to improve control but do not substitute for MSO. Apply after harvest but prior to frost. Suggested use in a 3-year program by applying 0.33 lb DF/A the first year and 0.17 to 0.33 lb DF/A in following years. May control foxtails, barnyardgrass, volunteer flax, and cleavers. B26 Y18 Y24

## ANNUAL CANARYGRASS

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
Bromoxynil + MCPA	<b>1 to 1.5 pt + 0.5 to 0.75 pt</b> (0.25 to 0.38 + 0.25 to 0.38)	Broadleaf weeds	POST Crop: At least 3 leaves.	Apply when weeds are in the early seedling stage for best results. B10
Bromoxynil	<b>1 to 1.5 pt</b> (0.25 to 0.38)		Weeds: Small with 4 or less leaves.	Apply to weeds before 2 inches tall. Allow a 75 day PHI. Do not graze livestock. Do not apply to canarygrass when stressed. B10 Z1

# Timing of postemergence herbicide application to hard red spring wheat, durum and barley\*



\*Herbicide may have different application timings for individual crops. Use these guidelines in consultation with specific label information for individual crops.

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
<b>Roundup Ultra/RT RU Original Glyfos Private labels (glyphosate)</b>	<b>0.5 to 2 pt of 3 lb ae/gal conc. (0.19 to 0.75)</b>	Emerged grass and broadleaf weeds.	Preplant or any time prior to crop emergence.	A nonselective, translocated, foliar herbicide. Apply with AMS fertilizer. Commercial mixtures available with 2,4-D as Landmaster or with dicamba as Fallow Master. See narrative for adjuvant use. A4 Q1 Q4
<b>Roundup Custom (glyphosate)</b>	<b>0.38 to 1.5 pt of a 4 lb ae/gal conc. (0.19 to 0.75)</b>			
MCPA amine or MCPA ester	<b>0.5 to 1.0 pt of 4 lb/gal conc. (0.25 to 0.5)</b>	Broadleaf weeds	Oat: Emergence until prior to boot stage.	Possible oat injury at any stage. Use full rate for sunflower and kochia. B1 B2 S3 X1
Bromoxynil	<b>1 to 1.5 pt EC (0.25 to 0.38)</b>	Wild buckwheat, volunteer sunflower, and most broadleaf weeds.		Apply when weeds are in early seedling stage for best results. Weak on wild mustard. B10 S3 S5 S6 S7 X1
Bromoxynil + MCPA ester	<b>0.75 to 1.5 pt (0.19 to 0.38 + 0.19 to 0.38)</b>		Oat: 3-leaf to boot stage.	Apply when weeds are in early seedling stage for best results. Volunteer sunflower control better than from 0.5 lb/A of 2,4-D. B10 S3 S5 S6 S7 X1
<b>Tordon 22K (picloram) + MCPA RUP</b>	<b>1 to 1.5 fl oz + 0.5 to 0.75 pt (0.0156 to 0.0234 + 0.25 to 0.38)</b>	Wild buckwheat and most broadleaf weeds.	Oat: 3 through 5-leaf stage.	Use only on land to be planted the following year to grass, small grains, corn, sorghum or flax. B32 S3 S5 S6
<b>Banvel Clarity (dicamba) + MCPA</b>	<b>2 to 4 fl oz + 0.5 to 0.75 pt (0.06 to 0.12 + 0.25 to 0.38)</b>		Oat: 2 through 5-leaf stage.	Use the low Banvel/Clarity rate and the high MCPA rate on 5-leaf oat. Early application increases crop safety. B9 S3 S5 S6 X1 Y15 Y24
<b>Starane (fluroxypyr)</b>	<b>0.67 pt (2 oz)</b>	ALS resistant kochia and a few other broadleaf weeds.	Oat: 2-leaf through flag leaf emergence. Weeds: Small.	No crop rotation restrictions. Controls ALS susceptible and resistant kochia and volunteer flax. Refer to label or narrative for tank-mix options. 40 day preharvest interval. B30 S3
<b>Starane Plus Salvo (fluroxypyr + 2,4-D ester)</b>	<b>1.33 pt (2 oz + 0.5)</b>	Most annual broadleaf weeds including ALS resistant kochia.	Oat: 4-leaf until prior to flax leaf emergence.	
<b>Starane Plus Sword (fluroxypyr + MCPA ester)</b>	<b>1.5 pt (2 oz + 0.5)</b>		Oat: 3-leaf until prior to flag leaf emergence.	
<b>Harmony GT (thifensulfuron) Registration Pending</b>	<b>3/10 to 4/10 oz DF (0.225 to 0.3 oz)</b>	Most broadleaf weeds including wild buckwheat, cocklebur, ragweed and lanceleaf sage.	Oat: 3 through 5-leaf stage but before jointing.	Do not use on Ogle, Porter, or Premier oat varieties. See label for list of tank-mix herbicides. The addition of MCPA at 0. to 0.75 pt/A enhances weed control and oat safety. Apply with a NIS at 0.125% v/v except when adding MCPA at 0.75 pt/A. B17 B21B22 X1
<b>Harmony Extra (thifensulfuron + tribenuron)</b>	<b>3/10 to 4/10 oz DF (0.225 to 0.3 oz)</b>			
<b>Peak (prosulfuron) + MCPA</b>	<b>½ oz DF + 0.5 to 0.75 pt of 4 lb/gal conc. (0.29 oz + 0.25 to 0.38)</b>	Most broadleaf weeds.	Oat: 3-leaf until 2nd node is detectable.	See label for list of tank-mix herbicides. The addition of MCPA enhances weed control. Apply with a NIS. See label for application timings, weeds controlled at various rates, and soil pH, herbicide and crop rotation restrictions. See section on herbicide resistance. Avoid drift. B25 X1Y17 Y24
<b>Stampede 80EDF (propanil) + MCPA ester</b>	<b>1.25 to 1.4 lb EDF + 0.5 pt of a 4 lb/gal conc. (1 to 1.13 + 0.25)</b>	Green and yellow foxtail and some annual broadleaf weeds.	Oat: 2 through 4-leaf stage.  Weeds: 1 to 4 leaves.	Treatment of foxtail larger than 3 leaves may result in reduced weed control. Use only isooctyl ester formulation of MCPA. Addition of oil additive at 1 pt/A is required. B29 X1

## RYE

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
Glyphosate	<b>0.5 to 2 pt of 3 lb ae/gal conc.</b> (0.19 to 0.75)	Emerged grass and broadleaf weeds.	Preplant or any time prior to crop emergence.	A nonselective, translocated, foliar herbicide. No soil residual activity. Apply with AMS fertilizer. See label or narrative for adjuvant use. A4 Q4
<b>Roundup Custom</b> (glyphosate)	<b>0.38 to 1.5 pt of 4 lb ae/gal conc.</b> (0.19 to 0.75)			
2,4-D amine or 2,4-D ester	<b>0.5 to 1 pt of 4 lb/gal conc.</b> (0.25 to 0.5)	Broadleaf weeds	Spring Rye: Tillered but prior to boot stage.	Do not apply from early boot to dough stage. Do not apply in the fall. B1 B2 S3 S5 S6 X1
MCPA amine or MCPA ester			Spring: 4-leaf stage and prior to boot.	
Bromoxynil	<b>1 to 1.5 pt 3.33 to 5 A/pack</b> (0.25 to 0.38)	Wild buckwheat and other broadleaf weeds.	Spring	Apply while weeds are small and before they are shaded by the crop. Do not apply in the fall. Addition of MCPA improves general broadleaf weed control including wild mustard. B10 S3 S5 S6
Bromoxynil + MCPA ester	<b>0.75 to 1.5 pt</b> (0.19 to 0.38 + 0.19 to 0.38)		Rye: Prior to early boot stage.	
<b>Peak</b> (prosulfuron) + MCPA or 2,4-D	<b>½ oz DF + 0.5 to 0.75 pt of 4 lb/gal conc.</b> (0.29 oz + 0.25 to 0.38)	Most broadleaf weeds.	<b>Peak + MCPA:</b> 3-leaf until 2 <sup>nd</sup> node <b>Peak + 2,4-D:</b> After tillering until prior to jointing.	Apply Peak with another herbicide for increased broadleaf control and weed resistance management. See label for application timings, weeds controlled at various rates, and soil pH, herbicide and crop rotation restrictions.
<b>Peak</b> (prosulfuron) + 2,4-D + <b>Banvel/Clarity</b> dicamba)	<b>1/4 to 3/8 oz DF + 0.5 pt + 2 to 3 fl oz</b> (0.14 to 0.21 oz + 0.25 + 0.06 to 0.09)	Broadleaf weeds including ALS resistant kochia and Russian thistle.	Rye: After tillering through 5-leaf stage.	Apply with a NIS. B9 B25 S3 S6 X1 Y15 Y19 Y24

## MILLET

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
2,4-D amine (Only certain formulations)	<b>0.5 to 1.3 pt of a 4 lb/gal conc.</b> (0.25 to 0.6)	Broadleaf weeds	Millet: 4 to 6 inches tall.	Do not graze dairy animals or meat animals being finished for slaughter on treated fields within 2 weeks after treatment. X1 Y24
<b>Banvel/Clarity</b> (dicamba)	<b>4 fl oz</b> (0.12)		Millet: 2 to 5-leaf stage.	Early application increases safety. B9 X1 Y15 Y24
<b>Banvel Clarity</b> (dicamba) + 2,4-D amine	<b>3 fl oz + 0.75 pt</b> (0.09 + 0.38)		Millet: 4 to 5-leaf stage.	Hay type millets are more sensitive than other millet types. Do not apply prior to the 3-leaf stage of millet. Only certain formulations of 2,4-D are registered. B9 X1 Y17 Y43
<b>Peak</b> (prosulfuron) + 2,4-D (Only certain formulations)	<b>1/4 to ½ oz DF + 0.5 to 0.75 pt</b> (0.14 to 0.29 oz + 0.25 to 0.38)	Most broadleaf weeds including wild buckwheat.	Millet: After tillering until prior to jointing.	Peak must be applied with a herbicide of different mode of action to prevent weed resistance. See section on herbicide resistance. See label for application timings, weeds controlled at various rates, soil pH, herbicide and crop rotation restrictions. Only certain formulations of 2,4-D are registered.
<b>Peak</b> (prosulfuron) + <b>Banvel/Clarity</b> (dicamba)	<b>1/4 to 3/8 oz DF + 2 to 4 fl oz</b> (0.14 to 0.21 oz + 0.06 to 0.09)	Broadleaf weeds including ALS resistant kochia and R. thistle.	Millet: After tillering to the 5-leaf stage.	B25 X1 Y19 Y24

## SMALL GRAIN PRE-HARVEST






Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
2,4-D ester  For HRS and Durum Wheat, Barley, and Rye	1.5 to 3 pt of 4 lb/gal conc. (0.75 to 1.5)	Broadleaf weeds	Wheat: Dough stage to harvest.	Use only when the weeds will interfere with harvest operations. Do not feed straw to livestock. Use only 2,4-D brands labeled for preharvest application, for example, Weedone 64, Weedone 638, Weedone LV4, Weedone LV6. CAUTION: Drift to broadleaf crops is especially hazardous at this time. B34 B35 T6 X1 Z1
Banvel Clarity (dicamba) + 2,4-D For HRS and Durum Wheat Only	0.5 to 1 pt + 1 to 2 pt of 4 lb/gal conc. (0.25 to 0.5 + 0.5 to 1)		Wheat: Hard-dough stage and green color is gone from the nodes of the stem.	A waiting period of 7 days is required before harvest. Do not feed treated straw to livestock. CAUTION: Drift to broadleaf crops is especially hazardous at this time. B34 B36 X1 Y15 Y24 Z1
Ally (metsulfuron) + 2,4-D  For HRS and Durum Wheat and Barley Only	1/10 oz DF + 1.5 to 3 pt of a 4 lb/gal conc. (0.075 oz + 0.75 to 1.5 2,4-D)		Wheat or Barley: Dough stage and at least 10 days prior to harvest.	For use in wheat/fallow or continuous wheat. Do not use if crop was treated previously with an ALS herbicide. Apply with NIS. May be tank-mixed with Banvel/Clarity in wheat for resistant weed management. Ally has no grazing restrictions. Refer to 2,4-D label for grazing restrictions and for brands labeled for preharvest application. Refer to Ally label for crop rotation intervals. B34 B37 Y3 Y24
Roundup Ultra/RT RU Original/RT Glyfos Private labels (glyphosate)  Roundup Custom (glyphosate) For HRS and Durum Wheat Only	0.5 to 2 pt of a 3 lb ae/gal conc. (0.19 to 0.75)  0.38 to 1.5 of a 4 lb ae/gal conc. (0.19 to 0.75)	Annual and perennial grass and broadleaf weeds.	Wheat: Hard-dough stage, 30% or less grain moisture and at least 7 days prior to harvest.	Do not apply more than 2 pt/A/season. Not suggested for use on wheat grown for seed because reduced germination/vigor may occur. Apply 2 pt/A for Canada thistle control. Apply 1 to 2 pt/A + 2,4-D at 1 to 2 pt/A for field bindweed control. A4B34 B35 B38 Q4 Z1
Landmaster BW (glyphosate + 2,4-D)  For HRS and Durum Wheat Only	3.38 to 5.25 pt (0.38 to 0.53 + 0.63 to 1)			Do not apply more than 5.25 pt/A/season. Application to wheat grown for seed is not recommended because a reduction in germination or vigor may occur. Do not feed or allow dairy or meat animals to forage for 14 days after application. Do not feed treated straw. Effective on Canada thistle. A4B34 B39 Q1 Q4 T1 Z1
Roundup Ultra/RT RU Original/RT Glyfos Private labels + Clarity (glyphosate + dicamba)	0.75 pt to 2 pt of a 3 lb ae/gal conc. + 0.25 to 0.5 pt of a 4 lb gal/conc. (0.28 to 0.75 + 0.125 to 0.25)		Wheat: Hard dough stage and green color is gone from the nodes (joints) of stem. Apply at least 7 days prior to harvest.	Allowed under a 2(ee) registration. The label must be in the possession of the applicator at the time of application. Use a minimum of 3 gpa by air and 5 to 20 gpa by ground application. Effective on Canada thistle. A4 B34 B36 B38 Q1 Q4 T1 Z1
Roundup Custom + Clarity (glyphosate + dicamba) For HRS and Durum Only	0.56 to 1.5 pt of a 3 lb ae/gal conc. + 0.25 to 0.5 pt of a 4 lb gal/conc. (0.28 to 0.75 + 0.125 to 0.25)			









# CORN

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
Roundup Ultra/RT RU Original/RT Glyfos Private labels (glyphosate)	0.5 to 2 pt of a 3 lb ae/gal conc. (0.19 to 0.75)	Emerged grass and broadleaf weeds.	Preplant or anytime prior to crop emergence.	Nonselective, translocated, foliar herbicides. No soil activity. Apply with AMS fertilizer. May be tank-mixed with residual preemergence herbicides. See label or narrative for adjuvant use. Q4
Touchdown (glyphosate - tms)	1.2 to 4.8 pt of a 3.43 lb ae/gal conc. (0.51 to 2)			
Roundup Custom (glyphosate)	0.38 to 1.5 pt of a 4 lb ae/gal conc. (0.19 to 0.75)			
Gramoxone Extra (paraquat)  RUP	1.5 to 3 pt (0.47 to 0.94)	Emerged annual grass and broadleaf weeds.		A nonselective, foliar herbicide. No soil activity. Apply with a NIS at 0.12 to 0.25% v/v. Good plant coverage is essential. Q5



## Soil Applied Herbicides

Eradicane (EPTC & safener)	5 to 7 pt 17 to 24 lb 25G (4.2 to 6)	Grass and some broadleaf weeds.	PPI Application and incorporation should be performed at the same time.	Immediate incorporation is required. Double incorporation and high rates recommended for wild proso millet, field sandbur, and wild oat. Weak on wild mustard. Can be applied with most PPI or PRE residual broadleaf herbicides labeled in corn. A1 C3 C20 S4	
DoublePlay (EPTC + acetochlor + safener)  RUP	5 to 8 pt/A (3.5 to 5.6 + 0.88 to 1.4)				
Axiom (flufenacet + metribuzin) 	15 to 23 oz DF (0.51 to 0.98 + 2 to 3.1 oz)		PPI or PRE		Poor wild oat control. Adjust rate according to soil type. Less effective PRE than Ramrod and Harness /Surpass on many soils. PPI gives more consistent weed control.
Dual II Dual II Magnum (metolachlor)	1.5 to 3 pt Dual II 6 to 12 lb IIG / 25G (1.5 to 3) 1 to 2 pt Magnum (1 to 2)		PPI or PRE Fall: After Sept 30 but before ground freezes.		May be tank-mixed with most residual soil- applied herbicides registered in corn. See label. Commercial mixture available: Dual + Atrazine = Bicep Lasso + Atrazine = Lariat, Bullet flufenacet (in Axiom) + Balance = Epic A1 A3 C2 C3 C24 S4
Lasso (alachlor) RUP	2 to 3.5 qt 4EC/MT 13 to 26 lb 15G (2 to 3.5)		PPI, PRE or EPOST on corn up to 5 inches tall.		
Frontier (dimethenamid)	20 to 32 fl oz 6E (0.93 to 1.5)		EPP, PPI or PRE.		Weak on wild mustard and wild oat. Can be applied with most PPI or PRE residual broadleaf herbicides labeled in corn. Commercial mixture available: Frontier + Atrazine = Guardsman Frontier + Clarity = OpTill C2 C21 S4
Harness (acetochlor + safener)  RUP	1.25 to 2.75 pt (1.1 to 2.4) 6 to 15 lb 20G (1.2 to 3)		PPI, PRE, EPOST and Fall.		Weak on wild mustard. Provides equal or greater weed control compared to Axiom, Dual, Lasso or Frontier. Adjust rate according to soil type. Surpass can be applied EPOST at 1.2 to 3 pt/A or in fall at 3 pt/A Can be applied with most PPI or PRE residual broadleaf herbicides labeled in corn. Commercial mixture available: Harness + Atrazine = Harness Xtra A1 C2 C3 C22 S4
Surpass (acetochlor + safener)  RUP	PPI and PRE: 1.5 to 3.75 pt 6 to 15 20G (1.2 to 3)				
Ramrod (propachlor) 	4 to 6 qt 20 to 30 lb 20G (4 to 6)				

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs	
<b>TopNotch</b> (microencapsulated acetochlor + safener)  RUP	<b>4 to 7.25 pt</b> (1.6 to 2.9)	Grass and some broadleaf weeds.	Reduced or No-till: EPP and PRE	Weak on wild mustard and wild oat. See label for tank-mix option. Commercial mixture available: TopNotch + Atrazine = FulTime	
<b>Degree</b> (microencapsulated acetochlor + safener)  RUP	<b>3.25 to 4.25 qt</b> (1.54 to 2)			Commercial mixture available: Degree + Atrazine = Degree Xtra  A1 C2 C22	
<b>Prowl</b> <b>Pendimax</b> (pendimethalin)	<b>2.4 to 3.6 pt EC</b> <b>1.7 to 3.3 lb DG</b> (1 to 1.5)			PRE or EPOST Corn: Before 4-leaf stage. Weeds: Less than 1 inch tall.	DO NOT INCORPORATE. Seed corn at least 1.5 inches deep to ensure adequate separation of from herbicide. C27 Y1 Y20 Y24
<b>Atrazine</b>  RUP	<b>1.1 to 2.2 lb DF</b> (1 to 2 lb ai/A)	Broadleaf and some grass weeds.	PPI and PRE Spring only.	Use higher rate on fine-textured soils. Soil residue may injure some crops planted the following year. Consult label for crop rotation restrictions. C2 C7 S4 Y1 Y9 Y24	
<b>Bladex/Cy-Pro</b> (cyanazine)  RUP	<b>1.3 to 3.3 lb DF</b> (1.2 to 3)			PPI and PRE	Soil residues unlikely the next year. Weak on redroot pigweed. Use higher rates on fine-textured, high OM soil. Do not use on sands, loamy sands or soil with less than 1% OM. C12
<b>Bladex/Cy-Pro + Atrazine</b>  RUP	<b>0.8 to 3.3 lb DF + 0.4 to 1.8 lb DF</b> (0.75 to 3 + 0.4 to 1.6)			Lower atrazine rates reduce potential for carryover. Do not use on coarse textured soils with less than 1% OM. Commercial mixture available: Extrazine II. C2 C7 C12 Y1 Y9 Y24	
<b>Python</b> (flumetsulam)	<b>0.8 to 1.33 oz DG or 5 to 3 A/pack</b> (0.64 to 1.06 oz)	Annual broadleaf weeds including nightshade.	EPP, PPI or PRE or POST to corn at early spike stage.	Shallow PPI. PRE applications require at least 0.75 inch rain for activation. Adjust rate for soil type.	
<b>Broadstrike + Dual</b> (flumetsulam + metolachlor) 	<b>1.75 to 2.75 pt</b> (0.64 to 1 oz + 1.6 to 2.33)	Some annual grass and broadleaf weeds.	EPP, PPI or PRE.	Do not apply to soil greater than 7.8 pH. See label for tank-mix options. Python and Hornet has no grass activity. C2 C13 C23 C28 S4 X1 Y4 Y15 Y21 Y24	
<b>Hornet</b> (flumetsulam + clopyralid)	<b>3.2 to 4.8 oz DF or 3 to 2 A/pack</b> (0.74 to 1.1 oz + 2 to 3 oz)	Most annual broadleaf weeds.			
<b>Balance</b> (isoxaflutole)  RUP	<b>1.25 to 2 oz DF</b> (0.058 to 0.094)	Most annual grass and broadleaf weeds including foxtails, wild proso millet, field sandbur, pigweeds, kochia, lambsquarters, nightshade, and mustards.	EPP, PPI or PRE. Corn: Apply alone or in tank-mix up to 14 days before or after seeding but prior to emergence.	<b>Adjust rate according to soil texture and pH.</b> Must pre-slurry or wait at least 15 minutes after adding to tank before application to allow WDG to dissolve. Allow more time to cold water. See label or narrative for tank-mix options. See label or narrative for rates based on application timing, soil type, soil pH, and OM. PPI no more than 2 inches deep and seed corn seed at least 1.5 inches deep. Corn seed must be completely covered with soil and seed furrow firmed to prevent seed contact with herbicide. Rainfall must occur soon after PRE application for activation. Do not apply POST. See label for instructions to avoid corn injury. Risk of injury as expressed as temporary yellowing/chlorosis may occur from misapplication, any stress condition to corn or failing to observe guidelines suggested above. A1 C2 C3 C12 C22 S4 Y9 Y11 Y24	
<b>Balance</b> (isoxaflutole) + <b>Harness/Surpass</b> (acetochlor + safener)  RUP	<b>1.25 to 2 oz DF + 1 to 2.25 pt Harness 1 to 3 pt Surpass</b> (0.058 to 0.094 + 0.88 to 2 Harness 0.8 to 2.4 Surpass)				
<b>Epic</b> (isoxaflutole + flufenacet)  RUP	<b>7 to 17 oz WDG</b> (0.7 to 1.7 oz + 0.21 to 0.51)				

# CORN

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
Bromoxynil	1 to 1.5 pt EC (0.25 to 0.37)	Most annual broadleaf weeds.	POST Corn: Prior to tasseling.	Apply to small weeds. Weak on wild mustard. Could be used when drift of dicamba or 2,4-D may injure susceptible broadleaf crops. C14
Bromoxynil + Atrazine  RUP	0.75 to 1.5 pt EC + 0.5 to 1.1 lb DF (0.19 to 0.38 + 0.5 to 1)		POST Corn: Up to 12 inches tall.	Atrazine soil residual may injure subsequent crops. Commercial mixtures available: Buctril + Atrazine, Brozine, or Moxy AT C2 C7 C14 Y6 Y9 Y24
Basagran (bentazon)	1.5 to 2 pt (0.75 to 1)	Wild mustard, cocklebur, Canada thistle, and sunflower.	POST Mustard: 4 to 6 leaf. Thistle: 6 to 8 inches tall.	Thorough coverage is essential. Split applications needed for Canada thistle control. Commercial mixture available: Basagran + Atrazine = Laddok C2 C7 C9 Y6 Y9
Atrazine + oil additive  RUP	Appropriate rate + oil additive (1 to 2)	Broadleaf weeds and some grasses.	POST Weeds: Less than 1.5 inches tall.	Apply before corn is 12 inches tall. Apply with an oil additive at 1 qt/A. Provides partial control of foxtail. Atrazine soil residue may injure crops planted the following year. C7 Y9 Y24
Bladex/Cy-Pro (cyanazine) + NIS or vegetable oil additive  RUP	1.3 to 2.2 lb DF (1.2 to 2.0)		POST Corn: Up to 4-leaf stage. Weeds: Less than 1.5 inches tall.	Do not use petroleum based crop oils. Vegetable oil additive increases weed control and risk of crop damage compared to NIS. Use only 90DF for POST applications. Avoid application during cool, wet conditions. C12
Bladex/Cy-Pro (cyanazine) + Atrazine + vegetable oil additive RUP	0.9 lb DF + 0.6 lb DF + 1 qt veg. oil (0.8 + 0.5)		POST Corn: Up to 12 inches tall or 4-leaf stage.	Apply with an vegetable oil additive at 1 qt/A. Apply to small grass and broadleaf weeds. Commercial mixture available: Extrazine II. C2 C7 C12 Y22 Y24
Sencor (metribuzin) + broadleaf herbicide	1.6 to 2 oz DF + BL herbicide (1.2 to 1.44 oz + labeled rate)	Most broadleaf weeds.	POST Corn: Prior to tassel.	See label for tank-mix options. Must follow crop stage restrictions of tank-mix broadleaf herbicide. <b>Do not use oil additive with any tank-mix.</b> C9 Y24
2,4-D	0.5 to 1 pt of a 4 lb/gal conc. (0.25 to 0.5)	Broadleaf weeds.	POST and POST Directed	Use drop nozzles when corn is over 8 inches tall but before tasseling. Apply POST directed to corn from 3-leaf to 30 inches tall. C33 X1
Shotgun (atrazine + 2,4-D)  RUP	2 to 3 pt (0.56 to 0.84 + 0.25 to 0.375)		EPP, PRE or EPOST	Lower atrazine rates reduce potential for carryover. Can be tank-mixed with bromoxynil at 0.75 pt/A or Banvel/Clarity at 2 to 4 fl oz/A. C2 C7 C16 C31 Y9 Y24
Banvel Clarity (dicamba)	0.5 to 1 pt (0.25 to 0.5)		EPOST Corn: From spike to 8 inches tall.	Apply with drop nozzles when corn is 8 to 36 inches tall or 15 days prior to tassel. Can be applied with Accent for grass control. C16 X1 Y15 Y24
	0.5 pt (0.25)		POST Directed See Remarks.	
Banvel Clarity (dicamba) + Atrazine	0.5 to 1 pt + 0.55 to 2.2 lb DF (0.25 to 0.5 + 0.5 to 2)	Most broadleaf weeds and small grasses.	PRE or EPOST Corn: Up to 5-leaf.	Do not apply to stressed corn. Atrazine soil residue may injure subsequent crops. Commercial mixture available: Marksman. C2 C7 C16 X1 Y3 Y9 Y15 Y24

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
<b>Distinct</b> (dicamba + diflufenzopyr)	<b>6 oz WDG</b> (3 oz + 1.2 oz)	Most broadleaf weeds and grass suppression.	POST Corn: Up to 24 inches tall.  Target application at 4 to 10 inch tall corn.	Add NIS at 0.25% v/v + 28% UAN at 1.25 qt/A or AMS at 17 lb/100 gallons. Provides a wider spectrum of weeds controlled and greater perennial weed control than Banvel/Clarity. Can be tank-mixed with Accent but refer to label or narrative for tank-mix options. Distinct at 6 oz 70WDG/A = 6 fl oz Clarity. C18 Y15 Y24
<b>Stinger</b> (clopralid) 	<b>1/4 to 2/3 pt</b> (1.5 to 4 oz)	Many composite, legume, and polygonum broadleaf weeds including Canada thistle.	POST Corn: Up to 24 inches tall. Canada thistle: Rosettes: Before bud stage.	Apply after most thistle shoots have emerged. See narrative for crop rotation restrictions. Refer to narrative for rosette technique for Canada thistle control and crop rotation restrictions. Fall apply for greater control than application to bolting or flowering plants.
<b>Hornet</b> (flumetsulam + clopyralid)	<b>1.6 to 4 oz WDG</b> (0.37 to 0.9 oz + 1 to 2.5 oz)	Many broadleaf weeds including Canada thistle.	POST Corn: Up to 24 inches tall.	Use drop nozzles on 20 to 24 inches corn. Add NIS at 0.25% v/v or oil additive at 1% v/v. Refer to label or narrative for tank-mix options. Aerial application registration pending. C23 X1 Y21 Y24
<b>Curtail</b> (clopyralid + 2,4-D)	<b>2 pt</b> (0.09 + 0.5)	Most broadleaf weeds and Canada thistle.	POST Corn: Up to 8 inches tall or 4 visible leaf collars showing.	Corn stalks may become brittle due to 2,4-D. Use drop nozzles from 8 to 24 inches tall. See label or narrative for risk of injury, delay in cultivation after application and other restrictions. May be tank-mixed with Stinger at 2 to 6 fl oz/A. C17 Y21 Y24
<b>Tough</b> (pyridate)	<b>12 to 24 fl oz</b> (0.47 to 0.94)	Small seeded broadleaf weeds including ALS susceptible and resistant kochia.	POST Corn: Up to 68 days prior to harvest Weeds: Small	Contact, nonresidual herbicides. Apply at 20 to 30 gpa with NIS or oil additive + 28% UAN. Apply when weeds are small and actively growing. Use an oil additive when weeds are large. Refer to label for tank-mix options. C32
<b>Aim</b> (carfentrazone) + tank-mix herbicide  <b>Atrazine is RUP</b>	<b>1/3 oz DF + labeled rate</b> (0.13 oz + labeled rate)	Redroot pigweed, lambsquarters, nightshade and may control or suppress kochia.	EPOST Corn: Up to 12 inches tall or 8 collars. Weeds: Small.	Aim may cause cosmetic speckling/spotting on corn leaves intercepting spray. See label or narrative for adjuvant and tank-mix options to increase spectrum of broadleaf weeds controlled. C6 X1
<b>Permit</b> (halosulfuron) 	<b>2/3 to 1.33 oz DF</b> (0.5 to 1 oz)	Pigweeds, cocklebur, Venice mallow, ragweeds, sunflower, velvetleaf, and nutsedge.	POST Corn: Up to 36 inches tall.  Use drop nozzles on 24 to 36 inch corn.	Add NIS at 0.25 to 0.5% v/v or oil additive with 28% UAN at 2 to 4 qt/A. Liquid fertilizer increases control of pigweed and other species. Common lambsquarters is not controlled. Can be tank-mixed with Atrazine, Banvel/Clarity, Marksman, 2,4-D, Bromoxynil, and Accent. C26 Y3 Y24
<b>NorthStar</b> (dicamba + primisulfuron)	<b>5 oz DF</b> (2.2 oz + 0.375 oz)	Many broadleaf weeds and suppression of foxtail, field sandbur, quackgrass, nightshade, and Canada thistle.	POST Corn: 4 to 20 inches tall with 6 or fewer collars. Use drop nozzles on 20 to 36 inch corn.	Add NIS at 0.25% v/v or oil adjuvants at 1.5 to 2 pt/A. UAN or AMS may be added with NIS or oil. See label or narrative for tank-mix options, crop rotation restrictions, insecticide interactions, and other restrictions. Primisulfuron may leave a residue in the soil for more than 1 year. C25 Y3 Y24

# CORN

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
<b>Basis</b> (rimsulfuron + thifensulfuron) + additive	<b>1/3 oz DF</b> (0.165 oz + 0.083 oz)	Barnyardgrass, foxtails, redroot pigweed, wild mustard, lambsquarters, and annual smartweed.	Early POST Corn: Spike to 4-leaf (2 collar) stage. ½ to 6 inches tall. Weeds: 1 to 2 inches tall.	Apply with oil additive. MSO and basic blend type adjuvants enhance weed control. Addition of 28% nitrogen enhances weed control. Do not use on corn hybrids less than 88 days maturity. Do not apply to corn previously treated with Counter insecticide. See label or narrative for tank-mix options. C2 C10 Y13
<b>Basis Gold</b> (nicosulfuron + rimsulfuron + atrazine)	<b>14 oz DF</b> (0.188 oz + 0.188 oz + 0.76)	Most all annual grass and broadleaf weeds plus quackgrass.	POST Corn: Up to 12 inches tall and prior to 6 collars.	Apply with oil adjuvant at 1 to 2% v/v with 28% UAN. Basis Gold at 14 oz/A contains 0.76 lb ai/A atrazine. Follow crop rotation restrictions. C2 C4 C11 Y3 Y9 Y12 Y24
<b>Accent</b> (nicosulfuron) + additive	<b>2/3 oz DF</b> (0.5 oz)	Annual grasses including wild-proso millet plus quackgrass, pigweed and smartweed.	POST Corn: Up to 20 inches with 6 or fewer collars. Use drop nozzles on 20 to 36 inch corn.	Apply with oil additive. MSO and basic blend type adjuvants enhance weed control. Addition of 28% nitrogen enhances weed control. Do not apply to corn previously treated with Counter 15G insecticide. See label or narrative for rotational restrictions and tank-mix options. C3 C4 X1 Y3 Y24
<b>Accent</b> (nicosulfuron) + Atrazine <b>RUP</b>	<b>2/3 oz DF + 0.42 to 1.7 lb DF</b> (0.5 oz + 0.375 to 1.5)	Grass and most small seeded broadleaf weeds.	POST Corn: Up to 12 inches tall.	Apply with oil adjuvants to enhance weed control. May be tank-mixed with dicamba for control of large-seeded broadleaf weeds. C3 C4 C7 X1 Y3 Y9 Y24
<b>Accent</b> (nicosulfuron) + <b>Banvel Clarity</b> (dicamba)	<b>2/3 oz DF + 0.5 to 1 pt</b> (0.5 oz + 0.25 to 0.5)	Most grass and broadleaf weeds including cocklebur, wild buckwheat and Canada thistle.	POST - Corn: Up to 8 inches tall. Use drop nozzles on 8 to 24 inch corn.	NIS is required but basic blend adjuvants provide greater weed control. Do not apply the 1 pt/A rate of dicamba to corn greater than 8 inches tall. May be tank-mixed with atrazine. C3 C4 C16 X1 Y4 Y15 Y24
<b>Celebrity Plus</b> (nicosulfuron + dicamba + diflufenzopyr)	<b>4.67 oz DF</b> (0.5 oz + 0.125 + 0.05)		POST Corn: 4 to 24 inches tall with 6 or fewer collars. Use drop nozzles on 24 to 36 inch corn.	Add NIS at 0.25 to 0.5% + UAN at 1 to 2 qt/A or basic blend adjuvants at 1% v/v. Use of oil additives are not prohibited. May be tank-mixed with Atrazine, Banvel/Clarity, or Marksman. Celebrity at 4.67 oz WDG/A = Accent at 0.67 oz 75DF/A + the dicamba in Distinct at 4 fl oz/A. C2 C15 X1 Y14 Y24
<b>Accent</b> (nicosulfuron) + Bromoxynil	<b>2/3 oz DF + 1 to 1.5 pt</b> (0.5 oz + 0.25 to 0.5)	Most grass and broadleaf weeds.	Use drop nozzles on 20 to 24 inch corn.	Use of oil additive is not prohibited but substitution of oil or basic blend additives may result in crop injury. Addition of 28% UAN is recommended with NIS. C4 C14 X1 Y3 Y24
<b>Accent</b> (nicosulfuron) + <b>Hornet</b> (flumetsulam + clopyralid)	<b>2/3 oz DF + 1.6 to 4 oz WDG</b> (0.5 oz + 0.37 to 0.9 oz + 1 to 2.5 oz)	Most grass and broadleaf weeds including ragweed, nightshade, cocklebur, and sunflower.	POST Corn: Up to 20 inches tall with 6 or fewer collars. Use drop nozzles on 20 to 24 inch corn.	Apply to broadleaf weeds less than 8 inches tall. Use NIS at 0.25% v/v or PO at 1% v/v. Use 28% UAN at 2.5% v/v during dry conditions. Do not cultivate within 10 days before or after application. Refer to label for rate range for various weeds and tank-mix options. C2 C4 C23 S4 X1 Y3 Y4 Y7 Y15 Y21 Y24
<b>Accent Gold</b> (nicosulfuron + rimsulfuron + clopyralid + flumetsulam)	<b>2.9 oz DF</b> (0.188 oz + 0.188 oz + 1.5 oz + 0.56 oz)	Suppression of Canada thistle.	Use drop nozzles on 20 to 24 inch corn.	Apply with oil adjuvant at 1 to 2% v/v. Not use on corn hybrids less than 88 days maturity. May tank-mix with Atrazine, Banvel/Clarity, or Marksman. Accent Gold at 2.9 oz DF/A contains 2.4 oz/A Hornet. Follow label for crop rotation restrictions. C5 X1 Y3 Y4 Y8 Y9 Y24

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
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**POST-Directed Herbicides**

Sencor (metribuzin) + broadleaf herbicide	2 to 3 oz DF + rate for broadleaf herbicide (1.44 to 2.24 oz)	Broadleaf weeds.	POST Directed Corn: More than 8 inches tall.	Apply with 2,4-D, Clarity, or Buctril. Refer to label for adjuvant use, application information, range of crop stage at application, cultivation, potential for injury, and other restrictions. C9 C31 Y16 Y24
Gramoxone Extra (paraquat) Directed Spray Only  RUP	13 to 24 fl oz (0.25 to 0.47)	Broadleaf and grass weeds.		Treat no more than lower 3 inches of corn stalk. Apply with NIS at 0.25% v/v. May be tank-mixed with atrazine. C34

**Preharvest Application**

Roundup Ultra/RT RU Original/RT Glyphos Private labels glyphosate	2 pt of a 3 lb ae/gal conc. (0.75)	Annual and perennial grass and broadleaf weeds.	Preharvest	Apply when grain moisture is 35% or less and corn is physiologically mature (black layer formed). Allow at least 7 days between application and harvest. Do not use on corn grown for seed. A4 Q4
Roundup Custom glyphosate	1.5 pt of a 4 lb ae/gal conc. (0.75)			

# HERBICIDE RESISTANT CORN

## LEARFIELD (Imidazolinone Resistant) CORN



Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
Lightning azethapyr + azapyr)	1.28 oz WDG (0.672 + 0.224 oz)	Most all annual grass and broadleaf weeds plus season-long suppression of some perennial weeds.	EPOST and POST	<b>Apply only to Clearfield corn varieties.</b> Apply with adjuvant and liquid fertilizer. Refer to label for weeds controlled, application information, and crop rotation restrictions. High risk of developing ALS kochia resistance. Should use with herbicides of a different mode of action and use complimentary weed control strategies. C35 Y2 Y19 Y24

## LIBERTY (Glufosinate) RESISTANT CORN

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
Liberty (glufosinate)	16 to 28 fl oz (0.2 to 0.365)	Most annual grass and broadleaf weeds plus suppression of some perennial weeds.	EPOST and POST  Corn: Up to 24 inches tall or 7 collars (V7).	<b>Apply only to glufosinate resistant corn varieties.</b> Liberty is nonselective, nonresidual with contact action and a unique mode of action. Apply with AMS at 3 lb/A in a minimum of 15 gpa. See label for tank-mix options. Liberty can be used to control resistant weeds. C36 S4 X1
Liberty ATZ (glufosinate + atrazine)  RUP	32 to 40 fl oz (0.25 to 0.31 + 0.83 to 1)		EPOST and POST  Corn: Up to 12 inches tall.	<b>Apply only to glufosinate resistant corn varieties.</b> Liberty ATZ contains atrazine and may carryover into the following growing season. Do not add NIS or oil additives. Apply with AMS at 3 lb/A in a minimum of 15 gpa. See label for application information and tank-mix options. C36 S4 X1 Y9 Y25 Y24

## ROUNDUP (Glyphosate) RESISTANT CORN

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
Roundup Ultra (glyphosate)	1.5 to 2 pt of a 3 lb ae/gal conc. (0.56 to 0.75)	Annual and perennial grass and broadleaf weeds.	EPOST and POST  Corn: Up to 30 inches tall or 8 collars (V8).	<b>Apply only to glyphosate resistant corn varieties.</b> Do not apply more than 1 qt/A per single in-crop application. Do not apply more than 2 qt/A in crop. Apply with AMS fertilizer at 8.5 to 17 lbs/ 100 gal water. Refer to label for tank-mix options, application information, and restrictions. Follow all rate and timing restrictions of tank-mix herbicides. Roundup is a foliar, nonselective, nonresidual, herbicide with a unique mode of action and can be used to control weeds resistant to other herbicides. A4 C37 Q4 X1
ReadyMaster ATZ (glyphosate + atrazine)	(1.5 to 2 qt) (0.56 to 0.75 + 0.75 to 1)		EPOST and POST  Corn: Up to 12 inches tall.	<b>Apply only to glyphosate resistant corn varieties.</b> ReadyMaster ATZ contains atrazine and may carryover into the following growing season. See label for application information and tank-mix options. A4 X1 Y5 Y9 Y24

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
Roundup Ultra/RT RU Original/RT Glyfos Private labels (glyphosate)	0.5 to 2 pt of a 3 lb ae/gal conc. (0.19 to 0.75)	Emerged grass and broadleaf weeds.	Preplant or anytime prior to crop emergence.	A nonselective, translocated, foliar herbicide. No soil activity. Apply with AMS fertilizer. See narrative or label for adjuvant use. A4 Q4
Touchdown (glyphosate - tms)	1.2 to 4.8 pt of a 3.43 lb ae/gal conc. (0.51 to 2)			
Roundup Custom (glyphosate)	0.38 to 1.5 pt of a 4 lb ae/gal conc. (0.19 to 0.75)			
Gramoxone Extra (paraquat) RUP	1.5 to 3 pt (0.47 to 0.94)			A nonselective, nonresidual, contact, foliar herbicide. Apply with a NIS. Q5
2,4-D	1 to 2 pt of a 4 lb/gal conc. (0.5 to 1)	Preplant burndown of emerged annual broadleaf weeds.	<u>Days before seeding</u> 1 pt amine=15 days 1 pt ester = 7 days 2 pt am or es = 30 d	A preplant application for use only in reduced tillage. Soybean injury may occur. Seed at least 1.5 to 2 inches deep to ensure seed is separated from the herbicide. D4 X1
Prowl Pendimax (pendimethalin)	2.4 to 3.6 pt 1.67 to 2.5 lb DG (1 to 1.5)	Some grass and broadleaf weeds.	PPI or PRE	Adjust rate according to soil type. Do not apply Sonalan or trifluralin PRE. Poor control of wild mustard and wild oat. DNA resistant green foxtail has been documented in North Dakota. D2 D4 D20 D27 X1 Y20 Y24
Sonalan Sonalan 10G (ethalfluralin)	1.5 to 3.5 pt 5.5 to 13 10G (0.55 to 1.3)		PPI Fall from Oct 1 to Dec 31 or Spring.	
Trifluralin	1 to 2 pt 5 to 10 lb 10G 0.83 to 1.67 lb 60DF (0.5 to 1)		PPI Fall or Spring.	
Pursuit Plus (imazethapyr + pendimethalin)	1.8 pt (0.75 oz + 0.72)	Grass and broadleaf weeds including wild mustard.	PPI	ND state label allows use at a reduced rate. 1.8 pt/A is equivalent to 3 fl oz/A Pursuit and 1.75 pt Prowl. Additional Prowl at 1.75 pt/A can be added. D2 D22 Y2 Y24
Lexone/Sencor (metribuzin) + Prowl or Sonalan or Trifluralin	0.33 to 0.5 lb DF + appropriate rate for soil type  0.25 lb DF + rate for soil type.			Use on soils with pH lower than 7.5.  Use on soils with pH greater than 7.5. D2 D17 D20 D25 Y23 Y43
Axiom (flufenacet + metribuzin) 	7 to 13 oz WDG (0.24 to 0.44 + 1 to 1.77 oz)	Barnyardgrass, foxtails and a few broadleaf weeds.	PPI or PRE	Poor wild oat control. PPI gives more consistent control than PRE. PRE requires precipitation for herbicide activation.
Domain (flufenacet + metribuzin) 	9 to 16 oz WDG (0.135 to 0.24 + 3.25 to 5.75 oz)	Grass and some broadleaf weeds.	EPP, PPI, and PRE.	Adjust rate according to soil type and OM. Frontier has given greater nightshade control. Refer to label for tank-mix options and grazing or feeding restrictions.
Dual II Dual II Magnum (metolachlor)	2 to 4 pt Dual II 8 to 16 lb of 25G (2 to 4) 1 to 2 pt Magnum (1 to 2)		Fall: After Sept 30 but before ground freezes or Spring PPI or PRE	Commercial mixtures available: Lasso + trifluralin = Freedom. Dual + metribuzin = Turbo A1 D2 D3 D16 S4
Lasso (alachlor) RUP	2 to 3 qt EC/MT 13 to 23 lb 15G (2 to 3)		PPI or PRE	
Frontier (dimethenamid)	20 to 32 fl oz (0.93 to 1.5)		PPI, PRE or EPOST	



# SOYBEAN

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
<b>Authority</b> (sulfentrazone) 	<b>4 to 5.33 oz WDG</b> (3 to 4 oz)	Broadleaf weeds including kochia, nightshade, pigweed species, and biennial wormwood and grass suppression.	EPP, PPI, and PRE.	Adjust rate according to soil texture and OM. Requires precipitation to activate herbicide. Provides excellent burndown applied EPP. See label or narrative for tank-mix options, application information, rate structure based on soil type, and crop rotation restrictions. D6 Y10 Y24
<b>Python</b> (flumetsulam) 	<b>0.8 to 1.33 oz WDG or 5 to 3 A/pack</b> (0.64 to 1.06 oz)	Broadleaf weeds including nightshade and biennial wormwood.	EPP, PPI, or PRE	Adjust rate according to soil texture and OM. Requires precipitation to activate herbicide. Do not apply to soil with greater than 7.8 pH. See label for tank-mix options. 85 days PHI. Commercial mixture available: Broadstrike + Dual - 1.75 to 2.5 pt/A D2 D9 D10 D23 S4 Y4 Y13 Y24
<b>Broadstrike+Treflan</b> (flumetsulam + trifluralin) 	<b>1.5 to 2.25 pt</b> (0.8 to 1.12 oz + 0.63 to 0.96)	Grass and broadleaf weeds including black nightshade.	PPI	Shallow PPI. Requires precipitation to activate herbicides. Adjust rate according to soil texture and OM. See narrative for rotational restrictions. D2 D9 D10 S4 Y4 Y13 Y24
<b>Basagran</b> (bentazon)	<b>1 to 2 pt</b> (0.5 to 1)	Wild mustard, cocklebur, Canada thistle, volunteer sunflower.	Soybean: Any stage. Mustard: 4 to 6-leaf Thistle: 6 to 8 inches See label for more information.	Excellent crop tolerance. Thorough coverage required. Oil additive at 1 qt/A improves weed control. Repeat applications necessary for Canada thistle. <u>Rosette technique</u> : In-crop applications controls Canada thistle during the growing season but allows fall rosette growth. Fall applications of Stinger, Curtail/M, or Glyphosate to Canada thistle in the rosette stage provides greater control than when applied to bolting or flowering stems. Refer to narrative for control of Canada thistle using the rosette technique. D7
<b>Rezult</b> (bentazon + sethoxydim)	<b>3.2 pt</b> (1+ 0.2)	Most grass and broadleaf weeds.	POST Soybean: Emergence to 30 days prior to harvest.	Add oil adjuvants at 1 to 2 pt/A. Refer to label or narrative for tank-mix options. Refer to Basagran and Poast sections for additional information. D7 D19
<b>Blazer</b> (acifluorfen)	<b>0.5 to 1.5 pt</b> (0.125 to 0.375)	Wild mustard, redroot pigweed, nightshade, wild buckwheat and ragweed, vol flax.	POST Soybean: 1 to 2 trifoliates. Weeds: 1 to 4 inches tall.	Use low rate on wild mustard and pigweed and vol flax. Use higher rate on larger weeds. Weed control is greater if applied when daytime air temperature exceeds 70 F. D8 S4
<b>Blazer</b> (acifluorfen) + <b>Basagran</b> (bentazon)	<b>1 pt + 1.5 pt</b> (0.25 + 0.75)	Broadleaf weeds.	POST - Soybean: 1 to 2 trifoliates. Weeds: Up to 4 inches.	Increase Blazer rate for black nightshade control. See label for additive recommendations. Commercial mixtures available: Galaxy and Storm. D2 D7 D8
<b>Cobra</b> (lactofen)	<b>6 to 12.5 fl oz</b> (1.5 to 3.2 oz)	Broadleaf weeds including wild mustard, ragweed, nightshade, and lanceleaf sage.	POST Soybean: 1 to 2 trifoliates. Weeds: 2 to 6 leaves.	May be applied PRE at 12.5 to 19 fl oz/A. Oil adjuvant increases control but increases risk of crop injury. Refer to narrative for use information, environmental response, tank-mix options, and to suppress white mold. D11 S4
<b>Flexstar</b> (fomesafen + adjuvants)	<b>0.75 to 1 pt</b> (0.176)	Several broadleaf weeds including cocklebur, smartweed, nightshade, pigweed, mustard, ragweed, sunflower and Venice mallow.	POST Weeds: 2 to 4 leaf stage.	May be used at 1pt/A in ND east of I-29 and south of I-94 and at 1 pt/A in MN south of I-94. May be used at 0.75 pt/A in ND east of Hwy 281 and in MN south of US Hwy 2. See narrative for crop rotation restrictions. May tank-mix with Fusion, Basagran or Pursuit. Use MSO adjuvants at 1%v/v + AMS at 10 lb/100 gal water. Follow restrictions for each geographic region. D13 Y24

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
FirstRate (cloransulam)	0.3 oz WDG or 10 A/pack (0.25 oz)	Cocklebur, Venice mallow, marestail, common and giant ragweed, sunflower, wild mustard and suppression of Canada thistle..	POST Weeds: Up to 10 inches tall or 8 leaves.	Apply with NIS at 0.125% v/v + 28% UAN at 2.5% v/v, or oil adjuvant at 1.2% v/v alone or with 28% UAN at 2.5% v/v. See label or narrative or label for weed size, tank-mix options and crop rotation restrictions. D12 X1 Y4 Y24
Pinnacle (thifensulfuron)	1/4 oz DF (0.062 oz)	Wild mustard, pigweed, lambs-quarters and other broadleaf weeds.	POST Soybean: After 1st trifoliolate leaf has fully expanded until 60 days prior to harvest.	Apply with a NIS at 0.25% v/v or oil additive under dry conditions. 28% UAN or AMS may be added. Avoid spray drift to susceptible crops and clean sprayer thoroughly after application. Pinnacle at 1/8 to 1/4 oz DF/A can be applied with Basagran at 1 to 1.5 pt/A. D7 D18 S4 X1
Pinnacle (thifensulfuron) + Cobra (lactofen)	1/4 oz DF + 6 to 8 fl oz (0.062 oz + 1.5 to 2 oz)		POST Soybean: 1 to 2 trifoliolate.	
Pursuit Pursuit DG (imazethapyr)	3 fl oz S 1.08 oz WDG or 6.67 A/packet (0.75 oz)	Annual broadleaf weeds including black nightshade, kochia, pigweed, and mustard.	POST Soybean: After first trifoliolate leaf has fully expanded but prior to flowering.	Apply with NIS or oil adjuvant and liquid fertilizer. MSO type oil adjuvants have given greater Pursuit enhancement than petroleum oil or NIS. See narrative for rotational restrictions. Avoid drift. D21 S4 X1 Y2 Y24
Pursuit Pursuit DG (imazethapyr) + Basagran (bentazon)	3 fl oz 1.08 oz WDG or 6.67 A/packet + 1 to 1.5 pt (0.75 oz + 0.5 to 0.75)		Weeds: Small and actively growing.	Apply with 28% UAN either with NIS or oil additive. Do not apply within 85 days of harvest. Refer to label for crop safety, optimum weed size, weed response, and stresses that may affect weed control. See narrative for rotational restrictions. D7 D21 S4 Y2 Y24
Pursuit Pursuit DG (imazethapyr) + Pinnacle (thifensulfuron)	3 fl oz 1.08 oz WDG or 6.67 A/packet + 1/4 oz DF (0.75 oz + 0.062 oz)		Apply with NIS and 28% UAN. Refer to label for crop safety, optimum weed size, weed response, and stresses that may affect control. See narrative for rotational restrictions. May increase common lambsquarters control. D18 D21 S4 X1 Y2 Y24	
Pursuit Pursuit DG (imazethapyr) + Cobra (lactofen)	3 fl oz 1.08 oz WDG or 6.67 A/packet + 4 fl oz (0.75 oz + 1 oz)	Annual broadleaf weeds including cocklebur, ragweed, and lanceleaf sage.		Apply with NIS and 28% UAN. Do not apply with oil additive. Refer to label for crop safety, optimum weed size, weed response, and stresses that may affect control. See narrative for rotational restrictions. D11 D21 S4 Y2 Y24
Raptor (imazamox)	4 to 5 fl oz (0.5 to 0.625 oz)	Most annual grass and broadleaf weeds.	POST Soybean: After first trifoliolate leaf has fully expanded but prior to flowering. Do not apply once flowering has begun. Weeds: 2 to 4 inches.	Apply at 5 fl oz/A or 4 fl oz/A following a soil-applied grass herbicide. Apply with NIS or oil additive with 28% UAN. Do not use oil additive + 28% UAN during high temperature and humidity. See narrative for use, application, weed size and control, crop rotation restrictions, and other use information. Reduced risk of herbicide carryover as compared to Pursuit in sensitive crop rotation systems. D11 D24 S4 X1 Y2 Y24
Raptor (imazamox) + Cobra (lactofen)	4 to 5 fl oz + 4 fl oz (0.5 to 0.625 oz + 1 oz)	Common ragweed	POST Soybean: 1 to 2 trifoliolates. Weeds: 2 to 6 leaves.	

# SOYBEAN

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
Assure II (quizalofop)	7 to 10 fl oz (0.77 to 1.1 oz)	Annual grasses and quackgrass.	POST Soybean: Up to pod set. Grass weeds: 2 to 6 inches tall.	Apply with oil additive to actively growing grasses. Apply: Assure II with oil additive at 1% v/v Fusilade with oil additive at 1% v/v Fusion with oil additive at 1% v/v Poast with oil additive at 1 qt/A Select with oil additive at 1qt/A
Fusilade DX (fluazifop-P)	5 to 12 fl oz (1.25 to 3 oz)		POST Soybean: Before bloom. Grass weeds: 2 to 4 inches.	Apply Assure II with nitrogen when weeds are drought stressed. See narrative for rates by weed species. Treat volunteer corn from 6 to 18 inches tall.
Fusion (fluazifop-P + fenoxaprop)	4 to 12 fl oz (1 to 3 oz + 0.32 to 0.96 oz)		POST Soybean: Before bloom. Grass weeds: 2 to 6 inches tall.	Grass control is reduced by tank mixtures or close interval application of POST broadleaf control herbicides. <u>The antagonism generally can be avoided by applying a higher rate of grass herbicide or apply the grass control herbicide 1 or more days before or 5 to 7 days after the broadleaf control herbicide.</u>
Poast (sethoxydim)	0.5 to 1.5 pt (0.09 to 0.28)	Annual grasses.	POST Soybean: All stages. Grass: Up to 8 inches tall.	Do not cultivate prior to 5 days before or 7 days after application. Reduced yellow foxtail control may result if Assure II is applied at rates lower than 8 fl oz/A, if used with broadleaf herbicides, or applied to stressed or larger yellow foxtail.
Select Prism (clethodim)	4 to 16 fl oz 8.5 to 34 fl oz (0.75 to 4 oz)	Annual grasses and quackgrass.	POST Soybean: All stages. Annual grasses: 2 to 6 inches tall. Quackgrass: 4 to 12 inches tall.	See label or narrative for tank-mix option allowed. See supplemental labels allowing reduced rates on small grass weeds. D5 D14 D15 D19 D25 D30 X1
Roundup Ultra RT RU Original Glyfos Private labels (glyphosate)	1 to 2 qt of a 3 lb ae/gal conc. (0.75 to 1.5)	Preharvest weed control.	Preharvest Soybean: All pods without green color.	Apply after pods have set and lost all green color. Allow a minimum of 7 days between application and harvest. Refer to narrative for adjuvant use. A4 Q1 Q4
Touchdown (glyphosate - tms)	Up to 1.6 pt of a 3.43 lb ae/gal conc. (Up to 0.69)			
Roundup Custom (glyphosate)	1.5 to 3 pt of a 4 lb ae/gal conc. (0.75 to 1.5)			
Gramoxone Extra (paraquat) RUP	12.8 fl oz (0.25)	Desiccant	Prior to harvest.	Add a NIS at 0.125% v/v. Do not apply within 15 days of harvest. Apply when at least 65% of the seed pods are a mature brown color or when seed moisture is 30% or less. Q5
Starfire (paraquat)	11 to 22 fl oz (0.125 to 0.25)			
Drexel Defol (sodium chlorate)	1 gal of a 6 lb/gal conc. (6)		7 to 10 days prior to harvest, after pods are brown.	Thorough coverage of plant is essential. Apply in 5 to 10 gpa by air or 20 to 30 gpa by ground.

**LIBERTY (Glufosinate) RESISTANT SOYBEAN**

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
Liberty (glufosinate)	16 to 28 fl oz (0.2 to 0.365)	Control of annual broadleaf weeds and control or suppression of grasses and perennial weeds.	POST Soybean: Emergence up to full bloom.	<b>Apply only to glufosinate resistant soybean varieties.</b> Apply with AMS fertilizer at 2 to 4 lb/A. Refer to label for weeds controlled, application information, tank-mix options with residual herbicides, and other restrictions. D28 S4 X1

**ROUNDUP (Glyphosate) RESISTANCE SOYBEAN**

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
Roundup Ultra RU Original Glyphomax Glyphomax Plus Glyfos Private labels (glyphosate)	1 to 6 pt of a 3 lb ae/gal conc. (0.38 to 2.25)	Annual and perennial grass and broadleaf weeds.	POST Soybean: Emergence through full flowering.  Apply as single or multiple applications.	<b>Apply only to glyphosate resistant soybean varieties.</b> Add AMS at 8.5 to 17 lb/100 gal water. Do not apply more than 4 pt/A for each single in-crop application OR during flowering. Do not exceed 6 pt/A for the total multiple in-crop applications from emergence through flowering. Multiple applications may be necessary for weeds flushes. Drift and off-site movement may cause injury or death to other plants and crops. Refer to label for weeds controlled, application information, adjuvant use, tank-mix options with residual herbicides, and restrictions. Commercial premix of glyphosate + Pursuit may be available: Extreme. A4 D29 S4 Q4 X1
Touchdown (glyphosate)	1.2 to 3.2 pt of a 3.43 lb ae/gal conc. (0.51 to 1.37)			<b>Apply only to glyphosate resistant soybean varieties.</b> Add AMS at 8.5 to 17 lb/100 gal water. Apply 1.2 to 3.2 pt/A for annual weed control. Apply 1.6 to 3.2 pt/A for perennial weed control. Do not exceed 3.2 pt/A for the total multiple in-crop applications from emergence through flowering. Multiple applications may be necessary for weeds flushes. Drift and off-site movement may cause injury or death to other plants and crops. Refer to label for weeds controlled, application information, adjuvant use, tank-mix options with residual herbicides, and restrictions. A4

# DRY EDIBLE BEAN

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
Roundup Ultra RT RU Original/RT Glyfos Private labels (glyphosate)	0.5 to 2 pt of a 3 lb ae/gal conc. (0.19 to 0.75)	Emerged grass and broadleaf weeds.	Preplant or anytime prior to crop emergence.	A nonselective, nonresidual, foliar herbicide. Apply with AMS fertilizer. Refer to label for adjuvant use. A4 Q4
Roundup Custom (glyphosate)	0.38 to 1.5 pt of a 4 lb ae/gal conc. (0.19 to 0.75)			
Eptam (EPTC)	3.5 to 4.5 pt 15 to 20 lb 20G (3 to 4)	Grass and some broadleaf weeds.	PPI	Weak on wild mustard. PPI immediately after application. May be tank-mixed with Dual, Lasso, Frontier, Prowl, Sonalan, or trifluralin to increase spectrum of weeds controlled. Consult label for rate range for specific tank mix. A1 A2 A3 E5 S4
	4.5 to 5.25 pt 20 to 22.5 lb 20G (4 to 4.5)		Fall incorporated after October 15 until freeze-up.	
Trifluralin	1 to 2 pt 5 to 10 lb 10G 0.83 to 1.67 lb 60DF (0.5 to 1)	Grass and some broadleaf weeds.	PPI Fall or Spring.	Poor wild mustard and wild oat control. PPI within 24 hours after application. May be tank-mixed with Dual, Eptam, Frontier, and Lasso. Refer to narrative for rotational restrictions. A1 A3 E5 E6 E8 X1 Y1 Y20 Y24
Sonalan (ethalfuralin)	1.5 to 4.5 pt 5.5 to 17 lb 10G (0.55 to 1.7)	Grass and some broadleaf weeds.	PPI Fall after October 15 or Spring. Spring PPI for EC only.	Poor wild mustard and wild oat control. Adjust rate according to soil type. Use highest rate allowed for nightshade control. Refer to narrative for rotational restrictions. E8 Y20 Y24
	7.5 to 12.5 lb 10G (0.75 to 1.25)	Foxtail suppression.	Fall incorporated between October 1 to December 31 or Spring.	Use in reduced or conservation tillage systems. Incorporate twice at 2-3 inches deep using a V- blade undercutter or rotary hoe at 5 mph. For fall applications, incorporate once in the fall and once in the spring before seeding. E8 Y20 Y24
Prowl Pendimax (pendimethalin)	2.4 to 3.6 pt 1.2 to 2.5 lb DG (0.75 to 1.5)	Grass and some broadleaf weeds.	PPI only	Poor on wild mustard and wild oat. Adjust rate according to soil type. PPI provides more consistent results. Refer to narrative for rotational restrictions. Can be tank-mixed and applied PPI with Dual, Eptam, Frontier, Lasso, Micro-Tech, and Partner. E3 E4 E5 E6 E8 Y20 Y24
Eptam (EPTC) + Sonalan (ethalfuralin)	2.5 to 3.5 pt 11 to 15 lb 20G + 3 to 4.25 pt 11.25 to 16 lb 10G (2.2 to 3 + 1.125 to 1.6)	Grass and some broadleaf weeds including eastern black nightshade.	PPI	Adjust rate according to soil type and OM. PPI immediately after application. Poor on wild mustard. Refer to narrative for rotational restrictions. A1 A3 D3 E3 E4 E5 E8 S4 Y20 Y24
Dual II Dual II Magnum (metolachlor)	2 to 3 pt Dual II (2 to 3) 1 to 2 pt Magnum (1 to 2)		Spring PPI or PRE Fall after Sept 30 but before ground freezes.	Poor on wild mustard and wild oat. Adjust rate according to soil type and OM. PPI improves consistency of weed control. Can be tank-mixed with Eptam, Prowl, Sonalan, or trifluralin.
Frontier (dimethenamid)	20 to 32 fl oz (0.93 to 1.5)		PPI, PRE, or POST to third trifoliolate.	Do not use Lasso on coarse-textured soils. Frontier provides greater nightshade control. Frontier can be applied EPOST with Basagran and Pursuit.
Lasso (alachlor)  RUP	4 to 6 pt (2 to 3)		PPI	A1 E3 E4 E6 S4

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
Basagran (bentazon)	1 to 2 pt (0.5 to 1)	Wild mustard, cocklebur, sunflower, lambsquarters, ragweed, Venice mallow, and suppression of kochia, annual smartweed, pigweed, and Canada thistle.	POST - Dry bean: After emergence. Broadleaf weeds: Small seedlings.	Thorough spray coverage is essential. Addition of oil additive at 1 qt/A improves weed control. D7 E3
Basagran (bentazon)	1 pt/1 pt (0.5/0.5)		POST Apply twice.  Make second application 7 to 10 days after first.	Basagran applied in a split application results in greater weed control compared to single application. First application should be made to small weeds and dry bean at unifoliate or first trifoliate stage. Apply with oil additive at 1 to 2 pt/A. Canada thistle control requires a second application 7 to 10 days later. D7 E3
Rezult (bentazon + sethoxydim)	3.2 pt/A (1+ 0.2)	Most grass and broadleaf weeds.	POST Soybean: Emergence to 30 days prior to harvest.	Add oil adjuvants at 1 to 2 pt/A. Refer to label or narrative for tank-mix options. Refer to Basagran and Poast sections for additional information. D7 D19 D25
Pursuit Pursuit DG (imazethapyr)	2 fl oz 0.72 oz WDG or 10 A/packet (0.5 oz)	Wild mustard and control or suppression of black nightshade and other weeds.	POST Dry bean: After first trifoliate but <b>prior to flowering.</b>	Reduced crop growth, quality, yield and/or delayed maturity may result. Do not apply to dry beans under stress or when cold and/or wet conditions are predicted within one week of application. Use only NIS. Refer to narrative for additional information. Can be applied with a reduced rate of Basagran to safen Pursuit on dry beans. D22 E9 S4 Y1 Y2 Y6 Y24
Raptor (imazamox) Section 18 Registration Pending	4 fl oz (0.5 oz)	Eastern black nightshade and other annual grass and broadleaf weeds.	EPOST and POST Dry bean: After first trifoliate but <b>prior to flowering.</b>	Use a NIS at 0.25% v/v. Allow a 60 day PHI. Refer to label for weeds controlled, application information, risk of crop injury, and crop rotation restrictions. E10 Y2 Y24
Assure II (quizalofop)	8 to 10 fl oz (0.88 to 1.1 oz)	Annual grasses and quackgrass.	POST Dry bean: 30 days or more prior to harvest  Grass: 2 to 6 inches tall.	Apply with oil additive to actively growing weeds. Apply: Assure II with oil additive at 1% v/v Poast with oil additive at 1 qt/A Select with oil additive at 1qt/A See narrative for rates for different weeds. May be tank-mixed with broadleaf herbicides but grass control is reduced by tank mixtures or close interval application of the broadleaf herbicide. <u>The antagonism generally can be avoided by applying a higher rate of grass herbicide or apply the grass herbicide 1 or more days before or 5 to 7 days after the broadleaf herbicide.</u> Follow all restrictions and precautions of the tank-mix herbicide. Lack of yellow foxtail control may result if Assure II is applied at reduced rates or with broadleaf herbicides. D5 D19 D25 D30 E2 E7 E11 X1
Poast (sethoxydim)	0.5 to 1.5 pt (0.1 to 0.3)	Annual grasses.		
Select Prism (clethodim)	6 to 8 fl oz 12.8 to 17 fl oz (1.5 to 2 oz)	Annual grasses and quackgrass.		
Gramoxone Extra (paraquat)  RUP	1 to 1.5 pt (0.31 to 0.47)	Desiccant	POST Dry bean: 7 days or more prior to harvest.	Apply when at least 80% of the pods are yellow and mostly ripe with no more than 40% (bush type beans) or 30% (vine type) of the leaves still green. Q5
Drexel Defol (sodium chlorate)	1 gal of a 6 lb/gal conc. (6)		7 to 10 days prior to harvest, after pods are brown.	Thorough coverage of plant is essential. Apply in 5 to 10 gpa by air or 20 to 30 gpa by ground.



# FIELD PEA


Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
Roundup Ultra/RT RU Original/RT Glyfos/ Private labels (glyphosate)	0.5 to 2 pt of a 3 lb ae/gal conc. (0.19 to 0.75)	Emerged grass and broadleaf weeds.	Preplant or anytime prior to crop emergence.	A nonselective, nonresidual, translocated, foliar herbicide. Apply with AMS fertilizer. Refer to label for adjuvant use. A4 Q4
Roundup Custom (glyphosate)	0.38 to 1.5 pt of a 4 lb ae/gal conc.			
Gramoxone Extra (paraquat) RUP	1.5 to 3 pt (0.47 to 0.96)			A nonselective, nonresidual, foliar herbicide. Apply with NIS. Q5
Far-Go (trifluralin)	1.25 qt 12.5 to 15 lb 10G (1.25 liquid or 1.25 to 1.5 10G)	Wild oat	PPI	PPI immediately after application. A two pass incorporation is recommended. A premix of trifluralin + trifluralin (Buckle) is labeled for use in field pea. A1 A3 B18 B19
Trifluralin	1 to 2 pt 5 to 10 lb 10G (0.5 to 1)	Grass and some broadleaf weeds.		Adjust rate according to soil type. Poor wild mustard and wild oat control. Some pea varieties may be injured. A1 E8 Y1 Y6 Y20 Y24
Sonalan (ethalfuralin)	1.5 to 2 pt 5.5 to 7.5 lb 10G (0.55 to 0.75)			
Prowl/Pendimax (pendimethalin)	1.2 to 3.6 pt (0.5 to 1.5)			
Dual II Dual II Magnum (metolachlor)	2 to 3 pt Dual II (2 to 3) 1 to 2 pt Magnum (1 to 2)		Spring PPI or PRE. Fall after Sept. 30 but before ground freezes.	Poor wild mustard and wild oat control. Adjust rate according to soil type and OM. PPI improves consistency of weed control. A1 E4 F3 S4
Sencor (metribuzin)	0.33 to 0.5 lb DF (0.25 to 0.38)	Suppression of lambquarters, henbit, chickweed, and mustard spp.	PRE	Adjust rate according to soil type. Refer to narrative for application and environment information, and special precautions which may affect weed control and crop safety. F10 Y16 Y24
	0.16 to 0.25 lb DF (0.125 to 0.19)		POST	
Chiptox (MCPA sodium salt)	0.5 to 1.5 pt (0.13 to 0.38)	Several broadleaf weeds.	POST Pea: Vines 4 to 6 inches.	MCPA registration has been discontinued on field pea. Use only products that still have field pea listed on the label. Apply to small broadleaf weeds. Do not apply when peas are in bloom. Slight, temporary injury may occur.
MCPA amine (certain brands)	0.5 to 0.75 pt (0.25 to 0.38)			Do not apply when temperature exceeds 90 F or when peas are stressed. F4
Thistrol (MCPB)	2 to 6 pt (0.5 to 1.5)	Several broadleaf weeds including Canada thistle.	POST Pea: 3 nodes prior to flowering.	
Basagran (bentazon)	1 to 2 pt (0.5 to 1)	Annual broadleaf weed and Canada thistle.	POST Pea: At least 3 pair of leaves or 4 nodes.	Apply with oil additive at 1 to 2 pt/A to small actively growing weeds. Do not harvest within 30 days following application. Maximum rate per season is 4 pt/A. F3
Pursuit Pursuit DG (imazethapyr)	2 fl oz 0.72 oz WDG or 10 A/packet DG (0.5 oz)	Most broadleaf weeds.	POST Pea: 1 to 2 trifoliates.	Reduced crop growth, quality, yield and/or delayed maturity may result. Do not apply during stress conditions (cold/wet) or when stress conditions are predicted within one week of application. Apply with NIS only. Refer to label for additional information. F6 Y2 Y24

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
Assure II (quizalofop)	8 to 10 fl oz (0.88 to 1.1 oz)	Annual grasses and quackgrass.	POST Pea: Up to pod set. Grass: 2 to 4 inch tall.	Apply Assure II with oil additive at 1% v/v and Poast with oil additive at 1 qt/A to actively growing grasses. See label for rates and tank-mix options.
Poast (sethoxydim)	0.5 to 1.5 pt (0.1 to 0.3)	Annual grasses.	POST	Allow a 30 day PHI following Poast application. D33 F2 F5
Roundup Ultra/RT RU Original/RT (glyphosate)	0.5 to 2 pt of a 3 lb ae/gal conc. (0.19 to 0.75)	Emerged grass and broadleaf weeds.	Harvest aid and desiccant.	Apply with AMS fertilizer. Allow a 7 day PHI for broadcast and 14 day PHI for spot treatment. Do not apply to crop used for seed the following year. For spot treatment: Use a 2% solution, apply to perennial broadleaf weeds at or beyond the bud stage, and crop will killed in treated areas. Q4
	4 to 6 pt of a 3 lb ae/gal conc. (1.5 to 2.25)	Perennial weeds.	Spot treatment.	




# CHICK PEA/GARBANZO BEANS

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
Roundup Ultra/RT RU Original/RT Glyphos Private labels (glyphosate)	0.5 to 2 pt of a 3 lb ae/gal conc. (0.19 to 0.75)	Emerged grass and broadleaf weeds.	Preplant or anytime prior to crop emergence.	A nonselective, nonresidual, translocated, foliar herbicide. Apply with AMS fertilizer. Refer to label for adjuvant use. A4 Q5
Roundup Custom (glyphosate)	0.38 to 1.5 pt of a 4 lb ae/gal conc. (0.19 to 0.75)			
Far-Go (trallate)  Far-Go EC = 	1.25 qt 12.5 to 15 lb 10G (1.25 for liquid or 1.25 to 1.5 10G)	Wild oat	PPI or PRE incorporated.	PPI immediately after application. A two pass incorporation is recommended. A commercial premix of triallate + trifluralin = Buckle is available. A1 A3 B18 B19 G3 Y24
Trifluralin (trifluralin)	1 to 1.5 pt (0.5 to 0.75)	Grass and some broadleaf weeds.	PPI	Adjust rate according to soil type. Poor wild mustard and wild oat control. Rate should be adjusted for soil type. Refer to label for application and environment information. A1 G1 H7 X1 Y20 Y24
Sonalan (ethalfluralin)	1.5 to 2 pt 5.5 to 7.5 lb 10G (0.55 to 0.75)			
Prowl Pendimax (pendimethalin)	1.2 to 3.6 pt 0.83 to 2.5 lb DG (0.5 to 1.5)			
Dual II Dual II Magnum (metolachlor)	2 to 3 pt Dual II (2 to 3) 1 to 2 pt Magnum (1 to 2)		Spring PPI or PRE Fall after Sept 30 but before ground freezes.	PPI improves consistency of weed control. Refer to label for application information. A1 G1 S4
Tough (pyridate)  	1.5 pt (0.94)	Pigweed species, kochia, cocklebur, lambsquarters, nightshade, sunflower, and Russian thistle	POST Weeds: Less than 3 inches tall	Do not add adjuvants. Allow a 60 day PHI. Do not make more than two applications and allow 20 days between applications. G7
Assure II (quizalofop)	8 to 10 fl oz (0.88 to 1.1 oz)	Annual grasses and quackgrass.	POST Crop: Up to pod set. Grass: 2 to 6 inches tall.	Apply with oil additive to actively growing weeds. Apply: Assure II with oil additive at 1% v/v Poast with oil additive at 1 qt/A Select with oil additive at 1qt/A See narrative for rates for different weeds. May be tank-mixed with broadleaf herbicides but grass control is reduced by tank mixtures or close interval application of the broadleaf herbicide. <u>The antagonism generally can be avoided by applying a higher rate of grass herbicide or apply the grass herbicide 1 or more days before or 5 to 7 days after the broadleaf herbicide.</u> Follow all restrictions and precautions of the tank-mix herbicide. Lack of yellow foxtail control may result if Assure II is applied at reduced rates or with broadleaf herbicides. D5 D19 D30 E2 E7 E11 F2 F5 G1 X1
Poast (sethoxydim)	0.5 to 1.5 pt (0.1 to 0.3)	Annual grasses.	POST Grass: 2 to 4 inches tall.	
Select Prism (clethodim)	6 to 8 fl oz 12.8 to 17 fl oz (1.5 to 2 oz)	Annual grasses and quackgrass.	POST Grass: 2 to 6 inches tall. 30 phi.	
Roundup Ultra/RT RU Original/RT (glyphosate)	0.5 to 2 pt of a 3 lb ae/gal conc. (0.19 to 0.75)	Emerged grass and broadleaf weeds.	Harvest aid and desiccant.	Apply with AMS fertilizer. Allow a 7 day phi for broadcast and 14 day PHI for spot treatment. Do not apply to crop used for seed the following year. For spot treatment: Use a 2% solution, apply to perennial broadleaf weeds at or beyond the bud stage, and crop will killed in treated areas. A4 Q4
	4 to 6 pt of a 3 lb ae/gal conc. (1.5 to 2.25)	Perennial weeds.	Spot treatment.	

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
Roundup Ultra/RT RU Original/RT Glyfos Private labels (glyphosate)	0.5 to 2 pt of a 3 lb ae/gal conc. (0.19 to 0.75)	Emerged grass and broadleaf weeds.	Preplant or anytime prior to crop emergence.	A nonselective, nonresidual, translocated, foliar herbicide. Apply with AMS fertilizer. Refer to label for adjuvant use. A4 Q4
Roundup Custom (glyphosate)	0.38 to 1.5 pt of a 4 lb ae/gal conc. (0.19 to 0.75)			
Far-Go (triallate) Far-Go EC = 	1.25 qt (1.25)	Wild oat	PPI or PRE incorporated.	Incorporation tool can be operated 4 inches deep without reducing wild oat control. A1 A3 B18 B19 H1 H3
Treflan (trifluralin)	1 to 1.5 pt (0.5 to 0.75)	Grass and some broadleaf weeds	PPI	No wild mustard control and poor wild oat control. A1 H1 H7 X1 Y20 Y24
Trilin (trifluralin)	5 to 7.5 lb 10G - spring 6 to 8.5 lb 10G - Fall (0.5 to 0.85)		PPI Spring or Fall	Lentil tolerance to trifluralin is marginal. Injury may occur under stress conditions. Refer to narrative for additional information. H1 H7
Prowl/Pendimax (pendimethalin)	1.2 to 3.6 pt (0.5 to 1.5)		PPI	Use lower rate on coarse textured soils and higher rate on fine-textured soils. H7 Y20 Y24
Frontier (dimethenamid)	20 to 32 fl oz (0.93 to 1.5)		PPI, PRE, or EPOST to third trifoliolate lentil.	Poor wild mustard and wild oat control. Adjust rate according to soil type and OM. Incorporation improves consistency of weed control. See label for tank-mix products. A1 E3 E6 S4
Sencor (metribuzin)	0.33 to 0.5 lb DF (0.25 to 0.38)	Suppression of lambsquarters, henbit, chick- weed and several mustard spp.	PRE	Rate should be adjusted for soil type. Refer to narrative for application and environment information, and special precautions which may affect weed control and crop safety. H1 H6 Y16 Y24
	0.16 to 0.25 lb DF (0.125 to 0.19)		POST	
Assure II (quizalofop)	8 to 10 fl oz (0.88 to 1.1 oz)	Annual grasses and quackgrass.	POST Lentil: Up to pod set.  Grass: 2 to 4 inch tall.	Apply with oil additive at 1% v/v to actively growing grasses. See narrative for rates for different weeds. Lack of yellow foxtail control may result if Assure II is applied at reduced rates. D30 H2 X1
Poast (sethoxydim)	0.5 to 1.5 pt (0.1 to 0.3)	Annual grasses.	POST Lentil: Before bloom. Grass: 2 to 4 inches Volunteer corn: 6 to 18 inches tall.	Apply with oil additive at 1 qt/A to actively growing grasses. See narrative for rates for different weeds. D28 H4 X1
Roundup Ultra/RT RU Original/RT (glyphosate)	0.5 to 2 pt of a 3 lb ae/gal conc. (0.19 to 0.75)	Emerged grass and broadleaf weeds.	Harvest aid and desiccant.	Apply with AMS fertilizer. Allow a 7 day phi for broadcast and 14 day PHI for spot treatment. Do not apply to crop used for seed the following year. For spot treatment: Use a 2% solution, apply to perennial broadleaf weeds at or beyond the bud stage, and crop will killed in treated areas. A4 Q4
	4 to 6 pt of a 3 lb ae/gal conc. (1.5 to 2.25)	Perennial weeds.	Spot treatment.	
Gramoxone Extra (paraquat)  RUP	1 to 1.5 pt (0.31 to 0.47)	Emerged annual and broadleaf weeds.	Desiccant	Add NIS at 0.25% v/v. Apply when crop is mature and at least 80% of the pods are yellow and no more than 30% of the leaves still green.


# SUNFLOWER

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
Roundup Ultra/RT RU Original/RT Glyphos Private labels (glyphosate)	0.5 to 2 pt of a 3 lb ae/gal conc. (0.19 to 0.75)	Emerged grass and broadleaf weeds.	Preplant or anytime prior to crop emergence.	A nonselective, nonresidual, translocated, foliar herbicide. Apply with AMS fertilizer. Refer to label for adjuvant use. A4 Q4
Roundup Custom (glyphosate)	0.38 to 1.5 pt of a 4 lb ae/gal conc. (0.19 to 0.75)			
Gramoxone Extra (paraquat)  RUP	2 to 3 pt (0.63 to 0.94)	Emerged annual grass and broadleaf weeds.		A nonselective, nonresidual, foliar contact herbicide. Apply with a NIS at 0.12 to 0.25% v/v. Good plant coverage is essential. A residual herbicide may be tank-mixed with Gramoxone Extra. Q5
Eptam (EPTC)	2.5 to 3.5 pt (2 to 3)	Grass and some broadleaf weeds.	PPI	Weak on wild mustard. PPI immediately after application. May be tank-mixed with Sonalan, or trifluralin to increase spectrum of weeds controlled.
	4.5 to 5.25 pt 20 to 22.55 lb 20G (4 to 4.5)		Fall PPI after October 15.	Consult label for rate range for specific tank mix. A1 A2 A3 J3
Sonalan (ethalfluralin)	1.5 to 4.5 pt 5.5 to 17 lb 10G (0.55 to 1.7)	Foxtail suppression.	PPI Spring or Fall from October 1 to December 31.	Poor wild mustard and wild oat control. Adjust rate according to soil type. Use highest rate allowed for nightshade control. Refer to narrative for rotational restrictions. A1 J3 X1 Y20 Y24
	7.5 to 12.5 lb 10G (0.75 to 1.25)			For use in reduced or conservation tillage. Incorporate twice at 2 to 3 inches deep using a V-blade under-cutter or rotary hoe. For fall applications, incorporate once in the fall and once in the spring before seeding. A3 Y20 Y24
Sonalan (ethalfluralin) + Eptam (EPTC)	1.25 to 3 pt + 2.5 to 3.5 pt (0.5 to 1.13 + 2 to 3)	Grass and some broadleaf weeds.	PPI	Adjust rate according to soil type and OM. PPI immediately after application. Poor on wild mustard. Refer to narrative for rotational restrictions. A2 J3
Prowl Pendimax (pendimethalin)	2.4 to 3.6 pt 1.67 to 2.5 lb DG (1 to 1.5)	Grass and some broadleaf weeds.	PPI	Poor on wild mustard and wild oat. Adjust rate according to soil type. Refer to narrative for rotational restrictions. May be tank-mixed with Eptam. A1 J3 X1 Y1 Y6 Y7 Y20 Y24
	3 to 3.6 pt 2.1 to 2.5 lb DG (1.25 to 1.5)		Surface applied from 30 days prior to seeding to immediately after seeding.	For use in no-till sunflowers only. Adjust rate according to soil type. Use lower rate only for coarse textured soil. Y1 Y6 Y7 Y20 Y24
	2.4 to 4.24 pt 1.67 to 2.9 lb DG (1 to 1.75)		Fall PPI when soil temperature is less than 45 F.	Keep spring tillage depth shallower than fall tillage. May be tank-mixed with EPTC. A3
Trifluralin	1 to 2 pt 5 to 10 lb 10G 0.83 to 1.67 lb 60DF (0.5 to 1)		PPI	Poor wild mustard and wild oat control. PPI within 24 hours after application. May be tank-mixed with Eptam. Refer to narrative for rotational restrictions. A1 J3 X1 Y1 Y6 Y7 Y20 Y24
	5 to 10 lb 10G (0.5 to 1)		Fall PPI after September 1 or Spring.	
Trifluralin + Eptam (EPTC)	1 pt + 7.5 to 10 lb 20G (0.5 + 1.5 to 2)	Grass and some broadleaf weeds.	PPI	Enhances wild oat control and reduces potential carryover of trifluralin. A2 J3

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
<b>Spartan</b> (sulfentrazone)  <b>Section 3 and 18 Registration Pending</b>  	<b>2.67 to 5.33 oz WDG</b> (0.125 to 0.25)	Many annual small-seeded broadleaf weeds including kochia, pigweed, lambsquarters, nightshade species and biennial wormwood.	EPP, PRE, or PPI,	Make EPP application up to 30 days prior to planting. Adjust rate to soil type. Requires precipitation for activation. Provide adequate furrow closure at planting. Temporary sunflower injury may occur in coarse, low organic matter soils with pH greater than 8.0. May give 6 to 8 weeks residual weed control. Refer to narrative for application information, crop rotation restrictions, and other information. J6 Y10 Y24
<b>Assert</b> <b>Assert SG</b> (imazamethabenz)	<b>0.6 to 0.8 pt</b> <b>4.5 to 6 oz WDG</b> (0.19 to 0.25)	Wild mustard	POST Sunflower: Less than 8 leaves or 15 inches.  Wild mustard: Prior to bloom.	Sunflower injury may occur when applied at high temperature and humidity. See narrative for rotational restrictions. Apply with NIS at 0.25% v/v. J1 J2 Y2 Y24
<b>Poast</b> (sethoxydim)	<b>0.5 to 1.5 pt</b> (0.1 to 0.3)	Annual grasses.	POST Grass: 2 to 6 inches.	Apply with oil additive at 1 qt/A to actively growing weeds. Allow a 70 day PHI. See narrative for rates for different weeds. D19 D30 J1 J4
<b>Select Prism</b> (clethodim) <b>Registration Pending</b>	<b>6 to 8 fl oz</b> <b>12.8 to 17 fl oz</b> (1.5 to 2 oz)	Annual grasses and quackgrass.	POST Grass: 2 to 6 inches tall.	Apply with oil additive at 1qt/A to actively growing weeds. See narrative for rates for different weeds. Allow a 70 day PHI. D26 D30 X1
<b>Roundup Ultra/RT</b> <b>RU Original /RT</b> (glyphosate)	<b>1 to 4 pt of a</b> <b>3 lb ae/gal conc.</b> (0.375 to 1.5)	Annual and perennial grass and broadleaf weeds.	<b>Shielded Application ONLY</b> Sunflower: Emergence through lay-by.	Apply only as a shielded application with pressure and volume to prevent contact with sunflower and minimize drift and off-site movement. Roundup Ultra will injure or kill all green plants except Roundup tolerant crops. Refer to label for adjuvant use. Avoid drift. Q1 Q4
<b>Roundup Custom</b> (glyphosate)	<b>0.75 to 3 pt of a</b> <b>4 lb ae/gal conc.</b> (0.375 to 1.5)			
<b>Gramoxone Extra</b> (paraquat)  <p style="text-align: right;">RUP</p>	<b>1 to 1.5 pt</b> (0.3 to 0.47)	Desiccant	Backside of sunflower heads yellow and bracts turning brown. Seed moisture content under 35%.	For use on confectionery and oilseed varieties. Apply with NIS. Randomly sample 10 average heads for seed moisture. Allow a 7 day PHI. Q5
<b>Drexel Defol</b> (sodium chlorate)	<b>1 to 2 gal of a</b> <b>6 lb/gal conc.</b> (6 to 12)			For use on confectionery and oilseed varieties. Thorough coverage of plant is essential. Apply aerially at 5 to 10 gpa or 20 to 30 gpa by ground sprayer.

# SAFFLOWER

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
Gramoxone Extra (paraquat)  RUP	2 to 3 pt (0.62 to 0.94)	Emerged annual grass and broadleaf weeds.	Preplant or anytime prior to crop emergence.	A nonselective, nonresidual, foliar herbicide. Apply with a NIS at 0.12 to 0.25% v/v. Good plant coverage is essential. Q5
Eptam (EPTC)	3.5 pt 15 lb 20G (3)	Grass and some broadleaf weeds.	PPI	See incorporation discussion in narrative for details. Poor wild mustard and wild oat control. A1 A2 J3
Trifluralin	1 to 2 pt 5 to 10 lb 10G 0.83 to 1.67 lb 60DF (0.5 to 1)		PPI Fall or Spring.	No wild mustard and poor wild oat control. A1 J3 X1 Y1 Y2 Y6 Y24
Dual II Dual II Magnum (metolachlor)	2 to 3 pt 8 to 12 lb 25G (2 to 3) 1 to 2 pt Magnum (1 to 2)		PPI or PRE	Poor wild mustard and wild oat control. PPI gives more consistent weed control. A1 E4
Drexel Defol (sodium chlorate)	1 gal of a 6 lb/gal conc. (6)	Desiccant	After physiological maturity and 7 to 14 days prior to harvest.	Thorough coverage of plant is essential. Apply aerially at 5 to 10 gpa or at 20 to 30 gpa by ground sprayer. Most active with warm, sunny conditions.

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
Trifluralin	1 to 2 pt 5 to 10 lb 10G (0.5 to 1)	Grass and some broadleaf weeds.	Fall PPI	Use higher rates on fine textured soils. Incorporate once in the fall within 24 hours after application. Keep spring tillage depth shallower than fall. A1 K1 K6 X1 Y20 Y24
Bromoxynil	1 pt 5 A/pack (0.25)	Wild buckwheat, and certain broadleaf weeds.	Flax: 2 to 8 inches tall.	Use for wild buckwheat control. Weak on wild mustard. Flax injury is possible. K1 K2
MCPA	0.5 pt of a 4 lb/gal conc. (0.25)	Broadleaf weeds	Flax: 2 to 8 inches tall.	Use MCPA ester or the higher rates of MCPA amine for hard-to-kill weeds. Early application less injurious to flax. K1 K4
Bromoxynil + MCPA	0.9 pt (0.23 + 0.23)	Most broadleaf weeds.	Flax: 2 to 8 inches tall.	Apply to small weeds prior to crop canopy and shading. Risk of crop injury. K1 K2 K3
<b>Curtail M</b> (clopyralid)  <b>Section 18</b> <b>Registration</b> <b>Pending</b> 	1.33 to 1.75 pt (2 to 3 oz)	Some broadleaf weeds including Canada thistle and perennial sowthistle.	POST Flax: 2 to 6 inches tall. Thistle: 4 to 6 inches tall.	Apply after most thistle shoots have emerged. Allow a 72 day PHI. Follow rotational crop interval and other precautions on product label. K3 Y21 Y24
Poast (sethoxydim)	0.5 to 1.5 pt (0.1 to 0.3)	Annual grasses.	Flax: Prior to bloom.  Grass weeds: 2 to 8 inches tall.	Apply with 1 qt/A oil additive to actively growing grasses. See narrative for rates to control different weed species. May be tank-mixed with bromoxynil or MCPA ester for broad spectrum weed control. K1 K5
Drexel Defol (sodium chlorate)	1 gal of a 6 lb/gal conc. (6)	Desiccant	7 to 10 days prior to harvest. 70 to 80% of the bolls should be brown.	Thorough spray coverage of vegetation is essential. Do not graze or feed treated straw. Apply in 5 to 10 gpa by air or 20 to 30 gpa by ground.


# CANOLA, RAPESEED, CRAMBE, AND TAME MUSTARD

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
Roundup Ultra/RT RU Original/RT Glyfos Private labels (glyphosate)	0.5 to 2 pt of a 3 lb ae/gal conc. (0.19 to 0.75)	Emerged grass and broadleaf weeds.	Preplant or anytime prior to crop emergence.	A nonselective, nonresidual, translocated, foliar herbicide. Apply with AMS fertilizer. Refer to label for adjuvant use. A4 Q4
Roundup Custom (glyphosate)	0.38 to 1.5 pt of a 4 lb ae/gal conc. (0.19 to 0.75)			
Trifluralin	1 to 2 pt 5 to 10 lb 10G (0.5 to 1)	Grass and broadleaf weeds.	PPI Spring or Fall.	Use only 1 to 1.5 pt/A on tame mustard varieties. Adjust rate according to soil type. Use only those brands of trifluralin that allow use on crambe (Treflan, Tri-4, Trifluralin 4EC, etc.). A1 L1 L8 X1 Y1 Y6 Y20 Y24
Assure II (quizalofop)	8 to 10 fl oz (0.88 to 1.1 oz)	Annual grasses and quackgrass.	POST Canola: 30 days or more prior to harvest	Apply with oil additive at 1% v/v to actively growing grasses. See label for rates for different weeds. Lack of yellow foxtail control may result if Assure II is applied at reduced rates. Avoid drift to small grain and desirable grass species. L1 L2
Canola and Crambe Only			Grass weeds: 2 to 6 inches tall.	
Poast (sethoxydim)	0.5 to 1.5 pt (0.1 to 0.3)		POST Canola: All stages. Grass: 2 to 4 inches. Volunteer corn: 6 to 18 inches tall.	Apply with oil additive at 1qt/A to actively growing grasses. Labeled crops are tolerant at all growth stages. Allow a 60 day PHI. See narrative for rates for different weeds. Avoid drift to small grains. D30 L1 L4
Canola, Rapeseed and Crambe Only				
Select Prism (clethodim)	4 fl oz 8.5 fl oz (1 oz)		POST Canola: Emergence to before bolting. Grass: 1 to 4 inches tall.	Apply with oil additive at 1qt/A to actively growing weeds. See narrative for rates for different weeds. 30 day PHI. D26 D30 X1
Canola Only Registration Pending				

## Possible Section 18 Registrations for Canola or Crambe in 2000 - Must have label prior to use!

Sonalan (ethalfluralin)	1.5 to 3 pt (0.55 to 1.15) 5.5 to 17 lb 10G (0.55 to 1.7)	Some grass and broadleaf weeds. May control or suppress ALS resistant kochia.	PPI Spring or Fall from October 1 to December 31	Adjust rate for soil type. Poor wild mustard and wild oat control. May result in reduced crop stand or early injury. May provide greater broadleaf weed control than trifluralin. L6 Y20 Y24
Section 3 and 18 Registration Pending				
Muster (ethametsulfuron)	0.3 oz (0.225)	Some broadleaf weeds including wild mustard.	POST Canola: 2- leaf to beginning of bolting.  Weeds: Up to 6-leaf stage.	Section 18 labeling is for seed canola only. Apply with NIS at 0.25% v/v. May be tank-mixed with Assure II with NIS at 0.25% v/v. Temporary yellowing may occur if canola is stressed at application. 60 day PHI. L3 Y3 Y24
Section 3 and 18 Registration Pending				
Stinger (clopyralid)	0.33 to 0.5 pt (2 to 3 oz)	Some broadleaf weeds including Canada thistle and perennial sowthistle.	POST Thistle: 4 to 6 inches tall.	Apply after most thistle shoots have emerged. Do not graze or harvest treated canola for livestock forage. Allow a 72 day PHI. Follow rotational crop interval and other precautions on product label. L7 Y21 Y24
Section 3 and 18 Registrations Pending for Canola and Crambe				

**CLEARFIELD (Imidazolinone Resistant) CANOLA**

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
Raptor (imazamox)   Section 18 Registration Pending	4 fl oz (0.5 oz)	Most annual grass and broadleaf weeds.	POST Canola: Prior to bloom.  Grass and broadleaf weeds: Small	<b>Apply only to Clearfield canola varieties.</b> Use a NIS at 0.25% v/v alone or with UAN at 1 to 2 qt/A. Refer to label for weeds controlled, application information, and crop rotation restrictions. High risk of developing ALS kochia resistance. Should use herbicides of a different mode of action and use complimentary weed control strategies. Allow a 60 day PHI. L9 X1 Y2 Y24

**LIBERTY (Glufosinate) RESISTANT CANOLA**

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
Liberty (glufosinate)  Registration Pending	34 fl oz (0.44)	Control of annual broadleaf weeds and control or suppression of grasses and perennial weeds.	POST Canola: Cotyledon up to early bolting stage.  Grass weeds: Up to 2 to 3 inches and 1 tiller.  Broadleaf weeds: Up to 3 inches tall.	<b>Apply only to Glufosinate resistant canola varieties.</b> Apply with AMS fertilizer at 3 lb/A. Refer to label for weeds controlled, application information, and other restrictions. Liberty is nonselective, nonresidual, contact herbicide with a unique mode of action that can be used to control weeds resistant to other herbicides. L10 X1

**ROUNDUP (Glyphosate) RESISTANT CANOLA**

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
Roundup Ultra (glyphosate)	1 pt of a 3 lb ae/gal conc. (0.375)  A second application may be made at 1 pt.	Annual and perennial grass and broadleaf weeds.	POST Canola: Emergence to bolting.  Apply once or twice as needed.	<b>Apply only to Glyphosate resistant canola varieties.</b> Add AMS at 8.5 to 17 lb/100 gal water. Do not apply more than 1 pt/A for each single in-crop application. Do not exceed 2 pt/A for the total multiple in-crop applications from emergence up to 5 to 6-leaf or bolting. Multiple applications may be necessary for weed flushes. Drift and off-site movement may cause injury or death to other plants and crops. Refer to label for weeds controlled, application information, adjuvant use, tank-mix options with residual herbicides, and restrictions. Glyphosate is a nonselective, nonresidual, systemic, foliar herbicide with a unique mode of action that can be used to control weeds resistant to other herbicides. A4 L11 Q4 X1






# SUGARBEET

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
Roundup Ultra/RT RU Original/RT Glyfos Private labels (glyphosate)	0.5 to 2 pt of a 3 lb ae/gal conc. (0.19 to 0.75)	Emerged grass and broadleaf weeds.	Preplant or anytime prior to crop emergence.	A nonselective, translocated, systemic, foliar herbicide. No soil residual activity. Apply with AMS fertilizer. Refer to label for adjuvant use. A4 Q4
Roundup Custom (glyphosate)	0.38 to 1.5 pt of a 4 lb ae/gal (0.19 to 0.75)			
Gramoxone Extra (paraquat)  RUP	1.5 to 3 pt (0.47 to 0.94)	Emerged annual grasses and broadleaf weeds.		A nonselective, foliar herbicide. No soil residual activity. Apply with NIS. Good plant coverage is essential. A4 Q5
Eptam (EPTC)	2.3 to 3.4 pt (2 to 3)	Annual grasses and some broadleaf weeds.	PPI	Some stand reduction and temporary stunting may occur from Eptam. Weak on wild mustard. A1 A2 A3 M1 M2 M6 M7 M16
	4 to 5 pt 17 to 22 lb 20G (3.5 to 4.38)		Fall incorporated after October 15 to freeze-up.	
Eptam (EPTC) + Ro-Neet (cycloate)	1.1 to 2.3 pt + 2.7 to 3.3 pt (1 to 2 + 2 to 2.5)	Grass and some broadleaf weeds.	PPI	Less sugarbeet injury than from Eptam alone and less expensive than Ro-Neet alone. See narrative for suggested rates for various soil textures and organic matter. A1 A2 A3 M1 M2 M6 M7
	1.1 to 2.9 pt + 2.7 to 4 pt (1 to 2.5 + 2 to 3)		Fall incorporated after October 15 until freeze-up.	
Ro-Neet (cycloate)	4 to 5.3 pt (3 to 4)	Annual grasses and some broadleaf weeds.	PPI	Sugarbeet has better tolerance to Ro-Neet than to Eptam. Weak on wild mustard. Weed control poor on fine textured, high organic matter soils. A1 A3 M1 M2 M6
	5.3 pt (4)		Fall incorporated after October 15 until freeze-up.	
Nortron SC (ethofumesate)	6 to 7.5 pt (3 to 3.75)	Many annual grasses and broadleaf weeds. Especially good on redroot pigweed.	PRE or PPI	Incorporation generally improves weed control. Band application reduces cost and risk of carryover into the next year. A1 M1 M2 M9 M10 Y3 Y24
Pyramin SC (pyrazon)	6 to 14.5 pt (3.1 to 7.6)	Most broadleaf weeds.	PRE	Has been less effective on soils with more than 5% organic matter. Incorporation improves weed control from Pyramin. A2 M1 M2
Stinger (clopyralid)	0.25 to 0.66 pt (0.09 to 0.25)	Canada thistle, cocklebur, sunflower, marshelder, wild buckwheat.	POST Sugarbeet: 2 to 8 leaves.	See narrative for rates and treatment sizes for various species. Stinger may be tank-mixed with Betanex or Betamix. See narrative for rotation restrictions. M1 M2 M15 M17 Y21 Y24
UpBeet (triflusaluron)	0.5 oz DF (0.25 oz)	Annual broadleaf weeds.	POST Weeds: Cotyledon to 2-leaf.	Apply two or more times in combination with Betanex, Betamix, Progress, or Stinger. Research in ND/MN has shown that three treatments including 0.25 to 0.3 oz/A of UpBeet generally gave better weed control than two treatments including 0.5 oz/A of UpBeet. Do not exceed 2.5 oz/A/season. M1 M2 M15 M17

<b>Herbicide</b>	<b>Product/A (lb ai/A)</b>	<b>Weeds</b>	<b>When to Apply</b>	<b>Remarks and Paragraphs</b>
<b>Betamix</b> (desmedipham + phenmedipham)	<b>0.75 to 7.5 pt</b> (0.06 to 0.6 + 0.06 to 0.6)	Most annual broadleaf weeds.	POST Sugarbeet: Cotyledon up to 8-leaf stage.	Risk of sugarbeet injury is increased by morning or midday application and by certain environments. Split application with reduced rates has reduced sugarbeet injury and increased weed control compared to single full dose application. See paragraph for rate adjustment information. M1 M2 M4 M17
<b>Betanex</b> (desmedipham)	<b>0.75 to 7.5 pt</b> (0.12 to 1.2)		Broadleaf weeds: Cotyledon up to 4-leaf stage.	
<b>Progress</b> (desmedipham + phenmedipham + ethofumesate)	<b>0.8 to 3.3 pt</b> (0.06 to 0.25 + 0.06 to 0.25 + 0.06 to 0.25)		POST Sugarbeet: Cotyledon up to 8-leaf stage.	
<b>Betanex/ Betamix/ Progress + UpBeet + Stinger + MSO type oil adjuvant</b> (desm/desm&phen/ desm&phen&etho + triflurosulfuron + clopyralid)	<b>0.5 / 0.5 / 0.4 pt + 0.125 oz + 1.3 fl oz + 1.5% v/v</b> (0.08 + 0.004 + 0.03) <b>Micro-rate Program</b>	Most annual broadleaf weeds. Fair to good annual grass control.  Will not control lanceleaf sage or ALS resistant kochia.	POST Sugarbeet: Apply a minimum of three times starting at cotyledon to early 2-leaf stage.  Apply subsequent treatments at 5 to 7 days intervals.	Supplemental label was issued in 1998 and 1999 and is expected in 2000. Timely application is critical to success of the Micro-rate Program. A grass control herbicide at 1/3 normal rate can be added. Herbicide precipitation in the spray tank and nozzle plugging has been a problem. Nozzle plugging can be reduced by mixing in warm water, raising water pH to 8 or 9, premixing UpBeet, use of a grass herbicide and frequent cleaning of sprayer. M1 M2 M4 M12 M14 M15 M17
<b>Herbicide 273</b> (endothal)	<b>0.67 to 2.67 pt</b> (0.25 to 1)	Wild buckwheat, smartweed.	POST Sugarbeet: Cotyledon to 2-leaf: Use 0.67 pt/A 2 to 4-leaf: Use 0.75 pt/A. 4 to 6-leaf: Use 1.3 to 2.76 pt/A.	Herbicide 273 may cause excessive injury over 80 F especially to 4 leaf or smaller sugarbeet. Greater injury potential with water saturated soil. Herbicide 273 is ineffective at temperatures below 60 F or when weeds are drought stressed. Do not apply later than 60 days after emergence. M1 M2 M10 M17
<b>Assure II</b> (quizalofop)	<b>8 to 10 fl oz</b> (0.88 to 1.1 oz)  <b>10 fl oz</b> (1.1 oz)	Annual grasses.  Quackgrass.	Foxtail: Assure II: 2 to 4 inches tall. Select: 2 to 8 inches tall. Wild oat: 2 to 6 inches tall. Vol. wheat or barley: 2 to 6 inches tall. Quackgrass: 6 to 10 inches tall.	Apply to actively growing grasses. Apply Assure II with oil additive at 1% v/v and treat quackgrass regrowth 4 to 8 inches tall with 6 to 7 fl oz/A. Apply Select/Prism with oil additive at 1qt/A and treat quackgrass regrowth 4 to 12 inches tall with 8 to 16 fl oz/A. D30 M1 M2 M3 M13 M17
<b>Select Prism</b> (clethodim)	<b>6 to 8 fl oz</b> <b>12.8 to 17 fl oz</b> (1.5 to 2 oz) <b>8 to 16 fl oz</b> <b>17 to 34 fl oz</b> (2 to 4 oz)	Annual grasses.  Quackgrass	Wild oat: 2 to 6 inches tall. Vol. wheat or barley: 2 to 6 inches tall. Quackgrass: 6 to 10 inches tall.	
<b>Poast</b> (sethoxydim)	<b>0.5 to 1.5 pt</b> (0.1 to 0.3)	Annual grasses.	Wild oat: 1 to 4 inches tall. Foxtail: 3 to 8 inches tall. Vol. wheat or barley: 1 to 6 inches tall. Wild-proso millet: 4 to 10 inches tall.	Apply with an oil additive at 1 qt/A to actively growing grasses. Apply with AMS or UAN fertilizer for greater control of certain grass species. See narrative for rates for different grass species. D19 D30 M1 M2 M11
Trifluralin	<b>1.5 pt</b> (0.75)	Late emerging annual grass and some broadleaf weeds.	POST Sugarbeet: 2 to 6 inches tall and well-rooted prior to incorporation.	Must be incorporated. Beet roots must be covered with soil before application. Emerged weeds not controlled. May be applied over the tops of sugarbeet. A1 A3 M1 M2 M16 M17 X1 Y20 Y24

# POTATO

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
Roundup Ultra/RT RU Original/RT Glyfos Private labels (glyphosate)	0.5 to 2 pt of a 3 lb ae/gal conc. (0.19 to 0.75)	Emerged grass and broadleaf weeds.	Preplant or anytime prior to crop emergence.	A nonselective, nonresidual, translocated, foliar herbicide. Apply with AMS fertilizer. Refer to label for adjuvant use. A4 Q4
Roundup Custom (glyphosate)	0.38 to 1.5 pt of a 4 lb ae/gal conc. (0.19 to 0.75)			
Gramoxone Extra (paraquat) RUP	1.5 pt (0.47)	Emerged annual grass and broadleaf weeds.		A nonselective, contact, foliar herbicide. No soil residual activity. Apply with NIS. A4 Q5
Eptam (EPTC)	3.5 to 7 pt 15 to 30 lb 20G (3 to 6.125)	Grass and some broadleaf weeds.	PPI, Dragoff, or Directed Spray at layby.	Incorporate into the top 2 to 3 inches of soil. Weak on wild mustard. See label for rates depending on use. Do not apply within 45 days of harvest. May be tank-mixed with metribuzin at 0.33 to 0.67 lb DF/A. A1 A2 A3 N1 N3
	5.25 to 7 pt 22.5 to 30 lb 20G (4.5 to 6)		Fall incorporated after October 15 until freeze-up.	
Trifluralin	1 to 2 pt 0.8 to 1.7 lb 60DF (0.5 to 1)		PoPI	Adjust rates according to soil type. Poor wild mustard and wild oat control. Incorporate above the seed piece after planting or immediately following drag-off or hilling but before potato and weed emergence. Can be tank-mixed with Eptam or Sencor.
Prowl Pendimax (pendimethalin)	1.2 to 3.6 pt 1.67 to 2.5 lb DG (1 to 1.5)		PPI, PRE or EPOST Potato: Before 6 inches tall.	May be applied PRE. Incorporation improves consistency of weed control.
Dual II Dual II Magnum (metolachlor)	2 to 3 pt 8 to 12 lb 25G (2 to 3) 1 to 2 pt (1 to 2)		PPI or PRE	Commercial mixture with metribuzin = Turbo A1 N1 N2 N7 X1 Y1 Y6 Y20 Y24
Linuron 	1.5 to 4 lb DF 1.5 to 4 pt L (0.75 to 2)	Most annual grasses and broadleaf weeds.	Potato: PRE Grasses: Up to 2 inches tall Broadleaf weeds: Up to 6 inches tall.	Seed piece must be planted at least 2 inches deep. Apply after drag-off or hilling. The higher rates are for fine-textured soils. Apply with surfactant to emerged weeds. A2 N1 N4
Lexone, Sencor (metribuzin)	0.67 to 1.33 lb DF (0.5 to 1)	Annual broadleaf weeds and some grasses.	PRE to Crop	Apply after planting and before potato emergence or after drag-off. Do not incorporate. Adjust rate according to soil type. Residue may injure susceptible crops the following year. N1 N9 Y1 Y6 Y16 Y24
Lexone, Sencor (metribuzin)	0.33 to 0.67 lb DF (0.25 to 0.5)	Annual broadleaf weeds and some grasses.	POST Weeds: Up to 1 inch tall.	<b>Only for russet type or white skinned varieties that are not early maturing.</b> Do not use on early maturing, smooth skinned white or red-skinned varieties or Atlantic, Shepody, Chip Bell, Bellchip, or Centennial varieties. Use low rate for pigweed or lambsquarters control. Allow a 60 day PHI. Soil residue may injure crops the following year. N1 N9 Y16 Y24

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
<b>Matrix</b> (rimsulfuron)  	<b>1.5 oz DF</b> (0.375 oz)	Annual grass and broadleaf weeds and suppression of quackgrass and Canada thistle.	PRE to crop and weeds: After hilling or drag-off but before potato emerge.	Requires 0.75 to 1 inch water no later than 5 days after application. May be tank-mixed with Dual, Eptam, Prowl, and Lexone. Matrix can be applied in a sequential program of 1 oz/A PRE followed by 1 oz/A POST. N1 N5 X1
	<b>1 to 1.5 oz DF</b> (0.25 to 0.375 oz)	Poor common lambsquarters control.	POST Potato: Up to 14 inches tall. Annual weeds: Less than 1 inch tall.	Apply to quackgrass 4 to 6 inches tall. Apply with NIS at 0.25% v/v. Refer to label for application information and restrictions. N1 N5 X1 Y24
<b>Matrix + Lexone/Sencor</b> (rimsulfuron + metribuzin)  	<b>1 to 1.5 oz DF + 0.25 to 0.33 lb DF</b> (0.25 to 0.375 oz + 0.188 to 0.25)	Annual grass and broadleaf weeds including common lambsquarters, ALS resistant kochia, and wild buckwheat and suppression of quackgrass and Canada thistle.	PRE to crop and weeds: After hilling or drag-off but before potato emerge.	Follow varietal restrictions according to metribuzin label. Injury may occur to russet type or white skin potato varieties - use only the low rate of metribuzin and consider benefits of weed control vs risk of potato injury prior to application to "at risk" varieties. Allow a 60 day PHI. Use the low rate of Lexone for PRE applications to coarse textured soil. Soil residual may injure susceptible crops the following year. N1 N5 N9 Y1 Y2 Y16 Y24
			POST Potato: Up to 14 inches tall. Annual weeds: Less than 1 inch tall.	
<b>Poast</b> (sethoxydim)	<b>0.5 to 1.5 pt</b> (0.1 to 0.3)	Annual grasses.	POST Weeds: 2 to 4 inches.	Apply with oil additive at 1 qt/A to actively growing grasses. See narrative for rates to control different weeds. May be tank-mixed with Sencor/Lexone. D18 D30 N1 N6
<b>Select/Prism</b> (clethodim) <b>Registration Pending</b>	<b>6 to 10 fl oz/ 12.8 to 21.3 fl oz</b> (1.5 to 2.5 oz)	Annual grasses and quackgrass.	POST Grass: 2 to 6 inches tall.	Apply with oil additive at 1qt/A v/v to actively growing weeds. See narrative for rates for different weeds. 30 day PHI. D26 D30 N8 X1

**POTATO VINE DESICCATION**

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs	
<b>Des-i-cate II</b> (endothall)	<b>2 to 4 pt</b> (0.5 to 1)	Desiccant.	At least 14 to 21 days prior to harvest.	Apply with AMS at 5 lb/A. Spray solution should not be below pH of 6. Use higher rate during cool, cloudy weather and on dense vine growth. Two applications may be necessary. May use a different desiccant for the second application. Allow a 10 day PHI.	
Diquat	<b>1 to 2 pt</b> (0.25 to 0.5)		At least 7 days prior to harvest.		Apply with a NIS. Sequential application may be made up to a total of 3 pt/A. No less than 5 days between applications. Diquat at 2 pt/A can be applied to all potatoes varieties.
<b>Rely</b> (glufosinate)	<b>48 fl oz</b> (0.375)		At least 9 days prior to harvest.		<b>Do not apply to potato grow for seed pieces.</b> Best results when applied a the beginning of natural potato vive senescence. Requires thorough coverage. Apply in 20 to 100 gpa by ground and 5 to 10 by aerial application. Use higher spray volumes to dense potato vines. Allow a 9 day PHI.
Sulfuric acid <b>RUP</b>	<b>20 gal</b>		At least 5 days prior to harvest.	Extremely corrosive. Do not harvest for 5 days after application.	

# LEGUME FORAGES

## Alfalfa or Trefoil Establishment, No Companion Crop

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraph
Roundup Ultra/RT RU Original/RT Glyfos Private labels (glyphosate)	0.5 to 2 pt of a 3 lb ae/gal conc. (0.19 to 0.75)	Emerged grass and broadleaf weeds.	Preplant or anytime prior to crop emergence.	A nonselective, nonresidual, translocated, foliar herbicide. Apply with AMS fertilizer. Refer to label for adjuvant use. A4 Q4
Roundup Custom (glyphosate)	0.38 to 1.5 pt of a 4 lb ae/gal conc. (0.19 to 0.75)			
Gramoxone Extra (paraquat) RUP	2 to 3 pt (0.63 to 0.94)	Emerged annual weeds.		A nonselective, contact, foliar herbicide. No soil residual activity. Apply with NIS. A4 Q5
Eptam (EPTC)	2 to 4.5 pt 10 to 20 lb 20G (1.75 to 4)	Grass and some broadleaf weeds.	PPI	Poor wild mustard control. Incorporate immediately after application. The 2 pt/A rate can be used on all varieties. A1
Treflan HFP (trifluralin)	1 to 1.5 pt (0.5 to 0.75)			PPI prior to direct-seeding alfalfa. Adjust rate for soil type. Use 1 pt/A in areas receiving less than 20 inches of rain. Some alfalfa stand reduction and stunting may occur but reduced weed competition will allow alfalfa establishment. P6
Butyrac 200/ others (2,4-DB ester 2,4-DB amine)	2 to 4 pt of a 2 lb/gal conc. (0.5 to 1)	Broadleaf weeds	Alfalfa: More than 2 trifoliolate leaves. Weeds: Less than 3 inches tall.	Sweet clover may be killed by 2,4-DB. Poor wild mustard control. Allow a 60 day PHI or grazing interval. 2,4-DB amine can be applied at a maximum of 6 pt/A.
Bromoxynil For Alfalfa Only	1 to 1.5 pt 3.33 to 5 A/pack (0.25 to 0.38)	Broadleaf weeds	Refer to "Legume Forages - with companion crop".	Refer to "Legume Forages - with companion crop" for comments. P2
Pursuit Pursuit DG (imazethapyr) For Alfalfa Only	3 to 4 fl oz 1.08 to 1.44 oz WDG or 10 to 6.67 A/pack (0.75 to 1 oz)	Most annual broadleaf and grass weeds.	POST Alfalfa: At least 2 trifoliate.  Weeds: 1 to 3 inches tall.	Excellent alfalfa safety. Can be applied to seedling or established alfalfa in the fall or spring to dormant or semi-dormant alfalfa or between cuttings. Apply with oil additive at 1.5 to 2 pt/A alone or with UAN at 1 to 2 qt/A. Can be tank-mixed with Butyrac 200/others (2,4-DB), bromoxynil, or Poast. P4 Y2 Y24
Poast (sethoxydim) For Alfalfa or Sainfoin	0.5 to 1.5 pt (0.19 to 0.28)	Annual grasses.	POST Grass: 2 to 4 inches tall.	Apply with oil additive at 1 qt/A to actively growing grasses. See narrative for rates to control different weed species. D30 P5
Select Prism (clethodim)	6 to 8 fl oz 12.8 to 17 fl oz (1.5 to 2 oz)	Annual grasses and quackgrass.	POST Grass: 2 to 6 inches tall.	Apply with oil additive at 1qt/A to actively growing weeds. See narrative for rates for different weeds. 30 day PHI. D26 D30 X1

## Alfalfa with Small Grains as a Companion Crop

Roundup brands (glyphosate)	0.5 to 2 pt of a 3 lb ae/gal conc. (0.19 to 0.75)	Emerged grass and broadleaf weeds.	Preplant or anytime prior to crop emergence.	A nonselective, translocated, foliar herbicide. No soil residual activity. Apply with AMS fertilizer. Refer to label for adjuvant use. A4 Q4
MCPA amine For Alfalfa Only	0.25 to 0.5 pt of a 4 lb/gal conc. (0.12 to 0.25)	Broadleaf weeds	Legumes: 2 to 3 inches tall. Companion crop: 8-leaf to early boot.	Possible injury to alfalfa. Use only when weed problem is severe and legume is protected by canopy. P1 X1
Bromoxynil For Alfalfa Only	1 to 1.5 pt (0.25 to 0.38)	Broadleaf weeds	Alfalfa: At least 4 trifoliolate leaves. Weeds: Small	Alfalfa injury can occur, especially if warm weather follows treatment. Refer to narrative for information for additional restrictions. P2

# LEGUME FORAGES

## Established Alfalfa

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraph
Gramoxone Extra (paraquat)	1.5 to 2 pt (0.47 to 0.62)	Small annual weeds and early germinating weeds.	Alfalfa: Before spring regrowth is 2 inches tall.	Apply to well established stands, at least 1 year old, after dormancy, but before spring regrowth reaches 2 inches. Allow a 60 day PHI or grazing interval. A4 Q5
	RUP 12.8 fl oz (0.25)	Larger weeds.	Between cuttings. (Includes first-year alfalfa.)	Apply up to 5 days after cutting. Allow a 30 day PHI. May be applied to dormant alfalfa. A4 Q5
Velpar (hexazinone)	0.67 to 1.33 lb DF (0.5 to 1)	Annual grass and broadleaf weeds and suppression of some perennial weeds.	Early spring:  Alfalfa: Dormant.	Do not apply to snow-covered or frozen ground. Apply to dormant alfalfa before new growth begins in spring. Weed control improves if 0.5 to 1 inch of rainfall occurs within 2 weeks after application, when soil is moist at application, and when weeds have not germinated or are less than 2 inches tall at application. Apply with NIS at 0.25% v/v if weeds have emerged. Apply to alfalfa stands established more than 1 year. P7
Lexone Sencor (metribuzin)	0.5 to 1.25 lb DF (0.37 to 1)	Annual grass and broadleaf weeds.		May be applied on frozen soil. Apply only to alfalfa stands established more than 1 year. P3
Trifluralin	1.5 to 2 pt (0.75 to 1)	Annual grasses.	Weeds: Prior to emergence.	Apply when crop is dormant, or in fall after a cutting. Incorporate by irrigation or mechanical equipment. X1
	20 lb 10G (2)			
Sinbar (terbacil)	0.5 to 1.5 lb W (0.4 to 1.2)	Annual grass and broadleaf weeds.	Fall or Spring  Alfalfa: Dormant.	Do not apply to frozen or snow covered soil. Do not rotate to any other crop within 2 years after application. Apply to alfalfa stands established more than 1 year.
Kerb (pronamide)	1 to 4 lb W (0.5 to 2.0)	Foxtail barley, quackgrass, wild oat, volunteer grains, mustards.	Fall After last cutting and before soil freeze-up.	Apply when soil temperatures are less than 55 F. Do not graze or harvest alfalfa within 25 days after application if apply less than 3 lb 50W/A or 45 days if apply between 3 to 4 lb 50W/A.
RUP Butyrac 200/others 2,4-DB ester 2,4-DB amine	2 to 4 pt (0.5 to 1.0)	Broadleaf weeds.	Weeds: Less than 3 inches tall.	Sweet clover may be killed by 2,4-DB. Poor wild mustard control. Allow a 30 day hay, harvest or grazing interval.
Pursuit Pursuit DG (imazethapyr)	3 to 4 fl oz 1.08 to 1.44 oz WDG or 10 to 6.67 A/packet (0.75 to 1 oz)	Most annual broadleaf and grass weeds.	POST Alfalfa: At least 2 trifoliate. Weeds: 1 to 3 inches tall.	Excellent alfalfa safety. Can be applied in the fall or spring to dormant or semi-dormant alfalfa or between cuttings. Apply with NIS at 0.25% v/v or oil additive at 1.5 to 2 pt/A. 28% UAN can be added to NIS or oil additive at 1 to 2 qt/A. Can be tank-mixed with 2,4-DB, Buctril, or Poast. P4
Poast (sethoxydim)	0.5 to 1.5 pt (0.2 to 0.3)	Annual grasses.	Grass 2 to 4 inches tall.	Requires an oil additive at 1 qt/A to actively growing grasses. D28 P5
Select/ Prism (clethodim)	8 fl oz/17 fl oz or 8 lb 8 fl oz/ 17 lb 17 fl oz (2 oz)	Annual grasses and quackgrass.	POST Grass: 4 to 8 inches tall.	Apply with oil additive at 1qt/A to actively growing weeds. Best quackgrass control when two sequential applications are made, each at 8 fl oz/A. Allow a 30 day PHI. D24 D28 X1
Roundup Ultra/RT RU Original/RT Glyfos Private labels (glyphosate)	2 pt of a 3 lb ae/gal conc. (0.75)	Emerged grass and broadleaf weeds.	Apply in spring or fall for quackgrass control.	Apply where crop destruction is acceptable. Treated crop and weeds can be harvested and fed 36 hours after treatment. A nonselective, nonresidual, translocated, foliar herbicide. Apply with AMS fertilizer. Refer to label for adjuvant use. A4 Q4
Roundup Custom (glyphosate)	1.5 pt of a 4 lb ae/gal conc. (0.75)			

## CHEMICAL FALLOW

### For Future Planting of Wheat and Durum

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
Atrazine  RUP	0.55 to 1.11 lb DF (0.5 to 1)	Annual broadleaf and grass weeds including downy brome.	Weeds: Before emergence.	Plant at least 2 inches deep and allow 12 or more months between application and planting. Do not use on sandy soils, eroded hillsides, caliche and rock out-croppings or exposed calcareous subsoil. Apply combinations with NIS at 0.12 to 0.25% v/v. C7 Q5 V1 Y9 Y24
Atrazine + (paraquat)  RUP	0.55 to 1.11 lb DF + 1 to 2 pt (0.5 to 1 + 0.31 to 0.62)		Weeds: Emerged but less than 6 inches tall.	
Paramount (quinclorac)	0.33 lb DF (0.25)	Field bindweed: Runners at least 4 inches long.	Postharvest or in the spring prior to seeding of wheat including durum.	Apply with MSO adjuvant at 1.5 pt/A. AMS at 2.5 lb/A or UAN at 1 ga/A may also be added to improve control but do not substitute for MSO. Apply after harvest but prior to frost. Suggested use in a 3-year program by applying 0.33 lb DF/A the first year and 0.17 to 0.33 lb DF/A in following years. May control foxtails, barnyardgrass, and volunteer flax. Q6 Y18 Y24

## CHEMICAL FALLOW

### For Future Planting of Wheat and Durum, Barley, and Oat


Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
Trifluralin	6 to 10 lb 10G (0.6 to 1)	Grass and some broadleaf weeds.	PPI in fallow.	Incorporate within 24 hours after application. Delayed second incorporation until weed control is necessary. Q7 X1 Y1 Y6 Y20 Y24
Gramoxone Extra (paraquat)  RUP	1 to 3 pt (0.31 to 0.93)	Emerged annual grass and broadleaf weeds.	Weeds: Less than 6 inches tall.	A nonselective, contact, foliar herbicide with no soil residual activity. Apply with a NIS. Effective as a post-harvest in-crop treatment. Q5
2,4-D	1.5 to 4 pt of a 4 lb/gal conc. (0.75 to 2)	Broadleaf weeds.	POST	Use the higher rate for perennial weeds. B2
Banvel Clarity (dicamba)	0.5 to 1 pt (0.25 to 0.5)	Wild buckwheat, kochia, and other broadleaf weeds.		Soil residual from fall application may damage broadleaf crops seeded the next year.  B8 R1 X1 Y15 Y24
Weedmaster (dicamba + 2,4-D)	0.5 to 4 pt (0.25 to 2)	Most broadleaf weeds.		
Distinct (dicamba + diflufenzopyr)	6 oz WDG (3 oz + 1.2 oz)	Most broadleaf weeds and suppression of Canada thistle.		Add NIS at 0.25% v/v + 28% UAN at 1.25 qt/A or AMS at 17 lb/100 gallons. Provides a wider spectrum of weeds controlled and greater perennial weed control than Banvel/Clarity. Can be tank-mixed with other herbicides but refer to label or narrative for tank-mix options. Distinct at 6 oz 70WDG/A = 6 fl oz Clarity. C18 Y15 Y18 Y24
Roundup Ultra/RT RU Original/RT Glyphos Private labels (glyphosate)	0.5 to 2 pt of a 3 lb ae/gal conc. (0.19 to 0.75)	Emerged grass and broadleaf weeds.	Weeds: Less than 6 inches tall.	A nonselective, nonresidual, foliar herbicide. See narrative for rates and adjuvants. Apply with AMS fertilizer. Use the lower rate for annual grasses. Glyphosate will not control glyphosate resistant volunteer crops. A4 Q1 Q4 X1
Roundup Custom (glyphosate)	0.38 to 1.5 pt of a 4 lb ae/gal conc. (0.75 to 1.5)			

**For Future Planting to Wheat, Durum, Barley, or Oat**


Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
<b>Landmaster BW</b> (glyphosate + 2,4-D)	<b>27 to 54 fl oz</b> (0.19 to 0.38 + 0.32 to 0.63)	Emerged grass and broadleaf weeds.	Weeds: Less than 6 inches tall.	Fallow Master provides greater control of kochia and wild buckwheat than Landmaster BW. Delay planting of wheat, barley, oat, or sorghum for 15 days and all other crops for 3 months after applying Fallow Master. A4 Q1 Q4 X1 Y15 Y24
<b>Fallow Master</b> (glyphosate + dicamba)	<b>22 to 44 fl oz</b> (0.19 to 0.38 + 0.08 to 0.17)			
<b>Curtail</b> (clopyralid + 2,4-D)	<b>4 pt</b> (0.19 + 1)	Broadleaf weeds including Canada thistle	Thistle: Prior to bud stage.	Apply after a majority of rosettes have emerged. See narrative for rotational restrictions. B13 T6 X1 Y21 Y24
<b>Tordon 22K</b> (picloram)	<b>0.25 to 0.5 pt</b> (0.063 to 0.125)	Annual weeds	Weeds: Actively growing.	Refer to label for grazing and rotational restrictions. Do not rotate to corn or sorghum the following year. Rates greater than 0.5 pt/A should be used post-harvest when rotating to fallow the following year. Q7 T14 X1 Y22 Y24
<b>Tordon 22K</b> (picloram) + 2,4-D	<b>0.5 to 1 pt + 1 to 2 pt</b> (0.125 to 0.25 + 0.5 to 1)	Perennial weeds	Canada thistle: Prior to bloom. Field bindweed: Actively growing.	
<b>Starane</b> (fluroxypyr)	<b>0.67 pt</b> (2 oz)	Kochia (including ALS resistant) and a few other broadleaf weeds.	Weeds: 4 to 6 inches tall.	No crop rotation restrictions or residual weed control. Controls ALS resistant and dicamba resistant kochia. Do not plant any crop for 120 days after application. B30 X1
<b>Harmony GT</b> (thifensulfuron) <b>Registration Pending</b>	<b>3/10 to 6/10 oz DF</b> (0.225 to 0.45 oz)	Annual broadleaf weeds.	Any time after harvest until 60 days prior to planting crop.	Apply with NIS at 0.25 to 0.5% v/v unless restricted by the tank-mix partner. Apply in a tank-mixture with other registered herbicides in areas where weed resistance may occur. Refer to narrative for tank-mix herbicides and restrictions on preceding and follow-crop herbicides and rotation crops. Q2 X1 Y3 Y24
<b>Harmony Extra</b> (thifensulfuron + tribenuron)	<b>3/10 to 6/10 oz DF</b> (0.225 to 0.45 oz)			
<b>Express</b> (tribenuron)	<b>1/6 to 1/3 oz DF</b> (0.125 to 0.25 oz)			
<b>Ally</b> (metsulfuron)	<b>1/10 oz DF</b> (0.06 oz)			
<b>Canvas</b> (metsulfuron + thifensulfuron + tribenuron)	<b>5 acres/pack</b> (0.075 oz met + 0.225 oz thif+trib)			
<b>Finesse</b> (chlorsulfuron + metsulfuron)	<b>2/20 to 3/10 oz DF</b> (0.15 to 0.225 oz)			



# PASTURE, RANGELAND AND CRP

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
<b>Ally</b> (metsulfuron)  	1/10 to 2/10 oz DF (0.06 to 0.12 oz)	Broadleaf weeds including pigweed and horseweed.	Late spring or early summer.	Apply with phenoxy type herbicide in late spring or early summer to small annual weeds or in spring or early summer before thistle plants bolt. Apply with NIS at 0.25 to 0.5 % v/v. Control or suppression of buckbrush. Suppression of Canada thistle. Add 2,4-D for Russian thistle control. Escort is for control of noxious and troublesome weeds in rangeland, pasture and non-cropland areas. Escort has no grazing restrictions. T2 T11 X1 Y3 Y24
	2/10 to 3/10 oz DF (0.12 to 0.18 oz)	Musk thistle, Canada thistle, snow-berry or buckbrush.		
<b>Escort</b> (metsulfuron)  <b>NOT FOR CRP</b>	0.5 to 4 oz DF (0.3 to 2.4 oz)	Several annual broadleaf weeds plus musk and Russian thistle.	Weeds: Up to bloom or apply to fall rosettes.	Suppression of Canada thistle, curly dock, musk thistle. May tank-mix with Tordon. No grazing restrictions. Do not cut hay for 30 days following application. Apply with NIS at 0.25 to 0.5% v/v. Y3
<b>Amber</b> (triasulfuron)	0.28 to 0.56 oz DF (0.21 to 0.42 oz)		Weeds: 2 to 6 inches tall.	
<b>Rave</b> (triasulfuron + dicamba)	2 to 5 oz DF (0.176 to 0.44 + 1.1 to 2.75)	Most annual broadleaf weeds and Canada thistle suppression.	60 days after grass emergence or sprigging of new grass stands.	Apply with NIS at 0.125 to 0.25% v/v unless restricted by tank-mix herbicide. See label for list of approved grass species. Can be tank-mixed with many broadleaf herbicides including 2,4-D, Crossbow, Weedmaster, Grazon P+D, Stinger, or Tordon. T13 Y3 Y24
<b>Paramount</b> (quinclorac)	0.5 lb DF (0.375)	Field bindweed, leafy spurge, thistle, sowthistles, and some annual grasses.	Fall for perennial broadleaf weeds.  Spring for annual grasses.	<b>DO NOT use on pasture and rangeland areas to be grazed or cut for hay.</b> Use an MSO type adjuvant at 2 pt/A. Provides only suppression of perennial broadleaf weeds.
<b>Plateau</b> (imazapic)	4 fl oz for establishing or established CRP (1 oz)	Annual broadleaf weeds and leafy spurge suppression.	Early September. to early October.	<b>DO NOT use on pasture and rangeland areas to be grazed or cut for hay.</b> Safe on alfalfa and sweet clover. Use on newly established or existing grass stands. Has PRE activity on annual weeds Use an MSO type adjuvant at 2 pt/A. 4 fl oz/A controls/suppresses annual weeds. 8 fl oz/A controls annual and controls/suppresses perennial weeds. 10 to 12 fl oz/A controls annual and perennial weeds. Rates above 8 fl oz/A may cause a height reduction in grasses. Use lower rates in areas of low rainfall. High risk of injury to switchgrass. Does not control absinth wormwood. See label for additional information. T2 T12 Y24
	4 to 12 fl oz for pasture and rangeland grasses (1 to 3 oz)	Annual and perennial grass and broadleaf weeds including foxtail and some noxious weeds including leafy spurge.	PRE or POST Grasses: 7 to 10 days after planting.  Weeds: Up to 6 inches tall.	

**PASTURE, RANGELAND AND CRP**

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
MCPA	0.5 to 4 pt of a 4 lb/gal conc. (0.25 to 2)	Annual weeds and suppression of perennial broadleaf weeds.	Weeds: Emergence to bud stage, preferably when young and actively growing.	Do not graze dairy animals for 7 days after treatment. Do not apply after boot stage on grasses for seed production. High rates are for perennial weed control. X1
2,4-D	1.5 to 4 pt of a 4 lb/gal conc. (0.75 to 2)		Weeds: Emergence to bud stage; preferably when young and actively growing. Grasses: After 5-leaf stage.	<u>Do not graze animals for 7 days after application or within 3 days of slaughter.</u> Do not apply after boot stage on grasses for seed production. Use 2 pt/A on annuals and gumweed and 4 pt/A on sages and other perennials. Controls buckbrush/western snowberry. Commercial premix of Tordon + 2,4-D is available = Grazon P+D. T2 T3 T8 X1
Banvel Clarity (dicamba)	0.5 to 4 pt (0.25 to 2)		Grasses: After 3-leaf stage of seedling grasses.  Weeds: Actively growing and prior to bud stage for thistles and knapweeds.	Apply with a surfactant. Spray drift from Banvel/Clarity may injure nearby susceptible crops and trees. Rates greater than 1 pt/A may injure newly seeded grasses. Consult the label for grazing restrictions and tank mixtures with other herbicides. T2 T3 T9 X1
Banvel/Clarity (dicamba) + mecoprop + 2,4-D <b>NOT FOR CRP</b>  Banvel/Clarity (dicamba) + dichlorprop + 2,4-D <b>NOT FOR CRP</b>	(See remarks section)			See individual label for usage rates. Provides a broader spectrum of broadleaf weed control than 2,4-D alone. A commercial premix of dicamba and 2,4-D is available = Weedmaster. T2 T3 T8 T9 X1
Curtail (clopyralid + 2,4-D)	4 to 8 pt (0.19 to 0.36 + 1 to 2)	Broadleaf weeds including Canada thistle and knapweeds.	Weeds: Actively growing and prior to bud stage for thistles and knapweeds.	Apply when majority of basal leaves have emerged but before bud stage. Do not apply to new seedings of grass. Use lower rate for annual broadleaf weeds and higher rate for perennial thistles and knapweeds. Do not cut treated grass for hay within 30 days after application. T2
Tordon (picloram)  <b>RUP</b>	0.25 to 0.5 pt (0.06 to 0.13)	Annual broadleaf weeds.	Weeds: Emergence to bud stage, preferably when young and actively growing.	Use 0.25 to 0.5 pt/A for small annual weeds. Use 2 pt/A for suppression of perennial weeds. Use 4 to 8 pt/A as spot treatment for control of deep rooted perennial weeds. Rates over 2 pt/A may suppress perennial grasses. See narrative for grazing and use restrictions. Often applied as a tank-mixture with 2,4-D to provide the most cost-effective weed control. Commercial premix of Tordon + 2,4-D is available = Grazon P+D. T2 T3 T14
	1 to 8 pt (0.25 to 2)	Perennial broadleaf weeds.		
Crossbow (triclopyr + 2,4-D)  <b>NOT FOR CRP</b>	1 to 6 qt (0.5 to 3.0 + 0.25 to 1.5)	Brush and broadleaf weeds.		Provides more consistent musk thistle and brush control (except buckbrush and western snowberry) than 2,4-D alone. Refer to narrative for grazing and haying restrictions. T10
Landmaster BW (glyphosate + 2,4-D)  <b>NOT FOR CRP</b>	54 fl oz or 3.38 pt (0.38 + 0.63)	Annual broadleaf weeds and some perennial weeds including leafy spurge.	Seed set stage or in fall when plants are actively growing.	Some grass injury and stunting may occur. Injury is greater with fall than spring applications. Not to be used in consecutive years. T2 T3
Gramoxone Extra (paraquat)	1 to 3 pt (0.31 to 0.93)	Annual broadleaf weeds and suppression of existing sod.	Weeds: Small.	Apply prior to emergence of new seeding. Apply to grazed or mowed pastures no more than 3 inches tall.

## GRASS ESTABLISHMENT

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs	
Roundup Ultra/RT RU Original/RT Glyphos Private labels (glyphosate)	0.5 to 2 pt of a 3 lb ae/gal conc. (0.19 to 0.75)	Emerged grass and broadleaf weeds.	Preplant or anytime prior to crop emergence.	A nonselective, translocated, foliar herbicide. No soil residual activity. Apply with AMS fertilizer. Refer to label for adjuvant use. A4 Q4	
Roundup Custom (glyphosate)	0.38 to 1.5 pt of a 4 lb ae/gal conc. (0.19 to 0.75)				
2,4-D MCPA	0.5 to 1 pt of a 4 lb/gal conc. (0.25 to 0.5)	Broadleaf weeds	Grasses: After 5-leaf stage.	Use rates listed for establishing grasses. Refer to "Pasture, Rangeland and CRP" section for restrictions and use information. T8 X1	
Bromoxynil	1.0 to 2 pt (0.25 to 0.5 )		Grasses: Anytime after emergence.		Grass tolerance is excellent. Can be applied to grass-alfalfa mixtures. Registered CRP species include wheatgrasses = crested, tall, western, bluebunch, and intermediate, perennial ryegrass, fescue, Russian wildrye, and alfalfa. Do not allow livestock to graze.
Bromoxynil + MCPA	1 to 2 pt (0.25 to 0.5 + 0.25 to 0.5)		POST: Grasses: Up to 3- leaf or larger.		

## VEGETATION CONTROL FOR CRP BREAKOUT

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs	
Roundup Ultra/RT RU Original RT Glyphos Private labels (glyphosate)	2 to 4 pt of a 3 lb ae/gal conc. (0.75 to 1.5)	CRP vegetation and weeds.	14 to 21 days prior to tillage.	Wheat grasses may be adequately controlled by applying Roundup/Touchdown in the spring. However, smooth brome grass require at least fall and preplant spring applications of Roundup and in-crop chemical and/or mechanical control for adequate season-long control. Always add AMS for improved weed control. Refer to label for adjuvant use. Allow 14 to 21 days prior to tillage. Fall applications provide greater Canada thistle control than spring applications.	
Touchdown (glyphosate - tms)	0.8 to 4.8 pt of a 3.43 lb ae/gal conc. (0.34 to 2)				
Roundup Custom (glyphosate)	1.5 to 3 pt of a 4 lb ae/gal conc. (0.75 to 1.5)				Addition of 2,4-D or use of Landmaster BW will increase alfalfa and sweet clover control but <b>decrease grass control.</b> A4 Q4 R1
Landmaster BW (glyphosate + 2,4-D)	54 fl oz (0.375 + 0.63)				

## North Dakota Noxious Weeds

By North Dakota Law, all property owners must control noxious weeds on their property.

Refer to the following Extension Circulars for additional information:

1. Absinth wormwood  
Extension Circular W-838, "Absinth Wormwood Control"
2. Field bindweed  
Extension Circular W-802, "Identification and Control of Field Bindweed"
3. Canada thistle
4. Musk thistle  
Extension Circular W-799, "Perennial and Biennial Thistle Control"  
Extension Circular W-1120, "Thistles of North Dakota"
5. Leafy spurge  
Extension Circular W-765, "Leafy Spurge Identification and Control"  
Extension Circular W-866, "Integrated Management of Leafy Spurge"  
Extension Circular W-1088, "Leafy Spurge - Biology, Ecology and Management"
6. Diffuse knapweed
7. Spotted knapweed
8. Russian knapweed  
Extension Circular W-1146, "Know your Knapweeds"
9. Purple loosestrife  
Extension Circular W-1132, "Identification and Control of Purple Loosestrife"
10. Yellow starthistle

Other Extension Circulars that may have additional information:

Extension Publication "Right-of-Way Certification Manual" provides additional information on identification, biology, characteristics, and other information on most North Dakota noxious weeds.

Extension Circular W-1097, "Weed Control in Tree Plantings"

# ABSINTH WORMWOOD

Extension Circular W-838, "Absinth Wormwood Control" provides additional information.

Herbicide	Product/A (lb ai/A)	Weed Location	When to Apply	Remarks and Paragraphs
2,4-D amine 2,4-D ester	4 pt of a 4 lb/gal conc. (2)	Pastures and rangeland, non- cropland, trees, fallow, or post- harvest.	Application should be made when plants are at least 12 inches tall and actively growing. Herbicides applied in late-June to mid- August have given greater residual control than fall or spring applications. Plants can be mowed in early to mid-summer to promote active regrowth prior to fall treatment.	Plants are controlled slowly. Avoid spraying tree foliage. Do not graze dairy cows for 7 days after treatment. Use only the amine formulation near trees. T8
Banvel Clarity (dicamba)	1 to 2 pt (0.5 to 1)			DO NOT apply in trees. Consult label for grazing restrictions. NIS may improve consistency of control. T9 Y15 Y24
Tordon 22K (picloram) RUP	0.5 to 1 pt (0.125 to 0.25)	Pasture and rangeland, non- cropland.		Consult reference paragraph for grazing restriction. Use high rate for dense stands. T13 Y22 Y24
Curtail (clopyralid + 2,4-D)	2 pt (0.09 + 0.5)	Cropland		See narrative for rotational restrictions. Do not apply to new seedings of grass. Do not cut treated grass for hay within 30 days after application. Consult label for grazing restrictions. B13 Y21 Y24
	4 to 8 pt (0.18 to 0.36 + 1 to 2)	Pasture and rangeland and non-cropland.		
Roundup Ultra/RT RU Original/RT Glyphos Private labels (glyphosate)	0.66 to 2 pt of a 3 lb ae/gal conc. (0.25 to 0.75)	Trees, noncropland, fallow or post- harvest.		Avoid spraying tree foliage. Apply with AMS fertilizer. Refer to label for adjuvant use. Use the high rate for dense stands. A4 Q4 T4 T6
Roundup Custom (glyphosate)	0.5 to 1.5 pt of a 4 lb ae/gal conc. (0.25 to 0.75)			
Landmaster BW (glyphosate + 2,4-D)	3.38 pt (0.38 + 0.63)	Noncropland and pasture.		Some grass injury and stunting may occur. Grass injury is greater with fall rather than spring treatments. Grass should not be grazed for 8 weeks after treatment.

# FRINGED SAGE

Extension Circular W-985, "Fringed sage" provides additional information.

Herbicide	Product/A (lb ai/A)	Weed Location	When to Apply	Remarks and Paragraphs
2,4-D ester	1 to 4 pt of a 4 lb/gal conc. (0.5 to 2)	Pastures and rangeland, non-cropland, trees, fallow, or post-harvest.	Before fringed sage is over 6 to 8 inches tall, usually late May to mid-June.	Best control if applied when air temperature exceeds 60 degrees. 2,4-D amine formulations provide 50% or less control compared to ester formulations. T8
Banvel Clarity (dicamba)	1 to 2 pt (0.5 to 1)	Pasture and rangeland, non-cropland, fallow or post-harvest.		Less effective than 2,4-D. Surfactant at 0.5% v/v may improve consistency of control. T10
Curtail (clopyralid + 2,4-D)	2.6 to 4 pt (0.125 to 0.19 + 0.75 to 1)			Good long-term control. Y21 Y24
Tordon 22K (picloram) RUP	2 to 4 pt (0.5 to 1)	Pasture and rangeland, non-cropland.		Consult reference paragraph for grazing restriction. High rate will provide nearly 100% control for several years. Picloram applied with 2,4-D is more cost effective. T14 Y22 Y24
Tordon 22K + (picloram) 2,4-D ester RUP	1 + 2 pt (0.25 + 1)			Control is best when 2,4-D ester is used with picloram rather than 2,4-D amine. T5 T13 Y20 Y24

# COMMON MILKWEED

Herbicide	Product/A (lb ai/A)	Weeds	When to Apply	Remarks and Paragraphs
Roundup Ultra/RT RU Original/RT Glyfos/Private labels (3 lb ae/gal conc.) or Roundup Custom (4 lb ae/gal conc.) (glyphosate)	6 pt of a 3 lb ae/gal conc. or 4.5 pt of a 4 lb ae/gal conc. (2.25)	Stubble or patches in barley, corn, oat, soybean, or wheat.	Milkweed: Late bud to flower stage.  Crop: prior to heading or flowering.	Apply to actively growing milkweed. Allow 3 or more days after application before tillage. Crop in treated area will be killed. Will not give complete control and will require retreatment. Refer to label for adjuvant use. A4 Q4 T3 T4 T5 T7
Touchdown (glyphosate - tms)	0.8 to 4.8 pt of a 3.43 lb ae/gal conc. 0.34(2)	Stubble or patches of corn, soybean, and wheat.		Use spray concentrations of 1.5% v/v for spot-spray in patches.
Banvel Clarity (dicamba)	1 to 4 pt (0.5 to 2)	Fallow or post- harvest.	Milkweed; Actively growing.	Rotate to wheat, corn, soybean or sorghum. Crop injury may occur if interval between application and planting is less than 45 days per pt/A of Banvel/Clarity, excluding days when ground is frozen. NIS improves consistency of control. Will not give complete control and will require retreatment. T3 T4 T5 X1 Y15 Y24
2,4-D + Banvel Clarity (dicamba)	2 pt + 0.5 pt (1 + 0.25)			Will not give complete control and will require retreatment. Q1 T3 T4 T5 Y15 Y24
Tordon 22K (picloram) + 2,4-D RUP	2 pt + 1 to 2 pt (0.5 + 0.5 to 1)	Pasture, rangeland, and noncropland.		Will not give complete control and will require retreatment. 2,4-D can be added to lower rates of Tordon to improve control.
Tordon 22K (picloram) RUP	4 to 8 pt (1 to 2)	Patches or individual plants in pastures.		Follow grazing restrictions. Q6 T3 T13 Y22 Y24
Arsenal (imazapyr)	4 to 6 pt (1 to 1.5 lb)	Noncropland.		Very long soil residual. Suppression only and requires retreatment. Avoid drift and contact with desirable plants. Apply with NIS at 0.25% v/v. T3

# FIELD BINDWEED

Extension Bulletin W-802, "Identification and Control of Field Bindweed" provides additional information.

Herbicide	Product/A (lb ai/A)	Weed Location	When to Apply	Remarks and Paragraphs
Roundup Ultra/RT RU Original/RT Glyphos Private labels + Banvel/Clarity (glyphosate + dicamba)	4 pt of a 3 lb ae/gal conc. + 1 pt (1.5 + 0.5)	Preplant, fallow or post-harvest.	Actively growing and at least 12 inches long to bud stage.	Less potential for soil residual than higher rates of Banvel/Clarity. A prepackaged mixture is available as Fallow Master. Apply with AMS fertilizer. Refer to label for adjuvant use. A4 Q1 Q4 T1
Roundup Custom + Banvel/Clarity (glyphosate + dicamba)	3 pt of a 4 lb ae/gal conc. + 1 pt (1.5 + 0.5)			
Landmaster BW (glyphosate + 2,4-D)	3.38 pt (0.38 + 0.63)	Preplant, fallow or post-harvest.	Vines: 6 to 18 inches.	Suppression in patches or individual plants. Allow at least 7 days between application and tillage. Control is reduced under dry conditions. Add AMS to improve weed control. A4 Q1 Q4 T1
2,4-D amine or ester	1.5 to 2 pt amine (0.75 to 1.0) 1.33 to 2 pt ester (0.66 to 1.0)	Spring wheat and barley.	Crop: Tiller stage.	The high rate may injure crop but may be beneficial, especially in small areas, to control bindweed. Does not provide long term control. T1
Express (tribenuron) + 2,4-D + Banvel/Clarity (dicamba)	1/6 to 1/3 oz DF + 0.5 pt + 2 to 3 fl oz (0.125 to 0.25 oz + 0.25 + 1 to 1.44 oz)	Spring wheat including durum.	Crop: Tillering and before crop exceeds the 5-leaf stage.	Treatments will provide season-long control. The addition of 2,4-D enhances weed control and crop safety. Apply with NIS at 0.125% v/v. Do not tank-mix with Hoelon. See section on herbicide resistance. No crop rotation restrictions the following year for Express 3-way mix. Do not apply Ally within 22 months from last Ally treatment or on soils above a pH of 7.9. Refer to Ally label for additional restrictions. B5 B9 B17 B32 T1 Y3 Y15 Y24
Ally (metsulfuron) + 2,4-D + Banvel/Clarity (dicamba)	1/20 to 1/10 oz DF + 0.5 pt + 2 to 3 fl oz (0.0375 to 0.075 oz + 0.25 + 1 to 1.44 oz)			
2,4-D	1 pt of a 4 lb/gal conc. (0.5)	Corn	Corn: 3 to 8 inches tall.	Use drop nozzles after corn is more than 8 inches tall. Provides field bindweed suppression only. C31 T1
Banvel Clarity (dicamba)	0.5 to 1 pt (0.25)		Corn: See remarks.	Apply 0.5 to 1 pt/A up to 8 inches tall. Apply 0.5 pt/A post-direct from 8 inches to 36 inches tall or 15 days prior to tassel. C16 T1
Roundup Ultra Roundup Ultra RT Glyphos (glyphosate)	8 to 10 pt of a 3 lb ae/gal conc. (3 to 3.75)	Patches in wheat, barley, oat, corn, soybean or trees.	Crop: Prior to heading or flowering. Bindweed: Bud to flowering stage.	Crop killed in treated area. Avoid drift or spraying tree foliage. Repeat applications are required for complete control. Treat bindweed when actively growing. Apply with AMS fertilizer. Refer to label for adjuvant use. A4 Q4 T1 T4 T5 T6 T7
Touchdown (glyphosate - tms)	6.4 pt of a 3.43 lb ae/gal conc. (2.71)	Patches in corn and soybean.		
Roundup Custom (glyphosate)	6 to 7.5 pt of a 4 lb ae/gal conc. (3 to 3.75)	Patches in wheat, barley, oat, corn, soybean or trees.		


**FIELD BINDWEED cont.**

Herbicide	Product/A (lb ai/A)	Weed Location	When to Apply	Remarks and Paragraphs
Paramount (quinclorac)	0.33 lb DF (0.25)	Fallow, postharvest or preplant in spring prior to seeding wheat including durum.	Bindweed: Actively growing and regrowth at least 4 inches long.	Apply with MSO adjuvant at 2 pt/A. AMS at 2.5 lb/A or UAN at 1 ga/A may also be added to improve control but do not substitute for MSO. Apply after harvest but prior to frost. Suggested use in a 3-year program by applying 0.33 lb DF/A the first year and 0.17 to 0.33 lb DF/A in following years. May control foxtails, barnyardgrass, and volunteer flax. Q6 T1 Y18 Y24
	0.5 lb DF (0.375)	Pasture, rangeland, and CRP.	Fall prior to frost and bindweed at least 4 inches long and actively growing.	<b>DO NOT use on pasture and rangeland areas to grazed or cut for hay.</b> Use an MSO type adjuvant at 2 pt/A. Provides only suppression of perennial broadleaf weeds.
2,4-D ester	2 to 4 pt of 4 lb/gal conc. (1 to 2)	Fallow or post-harvest.	Bindweed: Actively growing and regrowth 12 inches to bud.	Cultivate fallow until early July to achieve optimum growth at time of application. Spray in late August or September. Respray in following crop. Does not provide long term control. T1 T4 T5 T6 T8
Banvel Clarity (dicamba)	2 to 4 pt (1 to 2)			Mid to late fall treatments more effective than summer treatments. Rotate to wheat, corn, soybean or sorghum only. Crop injury may occur if the interval between application and planting is less than 45 days per pt/A Banvel/Clarity used, excluding days when ground is frozen. Surfactant improves consistency of control. A commercial mixture of dicamba and 2,4-D is available as Weedmaster. T1 T4 T5 T6 T9
Tordon 22K (picloram) + 2,4-D  RUP	0.5 to 1 pt + 1 to 2 pt (0.125 to 0.25 + 0.5 to 1)	Fallow, post-harvest and pasture.		Refer to label for crop rotation and preplant interval recommendations. Primarily for small grain/fallow rotations. A commercial mixture of Tordon + 2,4-D is available as Grazon P+D. Q6 Y22 Y24
Banvel Clarity (dicamba)	4 to 16 pt (2 to 8)	Patches or individual plants in pastures, fallow or non-cropland.		Apply to foliage and/or soil. Consult label for grazing restrictions. Use low rate only in fall and high rates in dense or old stands. Addition of NIS improves consistency of control. Q1 T4 T5 T9 Y15 Y24
Tordon 22K (picloram) + 2,4-D  RUP	2 to 4 pt + 1 to 2 pt (0.5 to 1 + 0.5 to 1)			Application with 2,4-D is more cost effective than picloram alone at higher rates. Consult reference for grazing restrictions. A commercial mixture of Tordon + 2,4-D is available as Grazon P+D. T1 T4 T5 T13 Y22 Y24




# CANADA THISTLE AND SOWTHISTLE

Extension Bulletin W-799, "Perennial and Biennial Thistle Control" provides additional information.

Herbicide	Product/A (lb ai/A)	Weed Location	When to Apply	Remarks and Paragraphs
<b>Curtail M</b> (clopyralid + MCPAe)	<b>1.75 to 2.33 pt</b> (0.09 to 0.122 + 0.5 to 0.68)	Wheat and barley	Crop: 3-leaf to jointing.	<b>Rosette technique:</b> Glyphosate or Curtail/Stinger fall-applied to Canada thistle in the rosette stage provides greater control than when applied to bolting or flowering stems. Refer to narrative for control of Canada thistle using the rosette technique.  See narrative for rotational restrictions. B13 T2 T8 Y21 Y24
<b>Curtail</b> (clopyralid + 2,4-D)	<b>2 pt</b> (0.09 + 0.5)		Crop: 4-leaf through jointing.	
	<b>4 pt</b> (0.19 + 1)	Fallow	Thistle: Rosette until prior to bloom.	
MCPA or 2,4-D amine or ester	<b>1.5 pt amine</b> (0.75) <b>1.33 pt ester</b> (0.66)	Wheat and barley	Crop: Tiller stage.	Patch spray at higher rates may injure crop but may provide greater thistle control. Small grains are more tolerant to MCPA than 2,4-D. T2
<b>Ally</b> (metsulfuron) 	<b>1/10 oz DF +</b> (0.075 oz)	Wheat, barley and pasture.	Thistle: Rosette to pre-bud stage.	SU herbicides should be applied with 2,4-D or MCPA + Banvel/Clarity. Provides season-long Canada thistle control. Apply with NIS except when adding 2,4-D or MCPA at 0.75 pt/A. See narrative about resistant weeds and rotational restrictions.  For information on 3-way tank-mixes for SU herbicides with 2,4-D and Banvel/Clarity, consult the herbicide listing in the "Hard Red Spring and Durum Wheat, Winter Wheat and Barley" section of this guide. B5 B6 B11 B17 B20 B21 T2 T6 Y1 Y3 Y24
<b>Escort</b> (metsulfuron)	<b>0.67 to 1.33 oz DF</b> (0.4 to 0.8 oz)	Rangeland	Wheat and Barley:	
<b>Harmony Extra</b> (thifensulfuron + tribenuron)	<b>1/2 to 6/10 oz DF</b> (0.375 to 0.45 oz)	Wheat and barley	Consult the herbicide listing in the "Hard Red Spring and Durum Wheat, Winter Wheat and Barley" section of this guide.	
<b>Express</b> (tribenuron)	<b>1/6 to 1/3 oz DF</b> (0.125 to 0.25 oz)			
<b>Canvas</b> (Ally + Harmony Extra)	<b>5 A/pack</b> (0.075 oz Ally + 0.225 oz Harmny X.)			
<b>Finesse</b> (chlrsifrn + mtslfrn)	<b>2/10 to 3/10 oz DF</b> (0.15 to 0.225 oz)			
<b>Amber</b> (triasulfuron)	<b>0.56 oz DF</b> (0.42 oz)			
<b>Basagran</b> (bentazon)	<b>2 pt applied twice</b> (1/1)	Soybean, corn and dry bean.	Canada thistle: 8 in. to bud stage.	Apply second treatment at 1 qt/A 7 to 10 days after first application. C9 D7 E3
<b>Roundup Ultra/RT</b> <b>RU Original/RT</b> <b>Glyphos</b> <b>Private labels</b> (3 lb ae/gal conc.) (glyphosate)	<b>4 to 6 pt of a</b> <b>3 lb ae/ gal conc. or</b> <b>3 to 4.5 pt of a</b> <b>4 lb ae/gal conc.</b> (1.5 to 2.25)	Patches in corn, wheat, oat or soybean: Prior to heading or flowering.		<b>Rosette technique:</b> Roundup or Curtail/Stinger fall-applied to Canada thistle in the rosette stage provides greater control than when applied to bolting or flowering plants. Refer to narrative for control of Canada thistle using the rosette technique.  Apply with AMS fertilizer. Avoid drift to non-target plants. Crop in treated area will be killed. Touchdown is labeled for use in patches of corn and soybean. A4 T2 T4 T5 T6
<b>OR</b>	<b>2 to 4 pt of a</b> <b>3 lb ae/gal conc. or</b> <b>1.5 to 3 pt of a</b> <b>4 lb ae/gal conc.</b> (0.75 to 1.5)	Roundup Ready Corn: Up to 24 inches tall/6 collars. Roundup Ready Soybean: Prior to flowering.		
<b>Roundup Custom</b> (4 lb ae/gal conc.) (glyphosate)	<b>2 to 6 pt of a</b> <b>3 lb ae/gal conc. or</b> <b>1.5 to 4.5 pt of a</b> <b>4 lb ae/gal conc.</b> (0.75 to 2.25)	Preharvest wheat at hard dough stage. Preharvest corn when black layer has formed and <35% seed moisture.		
	<b>2 to 6 pt of a</b> <b>3 lb ae/gal conc. or</b> <b>1.5 to 4.5 pt of a</b> <b>4 lb ae/gal conc.</b> (0.75 to 2.25)	Fallow or post-harvest.  Trees	Thistle: Rosette or beyond bud stage.	
<b>Touchdown</b> (glyphosate - tms)	<b>3.2 to 4.8 pt of a</b> <b>3.43 lb ae/gal conc.</b> (1.37 to 2)	Spot application in corn, soybean, and fallow	Summer or fall: Bud to early flower stage.	Allow a minimum of 6 to 8 inch rosette growth following mowing or in fall. Crop in treated areas will be killed. A4 Q1 QR4 T2 T4 T5 T6 T7

**CANADA THISTLE AND SOWTHISTLE cont.**

Herbicide	Product/A (lb ai/A)	Weed Location	When to Apply	Remarks and Paragraphs
Paramount (quinclorac)	0.5 lb DF (0.375)	Pasture, rangeland, and CRP.	Fall prior to frost and annual sowthistle actively growing.	<b>For annual sowthistle only. DO NOT use on pasture and rangeland areas to be grazed or cut for hay.</b> Use an MSO type adjuvant at 2 pt/A. Provides only suppression of annual sowthistle.
Banvel Clarity (dicamba)	0.5 to 1 pt (0.25 to 0.5)	Corn	Corn: EPOST up to 5 inches tall.	Use low rate on coarse textured or low organic matter soils. T2 Y15 Y24
	0.5 pt (0.25)		Corn: Up to 36 inches tall.	Use drop nozzles after corn is 8 inches tall to reduce drift. Can be applied 15 days prior to tasseling. T2 Y24
	2 to 4 pt (1 to 2)	Fall or post-harvest.	Canada thistle: At least 6 inches tall and actively growing. Most effective when thistle is in the rosette stage.	Rotate to wheat, corn, soybean, or sorghum only. Crop injury may occur if the interval between application and planting is less than 45 days per pt/A of Banvel/Clarity used, excluding days when ground is frozen. May be tank-mixed at a lower rate with 2,4-D or glyphosate to reduce soil residual. NIS improves consistency of control. C16 T2 T4 T5 T9
	1 pt (0.5)	Pasture and rangeland.	Rosettes to 12 inches tall. For fall treatment, mid-summer mowing promote active growth.	Consult label for grazing restrictions. NIS improves consistency of control. Cultivate fallow until early July to achieve rosette stage at time of application. Spray in late August or September. Retreatment necessary. Refer to narrative for additional information.
	4 to 8 pt (2 to 4)	Patches spray in pastures, noncropland, and fallow.	Thistle: Most effective when in rosette stage.	T2
Distinct (dicamba + diflufenzopyr)	6 oz WDG (3 oz + 1.2 oz)	Most broadleaf weeds and suppression of Canada thistle.	Corn and noncropland.	Add NIS at 0.25% v/v + 28% UAN at 1.25 qt/A or AMS at 17 lb/100 gallons. Provides a wider spectrum of weeds controlled and greater perennial weed control than Banvel/Clarity. Can be tank-mixed with other herbicides but refer to label or narrative for tank-mix options. Distinct at 6 oz 70WDG/A = 6 fl oz Clarity. C18 Y15 Y18 Y24
2,4-D ester or amine	2 to 4 pt of 4 lb/gal conc. (1 to 2)	Fallow or post- harvest.	12 inches tall and actively growing.	Cultivate fallow until early July to achieve rosette stage at time of application. Spray in late August or September. Retreatment necessary. T2
		Pasture, and rangeland or trees.		Do not graze dairy cows for 7 days after treatment and beef cows for 3 days after treatment. Use only amine formulation in trees. Provides suppression only. Commercial mixture available of Tordon + 2,4-D = Grazon P+D. T2 T4 T5 T8
Weedmaster (dicamba + 2,4-D)	4 pt (0.5 + 1.44)	Pasture, rangeland and noncropland.		
Stinger (clopyralid)	0.5 to 0.67 pt (0.19 to 0.25)	Sugarbeet, wheat, barley, and oat.	Thistles: Rosette to pre-bud stage.	See narrative for rotational restrictions. B13 M15 T2 T8 Y21 Y24
	 0.33 to 0.67 pt (0.12 to 0.25)	Corn		
Tordon 22K (picloram)	1 to 2 pt (0.25 to 0.5)	Pasture, rangeland and fallow.	Runners 12 inches tall and actively growing.	Retreat at the same rate the following year. Addition of 2,4-D at 1 qt/A with Tordon at the 1 pt/A rate may improve control. Mid-summer mowing promotes active growth for fall treatment. Refer to narrative for additional information. B29 T2 Y22 Y24
	RUP 4 pt (1)	Patches of plants in pastures.	Thistles: Actively growing.	Consult reference for grazing restrictions. B1 T2 T14

# LEAFY SPURGE

Extension Bulletins W-765, "Leafy Spurge Identification and Control", W-866, "Integrated Management of Leafy Spurge", and W-1088, "Leafy Spurge - Biology, Ecology and Management" provide additional information.

Herbicide	Product/A (lb ai/A)	Weed Location	When to Apply	Remarks and Paragraphs
2,4-D amine or ester	2 to 4 pt of 4 lb/gal conc. (1 to 2)	Fallow	Leafy spurge: Actively growing.	Cultivate or respray whenever regrowth is 4 to 6 inches high. Retreat in next years crop. T4 T5 T8
Banvel Clarity (dicamba)	2 to 4 pt (1 to 2)	Fallow or post-harvest.	Leafy spurge: Flowering in spring or 4 to 12 inches fall regrowth.	Rotate to wheat, corn, soybean, or sorghum only. Crop injury may occur if the interval between application and planting is less than 45 days per pt/A Banvel/Clarity used excluding days when ground is frozen. Surfactant improves consistency of control. T4 T5 T9 Y15 Y24
Paramount (quinclorac)	0.5 lb DF (0.375)	Pasture, rangeland, and CRP.	Fall prior to frost and leafy spurge actively growing.	<b>DO NOT use on pasture and rangeland areas to be grazed or cut for hay.</b> Use an MSO type adjuvant at 2 pt/A. Provides only suppression of leafy spurge.
2,4-D amine or ester	2 to 4 pt of 4 lb/gal conc. (1 to 2)	Pasture and rangeland.	Leafy spurge: Early bud stage and fall.	Apply both spring and fall for satisfactory control. Do not graze dairy cows for 7 days or beef cows for 3 days after treatment. T4 T5 T8
Tordon 22K (picloram) + 2,4-D ester or amine	1 to 2 pt + 2 pt of a 4 lb/gal conc. (0.25 to 0.5 + 1)	Pasture, rangeland and roadsides.	Leafy spurge: True flower growth stage or fall regrowth.	Tordon + 2,4-D at 1 pt/A + 2 pt/A is the most cost effective treatment in NDSU data. Retreatment at the same rate will be necessary for several years regardless of herbicide or rate. Annual control was greater and years of retreatment needed were less with the 2 pt/A Tordon rate. Use 2 pt/A rate for fall application. T14
RUP				
Banvel Clarity (dicamba)	4 pt (2)			Banvel/Clarity will give good control when applied in the fall for 3 to 5 years. Surfactant improves consistency of control. T9
	4 to 16 pt (2 to 8)	Patches or individual plants in pastures or noncropland.	Leafy spurge: True flower growth stage or fall regrowth.	Consult label for grazing restrictions. Surfactant improves consistency of control. Retreatment necessary. Q1 Q3 Q4
Tordon 22K (picloram)	4 to 8 pt (1 to 2)			Consult narrative for grazing restrictions. Commercial mixture of Tordon + 2,4-D available = Grazon P+D. T14
RUP				
Roundup Ultra/RT RU Original RT Glyphos Private labels (glyphosate)	2 pt of a 3 lb ae/gal conc. (0.75)	Trees	Leafy spurge: After July 1 to actively growing plants.	Other vegetation will also be killed. Avoid spraying tree foliage. Roundup Ultra is a nonselective herbicide. Retreat the following spring with 2,4-D at 2 to 4 pt/A to control seedlings and escapes. Add AMS fertilizer. Apply Touchdown in late summer or fall to plants greater than 12 inches tall. Touchdown can be applied with 2,4-D or Clarity. A4 Q4 T4 T5 T6 T7 T8
Touchdown (glyphosate - tms)	3.33 pt of a 3.43 lb ae/gal conc. (1.43)			
Roundup Custom (glyphosate)	1.5 pt of a 4 lb ae/gal conc. (0.75)			
2,4-D amine	2 to 4 pt (1 to 2)			
Casoron 4G Norosac 10G (dichlobenil)	150 to 200 4G 60 to 80 lb 10G (6 to 8)		Leafy spurge: Late Nov. to early March - before emergence.	Season long suppression only. Must be applied before leafy spurge emerges. No POST control.

Herbicide	Product/A (lb ai/A)	Weed Location	When to Apply	Remarks and Paragraphs
Krenite (fosamine)	12 to 16 pt (6 to 8)	Noncropland, adjacent to water and trees.	Leafy spurge: True flower growth stage or early fall.	Inconsistent control. Best control with high humidity and good soil moisture. Do not contaminate water during application.
Rodeo Pondmaster (glyphosate) (These formulations only)	2 pt of a 4 lb/gal conc. (0.75)	Adjacent to water.	Mid-July to mid- September.	Apply with a NIS approved for use near water. Control seedlings with a 2,4-D formulation near water in subsequent years. A4 Q4 T4 T5 T8
2,4-D amine	2 to 4 pt of a 4 lb/gal conc. (1 to 2)	Adjacent to water.	Leafy spurge: Actively growing.	Use only 2,4-D formulations labeled for use in or near water, such as PBI Gordon Amine 400. T4 T5 T8
Landmaster BW (glyphosate + 2,4-D)	54 fl oz or 3.38 pt (0.38 + 0.63)	Noncropland, pasture, and fallow.	Leafy spurge: Seed set stage or actively growing in fall.	Some grass injury and stunting may occur. Injury is greater with fall than spring treatments. Not to be used in consecutive years. Q1 T8
Plateau (imazapic)	8 to 12 fl oz (2 to 3 oz)	Newly planted or existing grass plantings in cropland or noncropland	Early to mid September.	May be used on CRP, pasture, rangeland, industrial sites, roadside right-of-way or noncropland. <b>DO NOT use on areas to be grazed or hayed.</b> Apply with MSO type adjuvant plus 28% UAN each at 1 qt/A. T12
Cultivation		Cropland	Leafy spurge: 2 to 4 inches tall.	Leafy spurge will not survive intensive tillage. Repeat when plants are 2 to 4 inches tall. T5
			Late fall.	Cultivate when plants are 3 to 6 inches tall on fallow or postharvest in Sept. and again in Oct.
Biological Control	Insects and Grazing	Pasture, rangeland and noncropland.	See narrative.	Several insects are available for biocontrol of leafy spurge. Sheep and goats can be used for management of leafy spurge infestations. See narrative for additional information. T15

## CATTAILS

Herbicide	Product/A (lb ai/A)	Weed Location	When to Apply	Remarks and Paragraphs
Rodeo, Pondmaster (glyphosate)	4.5 pt of a 4 lb/gal conc. (2.25)	Drainage and aquatic sites.	At or beyond the early to full bloom stage and actively growing - normally late July through mid August.	Add a NIS approved for use in water. Apply at 0.75% v/v solution (1 fl oz/gal) with hand-held sprayer equipment. A4 Q4
Roundup Ultra/RT RU Original/RT Glyfos Private labels (glyphosate)	6 pt of a 3 lb ae/gal conc. (2.25)	Agricultural and noncropland sites other than listed above.		Refer to label for adjuvant use. Only the Rodeo formulation of glyphosate is approved for use in drainage and aquatic sites because of environmental concerns. A4 Q4
Touchdown (glyphosate - tms)	6.4 pt of a 3.43 lb ae/gal conc. (2.71)			
Roundup Custom (glyphosate)	4.5 pt of a 4 lb ae/gal conc. (2.25)			

# DIFFUSE, SPOTTED and RUSSIAN KNAPWEED

Extension Bulletin W-1146, "Know Your Knapweed" provides additional information.

Herbicide	Product/A (lb ai/A)	Weed Location	When to Apply	Remarks and Paragraphs
2,4-D amine or ester	1.5 pt amine (0.75) 1.33 pt ester (0.66)	In wheat and barley.	Tiller stage of crop.	Prevents seed formation only. X1
2,4-D ester	2 to 4 pt of a 4 lb/gal conc. (1 to 2)	Fallow or post-harvest, pasture, and rangeland.	Knapweed: Rosette stage is preferred.	Several years of annual treatments are necessary. T4 T5 T6 T8
<b>Banvel Clarity</b> (dicamba)	2 to 4 pt (1 to 2)		Bud to bloom is second best.	Crop injury may occur if the interval between application and planting is less than 45 days per pt/A of Banvel/Clarity used, excluding days when ground is frozen. Plants are controlled slowly. Surfactant improves consistency of control. Retreatment annually required for Russian knapweed. T9
<b>Curtail</b> (clopyralid + 2,4-D)	2 pt (0.09 + 0.5)	Wheat and barley.	Wheat: 4-leaf through jointing.	Maximum rate labeled for spotted and diffuse knapweed in CRP and pasture is 6 pt/A. See narrative for rotational restrictions. B13 T6 Y21 Y24
	4 pt (0.19 + 1)	Fallow	Weeds: Bud to bloom stage or fall.	
	6 to 8 pt (0.28 to 0.38 + 1.5 to 2)	CRP and pasture.		
<b>Banvel Clarity</b> (dicamba)	4 to 12 pt (2 to 6)	Pasture, rangeland, and noncropland.	Spring or fall.	<u>For Russian knapweed.</u> Consult label for grazing restrictions. Plants are controlled slowly. T4 T5 X1
<b>Tordon 22K</b> (picloram)  RUP	4 to 8 pt (1 to 2)		Any time during growing season.	Consult label for grazing restriction. Y22 243 <u>For spotted and diffuse knapweed:</u> Use 1 pt/A of Tordon. May be tank-mixed with 2,4-D amine or ester to improve control. T8 Y22 Y24
<b>Tordon 22K</b> (picloram) + 2,4-D amine or ester  RUP	1 to 2 pt + 1 qt of a 4 lb/gal conc. (0.25 to 0.5 + 1)		Knapweed: Rosette stage preferred. Bud to bloom is second best.	<u>For Russian knapweed:</u> Several years of annual treatment is necessary. Consult label for grazing restrictions. Commercial mixture of Tordon + 2,4-D = Grazon P+D. T9 T14 Y22 Y24
<b>Escort</b> (metsulfuron) + 2,4-D  	1 oz DF + 1 to 2 pt of a 4 lb/gal conc. (0.6 oz + 0.5 to 1)		Knapweed: Bud to bloom stage or apply to fall rosettes.	<u>For Russian knapweed.</u> Controls many annual weeds and other noxious and troublesome weeds. Escort has no grazing restrictions. Apply with a NIS. May be tank-mixed with other broadleaf herbicides. T12 X1 Y3 Y24
Cultivation		Cropland	Cultivate whenever plants are 3 to 6 inches tall	<u>For spotted and diffuse knapweed.</u> Spotted knapweed is generally not a problem in cultivated land.

Herbicide	Product/A (lb ai/A)	Weed Location	When to Apply	Remarks and Paragraphs
<b>Accent</b> (nicosulfuron)	<b>0.67 oz DF</b> (0.5)	Corn: Up to 36 inches tall. Drop nozzles must be used from 24 to 36 inches.	POST	Apply with oil additive plus 28% UAN. Use of 28% UAN with MSO type adjuvants or NIS enhances control. Do not apply if Counter insecticide was used. Apply as drop nozzle application to corn over 24 inches tall. See narrative for rotational restrictions and registered tank-mix options. C4 X1 Y3 Y24
<b>Assure II</b> (quazalofop)	<b>Split: 10 fl oz then 7 fl oz</b> (1 oz/0.7 oz)	Soybean, dry bean, canola, crambe, lupin, lentil, field pea, and sugarbeet.	Quackgrass: 6 to 10 inches tall.	Apply with oil additive at 1 % v/v. Make second application at 7 fl oz when quackgrass is 4 to 8 inches tall. D5 D30
<b>Fusilade DX</b> (fluazifop-P)	<b>Split: 12 fl oz then 8 fl oz</b> (3 oz/2 oz)	Soybean and trees	Quackgrass: 4-leaves to 10 inches tall.	Apply with oil additive. Make second application at 12 fl oz when quackgrass has 3 to 5 leaves. D14 D30
<b>Fusion</b> (fluazifop-P + fenoxaprop-P)	<b>Split: 12 fl oz then 8 fl oz</b> (3 + 0.96 oz/ 1.92 to 0.64 oz)	Soybean	Quackgrass: 6 to 10 inches tall.	Apply with oil additive. First application should be at 12 fl oz/A. Make a second application at 8 fl oz/A to new growth 2 to 3 weeks after emergence. D15 D30
<b>Poast</b> (sethoxydim)	<b>Split: 1.5 pt then 1 pt</b> (0.28/0.2)	Canola, crambe, rapeseed, dry bean, field pea, flax, lentil, lupin, potato, sun-flower, sugarbeet and trees.		Apply with oil additive 1 qt/A. Make second application at 1 pt when quackgrass regrowth is 6 to 8 inches tall. <b>Maximum rate in dry bean is 1.5 pt/A.</b> D19 D30
<b>Select/ Prism</b> (clethodim)	<b>Split: 8 fl oz fb 8 fl oz/ 17 fl oz fb 17 fl oz</b> (2 oz/2 oz)	Alfalfa, dry bean, soybean, and sugarbeet.	Quackgrass: 4 to 12 inches tall.	Apply with oil additive at 1 qt/A. First application should be at 8 oz/A. Make second application at 8 fl oz/A to new growth 2 to 3 weeks after emergence. H25 D26 D30
<b>Roundup Ultra/RT RU Original/RT Glyfos</b> Private labels (3 lb ae/gal conc.)	<b>4 to 6 pt of a 3 lb ae/gal conc or 3 to 4.5 pt of a 4 lb ae/gal conc.</b> (1.5 to 2.25)	Patches in wheat, barley, oat, corn, or soybean.	Crop: Prior to heading. Quackgrass: 8 inches tall or more.	Crop in treated area will be killed. Avoid drift to non-target plants. Can be mixed with AMS fertilizer and drift retardants. Refer to label for adjuvant use. A4 Q4 T6 T7
or <b>Roundup Custom</b> (4 lb ae/gal conc.) (glyphosate)	<b>2 pt of a 3 lb ae/gal conc or 1.5 pt of a 4 lb ae/gal conc.</b> (0.75)	Preharvest in wheat and soybean only.	Wheat: Hard-dough stage.	Refer to label for adjuvant use. Application to wheat grown for seed is not recommended because a reduction in germination or vigor may occur. May be tank-mixed with 2,4-D. A4 Q4 T6 T8
		Preplant, fallow or post-harvest.	Fall or spring Quackgrass: 8 inches tall and actively growing.	Refer to label for adjuvant use. Allow 3 or more days after application before tillage. For established quackgrass sod, use at 4 pt/A. A4 Q4 T4 T5
<b>Touchdown</b> (glyphosate)	<b>1.5 to 4 pt of a 3.43 lb ae/gal conc.</b> (0.64 to 1.72)	Patches in corn or soybean.  Preplant, fallow, or post-harvest.	Use low rate on small weeds and high rate on large weeds or perennial weeds.	Apply to actively growing weeds. Refer to label for adjuvant use. Allow 3 days after application before tillage. A4 Q4 T7

## FALSE CHAMOMILE

Herbicide	Product/A (lb ai/A)	Weed Location	When to Apply	Remarks and Paragraphs
Bromoxynil + MCPA ester	1.5 pt (0.37 + 0.37)	Wheat, barley and oat.	Chamomile less than 4 inches tall.	Control of fall germinated plants will be less than plants germinating in the spring. B2 B10 S1
<b>Ally</b> (metsulfuron)	1/10 oz DF (0.06 oz)	Wheat and barley	Refer to "HRS and Durum Wheat, and Barley" section in this guide.	Do not apply Ally within 22 months after last Ally treatment. See narrative for information on resistant weeds and rotational restrictions. Apply with a NIS at 1 pt/100 gallon water. Do not apply to soils above pH 7.9. B2 B5 B11 B20 S1 X1 Y3 Y24
<b>Canvas</b> (metsulfuron + thifensulfuron + tribenuron)	5 A/pack (0.075 oz met + 0.225 oz thif+trib)			
<b>Finesse</b> (chlorsulfuron + metsulfuron)	2/10 to 3/10 oz DF (0.15 to 0.225 oz)			
<b>Maverick</b> (sulfosulfuron)	2/3 oz DF 0.5 oz)			
<b>Harmony Extra</b> (thifensulfuron + tribenuron)	3/10 to 6/10 oz DF (0.225 to 0.45 oz)			
<b>Express</b> (tribenuron)	1/6 to 1/3 oz DF (0.125 to 0.25 oz)	Chamomile less than 4 inches tall.	For information on 3-way tank-mixes for Ally, Harmony Extra or Express with 2,4-D and Banvel/Clarity, consult the herbicide listing in the "Hard Red Spring and Durum Wheat, Winter Wheat and Barley" section of this guide. B2 B17 B21 S1 X1	
<b>Tordon 22K</b> (picloram) RUP	1 to 1.5 pt (0.25 to 0.37)	Roadsides	Chamomile less than 4 inches tall.	Use the higher rate on plants over 4 inches tall. Avoid drift to susceptible plants. B2 S1 T14
<b>Gramoxone Extra</b> (paraquat) RUP	1.5 pt (0.47)	Tree rows or potholes.	Chamomile less than 6 inches tall.	Apply with a NIS. Avoid drift to non-target plants. B2 S1
<b>Roundup Brands</b> <b>Glyphos</b> <b>Private labels</b> (glyphosate)	2 pt of a 3 lb ae gal/conc. or 1.5 pt of a 4 lb ae/gal conc. (0.75)			A nonselective, translocated herbicide. Avoid drift to non-target plants. Can be applied with AMS fertilizer and drift retardants. Refer to label for adjuvant use. A4 Q4 S1
<b>Amitrol-T</b> (amitrole) RUP	6 pt (1.5)			Avoid drift to non-target plants. S1

## PURPLE LOOSESTRIFE

Extension Circular W-1132, "Identification and Control of Purple Loosestrife" provide additional information.

Herbicide	Product/A (lb ai/A)	Weed Location	When to Apply	Remarks and Paragraphs
<b>Rodeo</b> <b>Pondmaster</b> (glyphosate)	1 to 1.5 gal/100 gal water or 1.3 to 1.9 fl oz/gal (1 to 1.5% concentration)	Drainage and aquatic sites.	July to early September.	Add a NIS approved for use in water at 0.75% v/v. A 2,4-D formulation labeled for use near water will be needed to control seedlings. Biological control agents have been introduced for control. A4 A15 Q5 T16
<b>Garlon 3A</b> (triclopyr)  <b>Section 18 Registration Pending</b>	Up to 2 gallons/A (Up to 6)	Aquatic sites.	Bud to mid- flowering.	Aquatic sites include all flowing or non-flowing water and banks and shores of these sites. Avoid drift. Do not apply after bud stage. Available through Ostlund/UAP outlets. T16

# SHELTERBELT WEED CONTROL

Extension Bulletin W-1097, "Weed Control in Tree Plantings" provides additional information.

Herbicide	Product/A (lb ai/A)	Remarks	Refer to Paragraph U1
<b>Amitrol T</b> (amitrole)  RUP	<b>1 to 4 gal</b> (2 to 8)	Systemic, postemergence herbicide. Directed application only. Keep spray off desired species. Controls many annual and perennial weeds and poison ivy. Apply in combination with preemergence herbicides for residual weed control.	
<b>Casoron</b> (dichlobenil)	<b>100 to 200 lb 4G</b> (4 to 8)	Highly volatile. Preemergence herbicide for control of annual and perennial weeds in new plantings established at least 4 weeks. Application in November or March just before rain or snow are most effective.	
<b>Derby</b> (metolachlor + simazine)	<b>40 to 80 lb 5G</b> (2 to 4)	Apply to soil before weeds emerge or after existing weeds have been removed. A second application may be necessary to provide residual grass control. Apply no more than 160 lb product/year. Safe on many tree species used in shelterbelts.	
<b>Finale</b> (glufosinate)	<b>2 to 6 qt</b> (0.5 to 1.5)	Nonselective, nonresidual, contact herbicide. Directed application only. Controls many annual and perennial weeds. Use 1.5 to 4 fl oz/gal for spot application. Use 3 to 4 qt/A for weeds less than 6 to 8 inches, or 5 to 6 qt/A for weeds greater than 6 to 8 inches.	
<b>Fusilade DX</b> (fluzifop-P)	<b>1 to 1.5 pt</b> (0.25 to 0.38)	Systemic, postemergence, nonresidual herbicide for control of annual and perennial grasses. Spot spray or apply over-the-top of woody species. Add oil additive at 1 qt/A.	
<b>Roundup Brands</b> <b>Glyphos</b> Private labels (glyphosate)	<b>1.33 to 8 pt of a</b> <b>3 lb ae/gal conc.</b> <b>or 1 to 6 pt of a</b> <b>4 lb ae/gal conc.</b>	Nonselective, nonresidual, systemic postemergence herbicide. Effective on annual and perennial plants. Directed spray only. Avoid drift and contact with desirable species. Use 1 to 1.5 fl oz/gal for small annual weeds or 2.5 to 3 fl oz/gal for perennial weeds when applying with a hand-held sprayer. Refer to label for adjuvant use. A4	
<b>Goal</b> (oxyfluorfen)	<b>5 to 10 pt 1.6E</b> <b>4 to 8 pt 2XL</b> (1 to 2)	Residual, preemergence or contact postemergence herbicide for control of broadleaf and some grass weeds. <u>General:</u> Do not incorporate in soil. Apply POST with NIS at 0.25% v/v. User must possess North Dakota 24C SLN label at the time of application. Can be applied with a residual herbicide or as a split application. <u>Conifers:</u> Apply pretransplant, POST or POST-directed prior to budbreak or after new foliage has hardened off. <u>Hardwoods:</u> Apply pretransplant or POST-directed prior to budbreak. Spray only the base of deciduous trees and <u>not over- the-top</u> . If a nondormant application is required, apply after new foliage has expanded and hardened off and NOT during periods of new growth. Avoid direct or indirect spray contact with foliage of deciduous trees.	
<b>Karmex/Direx</b> (diuron)	<b>2.5 to 5 lb DF</b> (2 to 4)	Preemergence herbicide for plantings established at least one year. Apply as directed spray. Tolerance of labeled species is fair to very good. Do not use on light soil or in low, wet areas.	
<b>Plateau</b> (imazapic)	<b>8 to 12 fl oz</b> (2 to 3 oz)	Add MSO at 2 qt/A. Controls many broadleaf weeds including leafy spurge. May use up to 12 fl oz in and around established trees. Do not use on new plantings or seedling trees. Refer to label for list of tolerant tree species. Use with caution on trees not listed on label.	
<b>Poast/Vantage</b> (sethoxydim)	<b>1.5 to 2.5 pt Poast</b> <b>2.25 to 3.75 pt</b> <b>Vntg (0.1 to 0.5)</b>	Systemic, postemergence, nonresidual herbicide for control of annual and perennial grasses. Spot spray or apply over-the-top of most woody species. Add oil additive at 1 qt/A. Use a minimum of 5 to 10 gpa. Spray to wet foliage.	
<b>Princep 4L</b> <b>Caliber 90</b> (simazine)	<b>2 to 4 qt</b> <b>2.2 to 4.4 lb DF</b> (2 to 4)	<b>Use only on tree plantings at least three years old.</b> Preemergence herbicide that is most effective on annual broadleaf weeds. For adequate annual grass control apply with a preemergence, residual grass herbicide. Apply in fall or spring in full or split rate applications. Use high rate in fine textured soils. Refer to label for list of registered tree species.	
<b>Stinger</b> (clopyralid)	<b>0.25 to 0.67 pt</b> (0.1 to 0.25)	Systemic, postemergence, broadleaf herbicide. Effective on weeds in the legume, smartweed and aster families. Provides excellent control of Canada thistle and knapweeds. Safe to some conifer species only. Apply to actively growing weeds.	
<b>Stomp, Pendulum</b> (pendimethalin)	<b>2 to 4 qt</b> <b>3.3 to 6.6 lb WDG</b> (2 to 4)	Preemergence herbicide for control of annual grasses and some small seeded broadleaf weeds. Apply before bud break to avoid potential growth suppression. Apply with preemergence broadleaf herbicide for broad spectrum annual weed control.	
Trifluralin	<b>1 to 2 pt</b> <b>80 lb 5G</b> (0.5 to 1) (4)	Apply PPI for new plantings or established trees. Gives season long control of many annual grass and some broadleaf weeds. Does not control weeds in the aster, legume or mustard family. Poor perennial weed control but may suppress field bindweed. Cultivation may be required for broadleaf weed control the first season. Apply with a residual preemergence broadleaf herbicide for broad spectrum weed control.	
2,4-D amine	<b>1 to 2 qt</b> (1 to 2)	Systemic, postemergence, broadleaf herbicide. Directed application only. Used to reduce infestations of perennial weeds. Broadleaf plants and deciduous trees very sensitive. Avoid drift to desirable species. Use only amine formulations. Use low pressure, coarse spray droplets and apply only in calm weather.	



# NONCROPLAND WEED CONTROL

Herbicide	Product/A (lb ai/A)	Remarks	Refer to Paragraph V1
2,4-D	2 to 8 pt (1 to 4)	Systemic, short residual herbicide. For control of annual and perennial broadleaf plants. Avoid drift to desirable plants and sensitive crops. <b>Short residual.</b>	
Banvel/Clarity Vanquish (dicamba)	0.5 to 6 pt of a 4 lb/gal conc. (0.25 to 3)	Use 0.5 to 1.5 pt/A to control annual broadleaf plants, 0.5 to 3 pt/A to control biennials, 1 to 6 pt/A to control perennials. Apply when weeds are actively growing. Refer to label for registered tank-mixes. <b>Long residual.</b>	
Weedmaster (dicamba + 2,4-D)	0.5 to 4 pt (0.25 to 2)	Controls broadleaf weeds and woody plants. Apply when weeds are actively growing. Adjuvants may used for wetting, penetration, or drift control. <b>Moderate residual.</b>	
Crossbow (triclopyr + 2,4-D)	1 to 1.5 gal/100 gal, 2 qt to 4 gal/A	Use 1 to 1.5 gal product/100 gal water for spot treatment, 2 to 4 qt/A for broadleaf weeds, 1.5 to 4 gal in sufficient water to deliver 10 to 30 gpa for woody species. <b>Moderate residual.</b>	
Distinct (dicamba + diflufenzapyr)	6 oz WDG (3 + 1.2)	Add NIS at 0.25% v/v + 28% UAN at 1.25 qt/A or AMS at 17 lb/100 gallons. Provides a wider spectrum of weeds controlled and greater perennial weed control than Banvel/Clarity. Can be tank-mixed with other herbicides but refer to label or narrative for tank-mix options. Distinct at 6 oz 70WDG/A = 6 fl oz Clarity.	
Escort (metsulfuron)	0.3 to 2 oz DF (0.2 to 1.2 oz)	For annual broadleaf weed control. Can be applied anytime except when ground is frozen. No grazing restrictions up to 0.75 oz/A. Kochia biotypes have developed resistance. Apply with another herbicide of a different mode of action. <b>Long residual.</b>	
Paramount (quinclorac)	0.5 lb DF (0.375)	Use an MSO type adjuvant at 2 pt/A. May control or suppress broadleaf weeds including field bindweed, leafy spurge, and annual sowthistle.	
Plateau (imazapic)	8 to 12 fl oz (2 to 3 oz)	Add MSO at 2 pt/A. Controls many broadleaf weeds including leafy spurge. May use up to 12 fl oz in and around established trees, roadsides, prairies, and other noncropland areas used for wildlife cover, erosion control, etc. Do not use on new plantings or seedling trees. Refer to label for list of tolerant tree species. Use with caution on trees not listed on label.	
Roundup Brands Private labels (glyphosate)	2 to 10 qt or 1.5 to 7.5 qt (1.5 to 7.5)	Apply 2 to 10 qt of a 3 lb ae/gal concentrate or 1.5 to 7.5 qt of a 4 lb ae/gal concentrate. Nonselective/ <b>nonresidual</b> /systemic herbicide. Effective on annual and perennial grass and broadleaf plants. Avoid drift and contact with desirable species. A4	
Spike (tebuthiuron)	5 to 30 lb 20P 2.5 to 15 lb 40P	Controls over 125 grass and broadleaf species and 110 woody species. Rate varies by weed species and duration of control desired. Avoid drift to desirable species. <b>Long residual.</b>	
Telar (chlorsulfuron)	0.25 to 3 oz DF (0.19 to 2.24)	Use higher rate for perennial weed control. Avoid treatment to dry soil that may move off target. Apply with another herbicide for broad spectrum weed control. <b>Long residual.</b>	
Touchdown (glyphosate-tms)	0.75 to 6.33 pt (0.32 to 2.71)	Nonselective/ <b>nonresidual</b> /systemic herbicide. Effective on annual and perennial weeds. Avoid drift and contact with desirable species.	
Tordon 22K (picloram) RUP	0.25 pt to 2 gal (0.06 to 4)	For control of most annual and perennial broadleaf weeds and woody plants. Avoid drift and contact with desirable species. <b>Long residual.</b>	

# TOTAL VEGETATION WEED CONTROL

Herbicide	Product/A (lb ai/A)	Remarks	Refer to Paragraph V2
<b>Diuron/Direx</b> <b>Karmex</b> (diuron)	<b>1 to 8 gal</b> <b>5 to 15 lb</b> (4 to 32)	Refer to label for use in irrigation ditches. Higher rates needed for perennial grasses and broadleaf weeds. Deep rooted perennials will require retreatment. <b>Long residual.</b>	
<b>Gramoxone Extra</b> (paraquat) <b>RUP</b>	<b>2 to 3 pt</b> (0.625 to 0.94)	Nonselective, <b>nonresidual</b> , contact. Controls top-growth only of perennial species. Add NIS and repeat application as necessary. Avoid drift and contact with desirable species.	
<b>Hyvar X, Hyvar DF</b> (bromacil)	<b>3 to 15 lb DF</b> (2.4 to 9.6)	Use 3 to 6 lb for annual grass and broadleaf weeds or 7 to 15 lb for perennial weeds. Noncorrosive, nonvolatile, nonflammable. Refer to label for tank-mixes. <b>Long residual.</b>	
<b>Finale</b> (glufosinate)	<b>3 to 6 qt</b> (0.75 to 1.5)	Nonselective, <b>nonresidual</b> herbicide. Use 1.5 to 4 fl oz/gal for spot application, 3 to 4 qt/A for weeds less than 6 to 8 inches, 5 to 6 qt/A for weeds greater than 6 to 8 inches.	
<b>Krovar</b> (bromacil + diuron)	<b>4 to 30 lb DF</b> (3.2 to 24)	Control of annual grass and broadleaf weeds. Apply PRE or early POST. Refer to label for registered tank-mixes. <b>Long residual.</b>	
<b>Oust</b> (sulfometuron)	<b>2 to 4 oz DF</b> (1.5 to 3 oz)	Use high rate in high moisture areas such as railroad shoulders, under asphalt and concrete, except residential properties. Will control leafy spurge at 3 oz/A. Do not spray near water. <b>Long residual.</b>	
<b>Plateau</b> (imazapic)	<b>8 to 12 fl oz</b> (2 to 3 oz)	Add MSO at 2 pt/A. Controls many broadleaf weeds including leafy spurge. May use up to 12 fl oz in combination with Arsenal, Sahara, glyphosate, Oust, Karmex, diuron and other total vegetation control herbicides.	
<b>Pramitol</b> (prometon)	<b>5 to 30 gal</b> (10 to 15)	Use 5 to 7.5 gal/A for annual and susceptible perennial weeds, 20 to 30 gal/A for hard-to-kill perennial weeds. Apply before weeds emerge or EPOST. <b>Long residual.</b>	
<b>Roundup Brands</b> <b>Private labels</b> (glyphosate)	<b>2 to 10 qt or</b> <b>1.5 to 7.5 qt</b> (1.5 to 7.5)	Apply 2 to 10 qt of a 3 lb ae/gal concentrate or 1.5 to 7.5 qt of a 4 lb ae/gal concentrate. Nonselective, <b>nonresidual</b> , systemic herbicide. Effective on annual and perennial grass and broadleaf plants. Avoid drift and contact with desirable species. A4	
<b>Sahara</b> (imazapyr + diuron)	<b>3 to 4 A/copack or</b> <b>6.5 to 13 lb DF</b> (0.5 to 1 + 4 to 8)	Provides residual PRE and POST control of annual weeds and POST control of perennial weeds. Apply Sahara POST with NIS at 0.25% v/v or MSO type adjuvants at 1.5 to 2 pt/A alone or with UAN at 2 to 3 pt/A. Can be tank-mixed with Roundup, Finale, Krovar, Hyvar X, Oust, Garlon, and Clarity. Do not apply with 2,4-D due to reduced weed control.	
<b>Topsite</b> (imazapyr + diuron)	<b>200 to 300 lb 2.5G</b> (1 to 1.5 + 4 to 6)	Apply Topside 2.5G prior to weed emergence at 0.5 to 0.7 lb 2.5G/100 sq. ft. <b>Long residual.</b>	
<b>Touchdown</b> (glyphosate-tms)	<b>0.75 to 6.33 pt</b> (0.32 to 2.71)	Nonselective, nonresidual, systemic herbicide. Effective on annual and perennial weeds. Avoid drift and contact with desirable species.	

# GENERAL INFORMATION

Refer to web site listed on front cover of weed guide for:

- A1. PPI AND PRE HERBICIDES
- INCORPORATION OF HERBICIDES
- A2. SOIL ORGANIC MATTER TEST
- A3. FALL HERBICIDE APPLICATION

## A4. POST APPLIED HERBICIDES

**Glyphosate** applied POST will control annual and perennial weeds in preplant, in-crop use on resistant crops, and post-harvest in conventional or reduced-till systems.

Glyphosate is available under the following labels:

**Roundup Ultra/RT (Monsanto)**

**Glyphomax Plus (Dow)**

Formulated as an isopropyl amine salt at 4 lb ai/gal or 3 lb ae/gal with full adjuvant load.

**Roundup Ultra Dry (Monsanto)**

Formulated as an ammonium salt as a 65% SG with full adjuvant load.

(RUU Dry at 1.15 lb = 1qt/A Ultra)

**Roundup Original/RT (Monsanto) or**

**Glyfos (Cheminova) or**

**Glyphomax (Dow)**

**Private Labels (Various)**

Formulated as an isopropyl amine salt at 4 lb ai/gal or 3 lb ae/gal with partial adjuvant load.

**Touchdown (Zeneca)**

Formulated as a trimethyl sulfonium salt at 5 lb ai/gal or 3.45 lb ae/gal with partial adjuvant load.

1.6 pt/A of Touchdown = 2 pt Roundup Original

**Roundup Ultra Max (Monsanto)**

Formulated as an isopropyl amine salt at 4 lb ai/gal or 3 lb ae/gal with full adjuvant load.

**Roundup Custom (Monsanto) or**

**Rodeo (Monsanto)**

Formulated as an isopropyl amine salt at 5.4 lb ai/gal or 4 lb ae/gal without adjuvants.

**Do not add NIS:** Roundup Ultra/RT, Roundup Ultra Dry, Roundup Ultra Max.

**Add NIS at 0.5% v/v:** Roundup Original/RT, Private Labels, Glyfos, Touchdown.

**Add NIS at 1% v/v:** Roundup Custom, Rodeo.

ALWAYS add AMS to any glyphosate product at 8.5 to 17 lb/100 gallons of water. Increased weed control results from addition of AMS even under good growing conditions or lack of hard water. Allow sufficient time for AMS to dissolve before adding herbicides or surfactant.

**Minimum Interval Between Application and Rain for  
Maximum POST Weed Control.**

Herbicide	Time Interval	Herbicide	Time Interval
Accent	4-6 hr	Laddok S-12	4 hr
Accent Gold	6 hr	Landmaster BW	6-12 hr
Achieve	1 hr	Lexone	6-8 hr
Aim	1 hr	Liberty	4 hr
Ally	4 hr	Liberty ATZ	4 hr
Amber	4 hr	Lightning	1 hr
Assert	3 hr	Lorox	6-8 hr
Assure II	1 hr	MCPA amine	4 hr
Atrazine	4 hr	MCPA ester	1 hr
Avenge	6 hr	Marksman	4 hr
Banvel/Clarity	6-8 hr	Matrix	4 hr
Basagran	4 hr	Maverick	4 hr
Basis	4 hr	Muster	4-6 hr
Basis Gold	4-6 hr	Northstar	4 hr
Betamix/Betanex	6 hr	Paramount	6 hr
Bladex	2 hr	Peak	1 hr
Blazer	6 hr	Permit	4 hr
Bromoxynil	1 hr	Pinnacle	1 hr
Bronate	1 hr	Plateau	1 hr
Butyrac 200	6 hr	Poast	1 hr
Campaign	6-12 hr	Prism	1 hr
Canvas	6 hr	Progress	6 hr
Celebrity Plus	4-6 hr	Pursuit	1 hr
Cheyenne	4 hr	Puma	1 hr
Cobra	0.5 hr	Raptor	1 hr
Cy-Pro	2 hr	Rave	4 hr
Curtail/M	6-8 hr	ReadyMaster ATZ	4 hr
Dakota	1 hr	Reflex	1 hr
Desiccate II	5 hr	Rely	4 hr
Distinct	4 hr	Resource	1 hr
Discover	1 hr	Rezult	4 hr
Diquat	0.5 hr	Roundup Custom	1 hr
Escort	4 hr	RU Original/RT	1 hr
Everest	4-6 hr	RU Private Labels	6-12 hr
Express	4 hr	Roundup Ultra/RT	1-2 hr
Extreme	6-12 hr	Roundup Ultra Max	2 hr
Finale	4 hr	Select	1 hr
Finesse	4 hr	Sencor	6-8 hr
FirstRate	4 hr	Stampede 80EDF	4 hr
Flexstar	1 hr	Starane	1 hr
Fusilade DX	1 hr	Starfire	0.5 hr
Fusion	1 hr	Sterling	6-8 hr
Galaxy	6 hr	Stinger	6-8 hr
Garlon	6-8 hr	Storm	6 hr
Glyfos	6-8 hr	Tiller	1 hr
Goal	1 hr	Tordon 22K	6-8 hr
Gramoxone Extra	0.5 hr	Touchdown	2 hr
Guardman	4 hr	Tough	1-2 hr
Harmony Extra	4 hr	UpBeet	6 hr
Harmony GT	4 hr	Weedmaster	6-8 hr
Hoelon	1 hr	2,4-D amine	4-6 hr
Hornet	6 hr	2,4-D ester	1 hr

Refer to web site listed on front cover of weed guide for:

**A5. SPRAY ADJUVANTS**

Choosing adjuvants with herbicides:  
 Conditions that favor use of MSO type adjuvants:  
 Adjuvant use in low gallonage spray volumes

**A6. SPRAY CARRIER WATER QUALITY**

**A7. USING HERBICIDES AT REDUCED RATES**

**A8. SPRAYER CLEANOUT**

**A9. SPRAY AND VAPOR DRIFT**

**A10. FIELD INVESTIGATION OF CROP INJURY**

**A11. GROUNDWATER CONTAMINATION**

**A12. PESTICIDE COMBINATIONS**

**A13. HERBICIDE + INSECTICIDE COMBINATIONS**

**A14. HERBICIDE + FUNGICIDE COMBINATIONS**

**A15. HERBICIDE + LIQUID-FERTILIZER COMBINATIONS**

**A16. HERBICIDE STORAGE TEMPERATURES**

Excess herbicide quantities may be exposed to freezing temperatures in storage. The following information gives the minimum storage temperature to avoid risk of reduced herbicide activity.

**No storage temperature restriction**

DoublePlay, Surpass, Touchdown, Achieve, Maverick.  
 Most dry formulated herbicides in DF or WDG formulations.

**Do not store below 40 F**

Assert, Avenge, Broadstrike + Treflan, Bronco, Command, FallowMaster, Flexstar, Galaxy, Landmaster BW, Lariat, LI-700, Nortron, Passport, Prowl, Pursuit Plus, Pyramin, Sonalan HFP, Stomp, Treflan, Tri-4

**Do not store below 32 F**

Agri-Dex, Basagran, Blazer, bromoxynil + Atrazine, Betamix Progress, Conclude, Contour, CropStar, Cyclone, Dash HC, Diquat, Far-Go EC, Freedom, Goal, Gramoxone Extra, Herbicide 273, Hyvar, Kerb, Liberty, Liberty AZT, Lasso, Lorox DF, Motive, Poast, Pramitol, Puma, Pursuit, Quest, Raptor, Reflex, Stampede 80EDF, Stinger, Storm, Thistrol, Tornado, Velpar

**Do not store below 20 F**

Fusilade DX, Hoelon, Plateau, Ramrod, Ramrod + Atrazine, Ro-Neet, Weedar 64

**Do not store below 15 F**

Laddok S-12

**Do not store below 10 F**

Accord, Amitrole T, Arsenal, Cheyenne, Curtail/M, Crossbow, Dakota, Fusion, Rodeo, Roundup, Tiller.

**Do not store below 3 F**

Bronate, bromoxynil, Bullet, Micro-Tech.

**A17. HAND-HELD SPRAYERS:**

Hand-held sprayers are often used for spot treating patches of weeds or for treating small areas such as lawns. Spray coverage should be uniform and the leaves of the target plants should be wet but the amount of spray solution applied should be limited so that run-off does not occur. Hand-held sprayers should be calibrated by 1) spraying a known area using water and a standard and reproducible procedure, 2) measuring the amount of water applied, and 3) calculating gallons per acre (gpa). For example, 0.75 gallon on 500 sq ft is the same as 65 gallons per acre:

$$43,560 \text{ sq ft per acre} / 500 \text{ sq ft} \times 0.75 \text{ gallon} = 65 \text{ gpa.}$$

The desired rate in lb/A or pt/A can be used to calculate the amount of herbicide to add to the spray solution.

If 3 pt/A is desired:

$$3 \text{ pt/A} / 65 \text{ gpa} = 0.046 \text{ pt} \text{ or } 0.73 \text{ fl oz} \text{ or } 1.5 \text{ tablespoons/gal of spray solution (16 fl oz} = 1 \text{ pt, 2 tablespoons} = 1 \text{ fl oz).}$$

When calibration of a hand-held sprayer is not possible and the herbicide being used is safe to the environment and non-target plants, a volume of 50 to 70 gpa can be assumed. However, the actual volume applied can vary considerably with the type of sprayer, spray pressure, and technique of the applicator so calibration is strongly encouraged.

Some herbicide labels specify a percent solution for use in hand-held sprayers. The following chart provides mixing instructions to obtain solutions of varying percent concentrations on a volume/volume basis:

Desired solution volume	Concentration of herbicide, %				
	0.5	1.0	1.5	2.0	5.0
ga	----- Amount of herbicide to add, fl oz -----				
1	0.6	1.3	1.9	2.6	6.4
2	1.3	2.6	3.8	5.1	12.8
5	3.2	6.4	9.6	12.8	32.0
10	6.4	12.8	19.2	25.6	64.0
100	64.0	128.0	192.0	256.0	640.0

1 pt = 16 fl oz                      1 Tbsp = 3 tsp  
 1 Tbsp = 15 ml                    16 Tbsp = 1 cup  
 1 fl oz = 30 mls                    1 fl oz = 2 Tbsp

## Small Grains - Spring, Durum and Winter Wheat, Barley and Oat

### HARROWING FOR WEED CONTROL:

**Harrowing** a few days after a spring sown crop has sprouted but before emergence is effective in reducing stands of foxtails, wild oat and other weeds. The weeds must be emerging. Since foxtails are shallow rooted, set the teeth back on the harrow to minimize crop injury. Also, emerged small grains can be harrowed after they have 2 or 3 leaves but before tillering. Harrowing should be performed when a dry soil surface exists. Wheat can be harrowed one to three times but barley only once. Oat normally is not harrowed because risk of injury is greater than to wheat or barley.

### HERBICIDE USE IN SMALL GRAINS:

**B1.** Weed control in small grains generally is required to achieve a profitable yield. Broadleaf weeds, foxtails (pigeongrass), and wild oat infest small grains statewide. Applicable cultural control techniques plus use of herbicides or mixtures may be required to control all weeds. Normal height wheat varieties, rye, and winter wheat are more competitive than semi-dwarf wheat. Herbicides generally are more effective in more competitive crops. Small grains underseeded to sweetclover, alfalfa or other legumes should not be treated with an SU or growth regulator herbicide at rates required to control most broadleaf weeds because serious injury or death of the legumes may result. However, bromoxynil is registered for use on small grain/legume mixtures even though some legume injury may occur.

**B2.** Small grains are susceptible to 2,4-D during the seedling stage but can be treated safely with MCPA from emergence until prior to the boot stage. Do not treat small grains in the boot stage. Wheat and barley, when treated from 5-leaf until prior to the boot stage, are more tolerant than oat to 2,4-D. Wheat and barley varieties differ little in tolerance to MCPA and 2,4-D. Oat is more tolerant to MCPA than to 2,4-D, but injury to oat is possible with either chemical at any growth stage. Use 2,4-D on oat only for such hard-to-kill weeds as Russian thistle, Kochia, common ragweed, and redroot pigweed and when the crop is only in the 3- to 4-leaf stage. While some injury to oat can be expected, the better control of these weeds with 2,4-D usually will compensate for any yield loss caused by oat injury. Several brands of 2,4-D are available with some differences on application information; for example, Hi-Dep allows use at spray volumes as low as 1 gpa by ground or 0.5 gpa by air.

**B3. Achieve 40DG** (tralkoxydim) at 7 oz WDG/A controls green and yellow foxtail, wild and volunteer tame oat, Persian darnel, and annual ryegrass in wheat, durum and barley from 2-leaf to boot stage. Apply Achieve to 1- to 5-leaf foxtails, 1- to 4-leaf Persian darnel, and 1- to 6-leaf wild oat. Small grains and forage grasses have good tolerance to Achieve. Grass weeds cease growth soon after application but complete death may take up to 28 days. Grass weeds should be actively growing at application. Grass weed control may be poor and retiling may occur if plants are stressed at application.

Apply Achieve at 10 to 15 gpa by ground or 3 to 5 gpa by air. Use of higher water volumes than listed may result in reduced

grass weed control. Achieve is packaged with Supercharge adjuvant and should be added at 0.5% v/v. One box of Achieve (herbicide + adjuvant) will treat 40 acres at 7 oz DG/A. Always add AMS at 7 to 15 lb/100 gallon water to reduce antagonism from water sources with high bicarbonate levels (> 400 ppm bicarbonate ions), or broadleaf herbicide tank-mixture, or to increase control of stressed weeds. Achieve can be tank-mixed with MCPA ester, bromoxynil, bromoxynil + MCPA (maximum of 1 pt/A), 2,4-D ester, Curtail M (maximum of 2 pt/A), Harmony GT, and Starane. Tank-mixing other herbicides, especially Banvel/Clarity or SU herbicides will result in reduced grass weed control. If other herbicides are used, apply Achieve 5 or more days before the broadleaf herbicide.

**B4. Aim** (carfentrazone) At 0.33 to 0.67 oz 75DF/A applied POST controls most broadleaf weeds including mustards, nightshade, pigweed, lambsquarters, and may control or suppress Kochia (including ALS resistant types) and wild buckwheat in wheat. Add NIS at 0.25% v/v. Aim may be tank-mixed with most broadleaf herbicides registered in wheat. Aim may be tank-mixed only with Assert POST grass herbicide. Do not tank-mix Aim with 2,4-D ester or MCPA ester. Aim is a contact herbicide, requires application to small weeds, and may produce speckling and spotting on leaves receiving spray. Symptoms should soon disappear after new growth appears. Degree of speckling is determined by temperature, amount of leaf foliage receiving spray, and adjuvants used with tank-mixes.

**B5. Ally** (metsulfuron) at 0.1 oz 75DF/A provides POST control of broadleaf weeds in wheat and barley and should be applied with another broadleaf herbicide to prevent resistant weeds. Burndown or speed at which weeds are killed is faster with Ally than other SU herbicides. Ally can be mixed with MCPA, 2,4-D, bromoxynil, bromoxynil + MCPA, Banvel/Clarity, and Starane. Ally should be applied with a NIS at 0.125% v/v depending on the tank-mix herbicide and rate. Tank-mixing Ally with organophosphate insecticides increases crop injury potential. Do not apply Ally to soils with a pH greater than 7.9. Ally spray drift or sprayer contamination causes severe injury to most broadleaf crops. Thorough cleaning of a sprayer is required to prevent contamination of subsequent sprays and injury to susceptible crops. See sprayer cleanout section. Ally may persist in the soil for 3 years or more. Refer to the herbicide residue section on Ally carryover and recropping restrictions.

**B6. Amber** (triasulfuron) at 0.28 to 0.35 oz 75DF/A applied POST controls several broadleaf weeds and provides partial control of Canada thistle, cheat and downy brome in wheat and barley. Burndown or speed at which weeds are killed is slower for Amber than other SU herbicides. Apply 2,4-D in combination with Amber to improve Canada thistle control. Amber must be applied as a tank mixture with another broadleaf herbicide of different mode of action to prevent resistant weeds. Amber cannot be applied to fallow cropland in North Dakota where soil pH is 7.5 or greater. Do not apply Amber or other similar mode of action herbicides within a 12 month period after application. Allow 15 months if soil pH is greater than 7.5. Amber can be mixed with MCPA, 2,4-D, Assert, bromoxynil, Bronate, Curtail, Banvel/Clarity, Fallow Master, Gramoxone Extra, or Hoelon. Add a NIS at 0.12 to 0.25% v/v to Amber depending on the tank-mix herbicide and rate. Tank-mixing Amber with organophosphate (OP) insecticides increases potential for crop injury, but Amber can be tank-mixed with all OP insecticides except malathion. Amber spray drift or sprayer contamination causes severe injury to most broadleaf crops. Thorough cleaning of a sprayer is required to prevent contamination of subsequent sprays and injury to susceptible crops. See sprayer cleanout section. Amber may persist in the soil for 4 years or more. Consult label or herbicide carryover/residue section for rotational crop restrictions.

**B7. Assert** (imazamethabenz) at 1 to 1.5 pt/A provides POST wild mustard and wild oat control in wheat and barley. Assert should be applied to wild oat in the 1- to 4-leaf stage when wheat and barley are in the 2-leaf to jointing stage of growth. Assert also gives good mustard control and suppresses wild buckwheat that have 3 leaves or fewer. Assert has provided more consistent wild oat control with environmental stress than other POST wild oat herbicides in wheat and barley. Apply with a methylated seed oil adjuvant for greater and more consistent weed control. Refer to herbicide residue section for information on rotational crop restrictions. Assert can be tank-mixed with Ally, Amber, Canvas, Curtail M, MCPA or 2,4-D ester, bromoxynil + MCPA, Peak, Harmony Extra, or Express.

Spray solution incompatibility (thickening) may develop if Assert is tank-mixed with Banvel/Clarity or amine formulations of 2,4-D or MCPA. Thickening may result if spray solution pH is increased. Using hard water, water with high pH, or additives that increase spray solution pH can cause the spray solution to thicken. To reverse thickening, add an acid, preferably muriatic acid to lower water pH. Muriatic acid is available at most agricultural outlets and comes in different concentrations (10% HCl to 100% HCl). Regardless of the concentration add only enough to change the solution to a liquid state (less than 1 gal/100 gal water if using 10% HCl concentration).

**B8. Avenge** (difenzoquat) is applied at 2.5 to 4 pt/A for control of wild oat at the 3- to 5-leaf stage. Avenge is cleared for use on varieties of the following crops:

**Barley:** All varieties can be treated.

**Durum wheat:** All varieties can be treated except:

Vic, Fjord, Edmore, Lakota, Renville and Wascana.

**Winter wheat:** All varieties can be treated.

**Hard Red Spring Wheat: 2.5 to 4 pt/A can be used on:**

Amidon, Apex, Buckshot, Butte, Butte 86, Columbus, Coteau, Era, Erik, Fjeld, Fortuna, Glenlea, Glenman, HY320, Katepwa, Leader, Leif, Marshall, Minnpro, Newana, Norak, Norm, Olaf, Oslo, 2369, Pondera, ProBrand 711, Pro-Brand 715, Prodax, Rambo, Selkirk, Sharp, Solar, Sonya, Stoa, Success, Telemark, Vance, and Wheaton.

**2.5 to 3 pt/A can be used on:**

2375, AC Domain, AC Barrie, AC Majestic, Anvil, Bacup, Ernest, Forge, Hamer, Hi-Line, HJ 98, Ingot, Ivan, Kulm, Lars, McKenzie, McNeal, Norlander, Oxen, Russ, Sharpshooter.

**Hard Red Spring Wheat varieties injured by Avenge:**

Research is conducted each year to determine tolerance of new and experimental HRS wheat varieties to Avenge. Even though research may show tolerance of a non-labeled variety to Avenge, use Avenge only on wheat varieties listed on the label. Consult the Avenge label for a complete listing of varietal restrictions.

Wild oat is more susceptible to Avenge at the 5-leaf than the 3-leaf stage of growth and control is improved by good crop competition. High rates should be used on high populations of 3-leaf wild oat. Wheat injury may occur at temperatures above 80 F. Avenge may be mixed with bromoxynil, bromoxynil + MCPA, MCPA, 2,4-D, Ally, Harmony Extra, Express, or Curtail, for broadleaf weed control without loss of wild oat control.

**B9. Banvel/Clarity** (dicamba) at 0.125 to 0.25 pt/A Banvel/ Clarity controls kochia, wild buckwheat, smartweed and certain other broadleaf weeds in wheat, barley and oat. Banvel/Clarity can be applied alone but usually is applied with other herbicides such as MCPA, 2,4-D, and SU herbicides to increase control of wild mustard and other annual and perennial broadleaf weeds. Oat is more tolerant than wheat to Clarity. Both crops must be treated during the 2-through 4-leaf stage. Barley can be treated during the 2- through 3-leaf stage but barley tolerance is marginal. Banvel/Clarity can be applied with 2,4-D, MCPA, Ally, Harmony Extra, Express or bromoxynil to wheat. Allow 45 days/pt of Banvel/Clarity excluding days when ground is frozen for degradation.

**B10. Bromoxynil** controls kochia, wild buckwheat, fumitory and most annual broadleaf weeds in wheat, barley and oat from crop emergence to early boot. Trade names of some bromoxynil products available are **Buctril, Broclean, and Moxy**. For broader spectrum weed control, bromoxynil plus MCPA ester should be applied from the 3-leaf to early boot stage. Bromoxynil can be tank-mixed with many herbicides labeled POST in small grains. See label.

**Bromoxynil + MCPA** (ester) at 0.75 to 2 pt/A gives excellent control of volunteer sunflower. Trade names of some bromoxynil + MCPA products available are **Bison, Bromac, Bronate**.

**B11. Canvas 75DF** (metsulfuron + thifensulfuron + tribenuron) at 5 to 10 A/pack provides POST control of broadleaf weeds in wheat and barley and should be applied with another broadleaf herbicide to prevent weed resistance. Burndown or speed at which weeds are killed often is faster with Canvas than with other SU herbicides. Apply with NIS at 0.125% v/v depending on the tank-mix herbicide and rate. See sections on Ally and Harmony Extra for additional information.

**B12. Cheyenne** (fenoxaprop-P plus MCPA plus Harmony Extra (thifensulfuron plus tribenuron)) at 40 acres/case controls green foxtail, foxtail millets, barnyardgrass, proso millet, volunteer corn, and wild oat and provides suppression of yellow foxtail. Cheyenne also controls several broadleaf weeds including, kochia, Russian thistle, common lambsquarters, wild mustard, and redroot pigweed. Cheyenne is sold as a twin pack, one container of Cheyenne and one container of X-tra herbicide. One box of Cheyenne contains two 20 acre units. Cheyenne herbicide must always be tank-mixed and applied with the X-tra herbicide to ensure crop safety and control of weeds listed on label.

Apply Cheyenne to spring wheat from the 3-leaf stage to the end of tillering (6-leaf). Winter wheat should have a minimum of 3 tillers before application. **Do not** spray spring or winter wheat after jointing begins. Cheyenne will control wild oat in the 1- to 4-leaf stage of growth and green foxtail in the 2-leaf to 2-tiller stage. Annual broadleaf weeds should be beyond the cotyledon stage but less than 4 inches tall or in diameter. Cheyenne should be applied to vigorous growing weeds within the proper growth stage. Low soil moisture, low humidity, and high temperatures may interact to reduce wild oat control. Green foxtail is controlled over a wide range of soil moisture conditions but stress from severe drought may reduce weed control.

Cheyenne cannot be applied to durum wheat, barley, tame oat, or rye. Cheyenne can be tank-mixed with bromoxynil, Stinger, or Tordon for additional control of wild buckwheat. See Cheyenne label for tank-mix rates. **Do not** tank-mix Cheyenne with any other herbicides, surfactants or liquid fertilizers unless recommended on the Cheyenne label. Drift of Cheyenne may injure susceptible plants. Follow sprayer cleanout instructions on the label to avoid subsequent injury to crops other than wheat following application.

**B13. Curtail** (clopyralid plus 2,4-D) at 2 pt/A provides control of Canada thistle and annual broadleaf weeds in barley, durum, and hard red spring wheat. Canada thistle is most susceptible at rosette to early bolting stages. Curtail will not provide long-term control of Canada thistle with one application but will reduce populations with repeated use. Curtail contains 2,4-D and should be applied to wheat and barley from 4-leaf through jointing only. Do not apply Curtail to oat. See herbicide residue section for recropping restrictions.

**B14. Dakota** (fenoxaprop-P plus MCPA) at 16 to 21.3 fl oz/A controls green foxtail, foxtail millets, wild mustard and other broadleaf weeds in winter and spring wheat. Dakota can be tank-mixed with several broadleaf herbicides, however antagonism of foxtail may occur. Dakota at 16 oz/A can be tank-mixed with Banvel, Clarity, Starane, or Tordon. Dakota at the 21.3 fl oz/A rate can be tank-mixed with Ally, Amber, bromoxynil, Express, Harmony GT, Harmony Extra, Peak, Stinger, or Starane. Dakota should be applied to spring wheat from the 3-leaf stage to the end of tillering (up to 6-leaf stage). Winter wheat should have a minimum of 3 tillers before application. Do not apply to winter or spring wheat after jointing begins. Dakota will control grasses in the 2-leaf to 2-tiller stage and annual broadleaf weeds up to 4 inches tall. Poor green foxtail control may occur if plants are drought stressed. Dakota cannot be applied to durum, barley, tame oat, or rye and cannot be applied with other herbicides or other additives except as indicated on the label. Drift of Dakota may injure susceptible plants and trees. Dakota can be applied by air.

**B15. Discover** (clodinafop) at 3.2 fl oz/A plus DSV adjuvant at 10.2 fl oz/A controls wild and volunteer oat, barnyardgrass, canarygrass, and volunteer corn and at 4 fl oz/A plus DSV adjuvant at 12.8 fl oz/A controls green, yellow, and giant foxtail, Persian darnel and annual ryegrass in wheat, including durum. Discover and DSV adjuvant are packaged in one box in separate containers. Add both herbicide and adjuvant in spray tank and apply at 40 (3.2 fl oz/A) or 50 (4 fl oz/A) acres per box. Wheat has excellent tolerance to Discover. Discover does not contain or require a safener for wheat safety. Apply Discover with at least 10 gpa by ground or 5 gpa by air. Apply Discover to wheat from 2-leaf to emergence of 4<sup>th</sup> tiller. Discover will control foxtail in the 1- to 5-leaf stage and wild oat in the 1- to 6-leaf stage. Grasses should be actively growing but Discover control grass weeds over wide environmental conditions. Discover can be applied with many herbicides, insecticides, and fungicides labeled in wheat. Discover is antagonized much less than other grass herbicides labeled in wheat when tank-mixed with other pesticides. See label for approved tank-mix options.

**B16. Everest** (flucarbazone) at 0.4 oz WDG/A plus NIS at 0.25% v/v controls green foxtail and at 0.6 oz WDG/A plus NIS at 0.25% NIS controls wild oat and suppresses yellow foxtail in wheat, including durum. Wheat has excellent tolerance to Everest. Everest does not contain or require a safener for wheat safety. Everest may control a few broadleaf weeds like mustard species, annual smartweed species and may suppress redroot pigweed. Uptake is primarily through leaves may be absorbed by roots. Everest may leave a residue and injure certain crops planted the next year. See label for crop rotation restrictions. Apply Everest with at least 10 gpa by ground or 5 gpa by air. Apply Everest to 1- to 6-leaf (total leaves including 2 tillers) wheat and to grass weeds with no more than 4 leaves. Grasses should be actively growing. Everest can be applied 2,4-D amine or ester up to 1 pt/A, Ally at 0.1 oz/A plus 2,4-D ester or amine at up to 1 pt/A,

bromoxynil up to 1 pt/A or Bronate up to 2 pt/A. Do not apply Everest with MCPA or Banvel/Clarity. See label for approved tank-mix options.

**B17. Express** (tribenuron) at 0.17 to 0.33 oz DF/A applied POST with 2,4-D or 2,4-D + Banvel/Clarity controls several broadleaf weeds and provides season-long control of Canada thistle in wheat and barley. Burndown or speed at which weeds are killed is among the fastest with Express as compared to other SU herbicides. Express should be applied with another broadleaf herbicide to prevent weed resistance. Express can be mixed with MCPA, 2,4-D, bromoxynil, bromoxynil + MCPA, Curtail, Banvel/Clarity, Starane, Avenge or Assert. Do not tank mix with Hoelon as grass control may be reduced. Apply with NIS at 0.125% v/v depending on broadleaf herbicide and rate. Tank-mixing Express with organophosphate insecticides increases potential for crop injury. Express spray drift or sprayer contamination causes severe injury to most broadleaf crops. Thorough cleaning of a sprayer is required to prevent contamination of subsequent sprays and injury to susceptible crops. See sprayer cleanout section.

**B18. Far-Go** (trifluralin) at 1 to 1.5 qt/A or 10 to 15 lb 10G applied pre-plant or PRE incorporated (depending on formulation) controls wild oat control in wheat, durum, barley, lentil or pea. See tables for specific rates. Far-Go EC is volatile and must be incorporated immediately after application. The liquid formulation has given more consistent wild oat control with less crop thinning than the granular formulation when spring applied. See section on fall application. Far-Go at 1 qt/A also may be applied after seeding in combination with trifluralin at 1 to 1.5 pt/A for both wild oat and foxtail control in wheat, durum and barley.

**B19. Far-Go** (trifluralin) will control wild oat with a shallow incorporation. Two spike tooth harrowings at right angles will incorporate Far-Go if the soil is loose and free of trash. Experiments at NDSU have shown that deeper incorporation enhances wild oat control from Far-Go. Far-Go applied after seeding (PoPI) should be incorporated **less deeply** than the placement of the crop seed. Far-Go applied before seeding should be incorporated with a field cultivator plus harrow operated 3 to 4 inches deep. Delay HRSW or durum seeding for 3 days. Far-Go applied before seeding may injure certain wheat varieties. Spring PPI Far-Go has greater potential for injury to wheat than application at other times. Refer to label for on varieties that may be susceptible to PPI Far-Go.

**Buckle**, a prepackage mixture of Far-Go and trifluralin, can be applied as a fall or spring applied treatment in barley and durum or as a spring applied treatment in durum or in HRS wheat in Adams, Billings, Bottineau, Bowman, Burleigh, Burke, Divide, Dunn, Emmons, Grant, Golden Valley, Hettinger, Kidder, McHenry, McKenzie, McLean, Mercer, Morton, Oliver, Renville, Sheridan, Sioux, Slope, Stark, Ward, and Williams counties in North Dakota. Buckle may be applied for control of foxtail species and wild oat. Apply and incorporate Buckle at 10 lb/A according to directions on the Buckle label.

**HRS wheat varieties susceptible to Buckle include:**  
Alex, Amidon, Ellar, Era, Erik, Lew, Newana.

Seed semi-dwarf varieties no more than 1.5 to 2 inches deep to minimize stress and allow for uniform germination. Stand reduction may occur on hilltops when applied to fields with rolling terrain. Seed treatments are recommended to reduce potential stress to germinating seedlings from disease or insects.

**B20. Finesse** (chlorsulfuron + metsulfuron) PRE to HRSW only or POST at 2/10 to 4/10 oz 75DF/A with 2,4-D or 2,4-D + Banvel SGF/Clarity will control most annual weeds and suppress Canada thistle, and at 3/10 to 4/10 oz 75DF/A will suppress and/or control green foxtails in spring wheat (including durum), and barley. Follow label for application window for Finesse and tank-mix herbicides. Apply with NIS at 0.125% v/v depending on the tank-mix herbicide and rate. Finesse can be applied only once every 24 months in North Dakota. Green foxtail has developed resistance to trifluralin (Treflan), Sonalan, and Prowl in many areas of the state where Finesse can be used. Finesse controls weeds through a different mode of action than trifluralin, Sonalan, and Prowl, so Finesse with herbicides of different modes of action in a planned foxtail resistance program may be useful (See table in herbicide resistance section). Burndown or speed at which weeds are killed is relatively slow as compared with other SU herbicides.

**B21. Harmony Extra** (thifensulfuron plus tribenuron) at 3/10 to 6/10 oz 75DF/A applied POST with 2,4-D or 2,4-D + Banvel/Clarity controls annual broadleaf weeds and provides season-long control of Canada thistle in wheat, barley, and oat. Harmony Extra should be applied with another broadleaf herbicide to prevent weed resistance. Burndown or speed at which weeds are killed is relatively average with Harmony Extra as compared with other SU herbicides. Harmony Extra can be tank-mixed with 2,4-D, MCPA, bromoxynil, bromoxynil + MCPA, Curtail, Banvel/Clarity, Starane, Avenge or Assert. Do not tank-mix with Hoelon as grass control may be reduced. Add NIS at 0.125% v/v depending on the tank-mix herbicide and rate. Tank-mixing Harmony Extra with organophosphate insecticides increases potential for crop injury. Harmony Extra spray drift or sprayer contamination causes severe injury to most broadleaf crops. Thorough sprayer tank cleaning is required to prevent contamination of subsequent sprays and injury to susceptible crops. See sprayer cleanout section.

**B22. Harmony GT** (thifensulfuron) at 0.3 to 0.6 oz DF/A applied POST with 2,4-D or 2,4-D + Banvel/Clarity controls several broadleaf weeds and suppresses Canada thistle in wheat and barley. Express should be applied with another broadleaf herbicide to prevent weed resistance. Express can be mixed with MCPA, 2,4-D, Achieve, Assert, Avenge, bromoxynil, bromoxynil + MCPA, Banvel/Clarity, Curtail, Hoelon, Hoelon + bromoxynil, and Starane. Apply with NIS at 0.125% v/v depending on broadleaf herbicide and rate. Tank-mixing Express with organophosphate insecticides increases potential for crop injury. Express spray drift or sprayer contamination causes severe injury to some broadleaf crops. Thorough cleaning of a sprayer is required to prevent contamination of subsequent sprays and injury to susceptible crops. See sprayer cleanout section.

**B23. Hoelon** (diclofop) at 2 to 2.67 pt/A applied POST in wheat, durum wheat, barley controls 1- to 4 leaf foxtail and 1- to 4-leaf wild oat. Apply with oil additive at 1 to 2 pt/A to provide more consistent control, especially under moisture stress. Do not use oil additive with Hoelon on barley. Hoelon should not be mixed with any broadleaf herbicide other than bromoxynil, bromoxynil plus MCPA ester at 1.5 fl oz, or Harmony GT in small grains.

**B24. Maverick** (sulfosulfuron) at 0.67 oz DF/A applied fall POST control cheat, downy brome, and Japanese brome at 2- to 3-leaf stage in winter wheat, or applied spring POST suppresses annual bromes less than 5-tiller stage. Maverick at 0.67 oz DF/A applied spring POST in spring wheat control wild oat in the 1- to

4-leaf stage. Maverick applied spring POST may also control cleavers, false chamomile, flaxweed, annual smartweed species, mustard species, quackgrass, and sunflower. Apply Maverick with NIS at 0.5% v/v. Maverick may be applied with 2,4-D ester, bromoxynil, bromoxynil + MCPA, Cheyenne, Curtail, Dakota, MCPA ester, Stinger, Tiller and most SU broadleaf herbicides labeled in wheat. See label for approved tank-mix partners. Maverick should be applied with another broadleaf herbicide to prevent weed resistance. Maverick will not control ALS resistant weeds. Tank-mixing Maverick with organophosphate insecticides increases potential for crop injury. Maverick spray drift or sprayer contamination causes severe injury to most broadleaf crops. Thorough cleaning of a sprayer is required to prevent contamination of subsequent sprays and injury to susceptible crops. See sprayer cleanout section. Maverick may persist in the soil for 3 years or more. Refer to Maverick label for carryover and re-cropping restrictions.

**B25. Peak** (prosulfuron) at 0.25 to 0.5 oz 57DF/A provides POST control of broadleaf weeds in wheat, barley, oat, rye, triticale, proso millet, and sorghum and should be applied with another broadleaf herbicide to prevent weed resistance. Burndown or speed at which weeds are killed is relatively average with Peak as compared with other SU herbicides. Peak can be mixed with MCPA, 2,4-D, bromoxynil, bromoxynil + MCPA (Bronate, others) and Banvel/Clarity. Peak should be applied with a NIS. Do not apply a foliar or soil organophosphate insecticide within 15 days before or 10 days after Peak. Peak may be applied with bromoxynil, bromoxynil + MCPA, and MCPA from 3-leaf to 2nd node. Corn is tolerant to Peak which is different than other long residue SU herbicides labeled in small grains (Finesse, Ally, Amber). Peak is labeled in corn outside of North Dakota in the premix Exceed. Do not rotate to crops other than field corn, grain sorghum, wheat, barley, oat, rye, proso millet, or triticale the year following Peak application. Peak spray drift or sprayer contamination causes severe injury to most broadleaf crops. Thorough cleaning of a sprayer is required to prevent contamination of subsequent sprays and injury to susceptible crops. See sprayer cleanout section. Peak may persist in the soil for 3 years or more. Refer to the most current Peak label for carryover and re-cropping restrictions.

**B26. Paramount** (quinclorac) at 0.33 lb 75DF/A with only MSO type adjuvant postharvest to any crop on land to be planted the following year to wheat, including durum for control of broadleaf weeds including field bindweed. Wheat and sorghum have a 0 hour plant back restriction. An in-crop registration of Paramount may be available in 2001 for use in wheat, including durum. The registration will allow Paramount use at 0.17 to 0.33 lb DF/A for control of green foxtail, yellow foxtail, barnyardgrass, cleavers/ bedstraw, and volunteer flax, and possibly small kochia and Russian thistle. Refer to label for rate for each weed. Paramount will control or suppress field bindweed. Apply Paramount with another broadleaf herbicides, such as 2,4-D, MCPA, or ALS herbicides to broaden spectrum of weeds controlled. Refer to label for application and use directions.

**B27. Puma** (fenoxaprop-P + safener) at 0.33 pt/A controls green foxtail, foxtail millets, and volunteer corn, at 0.4 pt/A controls yellow foxtail and proso millet, and at 0.67 pt/A controls barnyardgrass and wild oat in wheat (including durum), and barley. Puma contains fenoxaprop-P + safener. Puma does not contain phenoxy type herbicides for broadleaf weed control. Apply Puma with at least 10 gpa by ground or 5 gpa by air. Apply Puma to wheat from 2- to 6-leaf stage. Puma will control grass weeds in the 2-leaf to 2-tiller stage and young, vigorously growing weeds are most susceptible. Low humidity, and high temperature may reduce wild oat control. Foxtail can be controlled over a wide range of soil moisture conditions but severe drought stress may reduce weed



control. Puma can be applied with Furadan or Sevin XLR Plus, Mancozeb, Tilt, Benlate, Peak, Curtail M, Tordon, Stinger, Starane, or MCPA ester. Other broadleaf herbicides listed for tank-mix applications with Puma may antagonize wild oat and yellow foxtail control. For green foxtail and foxtail millet control, apply Puma at 0.33 pt/A with Ally, Amber, bromoxynil, Bronate, Clarity, Curtail M, Express, Harmony Extra, Harmony GT, MCPA ester, Starane, Stinger, or Tordon. For yellow foxtail and wild proso millet, apply Puma at 0.4 pt/A with Banvel/Clarity, Curtail M, Harmony Extra, Harmony GT, MCPA ester, Peak, Starane, Stinger, or Tordon. For barnyardgrass and wild oat control apply Puma at 0.66 pt/A with bromoxynil, Bronate, MCPA ester, Stinger, and Tordon. Do not apply Puma to corn, tame oat, or rye. Do not apply Puma within 60 days of wheat harvest or 57 days of barley harvest.

**B28. Rave** (dicamba-Na + triasulfuron) at 2 oz WDG/A in barley and 4 oz WDG/A in wheat applied POST controls several broadleaf weeds and provides partial control of Canada thistle. Rave can be applied with bromoxynil, bromoxynil + MCPA, MCPA, 2,4-D, or Tilt. Apply with a NIS at 0.125 to 0.25% v/v. Tank-mixing Amber with organophosphate (OP) insecticides increases potential for crop injury. Rave spray drift or sprayer contamination causes severe injury to most broadleaf crops. Thorough cleaning of a sprayer is required to prevent contamination of subsequent sprays and injury to susceptible crops. See sprayer cleanout section. Rave may persist in the soil for 4 years or more. Consult label or herbicide carryover/residue section for rotational crop restrictions.

**B29. Stampede 80EDF** (propanil) at 1.25 to 1.4 lb 80EDF + MCPA iso-octyl ester at 0.5 pt/A controls wild buckwheat, redroot pigweed and other annual broadleaf weeds in hard red spring wheat, durum wheat, barley and oat. All ingredients must be applied together. Petroleum oil at 1 pt/A is required with Stampede 80EDF for optimum weed control. The propanil component controls foxtails. See tables for crop and weed stages. Stampede + MCPA ester + bromoxynil or bromoxynil + MCPA ester at 0.25 to 0.38 pt/A can be tank-mixed to provide greater kochia, Russian thistle, and annual smartweed control. Stampede requires good spray coverage because it is not translocated. Apply Stampede when temperature is between 65 and 85 F and plants are actively growing with adequate soil moisture within 2 inches of the surface. Stampede should not be applied to wheat treated with carbamate or organophosphate insecticides or wheat grown on soil treated the previous year with organophosphate insecticides. Stampede can also be tank-mixed with mancozeb fungicide. The recommended mixing order of products is: 1) add Stampede 80EDF, 2) add Mancozeb fungicide (if desired), 3) add MCPA ester, and 4) add oil additive.

**B30. Starane** (fluroxypyr) at 0.5 to 0.67 pt/A controls kochia (including ALS and dicamba resistant kochia), cleavers, cocklebur, ragweed, sunflower, Venice mallow, and volunteer flax in wheat, barley and oat. Starane is very effective on kochia and has benefits over Banvel/Clarity by having excellent wheat, barley, and oat safety, a much wider application window in small grains that extends to flag leaf emergence, controls larger kochia at in-crop use rates, and does not antagonize POST grass herbicides like Achieve, Assert, Avenge, Dakota, Puma, and Tiller. Starane at 0.5 pt/A control kochia less than 4 inches tall and 0.67 pt/A controls kochia at least 8 inches tall while bromoxynil only control small kochia less than 1 to 2 inches. Starane may suppress field bindweed, mustard species, nightshade, and wild buckwheat. Starane is not intended to be

used alone. Apply Starane with 2,4-D or MCPA for more broad-spectrum broadleaf weed control. Starane will be labeled with most POST grass herbicides registered in wheat (except Cheyenne). Refer to label of tank-mix partner for tank-mix options. Commercial premix formulations of Starane + 2,4-D are available as Starane + Salvo at 1 to 1.33 pt/A, or Starane + MCPA as Starane + Sword at 1.125 to 1.5 pt/A.

Starane is a systemic herbicide with no soil residual or carryover. Only weeds emerged at time of application will be controlled. Dew at time application may decrease control. Starane is very safe on small grains. Apply to small weeds that are actively growing. Do not allow livestock to graze treated fields within 7 days of application. Allow a 40 day PHI. If replanting is required, only plant registered crops within 120 days after application. Refer to tables or labels for weeds controlled, application timing, and other application information and restrictions.

**B31. Tiller** (fenoxaprop-P plus 2,4-D plus MCPA) at 1 pt/A controls green foxtail, foxtail millets, volunteer corn, common lambsquarters and wild mustard. Tiller at 1.2 pt/A controls all weeds listed above plus yellow foxtail, volunteer and wild-proso millet. Tiller at 1.7 pt/A controls all weeds listed above plus wild oat, barnyardgrass and several broadleaf weeds. Tiller can be applied to winter and spring wheat when wheat begins to tiller (3- to 4-leaf stage) up to the 6-leaf stage. Winter wheat should have a minimum of three or more tillers before application. **Do not apply to wheat or barley after jointing begins.** Tiller controls actively growing grasses in the 2-leaf to 2-tiller stage and annual broadleaf weeds less than 4 inches tall. Conditions that may reduce wild oat control are low soil moisture, low humidity, and high temperature. Foxtail can be controlled over a wide range of soil moisture conditions but severe drought stress may result in reduced control. Tiller can be tank-mixed with Starane, Stinger and Tordon for control of weeds listed on the label. Other broadleaf herbicides listed for tank-mix applications with Tiller may antagonize wild oat and yellow foxtail control. For green foxtail and foxtail millet control, apply Tiller at 1 pint/A and Tiller can be tank-mixed with Banvel/Clarity, bromoxynil, MCPA ester, Starane, Stinger or Tordon; at 1.2 pints/A Tiller can be tank-mixed with Ally, Amber, Express, Harmony GT, Harmony Extra, and Starane. For control of yellow foxtail, wild and volunteer millets, apply Tiller at 1.2 pints/A and Tiller can be tank-mixed with Banvel/Clarity, MCPA ester, Peak, Starane, Stinger or Tordon.

For wild oat control apply Tiller at 1.7 pints/A and Tiller can be tank-mixed with bromoxynil, Stinger and Tordon. Tank-mixing Tiller with bromoxynil or any sulfonyleurea herbicide will result in reduced yellow foxtail control due to antagonism. Tiller cannot be applied to durum, tame oat, or rye and cannot be applied with other herbicides or additives except as indicated on the label. Tiller can be applied by air ONLY for foxtail control.

**B32. Tordon** (picloram) 1 to 1.5 fl oz/A + 0.5 to 0.75 pt 2,4-D or MCPA is labeled for broadleaf weed control in hard red spring wheat, barley and oat. Tordon may be applied during the 3- through 5-leaf stage of crop growth. **NOTE:** Picloram should be used only on land that will be planted the following year to grass, small grains, or flax. See herbicide residue section.

**B33. Trifluralin** at 1 pt/A of a 4 lb/gal concentrate or 5 lb/A 10G applied after spring seeding and harrow incorporated shallowly after seeding, is labeled for control of foxtails in wheat and barley. The lower rate is for use on coarse textured soils and the higher rate on fine textured soils. Incorporation should be by harrowing twice at right angles and the depth of incorporation of the herbicide must be above

the wheat seed. The wheat should be seeded 2 to 2.5 inches deep to permit incorporation above the seed. Some wheat varieties, especially semi-dwarfs, emerge poorly from deep seeding so seed should be placed no deeper than 2 to 2.5 inches. A heavy rain or irrigation immediately after trifluralin application has caused wheat injury on light and medium textured soils. Trifluralin applied in this manner does not control wild oat. (See wild oat section for discussion on trifluralin-triallate combination).

Trifluralin at 1 pt/A or 5 lb/A 10G may be fall applied for foxtail control on ground to be planted to wheat or barley the following spring. Some stand reduction may occur from fall applied trifluralin but generally no yield loss will occur. Trifluralin is available in both liquid and granular formulations. Granular formulations may be applied to standing stubble; liquid or granular formulations may be used when residue will not interfere with incorporation. Seed wheat or barley no more than 2 inches deep into a moist seedbed. Refer to the chemical fallow section for information on trifluralin applications in the fallow year for foxtail control in small grains the next year.

### SMALL GRAIN PREHARVEST

**B34. Small grain preharvest herbicides** can desiccate weeds and crop and provide perennial weed control. Expectations for preharvest weed control may exceed reality. It is difficult to kill or dry down a 3-foot weed in the same manner as a 3-inch weed. Lower portions of the weed may not be affected. Plant desiccation requires 7 to 10 days or more if wet and cool after treatment. All herbicides labeled for preharvest application are systemic and slow acting which requires a longer dry down period as compared to contact type herbicides like bromoxynil or Gramoxone Extra. The intent of a preharvest treatment should be to facilitate harvest and reduce harvest loss. Preharvest treatments do not decrease yield losses due to weed competition or prevent weed seed production. Herbicide drift from preharvest treatments can cause injury to crops nearby. Consider sensitive crops (sugarbeet, potatoes, etc.) and other plants (trees, gardens, etc.) in the general vicinity of the field receiving treatment. No herbicides are labeled as a harvest aid for use on oats. **Gramoxone Extra (paraquat) is NOT labeled as a harvest aid in small grains.**

#### B35. 2,4-D as a Harvest Aid

2,4-D at 1.5 to 3 pt/A is labeled as a harvest aid in spring wheat, durum, barley, and rye. Labels vary in crop use. Follow the label. Apply at the dough stage of spring wheat, barley or rye. Not all 2,4-D formulations are labeled for preharvest applications. Some 2,4-D labels only allow use on wheat, others allow use on wheat and barley and others allow use on wheat, barley and rye. Choose a brand that is labeled for use on the intended small grain crop. An ester formulation will give better control and quicker burndown than an amine formulation. If using an ester formulation, use a low volatile formulation to reduce vapor drift potential. If using an amine, at least 2 pt/A is needed for larger weeds. Do not expect good control on large pigweed or kochia or wild buckwheat. Large kochia and other weeds with large stems may not burn down and may stay green.

2,4-D can be tank mixed with glyphosate on spring wheat and durum for additional broadleaf control and grass control. Follow the Roundup label. The labels of most formulations of 2,4-D have restrictions of no dairy grazing allowed, a 7 day waiting period for meat animal grazing, and a 30 day waiting period prior to haying. Do not feed straw to livestock.

#### B36. Banvel/Clarity + 2,4-D as a Harvest Aid

Banvel/Clarity is labeled only in North Dakota as a preharvest application in wheat and durum applied alone or in a tank-mix combination with 2,4-D. Apply Banvel/Clarity at 0.5 pt/A + 2,4-D at 1 to 2 pt/A when wheat is in the hard dough stage and the green color is gone from the nodes of the stem. Banvel/Clarity will provide additional control of wild buckwheat, kochia, common lambsquarters, pigweeds, sunflower, and Russian thistle. A waiting period of 10 to 14 days is required before harvest. Do not feed treated straw to livestock. **Caution: Drift to broadleaf crops is especially hazardous at this time.**

#### B37. Ally + 2,4-D as a Harvest Aid

Ally is labeled as preharvest aid in wheat, durum and barley alone or with 2,4-D or on wheat and durum with 2,4-D and/or Clarity. Ally has a long residue so use only in a continuous wheat or wheat-fallow rotation. Must follow crop rotation restrictions. Apply Ally at 0.1 oz product/A + 2,4-D at 1.5 to 3 pt/A to wheat, durum, and barley in the dough stage and at least 10 days prior to harvest. Do not use if crop was treated previously with another SU herbicide. For wheat, Ally + 2,4-D can be tank-mixed with Clarity for faster dry down and for weed resistance management. Follow the label for crop rotation restrictions and refer to the 2,4-D and/or Clarity label for grazing restrictions.

#### B38. Glyphosate as a Harvest Aid

Glyphosate is labeled as a harvest aid only in spring wheat and durum - not barley or oats. Glyphosate at 0.5 to 2 pt/A of a 3 lb ae/gal concentrate controls annual grass, broadleaf weeds, and quackgrass and suppresses Canada thistle in hard red spring wheat and durum. Do NOT apply to barley. DO NOT apply to wheat grown for seed as a reduction in germination or vigor may occur. Glyphosate drift will injure or kill sensitive plants.

Glyphosate should be applied after the hard dough stage (30% or less grain moisture) of the wheat and at least 7 days prior to harvest by air or ground in 3 to 10 gpa spray volume. Add NIS at 0.5 to 1% except with Roundup Ultra/RT. See label for adjuvant use. Always add AMS at 8.5 to 17 lb/100 gallons of water. AMS increases control of annual and perennial weeds and especially control of weeds stressed by dry weather. AMS also eliminates antagonism from ions and carbonates in hard water. DO NOT use AMS in place of an NIS. Refer to label for addition of other adjuvants

Glyphosate can be tank mixed with 2,4-D for additional broadleaf control. A ND 2(ee) label interpretation has been granted allowing use of glyphosate at 0.75 to 2 pt/A + Clarity at 0.25 to 0.5 pt/A for a preharvest application to wheat and durum at the hard dough stage after green color is gone from stems. Allow a 14 day PHI. The tank-mix can be applied by ground or air.

#### B39. Landmaster BW as a Harvest Aid

Landmaster BW (glyphosate + 2,4-D isooctyl ester) applied at 3.38 pt/A (54 fl oz/A) to 5.25 pt/A controls annual grass and broadleaf weeds, quackgrass, and suppresses Canada thistle in hard red spring wheat and durum. **DO NOT apply to barley.** DO NOT apply more than 5.25 pt/A as a harvest aid. See paragraph above on glyphosate for application information.

Application should be made after the hard dough stage (30% or less grain moisture) of the wheat and at least 7 days prior to harvest. DO NOT apply to wheat grown for seed as a reduction in germination or vigor may occur. Be aware of the injury potential of glyphosate drift on sensitive plants. Do not feed or allow dairy or meat animals to forage on treated plants for 2 weeks after application. Do not feed treated straw.

## CORN

**C1.** A combination of cultural, mechanical and chemical methods is necessary for effective weed control in corn. Control early germinating weeds by cultivation before planting if conventional tillage is used. A rotary hoe can be used to control emerging weeds when the corn coleoptile is below the working depth of the rotary hoe or when corn is beyond the spike stage. Cultivate between the rows soon after weeds emerge.

### C2. Package Mixtures Available For Corn:

Trade Name	Common Name	Product/A
Accent Gold	nicosulfuron+rimsulfuron+clopyralid+flumetsulam	2.9 oz DF
Axiom	flufenacet + metribuzin	15 to 23 fl oz
Axiom AT	flufenacet+atrazn+metrbzn	2 to 3.75 lb
Basis	rimsulfuron + thifensulfurn	0.33 oz DF
Basis Gold	nicosulf+rimsulf + atrazine	14 oz DF
Bicep, Bicep II	atrazine + metolachlor	1.8 to 3 qt
Bicep Lite	atrazine + metolachlor	1.5 to 3.5 qt
Broadstrike+Dual	flumetsulam + metolachlor	1.75 to 2.75 pt
Bronco	alachlor + glyphosate	3 to 5 qt
Buctril + Atrazine Brozine, Moxy AT	atrazine + bromoxynil	1.5 to 3 pt
Bullet	atrazine +alachlor	2.5 to 4.5 qt
Celebrity Plus	nicosulfuron + dicamba	4.67 oz WDG
Curtail	clopyralid + 2,4-D	2 pt
Degree Xtra	atrazine + acetochlor	2.9 to 3.7 qt
Epic	flufenacet + isoxaflutole	8 to 20 oz DF
Extrazine II	atrazine + cyanazine	1.4 to 5.8 lb DF
FulTime	atrazine + acetochlor	2.5 to 3 qt
Distinct	dicamba + diflufenzopyr	4 to 6 oz WDG
DoublePlay	acetochlor + EPTC	4.5 to 8 pt
Guardzman	atrazine+dimethenamid	2.5 to 5 pt
Harness Xtra	atrazine + acetochlor	1.8 to 2.3 qt
Hornet	flumetsulam + clopyralid	1.6 to 4 oz
Laddok	atrazine + bentazon	2 to 3.5 pt
Lariat	atrazine +alachlor	2.5 to 4.5 qt
Liberty ATZ	atrazine + glufosinate	32 to 40 fl oz
Lightning (CL corn)	imazethapy + imazapyr	1.28 oz WDG
Marksman	atrazine + dicamba	3.5 pt
NorthStar	dicamba + primisulfuron	5 oz DF/A
Ramrod + Atrazine	atrazine + propachlor	3.5 to 5.5 qt
ReadyMaster	atrazine + glyphosate	1.5 to 2 qt
Shotgun	atrazine + 2,4-D acid	2 to 3 pt

**C3.** Wild-proso millet is a competitive annual weed in eastern North Dakota. Eradicane, Harness, Lasso or Surpass PPI at the maximum rate for the soil type will only suppress millet for 2 to 3 weeks. Dual and Frontier give poor control. For full season control, apply Balance PPI or PRE at maximum rate with Harness/Surpass, followed by Prowl + Bladex (corn up to 2-leaf stage). Accent at 0.67 oz DF/A with Scoil adjuvant has given excellent POST control of wild-proso millet.

**C4.** Accent (nicosulfuron) at 0.67 oz 75DF/A can be applied POST to corn up to 20 inches tall with 6 collars or less. Apply Accent to corn 20 to 36 inches tall (free standing) with drop nozzles. Do not apply to field corn taller than 36 inches or with 10 collars, whichever is most restrictive. When banding Accent over the row with a three nozzle-per-row-system, plug the center nozzle to reduce corn injury from Accent concentrating in the whorl of the corn plant.

Always add an oil adjuvant at 1.5 pt/A or NIS at 0.25% v/v. NDSU research has shown that adjuvant enhancement of Accent was greatest with Scoil (MSO type oil) or Quad 7 (basic blend), followed by petroleum oil, and least with NIS. 28% UAN at 1% v/v with NIS or petroleum oil increases weed control compared to Accent + NIS. Accent may be used POST to control green and yellow foxtail, fall panicum, barnyardgrass, field sandbur, woolly cupgrass, wild-proso millet, wild oat, quackgrass, pigweed species, smartweed, wild mustard, jimsonweed, and burcucumber. NDSU results show that Accent provides good control of ALS susceptible kochia and fair Russian thistle control with MSO type adjuvant. Poor yellow foxtail control may result if Accent is applied at reduced rates, if yellow foxtail is larger than recommended or growing in stress conditions.

NDSU research has shown Accent at 0.33 to 0.5 oz DF/A + Atrazine at 0.42 lb DF/A + Clarity at 4 fl oz/A + Scoil (MSO type adjuvant) or Quad 7 (basic blend) controls most annual grass and broadleaf weeds. Accent at 0.67 oz DF/A is required to control yellow foxtail, wild proso millet, volunteer cereals, field sandbur, and quackgrass. Atrazine at 0.42 lb DF/A will not carryover or interfere with rotation crops unless drought occurs the year of application. The Clarity label restricts using an oil additive with Clarity alone or in tank-mix combination. However, the low rate of Clarity in tank-mix helps ensure corn safety if applied early. The Celebrity (premix of Accent DF and Clarity WDG) label, does not prohibit using an oil additive. Scoil and Quad 7 are approved adjuvants on DuPont's 'Approved Adjuvant List'. Do not use additives which lower spray solution pH. Acid hydrolysis degradation of Accent occurs in low water pH. In contrast, Quad 7 increases spray solution pH, prevents acid hydrolysis, but more importantly, greatly increases the solubility of Accent resulting in greater weed control.

Accent can be tank-mixed with atrazine, bromoxynil, Buctril + Atrazine, Clarity, Harness, Hornet, Marksman, Prowl, Scorpion III, Surpass and many other herbicides. Refer to label for adjuvant selection when tank-mixing Accent with other herbicides. Oil additives can be substituted for NIS when tank-mixing Accent with bromoxynil (Buctril, others) or Buctril + Atrazine but may increase risk of crop injury. Oil adjuvants should always be used when tank-mixing Accent with atrazine. Follow label for mixing procedure with tank-mix partners.

Basagran and organophosphate insecticides, such as Lorsban, malathion, or parathion, should not be applied less than 7 days before or 3 days after Accent to reduce the risk of crop injury. Significant injury may result if Accent is applied to corn previously treated with Counter insecticide. Corn treated with other organophosphate insecticides, such as Lorsban, Dyfonate, and Thimet applied at planting or over-the-row at cultivation may result in temporary crop injury.

**C5. Accent Gold** (nicosulfuron + rimsulfuron + clopyralid + flumetsulam) at 2.9 oz DF/A applied POST to corn up to 20 inches tall with less than 6 collars, controls most all annual grass and broadleaf weeds and suppresses Canada thistle. Apply with NIS or oil adjuvant at 1 to 2% v/v with 28% UAN. Apply only to corn hybrids of 88 or more days maturity. Accent Gold at 2.9 oz DF/A contains 0.25 oz 75DF/A Accent, 0.75 oz 25DF/A Matrix, 4 fl oz of Stinger and 0.7 oz Python 80DF. NDSU research has shown good safety from Accent, Matrix, Stinger, and Hornet to corn. Follow label for tank-mix options, weeds controlled, application information, and rotational crop restrictions.

**C6. Aim** (carfentrazone) at 0.33 oz WDG/A applied POST controls cocklebur, kochia, lambsquarters, nightshade, pigweed, and Venice mallow in corn. Apply Aim to corn up to 8 collar growth stage and to weeds from 1 to 4 inches tall. Apply Aim with NIS at 0.25% v/v and liquid fertilizer. Petroleum oil adjuvants may increase weed control but also may increase risk of corn injury. Aim should be applied with another broadleaf herbicide to broaden spectrum of weeds controls. Aim may be tank-mixed with atrazine at 1 pt/A or 9 oz 90DF/A. Aim + Atrazine may be tank-mixed with Accent, Accent Gold, , Basis Gold, Clarity, and Hornet. Refer to label of tank-mix herbicide for tank-mixing options and adjuvant restrictions. Aim is a nonresidual, contact herbicide and may produce cosmetic injury symptoms of speckling and spotting on leaves receiving spray. Symptoms should disappear after new growth appears. Degree of speckling may be determined by temperature, amount of leaf foliage receiving spray, and adjuvants used with tank-mixes.

**C7. Atrazine** at 1 to 2 lb/A applied PPI or PRE controls annual weeds without corn injury. Fine textured soils with high organic matter require 2 lb/A. Injurious atrazine residues to susceptible crops may remain in soils longer than one growing season. (See herbicide residue section for additional discussion). Atrazine is registered as a tank-mixture with most soil and POST herbicides. Atrazine is available as a prepackage mix with several herbicides; see table on commercial mixtures. Atrazine is a restricted use herbicide.

Atrazine at 0.38 to 2 lb ai/A applied POST to corn less than 12 inches tall controls broadleaf weeds less than 4 inches tall, or grass weeds less than 1 inch tall. Atrazine gives good wild oat control, partial foxtail (pigeongrass) control, and excellent control of broadleaved weeds (including volunteer sunflower) when used in combination with petroleum oil concentrate or emulsifiable vegetable oil adjuvants. Atrazine applied either with vegetable or petroleum oil at 1 qt/A gives similar weed control. Surfactants are less effective with atrazine than any oil additives. Refer to herbicide residue section for carryover precautions. Refer to label for application information and restrictions. Atrazine is a restricted use herbicide.

**C8. Balance** (isoxaflutole) at 1.25 to 2 oz WDG/A applied EPP, or PRE controls most annual grasses included foxtails, wild proso millet, field sandbur, and woolly cupgrass and most annual small-seeded broadleaf weeds, including nightshade, kochia, pigweed, lambsquarters, common ragweed, wild mustard, annual smartweed, seedling dandelion, and horseweed (marestail). Balance has a mode of action different from other herbicides and can control resistant green foxtail and kochia. Balance has a unique pigment inhibition mode of action and can cause chlorosis after corn emerges under stress conditions or any condition which may inhibit corn growth.

NDSU tests have shown that yellowing disappears after 3 to 5 days with no effect on subsequent growth or yield. Balance is applied at low rates. Accurate and precise application and using exact rates based on soil type, pH, and organic matter is required to insure adequate corn safety. Applying Balance at rates slightly greater than those recommended for soil type, soil pH, and organic matter can cause slight to serious corn injury. Uneven application, variable ground speed, lack of good agitation, sprayers not properly calibrated, improper incorporation and especially spray overlaps may increase corn response. Always preslurry Balance with water prior to adding to the tank. Allow time for Balance to dissolve in tank, afterward providing thorough agitation. Seed corn at least 1.5 inches deep with adequate soil covering the furrow to prevent herbicide contact on seed. DO NOT apply POST to corn or corn will die.

Balance is labeled with most PRE herbicides. A tank-mix with atrazine and/or acetochlor controls of most annual grass and broadleaf weeds. Balance PRE can be followed by all POST herbicides labeled in corn. Balance is weak on yellow foxtail, wild oat, volunteer grain, and large-seeded broadleaf weeds like wild buckwheat, cocklebur, sunflower, giant ragweed. Balance gives no wild buckwheat control. Research indicates Balance PRE provides greater weed control than other PRE corn herbicides. Balance has shown good to excellent weed control under limited rainfall conditions. However, 0.5 to 0.75 inches of rainfall after application is required for optimum weed control. If weeds emerge after application from lack of rainfall, a rain event can activate the herbicide, cause susceptible weeds to turn white and kill emerged weeds up to 2 inches tall. Balance will give 6 to 8 weeks residual weed control after activation. See herbicide residue section for crop rotation restrictions. Precipitation and soil moisture is more critical to breakdown than other factors.

**C9. Basagran** (bentazon) at 1.5 to 2 pt/A applied POST in corn controls many broadleaf weeds from 2 to 10 inches tall. Basagran will control common cocklebur, giant and common ragweed, smartweed, VENICE mallow, wild mustard, sunflower and suppression of yellow nutsedge. Basagran can control Canada thistle only with sequential applications. Corn is tolerant to Basagran at all stages. Liquid fertilizer can be used with Basagran in place of oil concentrate for improved control of several weeds. Basagran can be applied in corn when drift of Clarity or 2,4-D may injure sensitive crops. A premix of Basagran and atrazine (Laddok) is available. Atrazine is a restricted use herbicide.

**C10. Basis** (rimsulfuron + thifensulfuron) at 0.33 oz 75DF/A controls foxtail, barnyardgrass, redroot pigweed, wild mustard, common lambsquarters, and annual smartweed control to 4-leaf (2 collar) corn. Apply when grasses are 1 to 2 inches tall and broadleaf weeds are 1 to 3 inches tall. Sequential application of Accent may be needed to completely eliminate weeds. Always apply Basis with with an oil additive (petroleum or MSO type oil) at 1 to 2% v/v and nitrogen. Do not use 28% UAN without an oil additive. Corn varieties of 88 day maturity or less are more susceptible to injury from Basis than varieties greater than 88 days. Basis may be tank-mixed with Clarity. See label for tank-mix options. Corn hybrids with a maturity rating less than 88 days may be more susceptible to injury from Basis.

**C11. Basis Gold** (nicosulfuron + rimsulfuron + atrazine) at 14 oz 89.46DF/A applied POST to corn up to 12 inches tall and with less than 6 collars control most annual grass and broadleaf weeds plus quackgrass. Apply with oil adjuvant at 1 to 2% v/v. NDSU research has shown greater herbicide enhancement from Accent and atrazine applied with MSO type adjuvants than NIS or petroleum oil adjuvants. Apply only to corn hybrids of 88 or more days maturity.

Basis Gold at 14 oz 89.46DF/A contains 0.25 oz 75DF/A Accent, 0.75 oz 25DF/A Matrix, and 0.76 lb ai atrazine. NDSU research has shown good safety to most crops (including small grains and sugarbeet) planted the year following atrazine applied at 0.38 lb ai/A with normal rainfall the year of application. The atrazine in Basis Gold applied at a half rate (7 oz 89.46DF/A) would be equivalent to 0.38 lb ai/A. If a half rate of Basis Gold is used, additional Accent may need to be added to achieve adequate weed control. Applying herbicides at lower than labeled rates makes user liable for product performance and crop injury on crops planted at a shorter interval than directed on the label.

**C12. Bladex, Cy-Pro** (cyanazine) at 1.3 to 5.3 lb 90DF applied PRE controls annual grass and broadleaf weeds in corn. Use the higher rates on fine textured, high organic matter soils, and the lower rates on coarse textured soils with low organic matter. Do not use on sandy or loamy sand soils, or soils with less than 1% organic matter. Bladex requires 0.5 inch or more rain for activation, especially on fine textured soils.

Bladex 90DF/Cy-Pro 90DF at 1.3 to 3.33 lb 90DF applied as an early POST treatment gives grass and broadleaf weed control (including volunteer sunflower). Emulsifiable vegetable oil at 1 qt/A enhances weed control but may increase the risk of crop injury. Use only the 90DF formulation for POST applications. Bladex or Cy-Pro at 1.3 lb 90DF/A with 1 qt/A of vegetable oil has given good control of small weeds (less than 1.5 inches tall) on fine textured soil. Occasionally corn leaf burn occurs, but recovery is good. Higher rates will give more consistent weed control but also increase risk of corn injury. Corn should not be treated after the 4th leaf stage when corn is under stress, or during extended cold, wet conditions. Bladex/Cy-Pro is unlikely to carryover and cause crop injury the next year. Bladex/Cy-Pro are restricted use herbicides.

**C13. Broadstrike + Dual** (flumetsulam + metolachlor) at 1.75 to 2.75 pt/A of the premix product or 0.04 to 0.07 lb/A of the Broadstrike (Python) component + 1.6 to 2.6 pt 8E/A of the Dual component applied EPP, PPI, or PRE will control some grass and broadleaf weeds. Broadstrike is also packaged individually as Python. See Python paragraph for addition information on flumetsulam. Python does not control grasses, so grass control is limited to the activity of Dual. Dual has not given adequate weed control PRE and sometimes PPI in NDSU field trials. Adding more Dual or other similar product (Lasso, Frontier, Harness, Surpass, Ramrod) may be necessary to obtain adequate grass control. A higher rate of these herbicides will be required in medium to fine-textured soils. NDSU research has shown that Harness and Surpass have given greater weed control than Lasso, Dual or Frontier. Research has also shown that Dual does not enhance broadleaf weed control with Broadstrike as compared to trifluralin in the Broadstrike + Treflan product used in soybean.

**C14. Bromoxynil** at 1 to 1.5 pt/A applied to corn from emergence but before tasseling controls seedling wild buckwheat, volunteer sunflower, and most annual broadleaf weeds. Some corn leaf burn may occur when high temperatures follow application. Bromoxynil is a contact herbicide so thorough spray coverage is essential for adequate weed control. Bromoxynil can be mixed with atrazine to increase the spectrum of weed control. A commercial mixture of bromoxynil plus atrazine is available. Bucril and Bromox can be tank-mixed with atrazine, Bladex, Extrazine II, Roundup Ultra/RT, Stinger, 2,4-D, Clarity, and Accent. The premix Bucril + Atrazine and Bucril + Atrazine can be tank-mixed with Clarity, 2,4-D, Stinger, and Accent.

**C15. Celebrity Plus** (nicosulfuron + dicamba + diflufenzopyr) at 4.67 oz WDG/A applied EPOST or POST to corn from 4 to 24 inches tall or with 6 (V6) or fewer collars controls most grass and annual broadleaf weeds. Celebrity at 4.67 oz WDG/A is equivalent to Accent at 0.67 oz 75DF/A and dicamba at 4 oz 70WDG or Banvel/Clarity at 4 fl oz/A (dicamba at 0.188 lb ai/A). Refer to paragraph sections on Accent and Clarity for use information. The Celebrity Plus formulation is significant because dicamba is formulated as a dry granule rather than a liquid as in Banvel or Clarity. Celebrity labeling is important because use of PO or MSO type oils is NOT prohibited. The Banvel/Clarity label restricts use of oil additives but Celebrity allows use of oil additives. Refer to label for additional information on adjuvant use. See label or narrative for crop rotation restrictions.

**C16. Clarity/Banvel** (dicamba) at 0.5 to 1 pt/A 4S may be applied alone PRE or early POST to corn from emergence to 8 inches tall. Banvel/Clarity gives better control of Canada thistle, kochia, smartweed, wild buckwheat and volunteer sunflower than 2,4-D with less injury to corn. Banvel/Clarity can be applied before corn is 3 feet tall or until 15 days before tassel emergence. Drop nozzles should be used after corn is 8 inches tall to reduce injury if Banvel/Clarity is applied with 2,4-D and to reduce drift potential. Banvel/Clarity can be mixed with Accent, Bladex and atrazine.

**C17. Curtail** (clopypalid + 2,4-D) at 2 pt/A applied EPOST to corn up to 8 inches tall or up to 4 collars controls many broadleaf weeds and controls or suppresses Canada thistle. Do not apply broadcast to corn more than 8 inches tall. Curtail may be applied as a directed spray using drop nozzles to corn from 8 inches tall or the 5<sup>th</sup> leaf collar visible to corn 24 inches tall. The reason for exact staging of corn is because Curtail contains 2,4-D which can cause stem brittleness and corn injury. Corn treated with 2,4-D may become temporarily brittle. Winds or cultivation may cause stalk breakage while corn is brittle. Application during the window described above will reduce risk of stem brittleness but injury may still occur.

Curtail may be applied with Stinger at 2 to 6 fl oz/A for greater Canada thistle control. NIS may increase weed control but also increases risk of corn injury. If Curtail is applied when corn is growing rapidly under high temperature and good soil moisture, delay cultivation for 7 to 10 days to allow corn to overcome temporary stalk brittleness. Delay cultivation or fertilizing with shank-type applicators for 14 to 20 days after application for optimum weed control. Curtail will allow sugarbeet growers to control broadleaf weeds in corn without any crop rotational restrictions to sugarbeet following corn.

**C18. Distinct** (dicamba + diflufenzopyr) at 6 oz WDG/A applied EPOST or POST to corn up to 24 inches tall (preferred treatment when corn is 4 to 10 inches tall) controls annual and perennial broadleaf weeds and suppress foxtail. Apply with NIS at 0.25% v/v + UAN at 2 qt/A. Refer to paragraph on Banvel/Clarity for use information and restrictions. Distinct controls a wider spectrum of weeds and greater perennial weed control than Banvel/Clarity. Diflufenzopyr inhibits auxin transport and acts as a synergist to dicamba and other growth regulator herbicides. Diflufenzopyr aids translocation to metabolic sinks and areas of high metabolic activity, like growing points of shoots and roots. NDSU research has shown good to excellent leafy spurge and Canada thistle control from Distinct 12 months after treatment.

**C19. Epic** (flufenacet + isoxaflutole) at 7 to 17 oz WDG/A applied EPP, PPI or PRE controls most annual grass and broadleaf weeds. Epic contain flufenacet (Axiom) and Balance. See label or sections on Axiom and Balance for additional information.

**C20. Eradicane** (EPTC plus safener) at 5 to 7.33 pt/A or 17 to 24 lb 25G/A controls grass and certain broadleaf weeds. Soil should be dry enough and in good tilth to permit immediate and thorough incorporation. Eradicane is registered as a tank-mixture with atrazine, Bladex and Surpass. Eradicane can be tank-mixed with Surpass to improve performance over a wider range of environmental conditions.

**C21. Frontier** (dimethenamid) at 13 to 25 fl oz/A is used EPP up to 45 days before planting, PPI, PRE or early POST. Use the higher rate on fine textured soils with greater than 3% OM and the lower rates on coarse textured soils with less than 3% OM. Incorporation may improve weed control in drier conditions. Frontier is registered as a tank-mixture with atrazine, Clarity, Bladex, Roundup Ultra/RT, Marksman, Prowl, 2,4-D, and Princep. Frontier provides equal control of labeled weeds and may provide greater nightshade than Lasso or Dual.

Frontier may be applied at 8 to 12 fl oz/A POST in tank-mix combination with Accent at 0.25 to 0.67 oz 75DF/A to corn up to 8 inches tall. A NIS must be added at 0.25 % v/v plus 28% UAN at 4% v/v and . Clarity may be added to this tank-mixture for burndown and residual control of broadleaf weeds.

**C22. Harness** (acetochlor + safener) at 1 to 3 pt/A or **Surpass** (acetochlor + dichlormid (safener)) at 1 to 3 pt/A or **Degree** (encapsulated acetochlor + dichlormid (safener) or **TopNotch** (encapsulated acetochlor + dichlormid (safener) at 4 to 7.25 pt/A applied PPI or PRE control annual grasses and certain broadleaf weeds such as pigweed species, common lambsquarters, kochia, nightshade, and common ragweed. Use the higher rate on clay soils high in organic matter. Do not apply acetochlor on sands with less than 3% OM, loamy sands with less than 2% OM, or sandy loams with 1% OM if ground water is within 30 feet of soil surface. Incorporation may improve weed control under dry conditions. Harness Xtra can be applied with atrazine, Eradicane, Prowl, Clarity, Bladex, Roundup, and Gramoxone Extra. Harness Xtra may be applied up to 45 days before planting. Harness/Surpass can be applied POST to corn up to 11 inches tall. Do not apply with fluid fertilizer because severe injury may occur. Harness/ Surpass may be applied with Accent, Atrazine, Banvel/Clarity, Marksman, Permit, and Pursuit. Do not apply to corn over 8 inches tall when tank-mixing with Banvel/Clarity, or Marksman.

Harness/Surpass applied PPI or PRE provides greater and more consistent grass and broadleaf weed control than Axiom, Lasso, Dual or Frontier in NDSU research results. Greater control has been observed across variable climates and conditions in North Dakota. Results have shown greater or equal control of certain weed species than Frontier at relative respective use rates. PPI may provide greater weed control than PRE application in dry conditions. However, based on research results, Harness/Surpass applied PRE provides greater weed control under dry conditions than other chloroacetamide herbicides.

**C23. Hornet** (flumetsulam + clopyralid) at 0.2 to 0.3 lb/A of the premix product or 0.05 to 0.07 lb/A of flumetsulam + 0.13 to 0.19 lb/A of the clopyralid component can be applied EPP, PPI, or PRE. Use 0.2 to 0.25 lb/A on coarse textured soils and 0.25 to 0.3 lb/A on medium and fine textured soils. Hornet controls a wide spectrum of broadleaf weeds including nightshade, kochia, mustards, annual smartweed, wild buckwheat, biennial wormwood, Venice mallow, marshelder, Russian thistle, horseweed (marestail) and common ragweed. Hornet has shown excellent activity on large-seeded broadleaf weeds such as common cocklebur and sunflower. Hornet has no activity on grasses, so a grass control herbicide is required either in tank mix or as a separate application.

As with all soil applied herbicides, Hornet depends on soil moisture for adequate weed control. Hornet applied PRE requires rainfall shortly after application for maximum weed control. Incorporation improves weed control under dry conditions. Flumetsulam (Broadstrike/Python) is strongly affected by soil pH. Higher soil pH increases herbicide activity and also increases risk of crop injury. Some stunting may occur under poor growing conditions on soils with pH greater than 8.0. Soil insecticides should only be band-applied when using Hornet to avoid potential crop injury. See Hornet under the Herbicide Residue section for crop rotation restrictions.

Hornet at 1.6 to 4 oz WDG/A applied POST controls most annual broadleaf weeds and Canada thistle in corn from emergence up to 24 inches tall. Apply with NIS at 0.25% v/v or oil adjuvant at 1% v/v. Under dry conditions UAN may be also added 2.5% v.v. Soil applied Hornet provides greater pigweed and lambsquarters control than POST applied. Do not cultivate within 10 days before or after application. Hornet may tank-mixed with most other POST herbicides labeled in corn including Accent or Basis Gold.

**C24. Lasso** (alachlor) at 2 to 4 qt 4E/A are used PPI or PRE, **Dual II** (metolachlor) at 1.5 to 3 pt 8E/A, and **Axiom** (flufenacet + metribuzin) at 15 to 23 fl oz/A, to control annual grasses and certain broadleaf weeds such as redroot pigweed, common lambsquarters and common ragweed. Lasso may also be applied POST to corn up to 5 inches tall for PRE control of weeds and reduced competition of labeled weeds. Use the higher rate on clay soils high in organic matter. Incorporation improves weed control with Lasso and Dual. Lasso is registered as a tank-mixture with atrazine, Clarity, Bladex, glyphosate, and Gramoxone Extra. Dual may be surface applied or incorporated in the fall after October 15 but before ground freezes or applied in the spring. Dual is registered as a tank-mixture with atrazine, Bladex, Clarity or with atrazine plus paraquat or glyphosate. Dual may be applied up to 45 days before planting. Lasso is a restricted use herbicide.

**C25. NorthStar** (dicamba-na + primisulfuron) at 5 oz WDG/A applied POST controls most broadleaf weeds and some grasses in corn at 4 to 12 inches tall. Directed applications may be made in corn from 20 to 36 inches tall. Apply with NIS at 0.25% v/v or oil additive at 1 to 2 % v/v. Do not use oil additive if corn is greater than 12 inches tall or if tank-mixing with Banvel, Clarity, or Marksman. UAN at 2 to 4 qt/A may used with NIS or oil additive. Northstar contains dicamba and will control ALS resistant weeds. Northstar can be tank-mixed with other POST herbicides registered in corn. Northstar will leave a residue 3 or more years. See label or residue section for information on crop rotation restrictions.

**C26. Permit** (halosulfuron) at 2/3 to 1 1/3 oz 75DF/A applied POST in corn controls nutsedge and some broadleaf weeds including sunflower, ragweeds, and cocklebur. Permit must be tank-mixed with 2,4-D or Clarity for common lambsquarters and pigweed control. Always add NIS or oil additive. Addition of 28% UAN may enhance control of larger pigweed. Unlike many sulfonyleurea herbicides, Permit carryover does increase in high soil pH. Permit is most stable and breakdown is slowest at neutral pH. Degradation of Permit increases as soil pH increases. However, Permit can have a residue in the soil the year following application. Refer to the label or herbicide residue section for more information on crop rotation restrictions.

**C27. Prowl/Pendimax** (pendimethalin) at 1.8 to 4.8 pt EC or 1.25 to 3.33 lb DG controls annual grasses and certain broadleaf weeds such as redroot pigweed. Prowl must be used only PRE in corn and not PPI. Do not use Prowl on sands or loamy sands or on soils with less than 1.5% organic matter. Prowl can be tank-mixed with atrazine, Bladex and Clarity.

**C28. Python** (flumetsulam) at 0.8 to 1.33 oz 80WDG applied EPP, PPI, or PRE will control some small-seeded broadleaf weeds like nightshade, pigweed, kochia, lambsquarters, mustards, annual smartweed, marshelder, Russian thistle, and Venice mallow. Python may also provide suppression of common ragweed and lanceleaf sage. Python does not control grasses. As with all soil applied herbicides, Python requires rain to activate the herbicide for adequate weed control and dry weather following PPI and PRE applications will reduce weed control. Python is affected by soil pH. High soil pH increases herbicide activity and increases rate of herbicide degradation. Some stunting of corn may occur under poor growing conditions on soils with pH greater than 8.0.

Use the higher rate on fine textured soils with greater than 3% OM and the lower rates on coarse textured soils with less than 3% OM. Incorporate into the top 2 inches for PPI applications. Soil insecticides should be applied in a T-band to avoid corn injury. Refer to label for tank-mix options. See Herbicide Residue section for information on crop rotation restrictions.

**C29. Ramrod** (propachlor) applied PRE at 4 to 6 qt/A controls annual grasses and some broadleaf weeds but is ineffective against wild mustard or perennial weeds. Ramrod applied PRE gives greater foxtail control than Lasso and Dual. Ramrod is registered as a tank-mixture with atrazine.

**C30. Scorpion III** (flumetsulam + clopyralid + 2,4-D acid) at 0.25 lb 84.3DF/A of the premix product contains 0.023 lb/A of flumetsulam + 0.063 lb/A of clopyralid + 0.125 lb/A of 2,4-D acid. Apply POST to corn up to 8 inches tall (measured to the top of the whorl). Later applications may be made if the spray is

directed below the whorl using drop nozzles. Do not apply less than 85 days before harvest. Do not apply by air. Always add NIS at 0.25% v/v. Under adverse environmental conditions, add NIS at 0.25% v/v AND 28% UAN at 2.5% v/v. Apply to weeds in the 2- to 4-leaf stage. Scorpion III provides excellent control of a wide range of broadleaf weeds including sunflower, kochia, Russian thistle, pigweed spp., lambsquarters, common and giant ragweed, mustard spp., marshelder, and nightshade spp.

Scorpion III may be tank-mixed with Accent and other POST herbicides labeled for use in corn. Consult label for tank-mix options and restrictions. 2,4-D in Scorpion III may antagonize Accent and reduce grass control. Scorpion III may leave a residue in the soil the following year after application to corn. See label or herbicide residue section in this guide for more information on crop rotation restrictions.

**C31. Sencor** (metribuzin) at 1.6 to 2 oz 75DF/A or 2.4 to 3 fl oz 4F applied POST with another herbicide labeled for tank-mix use with Sencor controls many broadleaf weeds. Sencor can be tank-mixed with atrazine, Basagran, bromoxynil (Buctril, others), Clarity, Marksman, and 2,4-D. Consult label for adjuvant use with the different tank-mix options. Do not use oil additives with any Sencor tank-mix.

Sencor at 1.6 to 2 oz 75DF/A or 2.4 to 3 fl oz 4F can be applied POST directed with Clarity, 2,4-D, or Buctril. Use drop nozzles and appropriate spacing to direct spray below the corn whorl and upper leaves. The height of the weeds must be sufficiently below the whorl to achieve adequate crop safety. Apply before tassel emergence.

**C32. Tough** (pyridate) at 1 to 2 pt/A can be applied to corn up to 68 days before harvest to control kochia, pigweed, sunflower. Tough is a contact type herbicide and can be tank-mixed with atrazine, Bladex, Guardsman, Accent, Permit, Frontier, Clarity, Marksman, or 2,4-D. Apply with adjuvants as directed on the label. Do not graze or feed treated corn grain, forage, or fodder to livestock within 68 days after application.

**C33. 2,4-D amine** at 0.5 to 1 pt/A of a 4 lb/gal concentrate applied POST to corn 3 to 8 inches tall will control broadleaf weeds. 2,4-D at 0.5 pt/A will control susceptible weeds like wild mustard and 1 pt/A rate will control less susceptible weeds, including volunteer sunflower, but risk of corn injury is greater. Do not apply MCPA to corn, as it is more injurious to corn than 2,4-D. Apply 2,4-D with drop nozzles when corn is over 8 inches tall to reduce corn injury by directing the spray away from the whorl. 2,4-D may cause brittle stalks that may lodge or break. Several brands of 2,4-D are available with some differences on application information; for example, Hi-Dep allows use at spray volumes as low as 1 gpa by ground or 0.5 gpa by air.

**C34. Emergency control** of broadleaf and grass weeds in corn can be obtained with Evik or Gramoxone Extra applied POST directed. Gramoxone Extra at 0.25 lb/A should be applied as a directed spray to the weeds. A NIS must be used with both herbicides. These herbicides applied over the top of corn will cause severe injury and contact with the leaves will cause burning. Do not apply Evik before corn is 12 inches high or paraquat before corn is 10 inches high. Weeds should be less than 4 inches tall.

**HERBICIDE TOLERANT CORN****CLEARFIELD (Imidazolinone resistant) CORN**

**C35. Lightning** (imazethapyr + imazapyr) at 1.28 oz 70WDG/A (0.64 oz imazethapyr + 0.15 oz imazapyr) controls nearly all annual grass and broadleaf weeds and provides season-long suppression of perennial weeds including quackgrass and Canada thistle. Apply Lightning EPOST or POST only to IMI-corn varieties and to weeds 1 to 3 inches tall. Apply with oil adjuvant and liquid fertilizer. Can be tank-mixed with Atrazine, Basagran, Bicep, Buctril/ + Atrazine, Dual II/Magnum, FulTime, Guardsman, Harness, Harness Xtra, Laddok S-12, Lasso, Marksman, Surpass, TopNotch, or Tough. Refer to label for weeds controlled, adjuvants, application information and timing, and insecticide interaction.

Lightning contains Pursuit and Arsenal both imidazolinone herbicides. Pursuit is labeled in several legume crops in ND. The rate of Pursuit in Lightning is slightly below the equivalent of the 3 fl oz/A, 1.08 oz WDG/A or the ND soybean rate. The rate of Arsenal in Lightning is 1/100 the rate of Arsenal that is. Arsenal is registered on noncropland and right-of-ways for nonselective burndown and residual weed control. Carryover restrictions of Lightning are the same as Pursuit due to the small amount of Arsenal in Lightning. Refer to the rotational crop restriction section of this guide. Both active ingredients in Lightning are ALS inhibitors resulting in a high risk of developing ALS resistant weeds. Use herbicides with a different mode of action or use other weed control strategies that will slow development of resistant weeds.

**LIBERTY (Glufosinate) RESISTANT CORN**

**C36. Liberty** (glufosinate) at 16 to 28 fl oz/A (0.2 to 0.365 lb/A) applied POST to Liberty tolerant corn varieties controls most annual broadleaf weeds, controls or suppresses grasses, and provides suppression of some perennial weeds. Apply Liberty EPOST or POST to Liberty tolerant corn up to 24 inches tall or 7 or less collars.

Liberty is a nonselective, nonresidual, contact type herbicide with limited translocation. Liberty should be applied to small weeds because of limited translocation. Liberty does not control large or well tillered grasses like yellow foxtail, wild oat, or volunteer cereals. Liberty is nonresidual which may require multiple applications or applying with a residual herbicide to control multiple weed flushes. No residue will allow any crop to be planted the following year. Liberty does not require addition of an adjuvant. However, Liberty should always be applied with spray grade AMS fertilizer. Refer to label for weeds controlled, application information and timing, tank-mix options, application information, and other restrictions.

Liberty has a unique mode of action which is different from glyphosate and all other herbicides currently registered. Liberty will add another mode of action to prevent other weeds from developing resistance to other herbicides. However, effective weed control from Liberty may cause a heavy selection pressure to any weed with slight tolerance, like velvetleaf, yellow nutsedge. It is unlikely for weed resistance to develop because the resistant gene has only been found in soil bacteria and not in the plant kingdom. However, as with all weed control strategies, herbicide and crop rotation should be used as a primary defense in the development of resistant weeds.

**Liberty ATZ** (atrazine + glufosinate) at 32 to 40 fl oz/A on corn up to 12 inches tall controls most annual grass and broadleaf weeds. Liberty contains Liberty (glufosinate) + Atrazine. Liberty ATZ at 32 fl oz/A contains 0.83 lb ai/A atrazine, the equivalent of 1.65 pt/A or 0.92 lb 90DF/A. The atrazine in Liberty ATZ at 32 fl oz/A may carryover and injure crop planted the following year. See section on herbicide carryover and crop rotation.

**ROUNDUP (Glyphosate) RESISTANT CORN**

**C37. Glyphosate** at 1.5 to 2 pt/A of a 3 lb ae/gal concentration applied only to glyphosate resistant corn up to 24 inches tall with 6 collars or less will control most annual and perennial weeds. No adjuvant is required with Roundup Ultra. Roundup Original and Glyphos require NIS at 0.5% v/v. Add AMS at 8.5 to 17 lb/100 gal to ALL glyphosate formulations. Application timing may not be appropriate for effective perennial weed control. Roundup is a nonselective, nonresidual, systemic herbicide that can control grasses at rates as low as 0.25 pt/A. Labeled rates are required for broadleaf weeds. However, some broadleaf weeds like kochia, nightshade, wild buckwheat, horseweed (marestail), dandelion, lambsquarters may not be fully controlled by Roundup Ultra applied alone or from just one application.

Roundup Ultra is nonresidual so multiple applications or combining with a residual herbicide may be needed to control multiple weed flushes. The lack of residue from Roundup Ultra alone will allow any crop to be planted the following year. Roundup Ultra should always be applied with spray grade AMS fertilizer. Refer to label for weeds controlled, application information and timing, tank-mix options, and other restrictions.

Roundup has a unique mode of action which is different from Liberty and all other herbicides currently registered. Roundup will control resistant weeds and will add another mode of action to help prevent development of resistance weeds. However, effective weed control from Roundup Ultra may cause a heavy selection pressure to any weed with slight tolerance, like those listed earlier. Weed resistance to glyphosate is unlikely because the resistant gene has only been found in soil bacteria and not in the plant kingdom. However, as with all weed control strategies, herbicide and crop rotation should be used as a primary defense from the development of resistant weeds.

**ReadyMaster ATZ** (atrazine + glyphosate) at 1.5 to 2 qt/A applied EPOST and POST to glyphosate resistant corn up to 12 inches tall controls most annual and perennial grass and broadleaf weeds. ReadyMaster ATZ contains atrazine and may carryover into the following growing season. See label for application information and tank-mix options.



## SOYBEAN

**D1. Soybean** is a poor competitor with weeds when cool soil temperatures cause slow germination and growth but competes effectively in warm soils when germination and growth are rapid. Management practices such as thorough seedbed preparation, adequate soil fertility, choice of a well-adapted variety, and use of good quality seed all contribute to a crop that will compete with weeds. Soybean production requires good cultural practices. Prepare the seedbed prior to planting to kill germinating weeds. A rotary hoe or harrow may be used to control weeds after planting but before the soybean emerge or after emergence when soybean are in the 1 to 2 trifoliolate leaf stage. Rotary hoe or harrow help activate PRE herbicides under dry conditions and increase weed control. The rotary hoe is an effective and economical weed control method when the ground is not trashy, lumpy or wet and when weeds are beginning to emerge. Cultivation is most effective when the soybean are slightly wilted during the warm part of the day, because the crop is less susceptible to breakage and the weeds will die quickly.

**D2.** Some combinations best adapted to North Dakota are given in the chemical weed control tables. Several commercial herbicide mixtures are available for use in soybean.

### Package Mixtures Available For Soybean:

Trade Name	Common Name	Product/A
Axiom	flufenacet + metribuzin	7 to 13 fl oz
Broadstrike + Dual	flumetsulam+metolachlor	1.75 to 2.75 pt
Broadstrike + Treflan	flumetsulam + trifluralin	1.5 to 2.25 pt
Domain	flufenacet + metribuzin	9 to 16 oz
Extreme	imazethapyr + glyphosate	2.25 to 3 pt
Freedom	alachlor + trifluralin	3 to 4.5 qt
Fusion	fenoxaprop-P+fluazifop-P	6 to 12 fl oz
Galaxy	acifluorfen + bentazon	2 pt
Pursuit Plus	imazethapyr+pendimethln	1.75 pt
Rezult	bentazon + sethoxydim	3.2 pt
Salute	metribuzin + trifluralin	1.5 to 3 pt
Stellar	flumiclorac + lactofen	5 fl oz
Storm	acifluorfen + bentazon	1.5 pt

**D3. Wild-proso millet** is a competitive annual weed in some areas in eastern North Dakota. In soybean, trifluralin, Prowl or Sonalan will suppress wild-proso millet. For long term control, a PPI treatment of any of these herbicides should be followed with a POST application of Assure II, Fusilade DX, Fusion, Poast, or Select. See table at end of soybean section for rates.

**D4. Preplant** applications with 2,4-D at 0.75 to 1 pt/A of a 4 lb/gal concentrate may be applied 7 or more days prior to planting for the ester formulation or 14 or more days prior to planting for the amine formulation. 2,4-D amine or ester at 1 to 2 pt/A may be applied 30 or more days prior to planting. Plant soybean seed at least 1.5 inches deep. Planter press wheels should completely cover seed and separate seed from herbicide layer. 2,4-D may be tank-mixed with Roundup Ultra/RT, Gramoxone Extra or other herbicides registered for preplant soybean application. Risk of soybean injury from preplant 2,4-D

will depend on weather, rainfall, amount of weed vegetation, and previous crop residue. 2,4-D should not be applied if risk of injury and possible stand and yield loss cannot be accepted. Use only 2,4-D products that allow preplant application prior to planting soybean. Always read and follow 2,4-D label directions.

**D5. Assure II** (quizalofop) at 7 to 10 fl oz/A plus petroleum oil adjuvant at 1% v/v applied POST controls annual grasses and quackgrass. See table in the soybean section for rates of Assure II according to weed species and weed size. Quackgrass regrowth should be retreated when 4 to 8 inches tall at 8 fl oz/A. Blazer, Basagran, Betanex, Betamix, Herbicide 273, or Cobra tank mixed with Assure II often reduce grass control compared to Assure II alone. Reduced grass control can be avoided by applying Assure II at least 1 day before or 5 days after application of a broadleaf herbicide. MSO type oils have performed equal to petroleum based oil additives with Assure II. Assure II may provide excellent green foxtail control but less yellow foxtail control. Lower yellow foxtail may result from applying Assure II at reduced rates, with broadleaf herbicides, or to large or stressed plants. Addition of fertilizer may enhance yellow foxtail control and control of stressed grasses.

**D6. Authority** (sulfentrazone) at 4 to 5.33 oz/A applied PPI or PRE controls most annual small-seeded broadleaf weeds, such as, kochia, pigweed species, lambsquarters, nightshade, smartweed, and biennial wormwood and may suppress other weeds like buckwheat, mustard, ragweed, Venice mallow, and Russian thistle. Authority controls ALS resistant weeds, provides little grass, and no perennial weed control. Adjust rate for soil type. Authority provides excellent burndown weed control and may be applied up to 30 days prior to planting but use the higher rate in the appropriate rate range. Authority can tank-mixed with most PPI/PRE herbicides registered in soybean. NDSU research has shown excellent weed control in many different environments throughout the Great Plains region. However, consistent control of sensitive broadleaf weeds and control of grass and marginally controlled broadleaf weeds requires at least 0.75 inch rainfall prior to weed emergence. Authority will leave a residue in soil for more than one year. Refer to label or crop rotation restriction section for additional information.

**D7. Basagran** (bentazon) at 0.5 to 1 qt/A applied POST controls many broadleaf weeds. An oil additive with Basagran improves weed control. Use oil additive at 1.25% v/v (1 pt/A by air) or a maximum of 2 pt/A. Basagran at 1 pt/A plus an oil adjuvant has controlled wild mustard less than 4 inches tall. For volunteer sunflower control, apply 1.5 pt/A to plants less than 5 inches and 1 pt/A to plants 5 to 8 inches tall. Basagran at 1 qt/A with oil additive gives good control of common lambsquarters less than 1.5 inches tall and fair to good control of redroot pigweed less than 1.5 inches tall. Basagran is safe to soybean at all stages. However, soybean leaf burn occurs occasionally from Basagran but recovery is good. For Canada thistle control, apply at 1 qt/A when plants are 8 inches tall to bud stage and make a second application at 1 qt/A 7 to 10 days later. Basagran is commonly combined with fertilizer micronutrients which may cause incompatibility problems causing the zinc to precipitate. Chelated zinc materials (black in color) have greater incompatibility problems than unchelated material (clear). Recommendations to prevent precipitation are to fill sprayer with water, add Basagran and thoroughly agitate, then add zinc fertilizer material.

**D8. Blazer** (acifluorfen) applied POST at 0.5 to 1.5 pt/A controls many broadleaf weeds. The low rate will control wild mustard and redroot pigweed but the higher rates are needed for nightshade, smartweed and common cocklebur. Blazer will not adequately control volunteer sunflower. Blazer kills primarily by contact action. Apply to weeds 1 to 4 inches tall that are actively growing and first to second trifoliolate soybean. Soybean beyond the third trifoliolate leaf stage may intercept the spray and prevent thorough coverage of the weeds. Best results are obtained with Blazer applied at maximum daytime temperatures of 70 to 85 F. A NIS (80% active ingredient) generally should be added to the tank at the rate of 0.12% v/v. See the label for additional information on spray additives. Do not apply within 50 days of harvest or use treated plants for feed or forage.

**D9. Broadstrike + Dual** (flumetsulam + metolachlor). See Broadstrike + Dual under the Corn section for additional information.

**D10. Broadstrike + Treflan** (flumetsulam + trifluralin) at 1.5 to 2.25 pt/A of premix product or 0.05 to 0.07 of the Broadstrike/Python component + 0.64 to 0.96 lb/A of the trifluralin component applied PPI will control most grass and broadleaf weeds in soybean. Broadstrike is formulated alone as Python. See Python in this section for more information on flumetsulam. NDSU research has shown excellent weed control from Broadstrike + Treflan on most grass and broadleaf weeds ONLY after receiving adequate rainfall within the first 7 to 10 days after application. Broadstrike + Treflan will not control large-seeded broadleaf weeds. Refer to paragraph on Python for additional information on Broadstrike (flumetsulam). Use the higher rates on medium to fine textured soils and the lower rates on coarse textured soils. PPI applications may be made 30 days before planting. Instructions for incorporating Broadstrike + Treflan are the same as incorporation of Treflan alone. Incorporate uniformly into the top 2 inches for PPI applications. Do not apply to soils with a pH greater than 8.0 as crop injury may result. Broadstrike + Treflan is registered as a tank-mixture with glyphosate, Gramoxone Extra, and Lexone. See Broadstrike + Treflan under the Herbicide Residue section for information on crop rotation restrictions.

**D11. Cobra** (lactofen) at 6 to 12.5 fl oz/A applied POST controls many broadleaf weeds, including lanceleaf sage. Cobra is a contact herbicide and requires thorough spray coverage for good weed control. Soybean beyond the third trifoliolate leaf stage may interfere with the spray pattern and reduce the weed coverage. Apply Cobra by ground sprayer delivering at least 20 gpa. Do not apply during periods of crop stress or weed control may be reduced or crop injury increased. Best results are obtained at maximum daytime temperatures of 70 to 85 F. An oil additive at 0.5 to 1 pt/A increases weed control but may increase crop injury. Do not apply within 45 days of harvest or use treated plants for feed or forage. Several tank-mix options are available with Cobra at reduced rates. Cobra can be tank-mixed with Assure II, Select and Pinnacle or Basagran and Pinnacle at reduced rates. Cobra can be aerially applied. See label for use of Cobra to suppress white mold in soybean.

**D12. FirstRate** (cloransulam) applied at 0.6 to 0.75 oz 80WDG/A PPI or PRE controls common cocklebur, common lambsquarters, horseweed (marestalk), pigweed species, annual smartweeds, common and giant ragweed, sunflower, and velvetleaf. FirstRate gives poor nightshade control.

As with all soil applied herbicides, FirstRate requires rain to activate the herbicide for adequate weed control. At least 0.5 inch of rain after application must occur to ensure adequate weed control. FirstRate is affected by soil pH. High soil pH increases herbicide activity, increases speed of herbicide degradation, but also increases risk of crop injury. Some soybean stunting may occur under poor growing conditions on soils with pH greater than 7.8. FirstRate may increase iron chlorosis symptoms on soils where symptoms have been observed earlier. Use the higher rates on medium to fine textured soils and the lower rates on coarse textured soils. Incorporate uniformly into the top 2 inches for PPI applications. Do not apply to soils with a pH greater than 7.8 as crop injury may result. See label for tank-mix options.

FirstRate at 0.3 oz 80WDG/A applied POST to soybean prior to flowering controls cocklebur, Venice mallow, horseweed (marestalk), common ragweed, annual smartweed, sunflower, and velvetleaf and suppresses giant ragweed. Pigweed and lambsquarters are controlled ONLY with soil applications. Apply to broadleaf weeds prior to 10 inches. See label for maximum size of each weed. Use NIS at 0.125 to 0.25% v/v + 28% UAN at 2.5% v/v. Oil additive can be used with or without fertilizer but risk of crop injury increases. See FirstRate under the herbicide residue section for crop rotation restrictions.

**D13. Flexstar** (fomesafen + adjuvants) applied POST at 0.75 to 1 pt/A controls common cocklebur, annual smartweed, common lambsquarters, wild mustard, nightshade, pigweed species, common and giant ragweed, sunflower, and Venice mallow. Apply to broadleaf weeds in the 2 to 4 inch stage. Apply 1 pt/A in ND east of I-29 and south of I-94 and in MN south of I-94. Apply at 0.75 pt/A in ND east of Hwy 281 and in MN south of U.S. Hwy 2. Apply with NIS at 0.25 to 0.5% v/v or oil adjuvant at 0.5 to 1% v/v. Oil adjuvant may increase weed control but also increase risk of soybean injury. Flexstar may be applied with POST herbicides labeled in soybean. See label or crop rotation restriction section for additional information.

**D14. Fusilade DX** (fluazifop-P) at 5 to 12 fl oz/A plus oil additive at 1% v/v applied POST controls annual grasses and quackgrass. See table in the soybean section for information on the rate of Fusilade DX according to weed species and weed size. Fusilade DX provides quackgrass suppression with only one application. Quackgrass regrowth should be retreated at 3 to 5 leaves with Fusilade DX at 12 fl oz/A. Fusilade DX tank-mixed with other herbicides may provide less grass weed control or increase crop injury. Reduced grass control can be avoided by applying Fusilade DX at least 1 day before or 5 days after application of a broadleaf herbicide.

**D15. Fusion** (fluazifop-P + fenoxaprop-P) at 4 to 12 fl oz/A plus 1% v/v crop oil control concentrate or 0.25% v/v NIS applied POST controls annual grasses and quackgrass in soybean. See table in the soybean section for information on the rate of Fusion according to weed species and weed size. Fusion provides in-season quackgrass control. Fusion is currently registered for tank-mix or sequential application with Blazer, Basagran, Blazer + Basagran, Pinnacle, Storm and Galaxy. Reduced grass control may occur with tank-mix combinations with broadleaf herbicides. However, reduced control can be avoided by applying Fusion 1 day prior to or 5 days after broadleaf herbicides. Fusion may be tank-mixed with Pursuit herbicide for control of volunteer corn only. Fusion may be tank-mixed with Orthene insecticide.

**D16. Lasso** at 2 to 3 qt 4E/A applied PPI or PRE, **Dual** at 1.5 to 3 pt 8E/A applied PPI or PRE (NOT EPOST), **Frontier** at 1 to 2 pt 6.0E/A applied PPI, PRE, or EPOST up to third trifoliolate, or **Axiom** at 7 to 13 fl oz/A or **Domain** at 9 to 16 oz WDG/A applied PPI or PRE control annual grass and some broadleaf weeds, including redroot pigweed, black nightshade, and common lambsquarters but are ineffective against wild oat. Apply the higher rate on clay soils high in organic matter. Soybean has good tolerance and incorporation improves consistency of weed control. Dual may be surface applied or incorporated in the fall after October 15 but before ground freezes or applied in the spring. Herbicides are registered for tank-mixing with several herbicides. Frontier can be applied EPOST with Pursuit. Do not ensilage soybean or feed forage, hay or straw from soybean treated with Lasso.

**D17. Lexone/Sencor** (metribuzin) at 0.25 to 0.5 lb 75DF/A controls annual broadleaf weeds, especially wild mustard. The rate applied is important. Consult the label for the proper rate based on soil type, pH, and % organic matter. Some soybean varieties are susceptible to metribuzin; consult label for list of susceptible varieties. Soybean injury can be reduced by using herbicide combinations with lower rates of metribuzin. Metribuzin is registered as a tank-mixture with Lasso, Sonalan, Dual, Prowl and trifluralin.

**D18. Pinnacle** (thifensulfuron) at 0.25 oz 75DF/A applied POST controls wild mustard, common lambsquarters, and pigweed and suppresses several other broadleaf weeds. Pinnacle should be applied in combination with an NIS at 0.125 to 0.25% v/v or oil concentrate at 0.5% v/v. Further addition of 28% UAN liquid fertilizer at 4% v/v may improve weed control. Pinnacle can be tank-mixed with Basagran, Galaxy, or Storm to increase weed control, including black nightshade. Pinnacle as spray drift or sprayer contamination causes severe injury to susceptible crops such as sugarbeet and sunflower. Thoroughly clean sprayer to prevent contamination of subsequent sprays and injury to susceptible crops. See section on sprayer cleanout.

**D19. Poast** (sethoxydim) is a 0.5 to 1.5 pt/A plus oil additive at 1 qt/A controls annual grasses in canola, crambe, rapeseed, dry bean, field pea, flax, lentil, lupin, potato, soybean, sugarbeet, and sunflower. MSO type oils (Scoil and Sun-It II, etc) and Dash additives have enhanced grass control with Poast more than petroleum oil or unmodified seed oil additives. See table in the soybean section for rates according to weed species and weed size. Poast provides only suppression of quackgrass. Quackgrass initially should be treated with 1.5 pt/A and regrowth 6 to 8 inches tall should be treated with 1 pt/A. Cultivation between 14 and 21 days after application will improve quackgrass control. Poast mixed with Betanex, Betamix, Herbicide 273, Blazer or Basagran reduces grass control compared to Poast with oil additive. Poast with oil additives frequently has increased crop injury when combined with Betanex, Betamix, Herbicide 273, Blazer or Cobra. Reduced grass control and crop injury can be avoided by applying Poast at least 1 day before or 5 days after application of a broadleaf herbicide. 28% UAN at 2 to 4 qt/A or 2.5 lb/A of AMS with the oil additive may increase control of volunteer corn, cereal grains and quackgrass.

**D20. Prowl/Pendimax** (pendimethalin) at 2 to 3 pt/A EC or 0.83 to 2.5 lb DG applied PPI controls annual grass and certain broadleaf weeds. The high rate should be used on heavy clay soils. Prowl is registered as a tank-mixture with Lasso, Lorox, Dual, and metribuzin. See herbicide residue section.

**D21. Pursuit** (imazethapyr) at 3 fl oz/A or Pursuit DG at 1.08 oz or 6.67 acres per water soluble packet applied POST controls nightshade, kochia, wild mustard and pigweed species and may control or suppress many other broadleaf weeds not listed on the label. Pursuit has controlled foxtail, marshelder, Russian thistle, common cocklebur, sunflower, smartweed, and lanceleaf sage in NDSU field trials. Pursuit may give poor control of Venice mallow, wild buckwheat, horsetail, common lambsquarters and common ragweed greater than 1 inch tall. Soil residual from POST applications will not control subsequent flushes of these weeds. Poor residual control of eastern black nightshade may result when only a small amount of herbicide reaches the soil surface with POST application. However, even a small amount of Pursuit may give a reduction in number and intensity of flushes of other weeds. Pursuit should be applied with an NIS at 0.125 to 0.25% v/v or oil concentrate at 0.5% v/v, with 28% UAN liquid fertilizer at 4% v/v control. 28% UAN improves control of common lambsquarters. NDSU research has shown enhanced weed control by using MSO type oil adjuvants as compared to NIS or some oil additives with or without 28% UAN.

**Pursuit** at a reduced rate of 2 to 3 fl oz/A can be tank-mixed with Basagran, Cobra or Pinnacle to increase the spectrum of weeds controlled such as, common cocklebur, common lambsquarters, common ragweed, Venice mallow, and wild buckwheat. Crop injury from sequential postemergence applications of Pursuit following Pinnacle is greater than with either product alone OR the tank-mix of Pursuit plus Pinnacle. In sequential application, the herbicide applied first reduces the ability of the soybean plant to metabolize the second herbicide. Pursuit and Pinnacle applied as sequential treatments can result in severe crop injury. Weeds not controlled by the first herbicide may not be controlled after the second herbicide is applied. This is particularly important for common lambsquarters. Weeds that escape control from the first herbicide may be larger than labeled size by the time the soybean can safely be treated with the second herbicide. Cultivation before, during or within 7 days after application may also result in reduced weed control. Cultivation approximately 14 days after application is preferred.

Tank-mixtures of Pursuit with Assure II, Fusilade DX, Fusion, or Select may result in reduced grass control. Reduced grass control can be avoided by applying the POST grass herbicide either 1 or more days prior or at least 5 days after Pursuit.

**D22. Pursuit Plus** (imazethapyr + pendimethalin) at 1.8 pt/A applied PPI controls most annual grass and broadleaf weeds. ND state labeling allows use in ND south of State Highway 2 at a reduced rate of 1.8 pt/A which is 75% of the full labeled rate. Pursuit Plus at 1.8 pt/A contains the equivalent of Pursuit at 3 fl oz/A or 1.08 oz WDG/A plus 1.75 pt/A of Prowl. Add additional Prowl at 1.75 pt/A for more consistent weed control. Thoroughly incorporate into the top 1 to 2 inches of soil. Refer to paragraphs on Pursuit and Prowl for additional information on use and restrictions.

**D23. Python** (flumetsulam) at 0.8 to 1.33 oz 80WDG/A applied PPI or PRE will control many annual broadleaf weeds in soybean. Python is the Broadstrike component in the commercial premixes available as Broadstrike + Dual or Broadstrike + Treflan, and also a component in corn premixes Hornet, Scorpion III, and Accent Gold. Python is active on small-seeded broadleaf weeds like nightshade, pigweed,

kochia, biennial wormwood, common lambsquarters, mustard, annual smartweed, Venice mallow, and Russian thistle. Python gives poor control of large-seeded broadleaf weeds like common and giant ragweed.

As with all soil applied herbicides, Python requires soil moisture for optimum weed control. Good soil moisture and timely rains shortly after application are needed to ensure adequate herbicide performance. Python is also strongly affected by soil pH. High soil pH increases herbicide activity and increases speed of herbicide degradation, but also increases risk of crop injury. Excellent broad spectrum weed control may occur when applied on soils with above 7.5 pH, when significant precipitation occurs after application, when rates are based on soil texture and organic matter content, and under light to moderate weed infestations. Some stunting may occur under poor growing conditions on soils with pH greater than 8.0.

Use the higher rates on medium to fine textured soils and the lower rates on coarse textured soils. PPI applications may be made 30 days before planting. Incorporate uniformly into the top 2 inches for PPI applications. Do not apply to soils with a pH greater than 8.0 as crop injury may result. Python is registered as a tank-mixture with most soil applied herbicides labeled in soybean. See Python under the Herbicide Residue section for information on crop rotation restrictions.

**D24. Raptor** (imazamox) at 4 fl oz/A POST plus a soil applied grass herbicide or at 5 fl oz/A alone POST controls nearly all annual grass and broadleaf weeds in soybean. Grass weeds controlled are barnyardgrass, crabgrass, foxtail, wild proso millet, field sandbur, volunteer corn and small grains. Broadleaf weeds controlled are cocklebur, kochia, lambs-quarters, mustard species, nightshade species, pigweed species, giant ragweed, annual smartweed, and sunflower. Weeds suppressed are quackgrass, Venice mallow, common ragweed, sowthistle and Canada thistle.

Raptor is of the same chemistry as Pursuit but has the following differences: 1) More herbicidally active, 2) greater grass control, 3) greater broadleaf weed control, 4) increased control of Pursuit tolerant weed species like lambsquarters and common ragweed, 5) less carryover following application, and 6) less adjuvant response.

In NDSU field trials, Raptor has controlled weeds listed above plus marshelder, Russian thistle, and lanceleaf sage less than 1 inch tall. Raptor may give poor control of Venice mallow, wild buckwheat, horsetail (marestail), large lambsquarters and common ragweed. Low soil residue of Raptor may not control late germinating weeds or weeds flushes later in the growing season after rain events.

**Raptor** should be applied with a NIS at 0.125 to 0.25% v/v or oil concentrate at 0.5% v/v, each with 28% UAN liquid fertilizer at 4% v/v. Use of 28% UAN improves control of some weeds like common lambsquarters. MSO type oil additives should be used when weeds are large and/or stressed. NDSU research has shown enhanced weed control by using MSO type oil adjuvants as compared to NIS or some oil additives with or without 28% UAN. However, Raptor applied with MSO + 28% UAN may result in crop injury at temperatures greater than 88 F and greater than 80% relative humidity.

Crop rotation restrictions the year following Raptor application are much less than with Pursuit. However, Raptor carryover is affected by soil pH just as Pursuit. As soil pH increases, rate of Raptor degradation increases. At soil pH less than 6.5, rate of breakdown is slow and injury to sugarbeet and other sensitive crops may occur if planted in close rotation. See label or Raptor under the herbicide residue section for information on crop rotation restrictions.

**D25. Rezult** (bentazon + sethoxydim) at 3.2 pt (1.6 pt/A Rezult G and 1.6 pt/A Rezult B) applied POST controls most grass and broadleaf weeds in soybean can be applied from emergence to 30 days prior to harvest. Add oil adjuvants at 1 to 2 pt/A. Refer to label or narrative for tank-mix options. Rezult is priced economically compared to other POST herbicide programs. Refer to Basagran and Poast sections for additional information.

**D26. Select** (clethodim) at 4 to 16 fl oz/A or **Prism** at 8.5 to 34 fl oz/A plus oil additive at 1 qt/A applied POST controls annual grass weeds and quackgrass. See table in the soybean section for rates of Select according to weed species and weed size. Quackgrass can be controlled with sequential applications at 8 to 16 fl oz/A. Tank-mixing Blazer, Basagran, Cobra or Pursuit with Select may reduce grass control. Reduced grass control can be avoided by applying Select at least 1 day before or 5 days after application of a broadleaf herbicide.

Select is a ACCase mode of action herbicide, similar to Assure II, fenoxaprop, Fusilade, and Poast. However, research has shown that Select controls many grasses documented resistant to other ACCase herbicides. No grass has been documented resistant to Select. It is recommended that Select be used in rotation with herbicides of different modes of action and in a resistant weed management program.

**D27. Sonalan** (ethalfluralin), **Prowl** and **trifluralin** are dinitroaniline herbicides applied PPI for control of annual grasses and broadleaf weeds except wild mustard, common cocklebur and sunflower. Requirements for proper timing and depth of incorporation differ for each herbicide. Sonalan (ethalfluralin) at 1.3 to 3.5 pt/A applied PPI controls annual grass and certain broadleaf weeds. The low rate should be used on coarse-textured, sandy soils. Incorporate in the top 2 to 3 inches of soil within 2 days of application. Incorporation of Sonalan 10G can be delayed 3 to 5 days after application. Sonalan is registered as a tank-mixture with most soil PPI and PRE herbicides labeled in soybean including Dual, Lasso, or Lexone/Sencor. Sonalan has less soil residue than trifluralin but is more active at comparable rates than trifluralin.

**Trifluralin** at 1 to 2 pt 4E/A applied PPI controls annual grass and certain broadleaf weeds. Set the implement 4 to 6 inches deep to uniformly mix trifluralin in soil. Trifluralin incorporation may be delayed up to 24 hours if applied to a cool, dry soil and if wind velocity is less than 10 mph. Do not plant soybean deeper than 2 inches. Trifluralin is registered as a tank-mixture with Lasso, Dual, and metribuzin. See herbicide residue section.

**LIBERTY (Glufosinate) RESISTANT SOYBEAN**

**D28. Liberty** (glufosinate) at 16 to 28 fl oz/A applied POST to Liberty tolerant soybean varieties controls most annual grass and broadleaf weeds and provides suppression of some perennial weeds. Apply Liberty EPOST/POST to Liberty tolerant soybean varieties prior to flowering.

Liberty is a nonselective, nonresidual, contact type herbicide with limited translocation. Liberty should be applied to small weeds because of limited translocation. Lack of translocation may result in poor control of grasses that produce tillers or are large at the time of application. Grasses like yellow foxtail, wild oat, and volunteer cereals that produce many tillers may not be controlled with one application. Liberty is nonresidual so multiple applications or applying with a residual herbicide may be needed to control multiple weed flushes. Lack of soil residue will allow any crop to be planted the following year. Liberty does not require addition of an adjuvant. However, Liberty should always be applied with spray grade AMS fertilizer. Refer to label for weeds controlled, application information, timing, tank-mix options, and other restrictions.

Liberty has a unique mode of action which is different from Roundup and all other herbicides currently registered. Liberty will control all currently resistant weeds and will add another mode of action to prevent other weeds from developing resistance to other herbicides. Refer to Liberty paragraph in the herbicide tolerant corn section for additional information.

**ROUNDUP (Glyphosate) RESISTANT SOYBEAN**

**D29. Glyphosate** at 1 to 2 pt/A of a 3 lb ae/gal concentrate or 1.2 to 3.2 lb ae/gal concentrate applied only to glyphosate resistant soybean will control most annual and perennial weeds. No adjuvant is required with Roundup Ultra. Roundup Original and Glyfos require NIS at 0.5% v/v. Add AMS at 8.5 to 17 lb/100 gal to ALL glyphosate formulations. Application timing may not be appropriate for effective perennial weed control. Glyphosate is a nonselective, nonresidual, systemic herbicide that can control grasses at rates as low as 0.25 pt/A. Labeled rates are required for broadleaf weeds. However, some broadleaf weeds like kochia, nightshade, wild buckwheat, horseweed (marestail), dandelion, and lambsquarters may not be adequately controlled by one application of glyphosate. Refer to label for weeds controlled, application information, timing, tank-mix options, and other restrictions.

Roundup Ultra is nonresidual so multiple applications or applying with a residual herbicide may be needed to control multiple weed flushes. Lack of residue from Roundup Ultra alone will allow any crop to be planted the following year. Roundup has a unique mode of action which is different from Liberty and all other herbicides currently registered. Roundup will control weeds resistant to other herbicides and will add another mode of action to help prevent development of resistant weeds. However, effective weed control from Roundup Ultra may cause a heavy selection pressure to any weed with slight tolerance, like those listed earlier. Weed resistance to Roundup is unlikely because the resistant gene has only been found in soil bacteria and not in the plant kingdom. However, as with all weed control strategies, herbicide and crop rotation should be used as a primary defense in the development of resistant weeds.

Touchdown can be applied at 1.2 to 3.2 pt/A to glyphosate resistant soybean up to full bloom. Add AMS at 8.5 to 17 lb/100 gallons of water to improve weed control. Liquid formulations of AMS may be used at the equivalent rate. Refer to label for weeds controlled, application information, timing, tank-mix options and other restrictions.

**D30. POST Grass Herbicides:**

Herbicide	Weed Size (inches)	Rate
<b>Green and Yellow Foxtail</b>		
Assure II	2 to 4	8 fl oz
Fusilade DX	2 to 4	10 to 12 fl oz
Fusion	2 to 4	8 fl oz
Poast	1 to 8	1 pt
Prism	2 to 8	8.5 to 12.8 fl oz
Select	2 to 8	4 to 6 fl oz
<b>Wild Oat</b>		
Assure II	2 to 6	8 fl oz
Fusilade DX	2 to 6	8 fl oz
Fusion	2 to 6	8 fl oz
Poast	1 to 4	1 pt
Prism	2 to 6	12.8 fl oz
Select	2 to 6	6 fl oz
<b>Field Sandbur</b>		
Assure II	2 to 6	8 fl oz
Fusilade DX	2 to 4	10 to 12 fl oz
Fusion	2 to 4	8 fl oz
Poast	1 to 3	1.5 pt
Prism	2 to 6	12.8 fl oz
Select	2 to 6	6 fl oz
<b>Wild Proso Millet</b>		
Assure II	2 to 6	8 fl oz
Fusilade DX	4 to 8	6 fl oz
Fusion	4 to 8	6 fl oz
Poast	4 to 10	0.5 pt
Prism	1 to 10	8.5 to 12.8 fl oz
Select	1 to 10	4 to 6 fl oz
<b>Volunteer Small Grains</b>		
Assure II	2 to 6	8 fl oz
Fusilade DX	2 to 6	8 fl oz
Fusion	2 to 6	8 fl oz
Poast	1 to 4	1.5 pt
Prism	2 to 6	12.8 fl oz
Select	2 to 6	6 fl oz
<b>Volunteer Corn</b>		
Assure II	6 to 18	5 fl oz
Fusilade DX	12 to 24	6 to 8 fl oz
Fusion	12 to 24	6 fl oz
Poast	1 to 20	1 pt
Prism	4 to 12	8.5 fl oz
Prism	12 to 24	12.8 fl oz
Select	4 to 12	4 fl oz
Select	12 to 24	6 fl oz
<b>Quackgrass (First treatment/Regrowth)</b>		
Assure II	6 to 10	10/8 fl oz
Fusilade DX	6 to 10	12/8 fl oz
Fusion	6 to 10	12/12 fl oz
Poast	6 to 8	1.5/1 pt
Prism	4 to 8	17/17 fl oz
Select	4 to 8	8/8 fl oz

**DRY EDIBLE BEAN**

**E1. Navy bean** generally has less tolerance to herbicides than other dry beans or soybean. Rotary hoe before crook stage or after emergence up to 1 to 2 trifoliates.

**E2. Assure II** (quizalofop) at 8 to 10 fl oz/A plus petroleum oil adjuvant at 1% v/v applied POST controls annual grasses and quackgrass. See paragraph and table on Assure II under soybean for additional information.

**E3. Basagran** (bentazon) can be applied as sequential treatments for greater broadleaf weed control. The first Basagran application should be made before the weeds are 0.5 to 4 inches tall, depending on the weed species. Refer to label for information on weed sizes at application. Apply Basagran at 1 pt/A plus petroleum oil or Dash HC at 0.5 to 1 pt/A and repeat the application 7 to 10 days later. Basagran applied as a planned split application program will improve broadleaf weed control compared to a single application. Split applications will control cocklebur, lambsquarters, annual smartweed, Venice mallow, and wild mustard. Common ragweed, kochia, pigweed, and sunflower may be controlled or suppressed. NDSU research has shown greater control of lambsquarters, redroot pigweed and kochia by applying Basagran as split treatments either twice each at 1 pt/A, 3 times each at 0.67 pt/A, or 4 times each at 0.5 pt/A as compared to one application at 2 pt/A. Dash HC gives greater enhancement of Poast than petroleum oil or AMS.

**E4. Dual** (metolachlor) PPI or PRE at 2 to 3 pt 8E/A, **Frontier** (dimethenamid) PPI, PRE or EPOST up to the third trifoliolate at 1 to 2 pt/A 6E/A, or **Lasso** (alachlor) only PPI at 2 to 3 qt 4E/A - controls annual grasses and some broadleaf weeds. PPI may provide more consistent weed control since rainfall is essential for activation. Dual may be tank-mixed with Eptam for wild oat control. Frontier can be applied with Basagran and Pursuit EPOST. Sonalan has less soil residue but is more active than trifluralin.

**E5. Eptam** (EPTC) at 2.3 to 3.5 pt/A or 11 to 15 lb 20G/A plus Prowl, Sonalan, or trifluralin many grass and broadleaf weeds - including wild oat, common lambsquarters, and eastern black nightshade. Incorporate at a 4 to 6 inch depth immediately after application. Do not use Eptam on soybean.

**E6. Frontier** (dimethenamid) can be applied in multiple applications for improved nightshade control in dry bean. Frontier PPI or PRE provides greater nightshade control than Dual or Lasso but may degrade in the soil before nightshade emergence ceases. Apply Frontier EPOST alone or with Basagran up to third trifoliolate dry beans to prevent late nightshade emergence. Frontier applied as split applications and activated by rainfall will offer improved nightshade control compared to a single application. Split applications may provide greater control of other weeds.

**E7. Poast** (sethoxydim) at 0.5 to 1.5 pt/A plus petroleum oil adjuvant at 1qt/A applied POST controls annual grasses and suppresses quackgrass. See paragraph and table on Poast in soybean section for additional information.

**E8. Prowl/Pendimax** (pendimethalin), **Sonalan** (ethalfuralin), and **trifluralin** are discussed under the soybean section. Trifluralin, Prowl and Sonalan applied PPI controls annual grasses and certain broadleaf weeds except wild mustard, common cocklebur, and sunflower. The low rates should be used on coarse textured, sandy soils. The high rates should be used for control of eastern black nightshade. Incorporate in the top 2 to 3 inches of soil within 2 days of application. Trifluralin, Prowl and Sonalan are each registered as a tank-mixture with Dual, Eptam, Frontier, Lasso, Micro-Tech, and Partner.

Sonalan 10G at 7.5 to 12.5 lb/A 10G applied in the fall or spring suppresses foxtail in dry edible bean and sunflower grown in reduced tillage systems. Apply in the fall between October 10 and December 31, or spring PPI before planting. Apply to tilled land or standing or chopped stubble. Incorporate twice 2 to 3 inches deep using a V-blade undercutter or other implements such as a rotary hoe that leave a maximum amount of crop residue on the soil surface. Operate implements approximately 5 mph. The first incorporation should be performed within 48 hours after application. The second incorporation should be performed at an angle to the first incorporation and must be delayed at least 14 days after the first incorporation. Sonalan 10G applied in the fall should be incorporated once in the fall and the second time in the spring before planting. Refer to label for application rate according to soil type. The higher rate in the rate range should be used in high crop residues and heavy weed populations.

**E9. Pursuit** (imazethapyr) at 2 fl oz/A or Pursuit DG at 0.72 oz/A or 10 acres per water soluble packet applied POST only controls wild mustard and provides suppression of nightshade in pinto, navy, great northern, kidney, black turtle, and cranberry type dry beans. Reduced crop growth, yield, and/or delayed maturity may result from application. Do not apply if planting is delayed, or cold and/or wet weather are present or predicted to occur within one week of application. Do not apply to Domino variety black turtle bean. Pinto varieties UI-111 and Olathe are more sensitive to injury than other Pinto varieties. Apply Pursuit with NIS at 0.25% v/v to dry beans having at least one trifoliolate leaf. DO NOT use oil additives, liquid fertilizer or DASH. Refer to the Raptor paragraph in the soybean section for additional information on application use and restrictions. See Pursuit under the herbicide residue section for information on crop rotation restrictions.

**E10. Raptor** (imazamox) may be labeled through ND Section 18 emergency labeling in 2000 for control of nightshade with limited crop rotation restrictions. Raptor applied at 4 fl oz/A when preceded by a soil applied grass herbicide registered in soybean controls many annual grass and broadleaf weeds in soybean. Refer to the Raptor paragraph in the soybean section for information on imazamox (Raptor) application and adjuvant use and restrictions.

**E11. Select** (clethodim) at 6 to 8 fl oz/A or **Prism** at 12.8 to 17 fl oz/A plus petroleum oil adjuvant at 1qt/A applied POST controls annual grasses and quackgrass. See paragraph and table on Select in soybean section for additional information.

**Refer to web site listed on front cover of weed guide for:**  
**F1-10. Field pea**  
**G1-8. Chick pea**

## SUNFLOWER

**J1.** Sunflower competes poorly with weeds because of slow early growth and ground cover. Cultivation with a spike-tooth or coil spring harrow about 1 week after seeding but before sunflower emergence will kill weeds that emerge before sunflower. Use a harrow or rotary when sunflower has at least 4 leaves. Cultivation will control weeds between the rows.

**J2. Assert** (imazamethabenz) is registered through ND supplemental labeling at 0.6 to 0.8 pt/A or 4.5 to 6 oz/A Assert WGD for POST control of wild mustard in the rosette stage and prior to bloom and sunflower at the 2- to 8-leaf but before 15 inches tall. Severe sunflower injury may occur with high temperatures and humidity at application. Sunflower variety, growth stage, weather conditions, humidity, spray volume, spray additives, and type of application may affect sunflower safety. Risk of injury should be considered when deciding whether treatment is warranted. Do not apply to sunflower under drought or heat stress. Apply Assert only when air temperature plus relative humidity is below 150. Sunflower damage from misapplication may range from plant stunting to head deformation. Do not tank mix Assert with any insecticides or herbicides. After Assert application, wait 4 to 5 days before between-row cultivation. Read and follow the label information.

**J3. Eptam** (EPTC), **Prowl/Pendimax** (pendimethalin), **Sonalan** (ethalfuralin), and **trifluralin** are PPI herbicides that can be applied spring or fall (See discussion on herbicide incorporation). Sonalan at 1.5 to 2 pt/A or 5.5 lb 10G/A and trifluralin at 1 pt/A or 5 lb 10G/A can be applied on sandy soil. Eptam must be applied and incorporated immediately to prevent herbicide loss. Eptam may be applied in late fall before soil freeze-up at 4.5 pt 7E/A or 20 lb 20G/A on coarse textured soil and 5.25 pt 7E/A or 22.55 lb 20G/A on fine and medium textured soil. Eptam controls wild oat better than Prowl, Sonalan or trifluralin. Sonalan may be tank-mixed with Eptam. Rainfall after Prowl applied PRE is needed.

**J4. Poast** (sethoxydim) at 0.5 to 1.5 pt/A plus oil additive control annual grasses. Observe a 70 days PHI and do not feed treated sunflower forage to livestock. See paragraph and table on Poast in soybean section for additional information.

**J5. Select** (clethodim) at 6 to 8 fl oz/A or **Prism** at 12.8 to 17 fl oz/A plus oil additive controls annual grasses and quackgrass. Observe a 70 days PHI and do not feed treated sunflower forage to livestock. See paragraph and table on Poast in soybean section for additional information.

**J6. Spartan** (sulfentrazone) may be registered in sunflower in 2000 through Section 18 emergency registration. Spartan applied PRE at 2.67 to 5.33oz WDG/A controls most annual small-seeded broadleaf weeds, such as kochia, pigweed species, lambsquarters, nightshade, smartweed, and biennial wormwood. Spartan may suppress other weeds like buckwheat, mustard, ragweed, and Russian thistle. Spartan provides little grass and no perennial weed control. Adjust rate for soil type. Spartan may be applied up to 30 days prior to planting but use the higher rate in the appropriate rate range. Sunflower has shown good safety to Spartan on medium to fine textured soils with organic matter above 3%. Crop injury may occur on soils with low organic matter and soil pH greater than 8.0, especially

on calcareous outcropping. Do not use on coarse textured soils with less than 1% organic matter. Provide adequate furrow closure and soil covering to avoid crop injury. Poor growing conditions at and following sunflower emergence, cold temperatures, soil compaction, or rate too high based on soil type and organic matter may result in sunflower injury. NDSU research has shown excellent weed control in many different environments throughout the Great Plains region. However, consistent control of sensitive broadleaf weeds and control of grass and marginally controlled broadleaf weeds greatly depends on at least 0.75 inch rainfall shortly after application and before weeds emerge. Spartan is a PPO inhibitor mode of action herbicide. No plant resistance has been documented with herbicides of this type. Contact a county, area, or state extension specialist for registration status.

## FLAX

**K1.** Flax is less competitive with weeds than small grains and should be grown on relatively weed-free fields. Early post-harvest tillage of small grain stubble will prevent weed seed production, suppress perennial weeds and encourage annual weed seed germination prior to freeze-up. Weed problems will be reduced when weeds are controlled in the preceding crop. Flax should be seeded directly or with shallow spring tillage in fields which were not weedy the previous year. Deep tillage on such fields could bring dormant seeds to the surface, increasing weed problems. If fields are weedy, moldboard plowing after a year of weed seed production will bury the weed seeds, reducing the weed infestation in the following crop season. Moldboard plowing is especially effective in reducing infestation of small-seeded weeds like foxtails and kochia which have short seed survival.

Delayed seeding of flax with tillage prior to seeding will control wild oat and reduce infestations of other early germinating weeds. However, delayed seeding generally reduces flax yields. Early maturing flax varieties should be used with late seeding. Weed control is needed by flax emergence to reduce yield losses since flax is a poor competitor with weeds. PPI herbicides prevent weed emergence and minimizes early weed competition and maximizes flax yields. POST herbicides applied soon after weed emergence to small weeds and flax usually give better control and allow more time for flax recovery from possible herbicide injury than to larger weeds and flax.

**K2. Bromoxynil** at 1 pt/A on 2- to 8-inch flax controls wild buckwheat, volunteer sunflower and most broadleaf weeds. Some flax leaf burn may occur at higher rates or if high temperatures follow application. Mixtures of bromoxynil plus MCPA may cause flax injury if applied during hot, humid conditions.

**K3. Curtail M** may be labeled in flax through Section 18 emergency exemption registration in flax in 2000. Apply Curtail M at 1.33 to 1.75 pt/A for Canada thistle control and 1.75 pt/A for perennial sowthistle control. Apply when flax is 2 to 6 inches tall and weeds are actively growing. Extreme growing conditions prior to, at, and following application may reduce weed control and increase risk of flax injury. Contact local county agent, NDSU Extension Service, your dealer for Section 18 approval for use.

**K4. MCPA** at 0.5 pt/A on 2- to 6-inch flax controls many broad-leaf weeds. MCPA amine rates higher than 0.5 pt/A or MCPA ester should be used in flax for improved kochia and Russian thistle control.

**K5. Poast** (sethoxydim) at 0.5 to 1.5 pt/A plus oil additive controls annual grass weeds and quackgrass. See section on Poast under soybean for additional information. Poast is less effective when applied to grasses under stress. Allow a 75 day PHI. Poast plus oil additive can be tank-mixed with bromoxynil at 1 pt/A or MCPA ester at 0.5 pt/A for broad-spectrum weed control. Bromoxynil or MCPA ester applied with Poast may cause leaf burn, retarded growth, and delayed maturity of flax. Grass control from Poast may be reduced when applied as a tank-mixture with bromoxynil.

**K6. Trifluralin** at 1 to 2 pt/A or 10 to 12 lb 10G/A may be fall applied for foxtail and broadleaf weed control on fields to be planted to flax. Granular formulations may be applied to standing stubble, use liquid or granular formulations when residue will not interfere with incorporation. Seed flax less than 1.5 inches deep into a moist seedbed. Registration for shallow spring application is being pursued. To maximize crop safety, if incorporate shallow - seed deep or if incorporate deep - seed shallow.

Refer to web site listed on front cover of weed guide for:

**L1-11. Mustard crops**

**SUGARBEET**

**M1. Sugarbeet** herbicides may be used to supplement cultural practices. Hand labor, mostly hoeing, may be needed for optimum weed control but can be reduced or eliminated by timely cultivations and herbicide applications.

**M2.** Herbicides are commonly used as tank-mixtures on sugarbeet. Some herbicide combinations are registered for use as tank-mix combinations, but many other tank-mixes are not registered. Herbicides may be tank-mixed legally if all herbicides in the mixture are registered for use on sugarbeet. However, the user must assume liability for any resulting crop injury, inadequate weed control, or illegal and/or harmful residues.

**M3. Assure II** (quizalofop-P) at 7 to 10 fl oz/A plus petroleum oil controls annual grasses and quackgrass. See discussion on Assure II under soybean for additional information.

**M4. Betanex** (desmedipham) and **Betamix** (desmedipham plus phenmedipham) applied POST control annual broadleaf weeds. Sugarbeet injury occasionally occurs from Betanex and Betamix. Sugarbeet with four true leaves are much less susceptible to injury than smaller sugarbeet and they gain additional tolerance with increased size. Betanex or Betamix may be applied to sugarbeet with less than four leaves. Application rates totaling 3 pt/A or less should be followed by a second application in 5 to 7 days if living weeds are present after 5 days. Split application with reduced rates has reduced sugarbeet injury and increased weed control compared to one full-rate application. See Table 1 below for information on adjusting rates for sugarbeet size, sprayer pressure and presence of a soil applied herbicide. Risk

of sugarbeet injury is reduced by starting application in late afternoon so cooler temperatures follow application. Risk of injury is increased by recent flooding, high temperature, and especially, a sudden change from cool, cloudy conditions to hot, sunny weather.

Table 1. Betanex, Betamix, Broadcast Rate.

Sugarbeet Stage	No soil herbicide			
	Low pressure (<100 psi)		High pressure or aerial	
	(lb/A)	(pt/A)	(lb/A)	(pt/A)
Coty-2-leaf	0.25	1.5	0.16	1
2-leaf	0.33	2	0.25	1.5
4-leaf	0.5	3	0.4	2.5
6-8-leaf	0.75	4.6	0.75	4.6

Sugarbeet Stage	With soil herbicide			
	Low pressure (<100 psi)		High pressure or aerial	
	(lb/A)	(pt/A)	(lb/A)	(pt/A)
Coty-2-leaf	0.16	1	0.12	0.75
2-leaf	0.25	1.5	0.16	1
4-leaf	0.33	2	0.25	1.5
6-8-leaf	0.5	3	0.5	3

**M5. Micro-rate** program uses low rates of herbicides in combination applied three or more times at a 5 to 7 day interval starting when weeds are just emerging. The micro-rate treatment is Betanex or Betamix or Progress plus UpBeet plus Stinger plus an methylated seed oil (MSO) adjuvant at 0.5 or 0.5 or 0.4 pt/A plus 0.125 oz/A plus 1.3 fl oz/A plus 1.5% v/v. The MSO is essential to increase weed control from low herbicide rates used. Assure II at 4 fl oz/A or Select at 2 fl oz/A or Poast at 5.3 fl oz/A can be added to the micro-rate to improve grass control. The micro-rate will not control lanceleaf sage or ALS resistant kochia.

Three applications of the micro-rate generally has given better weed control than two applications of conventional rates. Three applications of conventional rates sometimes gave better weed control than three applications of the micro-rate but differences generally were 5% or less. Broadcast application of the micro-rate is encouraged since precise application is easier with broadcast rather than band application. If banding, adjust band width to 11 inches or wider and wind velocity should be low.

Precipitation and nozzle plugging is common with ground application of the micro-rate. Several factors may reduce nozzle plugging. 1) Start with a clean sprayer, spray out the tank load immediately after mixing, spray until tank is dry, flush sprayer between loads, clean sprayer frequently, and never allow spray solution to set in the tank. 2) Pre-mix the UpBeet in hot water or water with pH 8 to 9. Put UpBeet in the tank first and be sure it is dissolved before adding, in order, Betanex/Betamix/Progress, Stinger, and MSO type oil adjuvant. 3) Allow the spray tank water to warm before mixing and increase the pH of the water to 8 or 9 by using ammonia, Quad 7, or other pH increasing agents. A 2% solution of household ammonia at 1 gal/100 gal of water will give about pH 9. Add ammonia slowly as the tank fills so water pH does not go much over pH 9. 4) Add a grass herbicide. Tests using a single nozzle and a small volume of spray solution indicated that Assure II reduced precipitation more than Poast and Select but all had an effect. 5) Gentle agitation resulted in less precipitation than vigorous agitation.



**M6. Eptam (EPTC)** PPI in the spring at 2.3 to 3.4 pt 7E/A or in the fall at 4 to 5 pt 7E/A or 17 to 22 lb 20G/A controls annual grasses and certain broadleaf weeds but may sometimes cause sugarbeet stand reduction and temporary stunting. However, no yield reduction will occur if an adequate sugarbeet population remains after thinning. Use extreme caution in sandy loam or lighter soils with low organic matter because choosing a safe rate is difficult. Herbicides such as Ro-Neet, Nortron, or Pyramin cause less sugarbeet injury on the low organic matter soils where Eptam injury may be excessive.

**Ro-Neet** spring applied at 4 to 5.3 pt/A or fall applied at 5.3 pt/A gives weed control similar to Eptam. Eptam tends to give better weed control than Ro-Neet on fine-textured, high organic matter soils or under relatively dry conditions while Ro-Neet gives better control than Eptam under abundant spring rainfall. Ro-Neet causes less sugarbeet injury than Eptam and is safer to use on more coarse-textured, low organic matter soils.

**M7. Eptam (EPTC) plus Ro-Neet (cycloate)** has less potential for sugarbeet injury and is less expensive than Ro-Neet alone. The rate of the mixture must be adjusted for soil texture and organic matter. Suggested fall applied rates are: Ro-Neet alone at 5.3 pt/A on soils with less than 3 percent organic matter, Eptam plus Ro-Neet at 1.1 pt/A plus 4 pt/A on loam or coarser soils with 3% organic matter, 1.7 pt/A plus 3.3 pt/A on loam to clay loam soils with 3 to 4% organic matter, 2.3 pt/A plus 2.7 pt/A on clay loam soils with 3.5 to 4.5% organic matter, and 2.9 pt/A plus 3.3 pt/A on clay or clay loam soils with over 4.5% organic matter.

Suggested spring applied rates are: Ro-Neet alone at 4 pt/A on loam or coarser soils with 3% or less organic matter, Eptam plus Ro-Neet at 1.1 pt/A plus 3.3 pt/A on loam or coarser soils with 3 to 3.5% organic matter, 1.7 pt/A plus 3.3 pt/A on loam to clay loam soils with 3.5 to 4.5% organic matter, and 2.3 pt/A plus 2.7 pt/A on clay loam or finer soils with 4% or more organic matter. These rates may need to be adjusted on certain fields or with certain incorporation tools based on individual experience. Eptam, Ro-Neet, or Eptam plus Ro-Neet require immediate incorporation for best weed control.

**M8. Herbicide 273 (endothall)** at 0.67 to 2.67 pt/A applied POST controls wild buckwheat and smartweed, should be applied when temperatures are between 60 and 80 F, generally gives poor weed control when weeds are drought stressed, and is more effective than Stinger for control of vining wild buckwheat or smartweed at any growth stage.

**M9. Nortron SC (ethofumesate)** at 6 to 7.5 pt/A controls several broadleaf and grass weeds. Nortron is particularly effective on redroot pigweed and wild buckwheat but is weak on yellow foxtail. Nortron may be applied PRE but research results in North Dakota and Minnesota indicate that incorporation generally improves weed control. Nortron incorporated by operating the incorporation tool 2 to 4 inches deep gave slightly better weed control than when incorporated 1 inch deep. Band application of Nortron reduces cost and soil residue. Nortron has been relatively safe on sugarbeet but use of Nortron with Ro-Neet or fall-applied Eptam can cause sugarbeet injury especially on coarse textured soils. Nortron plus spring-applied Eptam may cause serious injury and should only be used on fine textured soils with over 6% OM.

**M10. Nortron SC (ethofumesate)** is registered as a tank-mix combination with **Betanex** (desmedipham). Nortron SC plus Betanex gives increased weed control and greater risk of sugarbeet injury than Betanex alone. The active ingredients should be used in a 1 part ethofumesate:2 parts desmedipham ratio. The total lb/A of the active ingredients in the tank-mix combination should be equal to the lb/A of Betanex if the Betanex were to be applied without the Nortron SC. For example, if the normal rate of Betanex was 0.3 lb/A, then the suggested Nortron SC plus Betanex rate would be 0.1 + 0.2 lb/A. Risk factors are the same as for Betanex alone.

**M11. Poast (sethoxydim)** at 0.5 to 1.5 pt/A plus oil additive controls annual grass weeds and quackgrass in sugarbeet. See discussion on Poast under soybean for additional information.

**M12. Progress (desmedipham + phenmedipham + ethofumesate)** applied POST gives increased weed control and greater risk of sugarbeet injury than Betamix alone. The active ingredients are in a 1:1:1 ratio. A tank mixture of Betamix plus Nortron SC can substitute for Progress but the ratio of the three active ingredients should be 1:1:1. Adjust the rate Progress so the total lb/A of the active ingredients is equal to the lb/A of Betamix if the Betamix were applied alone. For example, if the normal rate of Betamix was 0.3 lb/A then Progress also should be applied at 0.3 lb/A. Risk factors are the same as for Betamix alone.

**M13. Select (clethodim)** at 6 to 8 or **Prism** at 12.8 to 17 fl oz/A plus oil additive at 1qt/A controls annual and quackgrass in sugarbeet. See table in the soybean section for rates of Select/Prism according to weed species and weed size. Quackgrass can be controlled with two sequential applications, each at 8/17 fl oz/A. Tank-mixing POST sugarbeet herbicides or applying the herbicide within 1 day of Select/Prism may reduce grass control compared to Select/Prism applied alone. Reduced grass control can be avoided by applying Select/Prism at least 1 day before or 5 days after application of a broadleaf herbicide. However, research at NDSU indicated that grass control from Select/Prism was reduced less than from Poast or Assure II tank-mixed with Betanex or Betamix. Do not apply Select/Prism within 100 days of harvest. Do not apply more than 68 fl oz of Select/Prism per season.

**M14. UpBeet (triflusaluron)** at 0.25 to 0.5 oz/A should be used with an adjuvant when applied with Stinger but without adjuvant when applied with Betanex, Betamix, or Progress. UpBeet is a postemergence herbicide that should be applied in combination with other broadleaf herbicides mentioned above. UpBeet will antagonize grass control from Poast, Prism or Assure II similar to antagonism caused by Betanex, Betamix or Progress. The lowest labeled rate of UpBeet is 0.5 oz/A. Research in eastern ND and MN has shown that Betamix + UpBeet applied once at 1.5 pt + 0.5 oz/A followed 7 days later by 2 pt + 0.5 oz/A generally gave less control than Betanex + UpBeet applied three times at 7 day intervals using 1 pt + 0.25 to 0.3 oz/A in each treatment. Allow a 60 day PHI. Do not exceed 2.5 oz/A UpBeet in a single growing season.

**M15. Stinger (clopyralid)** at 0.25 to 0.66 pt/A applied POST controls several broadleaf weeds and volunteer crops. Stinger at 0.25 to 0.5 pt/A is most effective when applied to common cocklebur, giant ragweed, volunteer sunflower, wild sunflower, volunteer alfalfa, and volunteer soybean up to the 6-leaf stage, common ragweed up to the 5-leaf stage, and wild buckwheat in

the 3- to 5-leaf stage before vining begins. Apply Stinger at 0.5 to 0.66 pt/A to Canada thistle in the rosette to pre-bud growth stage. Rosette application will give better control than later application. Stinger must be applied to sugarbeet in the 2- to 8-leaf stage and at least 105 days prior to harvest.

**M16. Trifluralin** at 1.5 pt/A or **Eptam** (EPTC) at 3.4 pt/A can be used on 2- to 6-inch tall sugarbeet for annual grass and broadleaf weed control. Broadcast and incorporate immediately with cultivators or tillage tools adjusted to mix the herbicides in the soil without excessive sugarbeet stand loss. The crop should be clean cultivated before application since established weeds are not controlled. Trifluralin or Eptam will control late germinating weeds that may become a problem, well into the season with good moisture conditions.

**M17. Combinations of postemergence herbicides** give more broad spectrum and greater total weed control compared to individual treatments. The risk of sugarbeet injury also increases with combinations so combinations should be used with caution. Herbicide 273 has been used at 0.67 to 1.33 pt/A in combination with Betanex or Betamix for improved control of wild buckwheat and ladysthumb. Stinger + Betanex or Stinger + Betamix have given control of wild buckwheat, eastern black nightshade, common lambsquarters, buffalobur, giant ragweed, ladysthumb, lanceleaf sage, and Russian thistle superior to Stinger alone and superior to Betanex or Betamix alone. UpBeet plus Betanex, Betamix or Progress has provided improved control of redroot pigweed, prostrate pigweed, kochia, common mallow, nightshade, ladysthumb, Venice mallow, nightflowering catchfly, wild mustard and velvetleaf compared to Betanex, Betamix, or Progress alone. UpBeet generally has little effect on sugarbeet injury. A three-way combination of Betanex + UpBeet + Stinger has given good to excellent control of all common broadleaf weeds in sugarbeet in research conducted in ND and MN.

Refer to web site listed on front cover of weed guide for:

N1-9. Potato

P1-7 Legumes

Q1-8. Chemical Fallow

R1. CRP breakout

## ANNUAL WEED CONTROL

Refer to web site listed on front cover of weed guide for :

S1. False chamomile

S2. Foxtail

**S3. Kochia** is an exceptionally competitive weed and a few uncontrolled plants can cause severe yield losses. Use proper spray volumes for thorough coverage. ALS herbicides provide good kochia control unless resistant populations are present. Tank-mixing ALS herbicides with other effective broadleaf herbicides with differing modes of action is required to slow development of resistant kochia. Starane or dicamba controls susceptible and resistant kochia. Bromoxynil plus MCPA also gives good control of kochia, but plants should be small and spray coverage good. Tordon is not effective on kochia and 2,4-D and MCPA no longer control kochia due to repeated use and near eradication of susceptible kochia biotypes. 2,4-D and MCPA do not translocate readily in kochia. Treat small plants

(less than 3 inches tall) and use high spray volumes to thoroughly wet kochia foliage. Kochia seed is short-lived in soil so one or two years of excellent control can greatly reduce kochia populations. Trifluralin does not give consistent kochia control. However, use of Sonalan may improve control. Soil applied Authority in soybean or Spartan in sunflower gives good to excellent kochia control. Flexstar with MSO type adjuvant applied in high water volumes of 20 gpa may give good postemergence control of kochia in soybean.

Refer to web site listed on front cover of weed guide for a complete review of nightshade:

**S4. Nightshades** are tolerant to many classes of herbicide including SUs. Eastern black nightshade resistance to imidazolinone herbicides has been documented in the Red River Valley of North Dakota. Black nightshade is more tolerant to some herbicides (Matrix) than eastern black nightshade. Thus, herbicides may remove competing broadleaf weeds allowing nightshades to proliferate. Only a few herbicides with residual effect e.g. Authority, Balance, Pursuit, and Python can help control continuous nightshade emergence flushes.

**Nightshade control in small grains:**

POST herbicides: 2,4-D, Banvel SGF, Clarity, Bromoxynil, Bromoxynil + MCPA, Curtail, Tordon.

**Nightshade control in corn:**

PPI, PRE herbicides: Atrazine, Balance, Broadstrike + Dual, Doubleplay, Eradicane, Frontier, Harness, Lasso, Python, and Surpass.

POST herbicides: Accent Gold, Basis Gold, Clarity, Hornet, Bromoxynil, Scorpion III, Liberty (Liberty resistant corn), Lightning (Clearfield corn), and glyphosate resistant Corn).

**Nightshade control in soybean/dry bean:**

Not all herbicides are labeled for dry beans - see dry bean section or labels.

PPI and PRE herbicides: Authority, Broadstrike + Treflan, Frontier, Python, and Sonalan.

POST herbicides: Blazer, Cobra, Flexstar, Pursuit, Raptor, Liberty (Liberty tolerant Soybean), Roundup Ultra/RT/Glyfos (Roundup Ready Soybeans).

Notes: Basagran may control H. nightshade but not E. B. nightshade. Basagran, Blazer, and Cobra will control only small nightshade. Only Broadstrike/Python and Pursuit has residual control for multiple nightshade flushes. However, follow crop restriction must be observed.

**Nightshade control in sugarbeet:**

PPI and PRE herbicides: Eptam, Norton, and Ro-Neel.

POST herbicides: Single or multiple applications of Betanex/Betamix/Progress + Upbeet + Stinger to nightshade at the cotyledon to 2-leaf stage. Alternative control: inter-row cultivation, and hand weeding.

**Nightshade Control in potato:**

PPI and PRE herbicides: Eptam, Dual + Lexone/Sencor, or Matrix (e. b. and hairy nightshade only).

POST herbicides: Matrix (e. b. and hairy nightshade only).

**S5. Pigweed** control requires higher rates of most herbicides than rates for control of wild mustard. Ally, Amber, Harmony Extra or Express give good control. Most ALS herbicides, Banvel/SGF/ Clarity, 2,4-D, and Tordon plus 2,4-D at 0.75 pt/A also give good control. MCPA is not as effective as 2,4-D in controlling either pigweed. The esters of 2,4-D generally are more effective than the amines. A redroot pigweed population resistant to imidazolinone herbicides have been documented in Cass county.

**Waterhemp**, a related pigweed species, is tolerant to ALS herbicides. Geographic distribution has been primarily in the midwest, but waterhemp has been documented in the Red River valley of North Dakota. For more information on pigweed species refer to publications "Pigweed Identification" from Kansas State University Ext. Service, (913) 532-5776 (\$1.50) or "Waterhemp Management in Agronomic Crops" (No. X855) from University of Illinois Ext. Service, (217) 333-0005 (\$2.00).

Refer to web site listed on front cover of weed guide for :

- S6. Russian thistle
- S7. Volunteer sunflower
- S8. Wild oat

**S9. Biennial wormwood** plants emerge throughout the year, behave like an annual species, and produce numerous seed (approx. 1 million per plant). B. wormwood seeds are very small (magnification lens at 7x), can be dispersed easily by wind, water, and all human-related operations related to farming. B. wormwood thrive in undisturbed (no- or minimum-till) areas, low areas, and areas where soil may remain wet for extended periods of time. Consequently, with every rain event a new flush of wormwood seedlings may appear.

Biennial wormwood is difficult to control because of an extended emergence period and tolerance to many PPI, PRE (e.g. Treflan, Sonalan, Prowl, Lasso, Dual) and POST (e.g. most ALS herbicides and Blazer) herbicides used in row crops. Also, b. wormwood can emerge late after most POST herbicides have been applied and is often confused with common ragweed. However, b. wormwood is susceptible to growth regulator herbicides of 2,4-D, Banvel, Clarity, Curtail/M, Distinct, Hornet, Stinger and to non-selective herbicides of Liberty and glyphosate. Other herbicide that may control or suppress b. wormwood are soil applied Authority, Broadstrike + Treflan, Frontier, Harness/Surpass, Python, and Spartan.

Limited research and experience indicates Basagran applied as split applications - first split when wormwood is 1.5 inches tall and second split when wormwood is 3 inches tall will improve control. Additionally, from preliminary research, it appears that small wormwood, 1 to 3 inches tall, may be controlled by some herbicides that were previously thought to be ineffective. Wormwood apparently rapidly becomes tolerant to herbicides as plant size increases.

Commonly, biennial wormwood survives PPI, PRE, and POST herbicides, is then detected and misidentified as common ragweed when plants are large. Rescue treatments are made with herbicides that control common ragweed, such as Blazer and FirstRate but have little or no effect on wormwood. B. wormwood plants can grow six feet tall with a woody stem that averages 1 to 2 inches in diameter which impedes grain harvest or can damage harvesting equipment.

## PERENNIAL WEEDS

**T1. Field bindweed** is a problem in the more semi-arid parts of ND. Paramount (quinclorac) at 0.33 lb DF controls field bindweed in fallow, postharvest or preplant in spring prior to seeding wheat, including durum. Bindweed should be actively growing with regrowth at least 4 inches long. Apply with MSO adjuvant at 1.5 pt/A. AMS at 2.5 lb/A or UAN at 1 ga/A may also be added to improve control but do not substitute for MSO. Apply after harvest but prior to frost. Suggested for use in a 3-year program by applying 0.33 lb DF/A the first year and 0.17 to 0.33 lb DF/A in following years. May control foxtails, barnyardgrass, and volunteer flax. Field research in ND, SD, KS, NE, CO, and WY show Paramount to give excellent field bindweed control at rates of 0.33 to 0.5 lb/A. Will require yearly applications for rates less than 0.37 lb ai/A.

**T2. Canada thistle** has become a major problem in ND due to reduced tillage, wet weather, and lack of persistence in control. NDSU research has shown Curtail provides the best long-term Canada thistle control. Glyphosate alone or with 2,4-D gave better control applied post-harvest than pre-harvest. However, control was reduced under dry conditions. Banvel/Clarity gave good in-season control but dropped to 65% the following year. Express + 2,4-D did not control Canada thistle. 2,4-D at jointing followed by Curtail applied post-harvest to rosette thistle provided the best long-term control. In general, post-harvest treatments gave better thistle control than pre-harvest treatments. Glyphosate applied alone gave control similar to Curtail but less control than glyphosate + 2,4-D.

Clarity, Roundup, Tordon, 2,4-D, Curtail, and Stinger have the greatest activity on Canada thistle. Highest rates should be used without interfering with next years cropping pattern. Apply high rates of herbicides to patches before thistle infestation increase. Timing is a critical factor. Herbicide application after a light frosts may enhance control but application in late October when leaf tissue was destroyed by frost may result in less control due to lack of herbicide uptake. Tillage can be a critical factor. Tillage in late fall after spraying increases control and may add an additional 30 to 40% control for treatments that gave 30 to 50% control. If lower herbicide rates or less effective herbicides are used, tillage is very important. If tillage is not planned, then use the most effective herbicide at high rates. Spray rosettes of actively growing plants using the rosette technique.

**Rosette Technique.** Fall-applied herbicides are better absorbed and translocated when Canada thistle is in the rosette compared to bolting or flowering stage. The rosette techniques for Canada thistle control in fallow include the use of tillage and fall-applied herbicides, while control in row crops includes in-crop herbicide treatments, tillage, and fall-applied herbicides. Periodic tillage in fallow is used to control Canada thistle shoots and other weeds until late July when the day-length is less than 15 hours. Canada thistle shoots that emerge when day-length is less than 15 hours do not bolt but remain in the rosette growth stage. A herbicide used for Canada thistle control, such as glyphosate, Curtail/M, or Stinger, is then applied to rosettes in late September or early October. A similar technique can be used in row crops where between-row cultivation can be utilized. Herbicides and tillage are used to control Canada thistle in the crop to prevent bolting. Cultivation should be continued until canopy closure in soybean and until

early July in corn. Herbicides recommended for Canada thistle control can be applied post-harvest until early October. The rosette technique controls Canada thistle in both fallow and row-crops during the season and maximizes the number of rosettes for better absorption, translocation and activity of herbicides. Herbicides fall-applied to Canada thistle in the rosette stage provide greater control and root kill compared to treating bolted Canada thistle.

**T3. Common milkweed** has become a severe weed in cultivated cropland due to an extensive deep root system, insulating winter snow, moist to wet summer conditions, tolerance to many commonly used herbicides, reduced tillage, and lack of human persistence in chemical, mechanical, and cultural control measures. Common milkweed is tolerant to most labeled herbicides. Control requires multiple herbicide application. Preventing establishment and spread of common milkweed patches requires continuous scouting and persistent control efforts.

Prevent seed production. Milkweed seed is highly viable and will germinate readily. Pappus on seeds allows long-distance travel and is responsible for establishment in fields. Common milkweed becomes perennial (capable of reproducing from underground roots) approximately 3 weeks after emergence. New shoots developing from established roots begin emerging in late April and grow more rapidly than spring seeded crops.

Milkweed control is expensive. Individual plants and small patches are easier and less expensive to treat than entire fields. Patch spraying covers only a fraction of the area of a broadcast application. Patch spraying allows use of higher herbicide rates with less expense than broadcast spraying.

#### NDSU Research Data - applied June of 1988.

Herbicide	Rate pt/A	Fall 88 % control	Spring 89 % control
2,4-D	4	36	48
Banvel	2	71	61
Banvel + 2,4-D	0.5+2	26	15
Curtail	4	13	6
Tordon	2	86	83
Roundup	6	56	99

Apply herbicides when milkweed is in the late-bud to flowering stage and actively growing. Control patches when small. Patch-spray glyphosate at 6 to 8 pt/A (up to 10 pt/A is allowed). Apply at late bud to flowering. Apply glyphosate with AMS at 8.5 to 17 lb/100 gallons of water. Do not apply after small grain is headed and only a maximum of 10% of the field can be treated. After heading, the application is regarded as a preharvest application and maximum use rates are limited to 2 pt/A. Patch-spray Tordon at 4 to 8 pt/A. Tordon residue will help prevent other shoots from emerging. **CAUTION:** Treated areas will contain Tordon residues for several years after application.

## PERENNIAL WEED CONTROL

**T4. Fall applied herbicides** can be effective for controlling perennial weeds provided most weed stem and leaf tissue has not been killed by frost. Weeds such as field bindweed, leafy spurge and Canada thistle should have 6 to 12 inches or more of stem or rosette tissue before treatment for adequate leaf area

to absorb the herbicide. Good leafy spurge control can be expected through mid-October even after several light frosts if the leaves are green or red but still firmly attached to the stem.

**T5. Mowing or tillage** is a good means of reducing perennial weed seed production. If fall herbicide applications are planned, mowing or tillage should be discontinued early enough to allow adequate plant regrowth. Post-harvest treatments can be applied when weed growth is about 1 foot tall. A preharvest treatment with 2,4-D can be used in small grains after the grain matures to the dough stage or later. Herbicide treatment should be separated from harvest by at least 5 days to allow adequate herbicide translocation in the perennial weeds.

### PERENNIAL WEEDS IN CROPS

**T6. Perennial weed control systems in small grains** should include herbicide application in crop followed by post-harvest treatment for several years. Canada thistle and perennial sowthistle can be controlled in wheat and barley with Curtail, Express, Harmony Extra, MCPA and 2,4-D. Canada thistle control is generally better with Curtail than other herbicides. Perennial sowthistle and field bindweed can be controlled in tolerant crops with MCPA or 2,4-D. When controlling thistles in small grains, except oat, apply the maximum rate of 2,4-D or MCPA that the crop will tolerate: 2,4-D or MCPA amine at 1.5 pt/A of a 4 lb/gal concentrate and 2,4-D low volatile ester or MCPA ester at 1.33 pt/A of a 4 lb/gal concentrate. MCPA is less likely to cause injury to small grain than 2,4-D. MCPA can be used to suppress thistles in oat and flax, but these crops do not tolerate rates of MCPA necessary to control thistle. Clarity can be tank-mixed with 2,4-D or glyphosate for control of perennial broadleaf weeds after harvest or during fallow. Tank-mix Clarity at 1 to 4 pt/A with glyphosate at 2 to 4 pt/A of a 3 lb ae/gal concentrate. When higher Clarity rates restrict crop rotation, use the lower rate of Clarity and higher rates of glyphosate.

**T7. Glyphosate** at 4 to 10 pt/A of a 3 lb ae/gal concentrate may be applied for spot treatment of perennial weeds in wheat, barley, oat, corn and soybean. Spot treatments must be made prior to the heading stage of small grains, initial pod set on soybean and silking of corn. Glyphosate is a nonselective POST herbicide so the crop in the treated area will be killed, and care must be taken to avoid drift outside the target area. Roundup Ultra/RT does not have a soil residual, so plants arising from seed after treatment or unaffected underground rhizomes or roots of perennials will continue to grow. See the perennial weed control section of the tables for application stages and rates. Preharvest applications of Roundup Ultra at 2 pt/A have given good Canada thistle and quackgrass control. Preharvest applications will give greater Canada thistle control than post-harvest applications when tillage is used after harvest.

**Touchdown** (glyphosate - trs) at 2.4 to 6.4 pt/A may be applied for spot treatment of perennial weeds in corn and soybean. Spot treatment must be made prior to initial pod set on soybean and silking in corn. Touchdown is nonselective so crop in treated areas will be killed. Avoid drift to off-target sites during application. Touchdown does not have soil residue, so plants arising from seed after treatment or unaffected underground rhizomes or roots of perennials will continue to grow. Consult label for rates at specific weed stages.

## PERENNIAL WEEDS IN PASTURES

**T8. 2,4-D** ester or amine at 2 to 4 pt/A of a 4 lb/gal concentrate can be used to control many perennial weeds in pastures. Some perennials such as fringed sagebrush and western snowberry (buckbrush) are controlled with one application and perennials such as Canada thistle, field bindweed and leafy spurge require retreatment annually. 2,4-D can be used in many locations where Tordon cannot, but drift onto susceptible plants such as trees should be avoided. Several brands of 2,4-D with various application limitations are available. For example, Hi-Dep allows use at spray volumes as low as 1 gpa by ground or 0.5 gpa by air. PBI Gordon "Amine 400," Cornbelt Chemical "Navigate," and Rhone Poulenc "Weedar 64" are labeled for use in water. See individual labels for further details.

**T9. Banvel/Clarity** (dicamba) at 1 to 2 pt/A will suppress some perennials, especially field bindweed and weeds resistant to 2,4-D. Banvel/Clarity can be applied at 1 to 5 gpa in pasture, rangeland, and fallow. When applying Banvel/Clarity at 2 pt or less, use 0.5% v/v surfactant or AMS at 17 lbs/100 gal of spray solution. Long-term control generally is achieved with 4 to 16 pt/A but the high rates are economical only for spot treatment. Banvel/Clarity has a shorter soil residual than Tordon, but should not be applied where desirable plants may be damaged by herbicide leached to the root system. The label indicates the required delay between treatment and grazing of dairy animals or cutting for hay but varies with rate from 7 to 90 days.

**T10. Crossbow** (triclopyr plus 2,4-D) at 1 to 6 qt/A can be applied to grass pastures for broadleaf weed and brush control. Crossbow plus 2,4-D generally provides better musk thistle and brush control than 2,4-D alone. Do not graze lactating dairy animals or harvest hay from treated areas for 1 year after application. Do not graze beef animals within 3 days of slaughter during the first year after treatment.

**T11. Escort** (metsulfuron) at 0.5 to 1.5 oz 75DF/A or **Ally** (metsulfuron) at 0.1 to 0.3 oz 75DF/A can be applied in rangeland, grass pastures and non-cropland for control of noxious and troublesome weeds. For foliar spot treatment, mix 1 oz 75DF/A per 100 gallons of water. Spray foliage for thorough coverage but not to run-off. Add a NIS at 0.25 to 0.5% v/v. Use of NIS may cause temporary yellowing, stunting and suppression of head development in annual and perennial grasses. To avoid grass injury, do not apply Escort to desirable grasses under stress, nor to grasses grown for seed. Escort has no grazing restrictions. Escort can be tank-mixed with 2,4-D, Clarity, Tordon, Garlon, and Stinger. To reduce the risk of resistant weeds, apply Escort or Ally in a tank-mix with 2,4-D and Clarity. Escort may be applied through air (helicopter and fixed wing) for weed control to utility and pipeline right-of-ways, military installations, and rangeland and pasture.

**T12. Plateau** (imazapic) applied in the fall through early October controls many grass and broadleaf weeds including foxtail and leafy spurge in right-of-ways, pasture, rangeland, and CRP. **DO NOT apply to grass areas that will be grazed or hayed.** Warm season grasses are more tolerant than cool-season grasses. Apply with MSO type adjuvant plus 28% UAN each at 1 qt/A. Highest rate provides longer control but increases grass injury. Paramount does not control absinth wormwood. Paramount used in noncropland has two important benefits, no injury to desirable forage grasses and no injury to several desirable broadleaf species including lead plant (*Amorpha canescens*), purple

prairie clover (*Dalea purpurea*), prairie wild rose (*Rosa arkansana*), willow, (*Salix* species), and wild raspberry (*Rubus* species). Apply Paramount with MSO for optimum weed control in the fall from early September to mid-October.

**T13. Rave** (dicamba-Na + triasulfuron) at 2 to 5 oz WDG/A in pasture, rangeland and CRP applied POST controls several annual broadleaf weeds and provides partial control of field bindweed, Canada thistle, and musk thistle. Do not apply to new seedlings of grasses until at least 60 days after emergence. Rave can be applied with 2,4-D, Crossbow, Weedmaster, Grazon P+D, Stinger, and Tordon 22K. Apply with a NIS at 0.125 to 0.25% v/v or oil adjuvant at 1% v/v. Rave can be used on several established rangeland grasses. See label for approved list. Rave spray drift or sprayer contamination causes severe injury to most broadleaf crops. Thorough cleaning of a sprayer is required to prevent contamination of subsequent sprays and injury to susceptible crops. See sprayer cleanout section. Rave may persist in the soil for 4 years or more. Consult label or herbicide carryover/residue section for rotational crop restrictions.

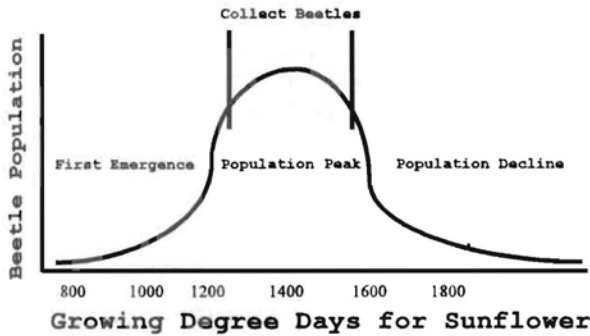
**T14. Tordon** (picloram) at 4 to 8 pt/A applied as a spot treatment controls broadleaf perennial weeds such as leafy spurge, common milkweed, field bindweed, Canada thistle and Russian knapweed on rangelands and permanent grass pastures. Tordon at 1 to 2 pt/A applied POST will suppress the growth of perennial broadleaf weeds. Retreatment at the same rates may be necessary the following year. The most cost effective broadcast spring treatment for leafy spurge control is Tordon at 1 pt/A plus 2,4-D at 2 pt/A applied annually for 3 to 5 years. Do not apply Tordon with dry fertilizers. Tordon is toxic to most broadleaf plants. Spray drift in small amounts may damage most broadleaf crops and plants. Tordon is water soluble and may leach in the soil; consequently, do not apply in areas where a sandy porous surface and substrata overlay ground water 10 feet or less below the surface. Tordon must not be allowed to drift into surface water (including wells), irrigation and drainage ditches or near shelterbelts, shrubs or trees. Do not cut grass for feed within 2 weeks after treatment at rates greater than 2 pt/A. Tordon is excreted in the urine, so do not transfer livestock from treated grass areas onto sensitive broadleaf crop areas for 12 months after application without first allowing 7 days of grazing on untreated grass. The total area treated should not exceed 25% of a land owner's acreage found in any particular watershed for rates exceeding 2 pt/A.

## BIOLOGICAL CONTROL OF PERENNIAL WEEDS

**T15. Leafy spurge.** Eight insects for biological control of leafy spurge have been released in North Dakota. **Flea beetles** (*Aphthona* spp.) have been the most effective for leafy spurge due to effective root feeding by larvae, rapid establishment and increase after introduction, and ease in capture and transport to additional locations. Flea beetles are distributed through the North Dakota Biological Control Program. Contact your county weed officer or a member of your local weed board for information. Flea beetles should be released on a well-drained south-facing slope and a moderate density of leafy spurge (60 to 90 plants/square yard) with minimal grass cover and thatch. Do not collect or move flea beetles, or cultivate or burn site, or apply insecticide within a quarter mile of release site for 3 to 5 years to allow establishment. During establishment, landowners should prevent expansion of the leafy spurge infestation by

monitoring the insect population to treat perimeters unaffected by beetles with herbicides.

Begin scouting for flea beetle establishment when the total accumulated growing degree days (AGDD) for sunflower reaches 1100 to 1200. Flea beetle density prior to 1200 AGDD is low which makes it difficult to monitor for establishment. Likewise waiting until 1600 AGDD, the flea beetle population is beginning to decline. The best time to collect flea beetles for redistribution and/or monitoring for establishment is between 1000 to 1500 AGDD.



Estimating beetle density should be done using a standard insect sweep net. Optimum flea beetle collection times are from 10:00 am to 3:00 pm when the air temperature is greater than 70 F, there is little or no wind, and the skies are generally sunny. Leafy spurge should be dry before collecting flea beetles because wet conditions will make sweeping difficult. Sweep 5 times covering an area of 1 m<sup>2</sup> and count the number of flea beetles in the net. If flea beetles are too numerous to count individually, remove excess trash and non-flea beetle insects and pour net contents into a graduated container. Every 10 ml of flea beetles is approximately 1000 individuals.

Redistribute flea beetles to other leafy spurge infestations when 500 to 1000 beetles per 5 minute sweeping period are collected. Collect and redistribute flea beetle adults when present. Over-harvest of beetles is not possible because many flea beetles fall to the ground prior to being swept or are on the soil surface laying eggs. Redistribute flea beetles in a small area of 10 ft<sup>2</sup> or less. A successful release should result in 50 or more flea beetles in 5 sweeps the summer following release. If densities are less than 50 flea beetles per 5 sweeps then re-infest the site with additional flea beetles. A portion of the release area could be treated with Tordon (picloram) plus 2,4-D (2 pt + 2 pt) from early to mid-September.

Research at North Dakota University has shown greater leafy spurge control when herbicides are combined with flea beetles compared to either used alone. Contact your county weed officer for date, time, and location of flea beetle collection in your area and information on purchasing collection equipment. An instructional video is available from the North Dakota Department of Agriculture, "[How To Raise Leafy Spurge Flea Beetles](#), North Dakota's Biological Control Program".

**Leafy spurge gall midge (*Spurgia esulae*)** prevents galled stems from flowering, decreasing seed production. The gall midge generally infests only part of a leafy spurge population so seed production is reduced but not eliminated. A second control method is needed to reduce the original infestation and prevent spread by roots and seeds of plants not galled. Research at NDSU has shown that the leafy spurge gall midge is compatible with herbicide treatment in an integrated leafy spurge

management program. Herbicides such as Tordon or 2,4-D should be applied at the optimum growth stage for leafy spurge control. Some of the area (perhaps 15 to 25%) must be left untreated to sustain the insect population. This integrated program may be most useful near wooded areas or rough terrain. Consult NDSU Ext. Service Circulars W-866 *Integrated Management of Leafy Spurge* and W-1088 *Leafy Spurge Biology, Ecology, and Management*, W-1183, *Leafy Spurge Control Using Flea Beetles*, for further details.

**Grazing.** Sheep and goats provide an alternative to herbicides for controlling leafy spurge top-growth in pasture and rangeland with large infestations or along waterways and tree areas. Grazing alone reduces but does not eliminate leafy spurge infestation. Grazing slows the spread and allows grasses to be grazed by livestock. Grazing should be started in spring when plants first emerge. Divide infested areas into sections so animals can repeatedly graze new growth. NDSU research has shown that grazing leafy spurge with goats followed by a fall applied herbicide treatment provided more rapid and better long-term leafy spurge control than either method used alone. Consult NDSU Ext. Service Circular W-866, *Integrated Management of Leafy Spurge*, for details.

Recommended stocking rates vary with terrain, leafy spurge density, and rainfall during the growing season. Sheep should be grazed at approximately 3 to 6 head/A/month or 1 to 2 ewes/A. Angora goats should be grazed at 12 to 16 goats/A/month or 3 to 4 goats/A. Grazing with goats controls leafy spurge with little utilization of the grass species. The stocking rate will decline over time as the leafy spurge infestation is reduced. Animals should be contained for 3 to 5 days so viable seed can pass through the digestive system before they are moved to non-infested areas. Which animal to utilize will depend on a land manager's specific conditions, such as fencing, availability of animals, need to overwinter, etc., and prevailing markets at the time. Consult NDSU Extension Service Circular R-1093, *Controlling Leafy Spurge Using Goats and Sheep*, for further details.

**T16. Purple loosestrife.** Six species of insects have been identified as having potential for biological control of purple loosestrife. Three species have been released into North Dakota by NDSU. The insects and plant parts attacked are: *Galerucella pusilla* - a leaf-feeding beetle, *Galerucella californiensis* - a leaf-feeding beetle, *Hylobius transversovittatus* - a root-mining weevil. Biological agents hold promise for large infestations, thereby reducing the spread from neighboring states. However, purple loosestrife infestations in North Dakota are very small and isolated and should be controlled by chemical and/or mechanical methods. Biological control agents for purple loosestrife have not worked well in urban areas because mosquito spraying has severely reduced populations of biocontrol agents.

- U1. Shelterbelt Weed Control
- V1. Noncropland Weed Control
- V2. Total Vegetation Control
- W1. Herbicide Resistant Crops
- X1. Herbicide Resistant Weeds
- Y1-22. Herbicide Carryover

## Herbicide Classification and Mode of Action for Resistant Weed Management

Mechanism of Action	Common Name	Herbicide Tradename	Premix Tradenames
ACC-ase Inhibitors (1) "Fops"	clodinafop-P diclofop fenoxaprop-P fluazifop-P quizalofop	Discover/Horizon Hoelon Puma Fusilade DX Assure II	Cheyenne, Dakota, Fusion, Tiller Fusion
	"Dims" clethodim sethoxydim tralkoxydim	Select/Prism Poast Achieve	Rezult
ALS Enzyme Inhibitors (2) Imidazolinones	imazamethabenz imazamox imazapic imazapyr imazaquin imazethapyr	Assert Raptor Plateau Arsenal Scepter Pursuit	Lightning, Sahara Backdraft, Detail, Squadron, Steel, Tri-Scept Extreme, Lightning, Pursuit Plus, Resolve, Steel
Sulfonylureas	chlormuron chlorsulfuron ethametsulfuron halosulfuron metsulfuron nicosulfuron oxasulfuron primisulfuron prosulfuron rimsulfuron sulfometuron sulfosulfuron thifensulfuron triasulfuron tribenuron triflusulfuron	Classic Glean/Telar Muster Permit Ally/Escort Accent Expert Beacon Peak Matrix Oust Maverick Harmony GT, Pinnacle Amber Express UpBeet	Canopy XL, Reliance STS, Synchrony STS Finesse  Canvas, Finesse Accent Gold, Basis, Basis Gold, Celebrity Plus  Exceed, NorthStar, Spirit Exceed, Spirit Accent Gold, Basis Gold  Basis, Canvas, Cheyenne, Harmony Extra, Reliance, Synchrony Rave Canvas, Cheyenne, Harmony Extra
Triazolopyrimides	chlorsulam diclosulam flumetsulam	FirstRate StrongArm Python (Broadstrike)	FrontRow  Accent Gold, Broadstrike+Dual, Broadstrike+Treflan, FrontRow, Hornet, Scorpion III
Sulfonylamino-carbonyl-triazolinone	flucarbazone MKH 6561	Everest	
Root Inhibitors (DNA) (3)	benflin ethalfluralin oryzalin pendimethalin trifluralin	Balan Sonalan Surflan Prowl/Pendimax/others Trifluralin/Treflan/others	Team  Rout Pursuit Plus, Squadron, Steel Broadstrike+Treflan, Buckle, Freedom, Passport, Salute, Tri-Scept
Growth Regulators (4) Phenoxys	2,4-D 2,4-DB MCPA	2,4-D/others Butyrac MCPA/others	Campaign, Crossbow, Curtail, Landmaster BW, Scorpion III, Shotgun, Starane Plus Salvo, Tiller, Weedmaster  Bronate, Cheyenne, Curtail M, Dakota, Starane Plus Sword, Tiller
Benzoic acids	dicamba	Banvel/Clarity/Sterling	Celebrity Plus, Distinct, Fallow Master, Marksman, NorthStar, OpTill, Rave, Resolve, Spirit, Weedmaster
Pyridines	clopyralid fluroxypyr picloram	Stinger/Reclaim/Transline Starane Tordon 22K	Accent Gold, Curtail, Curtail M, Hornet, Scorpion III  Starane + Salvo, Starane + Sword
Quinolines	quinclorac	Paramount/Drive	
Photosystem II Inhibitors (5) (different than 6)	atrazine	Atrazine/other	Axiom AT, Basis Gold, Bicep/II/Lite, Buctril+Atrazine, Bullet, Contour, Cy-Pro AT, Degree Xtra, Extrazine II, FieldMaster, FullTime, Guardsman, Harness Xtra, Laddok, Lariat, LeadOff, Liberty ATZ, Marksman, Readymaster ATZ, Shotgun
Triazines	cyanazine simazine	Bladex Princep	Cy-Pro AT, Extrazine II Derby
Triazones	hexazinone metribuzin	Velpar Lexone/Sencor	Axiom DF, Axiom AT, Canopy, Domain, Epic, Salute, Turbo
Uracils	bromacil terbacil	Hyvar X Sinbar	Krovar I, WeedBlast
Phenyl-carbamates	desmedipham phenmedipham	Betanex	Betamix, Progress Betamix, Progress

Mechanism of Action	Common Name	Herbicide Tradename	Premix Tradenames
Photosystem II Inhibitors (6) (different than 5)	bromoxynil	Buctril/Broclean/Moxy	Bison, Bromac, Bronate, Buctril + Atrazine, Brozine, Moxy AT, Rezult
	bentazon	Basagran	Galaxy, Laddok, Storm
	pyridate	Tough	
Photosystem II Inhibitors (7) (diff. than 5 or 6)	diuron	Diuron/Direx/Karmex	Krovar, Sahara, WeedBlast
	linuron	Lorox, Linex, Linuron	
Amide	tebuthiuron	Spike	
Lipid Synthesis Inhibition (8)	propanil	Stampede	Stampede CM
	cycloate	Ro-Neet	DoublePlay Buckle
EPTC	Eptam/Eradicane		
Thiocarbamates	triallate	Far-Go	
Difenzoquat	difenzoquat	Avenge	
EPSP Synthase Inhibitors (9)	glyphosate-ipa	Roundup	Backdraft, Bronco, Campaign, Extreme, FieldMaster, Landmaster BW, FollowMaster, ReadyMaster ATZ <u>Some commercial names for glyphosate:</u> Roundup/RT, Roundup Custom, Roundup Ultra/RT, Roundup Ultra Max, Roundup Original/RT, Rodeo, Glyphos, Glyphomax, Glyphomax Plus
	glyphosate-NH3	Roundup Ultra Dry	
	glyphosate-tms	Touchdown	
Glutamine Synthetase Inhibitors (10)	glufosinate	Liberty/Finale/Rely	Liberty ATZ
Pigment Inhibitors (13)	clomazone	Command	Commence
PPO Inhibitors (14)	acifluorfen	Blazer/Blazer Ultra/Status	Conclude, Galaxy, Scepter OT, Storm Tornado, Twister Stellar
	fomesafen	Flexstar/Reflex	
Diphenylethers	lactofen	Cobra	
N-phenylthalimides	oxyfluorfen	Goal	
	fluathiacet	Action	Stellar
	flufenpur	Resource	
flumiclorac	Valor		
Trizolinones	flumioxazin		
	carfentrazone	Aim/Affinity	Canopy XL
sulfentrazone	Authority/Spartan		
Action unknown (15)	acetochlor	Harness/Surpass/TopNotch/Degree	Degree Xtra, DoublePlay, FieldMaster, FulTime, Harness Xtra Bronco, Bullet, Freedom, Lariat Detail, Guardsman, LeadOff, OpTill Axiom, Axiom AT, Domain, Epic Bicep/II/Lite, Broadstrike+Dual, Turbo Ramrod and Atrazine
	alachlor	Lasso/others	
	dimethenamid	Frontier	
	flufenacet	Dual/Dual II/Magnum	
	metolachlor	Ramrod	
Acetamides	propachlor		
Auxin Inhibitor (19)	diflufenzopyr		Distinct, Celebrity, Celebrity Plus
Photosystem I Inhibitors (22)	diquat	Diquat	
	paraquat	Gramoxone Extra/Starfire	
Carotenoid Inhibitors (28)	isoxaflutole	Balance	Epic
	mesotrione		
Cold, Hard STEEL (29)	Plow, cultivator, rotary-hoe, etc.		

Adapted from Weed Sci. Soc. of Am. (WSSA) Herbicide Classification System For Resistant Weed Management. Weed Technol. 11:384-389.

### Y23. Laboratories That Analyze For Pesticide Residue in soil, water, and plant samples.

A & L Great Lakes Lab, 3505 Conestoga Drive  
Fort Wayne, IN 46808, (219) 483-4759  
www.algreatlakes.com

Agvise Laboratories, Northwood, ND  
701 587-6010 – johntlee@polarcomm.com

Animal Disease Lab, 9732 Shattuc Road  
Centralia, IL 62801-5858, (618) 532-6701

Harris Laboratories, 621 Rose Street, P.O. Box 80837  
Lincoln, NE 68501, (402) 476-2811 www.mdsharris.com

Hazelton Environmental Services, 525 Science Drive,  
Madison, WI 53711, (608) 232-3300

Midwest Laboratories, 13611 B Street, Omaha, NE 68144  
(402) 334-7770 www.midwestlabs.com

Minnesota Valley Testing Laboratories, Inc., 326 Center Street,  
New Ulm, MN 56073 - (507) 354-8517

Professional Service Industries  
4820 West 15th Street, Lawrence, KS 66049  
(800) 548-7901



Y24. CROP ROTATION RESTRICTIONS

**Rotation Restrictions for Crops Grown in North Dakota**

Herbicide	Alf- alfa	Bar- ley	Can- ola	Corn	Cra- mbe	CRP grss	Dry bean	Flax	Oat	Chck Pea	Dry Pea	Pot- ato	Saff- lowr	Soy- bean	Sgr- beet	Sun- flwr	HRS/ Durm
(months after application)																	
<b>DO NOT USE IN ND = Beacon, Canopy, Canopy XL, Classic, Concert, Exceed, Reliance, Scepter, Spirit, Steel, Synchrony</b>																	
Accent(a)	12	8	18	0	18	18	10	18	8	10	10	18a	18	0.5	18a	11/18a	8
Accent Gold	10.5	8	26b	0	B	26	10.5	B	8	18	18	18	B	10.5	26b	18	8
Ally(c)	34d	10	34d	22e	34d	2-4	22e	22e	10	34d	34d	34d	22e	34d	34d	22e	1/10
Amber	B	18c	B	22	B	B	B	B	18c	B	B	B	B	36b	B	24b	0
Assert	15	0	12/15f	NCS	12/15	4	NCS	15	15	15	15	15	NCS	NCS	0	NCS	0
Atrazine/Aatrex	B	B	B	0	B	2CS	B	B	B	2CS	2CS	B	B	B	B	B	B
<b>Premixes containing atrazine - refer to Atrazine.</b>																	
Authority	12	4	30	10	30	12	12	18	4	12	12	30	30	0	30	-	4
Axiom	12	12	18	0	18	12	12	12	12	12	12	1	12	0	18	12	12
Balance	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Banvel(<1.5pt/A) h	4	4h	4	0h	4h	4	4	4	4h	4	4	4	4	4	4	4	0h
Basis	10	8	18	0	18	18	8	18	8	8	8	4	18	0.5	10	10	8
Basis Gold	18	18	18	0	18	8	18	18	18	18	18	18	18	10	18	18	18
Beacon	8	3	18	0.5	18	18	8	18	8	8	8	2CS	18	8	B	8	8
Brdstrike+Dual	4	4.5	26b	0	26b	12	4	26b	4.5	4	4	12	26	0	26b	18	4.5
Brdstrk+Treflan	4	4	B	8	B	12	4	B	18	4	4	12	B	0	26b	18	4
Buckle	NCS	0	NCS	16	NCS	18	NCS	NCS	16	NCS	NCS	NCS	NCS	NCS	14g	NCS	NCSg
Canvas(0.2 oz/A)e	22	10	22	22	22	2-4	22	22	10	22	22	22	10	22	22	22	1/10
Celebrity(a)	12	8	18	0	18	18	10	18	8	10	10	18a	18	0.5	18a	10/18a	8
Celebrity Plus	12	8	18	0.25	18	18	10	18	8	10	10	18a	18	4	18a	10/18a	8
Clarity(< 1.5pt/A) h	4	4h	4	0h	4h	4	4	4	4h	4	4	4	4	4	4	4	0h
Curtail/M	10.5	1	10.5	1	10.5	1	10.5m	12	1	18	18	18	10.5	10.5m	NCS	10.5m	1
Degree(n)	NCS	NCS	NCS	0	NCS	NCS	NCS	NCS	NCS	NCS	NCS	NCS	NCS	NCS	NCS	NCS	4
Domain	12	12	18	1	18	18	18	18	18	18	18	1	18	0	18	18	12
Distinct(h)	4	4	4	4h	4	4	4	4	4	4	4	4	4	4	4	4	0
Epic	12	12	12	0	12	12	18	12	12	12	12	6	12	6	12	12	12
Everest	-	NCS	18	-	18	-	-	-	18	-	-	-	-	-	B	-	NCS
Extreme	<b>Same as Pursuit</b>																
Far-Go	NCS	0	NCS	NCS	NCS	NCS	NCS	NCS	18	NCS	NCS	NCS	NCS	NCS	NCS	NCS	0
Finesse	B	16	B	B	B	4	B	B	10	B	B	B	B	B	B	B	0
FirstRate	9	B	B	9	B	9	B	B	B	B	30	B	B	0	30b	30b	3
Flexstar	NCS	4	18	10	18	4	10	18	4	10	10	18	18	0	18	18	4
Harness(n)	NCS	NCS	NCS	0	NCS	NCS	NCS	NCS	NCS	NCS	NCS	NCS	NCS	NCS	NCS	NCS	4
Hornet	10.5m	4	B	0	B	12	10.5m	B	4	10.5m	10.5m	18	B	10.5m	B	18	4
Lexone(u)	4	8u	18	4	18	12	12	12	12	12	12	4	12	4	18	12	8u
Liberty ATZ	B	B	B	0	B	2CS	B	B	B	2CS	2CS	B	B	B	B	B	B
Lightning	9.5	9.5	40b	8.5	40b	40	9.5	40b	18	9.5	9.5	26	18	9.5	40b	40b	4
Matrix	12	9/19p	18	0	18	18	10	18	9	18	18	0	18	10	18	10	9

Herbicide	Alf- alfa	Bar- ley	Can- ola	Corn	Cra- mbe	CRP grss	Dry bean	Flax	Oat	Chck Pea	Dry Pea	Pot- ato	Saff lowr	Soy- bean	Sgr- beet	Sun- flwr	HRS/ Durm
	(months after application)																
<b>Maverick</b>	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	0
<b>Muster</b>	22	10	22	22b	22b	22	22	10	10	22	22	22b	22b	22b	22b	22b	10
<b>NorthStar(r)</b>	8	8	36	0.5	36	18	8	18	8	8	8	36	18	8	36r	36	8
<b>Paramount</b>	10	10	10	10	10	10	10	24	10	24	24	10	10	10	24	10	0
<b>Peak(r)</b>	22	0	22	1	22	10	22	22	0	10	10	22	22	22	22	22	0
<b>Permit</b>	10	3	B	0	B	3	10	B	3	B	B	12	B	10	30	26	3
<b>Plateau</b>	9	18	40	9	40	0	9	26	18	9	9	40	26	9	40	26	4
<b>Prowl/Pendimax</b>	NCS	NCS	NCS	0s	NCS	NCS	0	NCS	NCS	0	0	0	NCS	0	2CS	0	NCS
<b>Pursuit</b>	4	18	40b	8.5	40b	4	4	26	18	4	4	26	18	0	40b	18	4
<b>Pursuit Plus</b>	NCS	18	40b	8.5	40b	NCS	4	26	18	4	4	26	18	0	40b	18	NCS
<b>Python</b>	4	4	26b	0	26b	12	4	26b	4	4	4	12	26b	0	26b	18	4
<b>Raptor</b>	9	4	18	9	18	9	9	18	9	9	9	9	18	0	18t	9	3
<b>Rave</b>	B	18c	b	22	b	b	b	b	18c	B	B	B	B	36b	B	24b	0
<b>Reflex</b>	NCS	4	18	10	18	4	10	18	4	10	10	18	18	0	18	18	4
<b>Scorpion III</b>	10.5m	4	B	0	B	10	10.5m	B	4	18	8	B	B	0.5m	B	18	4
<b>Sencor(u)</b>	4	8u	18	4	18	12	12	2	12	12	12	4	12	4	18	12	8u
<b>Sonalan</b>	NCS	NCS	NCS	NCS	NCS	3w	0	NCS	NCS	0	0	NCS	NCS	0	2CS	0	NCS
<b>Spartan</b>	10	4	24	10	24	12	10	24	4	10	10	10	10	0	24	-	4
<b>Spirit(r)</b>	18	3	18	1	18	10	18	18	3	10	10	18	18	18	18r	18r	3
<b>Stinger</b>	10.5	0	10.5	0	10.5	1	10.5m	10.5	0	18	18	18	10.5	10.5m	0	10.5m	0
<b>Surpass(n)</b>	NCS	NCS	NCS	0	NCS	NCS	NCS	NCS	NCS	NCS	NCS	NCS	NCS	NCS	NCS	NCS	4
<b>Tordon (1.5 oz)</b>	2CS	NCS	2CS	2CSx	2CS	1	2CS	NCS	NCS	2CS	36	2CS	2CS	2CS	2CS	2CS	NCS
<b>TopNotch(n)</b>	NCS	NCS	NCS	0	NCS	NCS	NCS	NCS	NCS	NCS	NCS	NCS	NCS	NCS	NCS	NCS	4
<b>Trifluralin(y)</b>	0	NCS	0	NCS	0	18/21	0	0	18	0	0	0	0	0	2CS	0	NCS

NCS = Next cropping season after herbicide application.  
 2CS = Second cropping season after herbicide application.  
 MAA = months after application.

**Field Bioassay Instructions - Refer to label or paragraph Y7 in the Narrative Section.**

- a Soil pH <7.5 = 10 MAA for sorghum and 11 MAA for sunflower.  
 Soil pH >7.5 = 18 MAA for sorghum and sunflower  
 Soil pH <6.5 = 10 MAA for sugarbeet and all other crops not listed.  
 Soil pH >7.5 = 18 MAA for sugarbeet and all other crops not listed and cumulative precipitation in the 18 MAA period must exceed 28 inches (includes potatoes).
- B or b = Bioassay. Do not plant until field bioassay indicates it is safe.  
 Crop rotation after Atrazine is rate and soil pH dependant. Accent Gold, Broadstrike/Python, Hornet, and Scorpion III require a 26 month rotation and a successful field bioassay.  
 FirstRate requires a 30 month rotation and a successful field bioassay. Lightning, Pursuit, and Pursuit Plus requires a 40 month rotation and a successful field bioassay.
- c Do not use on soil with pH greater than 7.9. Barley and oat can be planted 6 months after Amber application west of highway 83.
- d Requires soil pH to be 7.9 or less and a 34 month minimum rotation interval and 28 inches of cumulative precipitation.

- e Requires 22 months and 22 inches of precipitation west of Hwy 1 or 34 months and 34 inches of precipitation east of Hwy 1. The previous restriction also applies to Canvas at rates greater than 0.2 oz DF/A.
- f Imi resistant canola varieties may be planted the season after application. Conventional canola varieties may be planted the following season after application at 1 pt/A in ND counties of Cavalier, Pembina, Ramsey, Rolette, Towner, and Walsh and MN counties of Kittson, Marshall, Pennington, Red Lake, and Roseau.
- g Sugarbeet requires 20 months in areas that received less than 20 inches of precipitation during the growing season. Buckle is labeled as a fall treatment in durum wheat and spring PPI application for durum and HRSW (some varieties excluded).
- h Any rotational crop may be planted 120 days following application of Clarity at 1.5 pt/A or less, excluding days when ground is frozen. For wheat, barley, oat, and grass seedings, allow 45 days per pint/A of Clarity after application before planting. For all crops and for rates greater than 1.5 pt/A allow 45 days per 1 pt/A of Clarity used excluding days when ground is frozen.
- m Do not plant dry bean, soybean or sunflower for 18 months on soil with less than 2% OM and rainfall less than 15 inches during the 12 MAA OR may be planted 12 MAA if risk of injury is acceptable. Do not plant lentil, pea, potato or any other broadleaf crop grown for seed for 18 months unless risk of injury is acceptable. Perform a field bioassay prior to planting for areas that receive less than 15 inches of rainfall and have less than 2% OM.
- n Restriction applies to DoublePlay, FulTime, Harness, Surpass, and TopNotch. Label restricts crops allowed to be planted the next season as corn, soybean, sorghum, and wheat only. Restriction to other crops is based on incomplete residue data and not on crop safety.
- p Barley can be planted 9 months after application in Cass, Grand Forks, Pembina, Towner, Traill, and Walsh counties of ND. In all other counties of ND allow an 18 month rotation restriction before planting barley.
- r Do not apply NorthStar, Peak, or Spirit in the Red River Valley of ND and MN or on soil with pH greater than 7.8. User must follow crop rotation restrictions as given on labels. Refer to label for additional information on soil pH, rotation intervals, maximum use rates, application timing and other restrictions. The number of months after application given in the previous table are applicable only on soil with a pH less than 7.8, only using less than maximum rates allowed, only using approved application timings, and only on approved locations (inside or outside Red River Valley) as indicated on the label. Do not replant to any broadleaf crop if less than 10 inches of precipitation has occurred since Peak application. For situations not covered on the label or in the previous table, conduct a soil bioassay to determine if Peak soil residue will allow successful planting of desired rotational crop.
- s Corn can be planted only if Prowl is applied PRE. DO NOT APPLY PPI.
- t Rotation to sugarbeet is after 26 months if soil pH is less than 6.2.
- u Must add 2 months if soil pH is 7.5 or above. Wheat and barley can be planted 4 MAA following lentils or soybeans.
- w CRP grasses may be planted 13 MAA under the following conditions:
  1. By label this is deemed as a non-standard rotation.
  2. Dow assumes no liability for injury.
  3. Fall is recommended as the best time to plant CRP grasses.
  4. A field bioassay is recommended prior to planting CRP grasses.
- x Do not plant corn or sorghum until soil samples analyzed for Tordon residue indicates no detectable levels present. Restriction is based on non-legal residue that may be found in corn and sorghum and not on crop safety.
- y Oats, sorghum, and annual or perennial grass crops may be planted at least 12 MAA in areas that received 20 inches or more of precipitation during the growing season. CRP grasses may be planted 18 MAA if trifluralin is spring applied or 21 MAA if fall applied.

## Restrictions on Feeding and Grazing of Crops Treated with Herbicides

**DAA = days after application, WAA = weeks after application**

### Alfalfa/Small Seeded Legumes

Balan, Eptam, Roundup Ultra/RT:  
No restrictions.

MCPA: Do not graze or forage within 7 days of slaughter.

Roundup Ultra/RT: Do not graze, feed, or harvest established alfalfa for 1.5 DAA.

Trifluralin: Do not graze or feed until 21 DAA.

Kerb: Do not graze or feed until 25 DAA.

Lexone/Sencor: Do not graze/harvest until 28 DAA.

Bromoxynil, 2,4-DB, Pursuit/DG, Velpar:  
Do not graze or feed for 30 DAA.

Gramoxone Extra: Do not graze or feed until 42 DAA.

### Annual Canarygrass

Bromoxynil: Do not graze or feed.

MCPA: Do not graze or feed until 21 DAA.

### Canola, Crambe, Rapeseed, and Tame Mustard

Herbicide 273: No restrictions.

Assure II, Liberty, Raptor, Select, Sonalan, Trifluralin:  
**Do not graze or feed.**

Stinger: Do not graze or feed until 7 DAA.

### Chemical Fallow

Finesse, Paramount: No restrictions.

Canvas, Express, Gramoxone Extra, Paraquat:  
**Do not graze or feed.**

Tordon 22K: Do not graze or feed until 7 DAA.

2, 4-D: Do not graze or feed until 7 DAA.  
Do not hay until 30 DAA.

Curtail, Tordon 22K:  
Do not graze or feed until 14 DAA for dairy cattle.

Banvel/ Clarity, Distinct:  
Do not remove animals for slaughter for 30 DAA.  
Grazing and feeding = No restrictions for non-lactating animals/70 DAA for lactating animals .

Fallow Master, Landmaster BW, Roundup/Ultra:  
Do not graze or feed until 8 WAA.

Atrazine: Do not graze or feed until 26 WAA.

### Chickpea

Dual II/Magnum, Prowl, Roundup Ultra/RT, Trifluralin:  
No restrictions.

Assure II, Far-Go, Select: **Do not graze or feed.**

### Corn

Aim, Axiom, Axiom AAT, Balance, Bladex, Cy-Pro, DoublePlay, Epic, Eradicane, Extrazine II, FulTime, Gramoxone Extra(PRE), Harness, Harness Xtra, Lasso, Lorox, Prowl, Ramrod, Roundup Ultra (PRE or in-crop applications in Roundup resistant corn), Surpass, TopNotch: No restrictions.

Princep, Python: **Do not graze or feed.**

2,4-D, Gramoxone Extra, Roundup Ultra (Preharvest):  
Do not graze or feed until 7 DAA.

Basagran: Do not graze or feed until 12 DAA.

Atrazine, Bullet, Laddok, Lariat, Shotgun:  
Do not graze or feed until 21 DAA.

Resource: Do not graze or feed until 28 DAA.

Accent, Basis/Gold, Bicep, Bromoxynil, Buctril+Atrazine, Dual/II/Magnum, Evik: Do not graze or feed until 30 DAA.

Beacon, Exceed, Lightning, Permit:  
Do not graze until 30 DAA or harvest until silage for 45 DAA.

Curtail, Frontier, Guardsman, Stinger:  
Do not graze or feed until 40 DAA.

Poast/Plus, Pursuit, Resolve: Do not graze/feed until 45 DAA.

Sencor: Do not graze or feed until 60 DAA.

Liberty/ATZ: Do not forage until 60 DAA.

Tough: Do not graze or feed until 68 DAA.

Accent Gold, Broadstrike + Dual, Hornet, Scorpion III:  
Do not graze or feed for 85 DAA

Touchdown: Do not graze or feed until 90 DAA.

Banvel/Clarity, Celebrity, Marksman:  
Do not graze or harvest for feed prior to ensilage (milk) stage of crop.

Roundup Ultra: Do not graze or feed until 8 WAA.

### CRP

2,4-D, Ally, Gramoxone Extra, Landmaster BW, Plateau, Touchdown:  
**Do not graze, feed, or hay.**

MCPA: Do not graze or feed until 7 DAA.

Amber: No restrictions for grazing and feeding.  
Do not hay until 30 DAA.

Banvel/Clarity: Do not remove animals for slaughter for 30 DAA.  
Grazing and feeding = No restrictions for non-lactating animals and up to 70 DAA for lactating animals depending on rate (check label).

Curtail: Do not graze or feed until 14 DAA for dairy cattle.  
Do not hay for 30 DAA.

Paramount Do not graze or feed until 309 DAA.

Roundup Ultra/RT: Do not graze or feed until 8 WAA.

### Dry Edible Bean

Lasso, Poast, Prowl, Roundup(PRE): No restrictions.

Assure II, Basagran, Drexel Defol, Pursuit/DG, Raptor, Select, Sonalan, Treflan: **Do not graze or feed.**

Gramoxone Extra: Do not graze or feed until 7 DAA.

Eptam: Preplant = no restrictions;  
Layby = Do not graze or feed until 45 DAA.

Dual II: Do not graze or feed until 120 DAA.

### Field Pea

Basagran, Gramoxone Extra, Poast, Prowl, Roundup Ultra/RT, Sonalan: No restrictions.

Assure II, Chiptox, Far-Go, MCPA amine, Pursuit/DG, Thistrol, Treflan: **Do not graze or feed.**

Sencor: Do not graze or feed until 40 DAA.

**Flax**

Bromoxynil, Trifluralin: No restrictions.  
 MCPA: Do not graze or feed until 7 DAA.  
 Drexel Defol: Do not graze or feed until 14 DAA.  
 Poast: Do not graze. Processed meal may be fed.

**Grass establishment**

Roundup Ultra/RT: No restrictions.  
 Bromoxynil, Plateau: **Do not graze, feed, or hay.**  
 MCPA: Do not graze or feed until 7 DAA.  
 2,4-D: Do not graze or feed until 7 DAA.  
 Do not hay until 30 DAA.

**Lentil**

Prowl, Roundup Ultra/RT(PRE): No restrictions.  
 Assure II, Far-Go, Gramoxone Extra, Poast, Trifluralin:  
**Do not graze or feed.**  
 Sencor: Do not graze or feed until 40 DAA.

**Millet**

2,4-D amine: Do not graze until 14 DAA.  
 Do not feed treated straw.  
 Banvel: Do not graze or harvest prior to maturity.  
 Clarity: Do not graze or feed until 7 DAA for lactating  
 animals, or hay for 37 DAA.  
 No restriction for non-lactating animals.  
 Peak: Do not graze or feed until 30 DAA or harvest  
 for silage until 40 DAA.

**Potato**

Gramoxone Extra(PRE), Sencor, and Roundup Ultra/RT:  
 No restrictions.  
 Des-i-cate, Diquat, Dual II, Gramoxone Extra, Poast, Prowl,  
 Select, Sulfuric acid, Trifluralin: Do not graze or feed.  
 Eptam: PRE = No restrictions,  
 Layby = Do not graze or feed until 45 DAA.

**Safflower**

Gramoxone Extra, Eptam: No restrictions.  
 Drexel Defol, Dual II, Trifluralin: **Do not graze or feed.**

**Soybean**

Domain, Dual II/Magnum, Gramoxone Extra(PRE), Lasso, Prowl,  
 Roundup Ultra (preplant), Roundup Original, Starfire, Treflan:  
 No restrictions.  
 Assure II, Authority, Axiom, Blazer, Broadstrike + Dual/Treflan,  
 Classic, Cobra, Command, Concert, Flexstar, Freedom, Frontier,  
 Fusilade DX, Fusion, Galaxy, Gramoxone Extra, Liberty, Linex,  
 Lorox, Option II, Pinnacle, Pursuit, Pursuit/DG/Plus, Python,  
 Raptor, Reflex, Reliance STS, Resource, Scepter, Select,  
 Sonalan, Stellar:

**Do not graze or feed.**

Roundup Ultra: Preplant = No restrictions,  
 Broadcast = 14 DAA, Spot treatment = 8 WAA,  
 Selective equip. = 7 DAA, Preharvest = 25 DAA  
 FirstRate: Do not graze or feed for 14 DAA.

Touchdown: Spot treatment. = 8 weeks  
 Selective equipment = 7 days.  
 Roundup Ultra(Roundup Ready Soybeans):  
 Do not graze or feed until 25 DAA.  
 Basagran: Do not graze or feed until 30 DAA.  
 Sencor/Lexone, Turbo: Do not graze or feed until 40 DAA.  
 2,4-DB: Do not graze or feed until 60 DAA.  
 Poast/Plus: Do not graze or feed until 75 DAA.

**Sunflower**

Eptam, Gramoxone Extra(PRE), Roundup Ultra/RT:  
 No restrictions  
 Assert/SG, Gramoxone Extra(desiccant), Poast, Prowl, Select,  
 Sonalan, Spartan, Trifluralin: **Do not graze or feed.**  
 Drexel Defol: Do not graze or feed until 14 DAA.

**Sugarbeet**

Betamix/Progress, Betanex, Eptam, Gramoxone Extra, Herbicide 273,  
 Nortron SC, Ro-Neet, Roundup Ultra/RT(PRE), UpBeet:  
 No restrictions.  
 Assure II, Poast, Select, Trifluralin: **Do not graze or feed.**  
 Stinger: Do not graze or feed until 7 DAA.

**Winter, Spring and Durum Wheat, Barley, Oat, and Rye**

Aim, Ally, Amber, Dakota, Finesse, Paramount, Puma, Tiller, or  
 trifluralin: No restrictions.  
 Assert, Avenge, Buckle, Canvas, Cheyenne, Express, Far-Go,  
 Gramoxone Extra, Harmony GT, Harmony Extra, Hoelon, Stampede:  
**Do not graze or feed.**  
 Banvel: Do not graze or harvest for feed prior to maturity.  
 Do not feed straw after preharvest application.  
 Clarity: Do not graze or feed until 7 DAA for lactating  
 animals, no restriction for non-lactating animals.  
 Do not hay for 37 DAA. Do not feed treated straw  
 after preharvest application.  
 Roundup Ultra: Preplant: No restrictions, Broadcast = 14 DAA Spot  
 treatment. = 8 WAA, Preharvest = 7 DAA.  
 Curtail/M: Do not graze dairy animals or meat animals for  
 slaughter until 7 DAA. Do not harvest for hay.  
 MCPA, Stinger: Do not graze dairy animals or meat animals for  
 slaughter until 7 DAA.  
 Starane: Do not graze or feed until 7 DAA and harvest for  
 hay until 14 DAA.  
 Tordon 22K: Do not graze or feed until 14 DAA.  
 Do not harvest for hay.  
 Bromoxynil: Do not graze or harvest until 30 DAA.  
 Achieve: Do not graze, feed, or hay until 45 DAA.  
 Do not harvest mature straw until 60 DAA.  
 Peak: Do not graze or feed until 30 DAA or harvest for  
 silage until 40 DAA.  
 2,4-D, Landmaster BW: Do not graze until 14 DAA.  
 Do not feed treated straw.

## Grazing and Haying Restrictions for Herbicides Used in Pasture and Rangeland

Herbicide <sup>1</sup>	Lactating Dairy Animals		Beef and Non-Lactating Dairy Animals		
	Before Grazing	Before Hay Harvest	Before Grazing	Before Hay Harvest	Removal Before Slaughter
Ally/Escort	0	0	0	0	0
Amber	0	0	0	0	0
Banvel/Clarity <sup>1</sup>					
Up to 1 pt	7 days	37 days	0	0	30 days
Up to 2 pt	21 days	51 days	0	0	30 days
Up to 4 pt	40 days	70 days	0	0	30 days
Up to 16 pt	60 days	90 days	0	0	30 days
Crossbow	1 year	1 year	0 <sup>2</sup>	1 year	3 days
Curtail	14 days	30 days	0	30 days	7 days <sup>3</sup>
FallowMaster	8 weeks	8 weeks	8 weeks	8 weeks	8 weeks
Gramoxone Extra <sup>4</sup>	1 month	1 month	1 month	1 month	0
Grazone P + D	7 days	30 days	7 days	30 days	3 days
Landmaster BW <sup>5</sup>					
Campaign	7 days	30 days	3 days	30 days	3 days
Paramount = DO NOT use on areas to be grazed or hayed.					
Roundup Brands, Glyphos <sup>1</sup>					
Spot Spray <sup>6</sup>	14 days	14 days	14 days	14 days	0
Broadcast	8 weeks	8 weeks	8 weeks	8 weeks	0
Spike <sup>7</sup>	0	1 year	0	1 year	0
Stinger/Transline	0	0	0	0	0
Tordon 22K <sup>8</sup>	14 days	14 days	0	14 days	3 days
2,4-D/MCPA <sup>1</sup>	7-14 days	30 days	0-7 days	0-30 days	0
Weed-Out 2,4-D	7 days	0	0	0	0

<sup>1</sup> Check individual product labels for restrictions and use rates. Many products containing the same active ingredients may be available.

<sup>2</sup> One year if more than 1.5 gallons/A is used.

<sup>3</sup> Withdrawal not needed if 2 weeks or more time elapsed since application.

<sup>4</sup> Restrictions based on degree of new seedling establishment before grazing. Suggested at least 6 inches of grass or legume growth.

<sup>5</sup> No restrictions if 10% or less of the area is treated.

<sup>6</sup> Do not treat more than one-tenth of any given acre at one time with spot or wiper applications. Remove livestock before application.

<sup>7</sup> If no more than 20 lb/A used.

<sup>8</sup> Remove livestock to untreated grass pasture for 7 days before transferring livestock to broadleaf or pasture areas. Removal before slaughter statement only applies to animals grazing treated forage for 2 weeks immediately after application.

## RELATIVE HERBICIDE EFFECTIVENESS ON WEEDS AND PERSISTENCE IN SOIL

This table gives a general rating of relative herbicide effectiveness to weeds listed and persistence of herbicides in soil. Under favorable weather conditions, control may be better than indicated. Under unfavorable conditions, some herbicides rated as good or fair may give erratic and unacceptable results. Also, dry and/or cool weather increases herbicide persistence while wet and/or warm weather reduces herbicide persistence.

SOIL APPLIED HERBICIDES	Barnyardgrass	Field Sandbur	Foxtail, Green	Foxtail, Yellow	Quackgrass	Volunteer Cereals	Wild Oat	Wild Proso Millet	Herbicide Persistence
Atrazine (PPI)	G	F	F-G	G	P-F	E	E	P-F	O
Atrazine (PRE)	G	F	F-G	G	P	E	G-E	P	O
Axiom (PPI)	G-E	P	G-E	G-E	N	P	P	P	N
Axiom (PRE)	F-G	P	G-E	G-E	N	P	P	N	N
Balance (PRE)	E	G	E	F-G	P	N	N	E	S
Bladex/Cy-Pro (PPI)	F	F	G	G	P-F	E	F	P-F	S
Bladex/Cy-Pro (PRE)	P-F	F	F-G	F-G	P	G-E	P-F	P-F	S
Broadstrike + Treflan (PPI)	E	G	E <sup>1</sup>	E	N	N	F-G	P-F	S
DoublePlay (PPI)	E	G-E	E	E	F-G	G-E	G-E	F-G	N
Dual/II/Magnum (PPI)	G-E	P	G-E	G-E	N	F-G	P-F	P	N
Dual/II/Magnum (PRE)	F-G	P	G	G	N	F	P	N	N
Epic (PRE)	E	G	E	G-E	N	N	N	G	S
Eptam/Eradicane (PPI)	E	G-E	E	E	F-G	G-E	G-E	F-G	N
Far-Go (PPI)	N	N	N-P	N-P	N	N	E	N	N
Far-Go (PoPI)	N	N	N-P	N-P	N	N	G	N	N
FirstRate (PPI/PRE)	N	N	N	N	N	N	N	N	O
Goal (PRE)	P	-	F	F	P	-	-	-	N
Frontier (PPI)	G-E	G	G-E	G-E	N	G	P	F	N
Frontier (PRE)	F-G	G	G-E	G-E	N	F	P	F	N
Harness/Surpass (PPI)	E	G-E	G-E	G-E	N	G	F	F-G	N
Harness/Surpass (PRE)	E	G	G-E	G-E	N	G	P	F-G	N
Hornet (PPI)	N	N	N	N	N	N	N	N	O
Hornet (PRE)	N	N	N	N	N	N	N	N	O
Lasso/generics (PPI)	G-E	F	G-E	G-E	N	F-G	P-F	P-F	N
Lasso/generics PRE	F-G	P	G	G	N	F-G	P	P	N
Lexone/Sencor (PPI)	F	F-G	F	F	F	G	N	P	S
Lexone/Sencor (PRE)	P-F	F	P-F	P-F	N	F-G	P	P	S
Nortron SC (PPI)	P	F	F-G	F-G	P	E	G	-	O
Nortron SC (PRE)	P	P-F	F	F	P	G-E	F-G	-	O
Matrix (PRE)	G	-	G	F-G	N	G	F	P	S
Paramount	G-E	N	E	G	N	N	N	N	S
Prowl/Pentagon (PPI)	E	G	E <sup>1</sup>	E	N	G	F	P-F	S
Prowl Pentagon (PRE)	E	F	G-E <sup>1</sup>	G-E	N	F-G	P-F	P	S
Pursuit Plus (PPI)	E	G	E <sup>1</sup>	E	N	G	F	P-F	O
Python (PPI/PRE)	N	N	N	N	N	N	N	N	S
Ramrod (PRE)	E	F-G	G-E	G-E	N	G-E	P	P	N
Ro-Neet (PPI)	E	G	E	E	P	G-E	G	-	N
Sonalan (PPI)	E	G	E <sup>1</sup>	E	N	G	F	P-F	S
Spartan/Authority (PRE)	N	N	P	P	N	N	N	N	S
Trifluralin (PPI)	E	G	E <sup>1</sup>	E	N	N	F	P-F	S
Trifluralin (PoPI)	E	F-G	E <sup>1</sup>	E	N	N	P	P	S

PPI = Preplant Incorporated, PRE = Preemergence, PoPI = Post plant incorporated.

<sup>1</sup>Except where resistant populations have developed.

Weed control ratings in this section are based on the following scale:

E = Excellent = 90 to 99% Control

P = Poor = 40 to 65% Control

G = Good = 80 to 90% Control

N = None = No Control

F = Fair = 65 to 80% Control

Herbicide persistence ratings are for residues present 12 months after application:

O = Often

S = Seldom

N = None

SOIL APPLIED HERBICIDES	Buckwheat, Wild	Cocklebur, Common	Flixweed	Kochia	Lambsquarters, C	Lanceleaf Sage	Mallow, Venice	Marshelder	Mustard, Wild	Nightshade, Black	Pigweed, Redroot	Prickly Lettuce	Ragweed, Common	Smartweed, Annual	Sunflower	Thistle, Russian	Wormwood, Biennial	Thistle, Canada
Atrazine (PPI)	E	G	E	E	E	E	G	E	E	E	E	E	E	E	G-E	E	-	F
Atrazine (PRE)	G-E	F-G	E	G-E	G-E	E	G	E	E	G-E	G-E	E	E	E	F-G	G-E	-	P-F
Axiom (PPI)	P	N	-	F	F	N	N	N	F	P	G-E	P	P	P	N	F	N	N
Axiom (PRE)	P	N	-	P-F	F-P	N	N	N	P	P	F-G	P	P	P	N	P-F	N	N
Balance (PRE)	N	P	G-E	E	E	-	G-E	G	E	G-E	E	-	G-E	G	P	G	-	N
Bladex/Cy-Pro (PPI)	G	F	E	G-E	G-E	E	G	E	E	F	F	E	E	E	F-E	E	-	N
Bladex/Cy-Pro (PRE)	F-G	F	E	G	G-E	E	G	E	G-E	P-F	P-F	E	E	E	P-F	G-E	-	N
Brdstrk + Treflan (PPI)	G-E	F-G	E	E <sup>1</sup>	E	G-E	E	E	E	G-E	E	E	G	E	G-E	G-E <sup>1</sup>	G-E	F
DoublePlay (PPI)	F	P	P	G-E	E	N	N	P	F	G-E	E	P	G-E	P	P	F	P	N
Dual/II/Magnum (PPI)	P	N	-	P	F	N	N	N	P	F	G-E	P	P-F	P	N	F	P	N
Dual/II/Magnum (PRE)	P	N	-	P	P-F	N	N	N	P	P	F-G	P	P-F	P	N	P-F	P	N
Epic (PRE)	N	P	G-E	G-E	E	-	G-E	G	E	G-E	E	-	G-E	G	P	F-G	-	N
Eptam/Eradicane (PPI)	F	P	P	F	F	N	N	P	P	F-G	G	P	F	P	N	P	N	N
Far-Go (PPI)	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Far-Go (PoPI)	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
FirstRate (PPI/PRE)	P	E	P	P	G	F-G	-	E	P	N	G	-	E	E	E	-	N	N
Goal (PRE)	-	-	G	E	G	E	-	E	G	G	E	-	G	G	-	-	-	N
Frontier (PPI)	P	N	-	P	F	N	-	N	P-F	G-E	E	-	P	P	N	P-F	G	N
Frontier (PRE)	P	N	-	P	F	N	-	N	P-F	G	G-E	-	N	P	N	P	G	N
Harness/Surpass (PPI)	P	P	-	G-E	G-E	N	-	P	F	G-E	E	-	F-G	P	P	F	G	N
Harness/Surpass (PRE)	P	P	-	G	G	N	-	P	F	G	G-E	-	F	P	N	F	G	N
Hornet (PPI)	E	G-E	E	E <sup>1</sup>	E	G-E	E	E	E	E	E	E	E	E	E	E <sup>1</sup>	E	F-G
Hornet (PRE)	E	G	E	G-E	G-E	G-E	E	E	E	E	E	E	E	E	E	E	E	F
Lasso/generics (PPI)	P	N	-	F	F	N	N	N	P	G	G-E	P	P	P	N	F	P	N
Lasso/generics (PRE)	P	N	-	P-F	P-F	N	N	N	P	G	F-G	P	P	P	N	P-F	P	N
Lexone/Sencor (PPI)	F	F	E	G	F	F-G	G-E	E	E	P	E	E	E	G	P-F	E	-	N
Lexone/Sencor (PRE)	F	P-F	G-E	F-G	P-F	F-G	G	E	G-E	P	G-E	E	G-E	G	P	G-E	-	N
Nortron (PPI)	F-G	P	-	F-G	P-F	-	F	P	F	F-G	G-E	-	P	G-E	P	F-G	-	N
Nortron (PRE)	F	P	-	F	P-F	-	F	P	P-F	F	G	-	P	G	P	F	-	N
Matrix (PRE)	P	F	-	G	F	N	-	N	F	P	E	-	F	P	F	-	N	P
Paramount	N	N	N	F	F	N	N	N	N	N	F	N	F	N	F	F	-	P
Prowl/Pentagon (PPI)	P-F	N	P	F-G	E	N	F-G	N	N	P	E	N	P	P	N	G	P	N
Prowl/Pentagon (PRE)	P	N	P	F-G	G	N	F	N	N	N	G	N	P	P	N	F-G	P	N
Pursuit Plus (PPI)	F-G	G	E	E <sup>1</sup>	E	E	F-G	G-E	E	E	E	E	F	G	G-E	G-E	P	N
Python (PPI/PRE)	P	P	E	E <sup>1</sup>	E	G-E	E	P-F	E	G-E	E	-	P	G-E	P	E	G-E	N
Ramrod (PRE)	F	P	P	G	F	N	N	N	P	N	E	P	P	P	N	P	N	N
Ro-Neet (PPI)	P-F	P	P	P	F-G	N	F	P	P	F-G	G	P	P	P	N	P	-	N
Sonalan (PPI)	P-F	P	P	G	E	N	F-G	N	N	F	E	P	P	P	N	G-E	P	N
Spartan/Authority (PRE)	P-F	P	F-G	E	E	N	G	G-E	F-G	E	E	E	F	E	N	G-E	G-E	N
Trifluralin (PPI)	P-F	N	P	F-G	G-E	N	F-G	N	N	P	E	N	P	P	N	G	P	N
Trifluralin (PoPI)	P	N	P	F-G	F-G	N	P	N	N	N	F-G	N	P	P	N	F-G	P	N

PPI = Preplant Incorporated, PRE = Preemergence, PoPI = Post plant incorporated,

<sup>1</sup>Except where resistant populations have developed.



POST APPLIED HERBICIDES	Barnyardgrass	Field Sandbur	Foxtail, Green	Foxtail, Yellow	Quackgrass	Volunteer Cereals	Wild Oat	Wild Proso Millet	Herbicide Persistence
Accent	E	G-E	E	G-E	G-E	G-E	E	G-E	O
Accent Gold	E	G	E	E	G-E	G	G-E	G-E	S
Achieve	F	G	G-E	G	N	N	E	E	N
Aim	N	N	N	N	N	N	N	N	N
Ally + 2,4-D	N	N	P	P	N	N	N	N	O
Amber + 2,4-D	N	N	N	N	N	N	N	N	O
Assert	P	N	P	P	N	N	E	N	S
Assure II	E	E	E	G-E	G-E	E	E <sup>1</sup>	E	N
Atrazine + oil	G	F	G	G-E	P-F	F-G	G-E	F	S
Avenge	N	N	N	N	N	N	G-E	N	N
Banvel/Clarity	N	N	N	N	N	N	N	N	S
Banvel + MCPA	N	N	N	N	N	N	N	N	S
Basagran	N	N	N	N	N	N	N	N	N
Basis	G-E	F-G	G-E	G	F-G	F-G	F-G	F	S
Basis Gold	E	G	E	E	E	G	E	G-E	O
Betamix	P	N	F	F	N	N	N	P	N
Betanex	P	N	P-F	P-F	N	N	N	P	N
Betamix Progress	P	N	F-G	F-G	N	N	N	P	S
Betanex + Nortron SC	P	N	F	F	N	N	N	P	S
Bladex/Cy-Pro + oil	G	F-G	G	G	N	G-E	F-G	P-F	N
Blazer	N	P	P-F	P-F	N	N	N	P	N
Bronate/others	N	N	N	N	N	N	N	N	N
Bromoxynil	N	N	N	N	N	N	N	N	N
Canvas + 2,4-D	N	N	N	N	N	N	N	N	O
Celebrity Plus	E	G-E	E	G-E	G-E	G-E	E	G-E	O
Cheyenne	G-E	F	E	G-E	P	N	E <sup>1</sup>	E	N
Cobra	N	P	P-F	P-F	N	N	N	P	N
Curtail/M	N	N	N	N	N	N	N	N	S
Dakota	G	P-F	G-E	G	P	N	P <sup>1</sup>	E	N
Discover	E	-	E	E	P	N	E <sup>1</sup>	-	N
Distinct	P-F	P	P-F	P-F	N	P	P	P	S
Everest	-	-	E	G	N	N	E	-	S
Express + 2,4-D	N	N	P	P	N	N	N	N	N
Extreme	E	E	E	E	E	E	E	E	O
Finesse + 2,4-D	N	N	F-G	F	N	N	N	N	O
FirstRate	N	N	N	N	N	N	N	N	O
Flexstar	N	N	P-F	P-F	N	N	N	N	O
Fusilade DX	E	E	G-E	G-E	G	E	E <sup>1</sup>	E	N
Fusion	E	E	E	E	G	E	E <sup>1</sup>	E	N
Goal	P	N	P	P	P	P	F-G	-	N
Gramoxone Extra	G	G	G	G	P	F-G	G	F-G	N
Harmony Extra + 2,4-D	N	N	P	P	N	N	N	N	N
Harmony GT	N	N	N	N	N	N	N	N	N
Herbicide 273	N	N	N	N	N	N	N	N	N
Hoelon	F	P	G-E	G	P	N	G-E <sup>1</sup>	P-F	N
Hornet	N	N	N	N	N	N	N	N	O
Liberty	E	G	E	G	P	F-G	G-E	E	N
Liberty ATZ	F	F	E	G-E	P	G-E	E	E	S

POST APPLIED HERBICIDES	Buckwheat, Wild	Cocklebur, Common	Flaxweed	Kochia	Lambsquarters, C.	Lanceleaf Sage	Mallow, Venice	Marshelder	Mustard, Wild	Nightshade, E. Black	Redroot Pigweed	Prickly Lettuce	Ragweed, Common	Smartweed, Annual	Sunflower	Thistle, Russian	Wormwood, Biennial	Thistle, Canada
Accent	P-F	P	-	F	P	P	P	P	E	N	E	-	P	G-E	P	P	P	N
Accent Gold	F	E	E	F	G	E	E	E	E	G-E	E	-	E	E	E	F	E	G-E
Achieve	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Aim	N	N	N	G-E	G-E	-	N	N	N	G-E	G-E	N	N	N	N	N	-	N
Ally + 2,4-D <sup>1</sup>	F-G	F	E	E <sup>2</sup>	E	F-G	G-E	G-E	E	F-G	E	E	E	F	G-E	E <sup>2</sup>	F-G	G
Amber + 2,4-D <sup>1</sup>	F-G	F-G	E	E <sup>2</sup>	F-G	F-G	-	E	E	F-G	E	E	E	F	E	E <sup>2</sup>	F-G	F-G
Assert	F-G	P	G-E	P-F	P	N	N	N	E	N	P	N	N	P	N	P-F	N	N
Assure II	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Atrazine + oil	G	G	E	E	E	E	-	E	E	G	E	E	E	E	G	E	-	P
Avenge	N	N	P	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Banvel/Clarity <sup>1</sup>	E	E	P-F	E	G	P-F	F	E	G	E	G	G-E	E	E	G-E	G	G-E	F-G
Banvel + MCPA <sup>1</sup>	G-E	E	F-G	G-E	E	G-E	G	G-E	E	E	G	E	E	E	E	G	G-E	F
Basagran	F-G	G-E	E	F-G	F-G	P	E	G-E	E	F	F	E	F-G	E	E	F	F-G	F-G
Basis	F	P	-	F-G <sup>2</sup>	G	P	F	G	E	P	E	-	P	E	F-G	G <sup>2</sup>	P	P
Basis Gold	G	F-G	E	E <sup>2</sup>	E	E	E	E	E	F	E	E	G-E	E	G	E	-	P-F
Betamix	F	P-F	-	F-G	G	P	F	G	G-E	F-G	G	-	F	F	P	P	P	N
Betanex	P-F	P	-	F	G	P	F	G	G-E	F-G	G-E	-	F	F	P	P	P	N
Betamix Progress	F-G	F	-	F-G	G-E	P-F	F	G	G-E	G	G	-	F-G	F-G	P	P	P	N
Betanex + Nortron SC	F	F	-	F	G-E	P-F	F	G	G-E	G	G-E	-	F-G	F	P	P	P	N
Bladex/Cy-Pro + oil	G	G	F-G	G	G	E	E	E	E	G	F-G	G	E	E	E	G	-	P
Blazer	G	F-G	-	F-G	G	P-F	F	F	E	G	E	-	F-G	E	P-F	F	P	P
Bronate/others	E	E	G-E	E	E	E	G-E	E	E	E	G	E	E	G	E	E	F	F
Bromoxynil	E	E	F-G	G-E	G	E	G-E	E	F-G	E	F-G	E	E	G-E	G-E	E	F	F
Canvas + 2,4-D	G	F-G	E	E <sup>2</sup>	E	F-G	G-E	E	E	F-G	E	E	E	F-G	G-E	E <sup>2</sup>	F-G	G
Celebrity Plus	E	E	E	E	G	F	F	E	E	E	E	E	E	E	E	G	E	F-G
Cheyenne	F-G	G	E	E <sup>2</sup>	E	F-G	G	E	E	F-G	E	E	E	E	E	G-E <sup>2</sup>	P-F	P
Cobra	G	G	-	G	F	E	F-G	G	E	G	E	-	G-E	G	F	P	P	F
Curtail/M	G	E	E	F-G	G	F-G	G	E	E	F	G	E	E	E	E	G	E	G-E
Dakota	P	G	G	F	E	F-G	F	G	E	F	P	G-E	G	G	G	P	P	P
Discover	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	P-F	N
Distinct	E	E	G	E	E	G	E	E	E	E	E	E	E	E	E	E	E	G-E
Everest	N	N	E	N	N	N	N	N	E	N	N	N	N	N	N	N	-	N
Express + 2,4-D <sup>1</sup>	F	G	E	E <sup>2</sup>	E	F-G	-	E	E	F-G	G	G-E	G	G	F-G	E <sup>2</sup>	F-G	G
Extreme	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Finesse + 2,4-D <sup>1</sup>	E	G-E	E	E <sup>2</sup>	E	F-G	E	E	E	F-G	E	E	E	E	E	E <sup>2</sup>	F-G	G
FirstRate	P	E	P	P	P	G-E	G-E	E	P-F	N	P	-	E	E	E	-	P	N
Flexstar	P	E	P	G	F	E	G-E	F	E	G-E	E	-	E	E	E	-	P	N
Fusilade DX	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Fusion	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Goal	G-E	E	F	G-E	G	E	-	-	F	G-E	E	G-E	G	F	F-G	G-E	G	N
Gramoxone Extra	F	F-G	G	G-E	E	E	G	G	E	G-E	E	E	G-E	E	E	E	-	P
Harmony Extra + 2,4-D <sup>1</sup>	G-E	E	E	E <sup>2</sup>	E	G-E	-	E	E	F-G	E	E	E	G	G-E	E <sup>2</sup>	F-G	G
Harmony GT	P-F	F	-	F-G <sup>2</sup>	G	P	F	F	E	P	E	-	P	E	F-G	G	P	N
Herbicide 273	G	P	P	P	P	P	P	F-G	P-F	P	P-F	-	P	G	F-G	P	-	N
Hoelon	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Hornet	F-G	E	E	F-G	P-F	E	E	E	E	G-E	P-F	-	E	F-G	E	F-G	E	G-E
Liberty	E	E	G-E	E	F-G	E	E	E	E	E	E	G-E	E	E	E	G-E	E	P-F
Liberty ATZ	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	F

POST APPLIED HERBICIDES (cont.)	Barnyardgrass	Field Sandbur	Foxtail, Green	Foxtail, Yellow	Quackgrass	Volunteer Cereals	Wild Oat	Wild Proso Millet	Herbicide Persistence
Lightning	E	E	E	E	F	G-E	G-E	G-E	O
Lorox	F	-	G	G	P	-	-	-	N
Matrix	G	-	E	G-E	G	E	G	F	S
Maverick	-	-	P-F	P-F	G-E	N	E	-	O
MCPA	N	N	N	N	N	N	N	N	N
Muster	N	N	N	N	N	N	P	N	N
NorthStar	-	G-E	G-E	G-E	G-E	-	-	-	O
Paramount	G-E	N	E	G	N	N	N	N	S
Peak + 2,4-D	N	N	N	N	N	N	N	N	O
Permit	N	N	N	N	N	N	N	N	O
Pinnacle	N	N	P	P	N	N	N	N	N
Plateau	N	N	E	G-E	N	N	N	N	O
Poast	E	E	E	E	F-G	E	G-E <sup>1</sup>	E	N
Prism	E	E	E	E	F-G	E	G-E <sup>1</sup>	E	N
Puma	E	E	E	G-E	N	N	E	E	N
Pursuit	G	P-F	G	F-G	N	G	F	P-F	O
Raptor	E	F-G	E	G-E	G-E	G-E	E	G-E	N
Rave	N	N	N	N	N	N	N	N	O
ReadyMaster	E	E	E	E	E	E	E	E	O
Resource	N	N	N	N	N	N	N	N	N
Rezult	E	E	E	E	F-G	E	G-E	E	N
Roundup Brands	E	E	E	E	E	E	G-E	E	N
Scorpion III	N	N	N	N	N	N	N	N	S
Select	E	E	E	E	G	E	E	E	N
Sencor/Lexone	F	-	F	F	P	P	-	-	O
Sencor + Banvel/Buctril	P	N	P	P	N	N	N	N	N
Stampede EDF + MCPAe	G	P	G	G	N	N	N	P	N
Starane	N	N	N	N	N	N	N	N	N
Stellar	N	N	N	N	N	N	N	N	N
Stinger	N	N	N	N	N	N	N	N	S
Tiller	G-E	F	E	G-E	N	N	G-E <sup>1</sup>	E	N
Tordon 22K + 2,4-D	N	N	N	N	N	N	N	N	O
Touchdown	E	E	E	E	E	E	G-E	E	N
Tough	N	N	N	N	N	N	N	N	N
UpBeet + Betanex/Betamix/ Progress	P	P	F-G	F-G	N	P	N	P	N
2,4-D	N	N	N	N	N	N	N	N	N

<sup>1</sup>Herbicides will not control resistant biotypes.

POST APPLIED	Buckwheat, Wild	Cocklebur, Common	Flixweed	Kochia	Lambsquarters, C.	Lanceleaf Sage	Mallow, Venice	Marshelder	Mustard, Wild	Nightshade, Black	Redroot Pigweed	Prickly Lettuce	Ragweed, Common	Smartweed, Annual	Sunflower	Thistle, Russian	Wormwood, Biennial	Thistle, Canada
Lightning	E	G	E	E	E	-	G	E	E	E	E	-	G	E	G	E	P	F
Lorox	E	E	G	-	E	-	-	-	G	E	E	-	E	E	-	-	-	N
Matrix	P	F	-	G	F	-	-	-	E	P	E	-	F	F	P	-	N	N
Maverick	N	-	E	P	P	-	N	-	E	-	P	-	-	-	E	-	P	N
MCPA	N	G	G-E	F	E	G-E	F	G	E	F	F	F	G	F	G	P	F-G	F-G
Muster	P	P	E	P <sup>2</sup>	P-F	P	P	P	E	P	P-F	P	P	G	P	P	N	N
NorthStar	E	E	E	E	E	F	F	E	E	E	E	G-E	E	E	E	E	G-E	G-E
Paramount	N	N	N	F	F	N	N	N	N	N	F	N	F	N	F	F	-	P
Peak + 2,4-D	F-G	G-E	E	G-E <sup>2</sup>	G	F-G	-	-	E	-	E	E	E	-	E	E <sup>2</sup>	F-G	F-G
Permit	P	E	E	F <sup>2</sup>	P-F	P	E	G-E	E	P	F-G	-	G-E	F-G	E	-	P	N
Pinnacle	P-F	F	-	F-G <sup>2</sup>	G	P	F	-	E	P	E	-	P	E	F-G	G	P	N
Plateau	-	E	E	E <sup>2</sup>	E	-	-	E	E	G-E	E	E	E	-	E	-	N	F
Poast	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Prism	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Puma	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Pursuit	F-G	G	E	E <sup>2</sup>	F-G	E	P	E	E	E	E	E	P-F	G	G-E	G-E	P	N
Raptor	F	G-E	E	E <sup>2</sup>	F-G	E	P	G-E	E	E	E	-	G	G-E	E	G-E	P	N-P
Rave	E	E	E	E	G-E	F-G	G	E	E	E	E	E	E	E	E	E	F-G	G
ReadyMaster	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Resource	P	N	P	P	G	-	N	-	P-F	P-F	G	-	G	N	N	-	P	N
Rezult	F-G	G-E	E	F-G	F-G	P	E	G-E	E	F	F	E	F-G	E	E	F	F	F-G
Roundup Brands	P-F	G-E	G-E	F-E	G-E	E	E	G-E	G-E	F-G	G-E	E	E	E	G	F-G	E	G
Scorpion III	G-E	E	G	G-E <sup>2</sup>	E	-	E	E	E	G-E	G-E	-	G	G	E	G-E	E	F-G
Select	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Sencor	G	P	E	F-G	E	-	-	-	E	P	G	-	E	E	F	-	-	P
Sencor + Banvel/Buctril	E	E	G-E	E	E	G-E	G-E	E	G-E	G-E	E	G-E	E	E	G-E	E	-	P-F
Stampede + MCPAe	G-E	G	P	G	E	N	-	F	E	-	E	-	P	F	G	F	F	F
Starane	G	G-E	P	E	N	-	G-E	G-E	P	F-G	N	E	G-E	F	G	P	-	N
Stellar	P	F	P	F	F-G	F-G	N	-	P	P	G-E	-	G-E	-	-	-	P-F	N
Stinger	F-G	E	P	N	P-F	F	G	E	P	F-G	P	E	G-E	G-E	G-E	P-F	E	G-E
Tiller	P	G-E	G	F	E	G	F-G	F-G	E	F	F	E	F	P	G-E	F	P-F	F
Tordon 22K + 2,4-D <sup>3</sup>	E	E	F-G	F-G	E	-	G-E	E	E	G-E	E	E	G-E	G	E	G-E	G	F-G
Touchdown	P-F	G-E	G-E	F-E	G-E	E	E	G-E	G-E	F-G	G-E	E	E	E	G	F-G	E	G
Tough	P	G	P	E	E	P-F	P-F	-	P	E	E	P	P	P	F-G	E	-	N
UpBeet + Betanex/ Betamix/Progress	F-G	F-G	-	E	G-E	P-F	F-G	G	E	G	G-E	-	F-G	G	G	P	P	N
2,4-D	P-F	G-E	F-G	F-G	E	P-F	G-E	E	E	P-F	G	E	G-E	F-G	E	G	F-G	F-G

<sup>1</sup>ALS herbicides tank-mixed with 2,4-D and Banvel controls most broadleaf weeds and reduce risk of developing resistant kochia.

<sup>2</sup>Herbicides will not control resistant biotypes.

<sup>3</sup>Tordon + 2,4-D at 1 to 1.5 fl oz/A + 2,4-D at 0.5 to 0.75 pt/A

## 1999 Herbicide Price List

The listings are approximate retail prices for small quantities. Herbicide prices do not include cost of such additives as surfactants, oils, fertilizer or application costs. Prices may vary depending on area of the state, wholesaler, bulk discounts, seasonal changes, quantities purchased and particular programs the manufacturing company offers. Prices are averages based on statewide dealer survey for small quantities. Producers should consult local agricultural product suppliers for exact price of each product in their area.

Product	Formulation	Active Ingredients	Cost/Unit	Product/A			Cost \$/A		
				Low	Med	High	Low	Med	High
Accent	75DF	nicosulfuron	30.00 oz	0.33 oz	0.5 oz	0.67 oz	9.90	15.00	20.10
Accent Gold	nic + rim = 75DF + Hornet = 85.6DF	nicosulfuron + rimsulfuron + cloparylid + flumetsulam	7.00 oz	2 oz	2.5 oz	2.9 oz	14.00	17.50	20.30
Acclaim	1EC	fenoxaprop	380 gal	15 fl oz	30 fl oz	45 fl oz	44.55	89.10	133.65
Achieve + MSO	40WDG	tralkoxydim	2.37 oz	4.67 oz	5.6 oz	7 oz	11.05	13.25	16.75
Aim	40DF	carfentrazone	7.60 oz	0.33 oz	-	0.33 oz	2.50	-	2.50
Ally	60DF	metsulfuron	22.00 oz	0.05 oz	0.1 oz	0.3 oz	1.10	2.20	6.60
Amber	75DF	triasulfuron	9.25 oz	0.14 oz	0.28 oz	0.56 oz	1.30	2.60	5.20
Aqua-Kleen/Navigate	19G	2,4-D bee	2.00 lb	100 lb	150 lb	200 lb	200.00	300.00	400.00
Aquathol	10G	endothall	2.35 lb	200 lb	300 lb	400 lb	470.00	705.00	940.00
Arsenal	2SL	imazapyr	280.00 gal	1 qt	2 qt	3 qt	70.00	140.00	210.00
Assert 2.5S	2.5SL	imazamethabenz	104.00 gal	0.6 pt	1 pt	1.2 pt	7.80	13.00	15.60
Assert 67SG	67SG		1.70 oz	4.5 oz	7.5 oz	9 oz	7.65	12.75	15.30
Assure II	0.88EC	quizalofop	120.00 gal	7 fl oz	8 fl oz	10 fl oz	6.70	7.50	9.40
Atrazine 4L	4L	atrazine	14.00 gal	0.75 pt	1.5 pt	2 pt	1.30	2.65	3.50
Atrazine 90DF	90DF		3.15 lb	0.42 lb	0.83 lb	1.11 lb	1.30	2.60	3.50
Authority	75WDG	sulfentrazone	2.55 oz	3 oz	4 oz	5.33 oz	7.65	10.20	13.65
Avenge	2SL	difenzoquat	38.50 gal	2.5 pt	3 pt	4 pt	12.00	14.45	19.25
Axiom	54.4 + 13.6DF	flufenacet + metribuzin	1.05 oz	15 oz	20 oz	23 oz	15.75	21.00	24.15
Axiom AT	50.5 + 19.6 + 4.9DF	atrazine + flufenacet + metribuzin	-	2 lb	3 lb	3.75 lb	-	-	-
B-4	1.33 + 2.67EC	bromoxynil + AGSCO 400	40.00 gal	1.1 pt	1.25 pt	1.5 pt	5.50	6.25	7.50
Balan	2.5G	benefin	0.70 lb	60 lb	70 lb	80 lb	42.00	49.00	56.00
Balance	75DF	isoxaflutole	8.25 oz	1.25 oz	1.5 oz	2 oz	10.30	12.40	16.50
Banvel	4SL	dicamba - dma salt	82.00 gal	2 fl oz	1 pt	4 pt	1.28	10.25	40.95
Basagran	4SL	bentazon - Na salt	72.00 gal	1 pt	1.5 pt	2 pt	9.00	13.50	18.00
Basagran T/O	4SL	bentazon - Na salt	110.00 gal	1 pt	1.5 pt	2 pt	13.75	20.65	27.50
Basis	50 + 25DF	rimsulfuron + thifensulfuron	16.50 oz	0.33 oz	-	0.33 oz	5.45	-	5.45
Basis Gold	1.34 + 1.34 + 86.78DF	nicosulfuron + rimsulfuron + atrazine	1.20 oz	7 oz	10 oz	14 oz	8.40	12.00	16.80
Beacon	75DF	primisulfuron	25.00 oz	0.38 oz	0.5 oz	0.76 oz	9.50	12.50	19.00
Betamix	0.65 + 0.65EC	desmedipham + phenmedipham	100.00 gal	4.62 pt	6 pt	7.7 pt	57.75	75.00	96.25
Betanex	1.3EC	desmedipham	100.00 gal	4.62 pt	6 pt	7.7 pt	57.75	75.00	96.25
Bicep II Magnum	2.4 + 3.1L	metolachlor + atrazine	41.00 gal	2.4 qt	2.7 qt	3 qt	24.60	27.70	30.75
Bison	2 + 2EC	bromoxynil + MCPAe	44.00 gal	0.75 pt	1 pt	1.5 pt	4.15	5.50	8.25
Bladex/CyPro 4L	4L	cyanazine	30.00 gal	1 qt	2 qt	3 qt	7.50	15.00	22.50
Bladex/CyPro 90DF	90DF		6.25 lb	1.11 lb	2.22 lb	3.33 lb	6.95	13.90	20.80
Blazer	2SL	acifluorfen	65.00 gal	1 pt	1.5 pt	2 pt	8.15	12.20	16.25
Boundary	6.3 + 1.5L	metolachlor + metribuzin	- gal	-	-	-	-	-	-
Broadstrike + Dual	0.2 + 7.47EC	flumetsulam + metolachlor	65.00 gal	1.75 pt	2 pt	2.5 pt	14.25	16.25	20.35
Broadstrike + Treflan	0.25 + 3.4EC	flumetsulam + trifluralin	82.00 gal	1.5 pt	2 pt	2.25 pt	15.40	20.50	23.05
Broclean	2EC	bromoxynil	56.00 gal	1 pt	1.5 pt	2 pt	7.00	10.50	14.00
Bromac	2 + 2EC	bromoxynil + MCPAe	44.00 gal	0.75 pt	1 pt	1.5 pt	4.15	5.50	8.25
Bromox + Atrazine	2 + 1L	bromoxynil + atrazine	35.00 gal	1.5 pt	2 pt	3 pt	6.55	8.75	13.15
Bronate	2 + 2EC	bromoxynil + MCPAe	42.00 gal	0.75 pt	1 pt	1.5 pt	3.95	5.25	7.90
Brozine	2 + 1L	bromoxynil + atrazine	35.00 gal	1.5 pt	2 pt	3 pt	6.55	8.75	13.15
Buckle	10 + 3G	triallate + trifluralin	1.13 lb	10 lb	11 lb	12.7 lb	11.30	12.45	14.35
Buctril	2EC	bromoxynil	55.00 gal	1 pt	1.5 pt	2 pt	6.90	10.30	13.75
Buctril + Atrazine	2 + 1L	bromoxynil + atrazine	35.00 gal	1.5 pt	2 pt	3 pt	6.55	8.75	13.15
Bullet	2.5 + 1.5L	alachlor + atrazine	18.50 gal	2.5 qt	3 qt	3.75 qt	11.60	13.90	17.35
Butyrac 200	2SL	2,4-DB	35.00 gal	2 pt	3 pt	4 pt	8.75	13.15	17.50
Canopy	64.3 + 10.7DF	metribuzin + chlorimuron	2.75 oz	4 oz	5.5 oz	7 oz	11.00	15.15	19.25
Canvas	71.25DF	thifensulfuron + tribenuron + metsulfuron	14.60 oz	10 A/pk	-	5 A/pk	3.20	-	6.40
Casoron 4G	4G	dichlobenil	2.05 lb	100 lb	150 lb	200 lb	205.00	307.50	410.00
Casoron 10G	10G		5.25 lb	40 lb	60 lb	80 lb	210.00	315.00	420.00
Celebrity	63 + 7.5WDG	dicamba-Na + nicosulfuron	3.35 oz	3.34 oz	5 oz	6.67 oz	11.20	16.75	22.35
Celebrity Plus	42.4 + 17 + 10.6WDG	dicamba-Na + diflu-Na + nicosulf	- oz	4.67 oz	-	4.67 oz	-	-	-

Product	Formulation	Active Ingredients	Cost/Unit	Product/A			Cost \$/A		
				Low	Med	High	Low	Med	High
Cheyenne	fenoxaprop-P + MCPA + thifensulfuron + tribenuron 0.467 + 2.16e + 50DF + 25DF		810.00 case	Each case treats 40 acres			20.25	-	20.25
Clarity	4S	dicamba - dga salt	85.00 gal	0.5 pt	0.75 pt	1 pt	5.45	8.15	10.90
Classic	25DF	chlorimuron	10.70 oz	0.5 oz	0.67 oz	0.75 oz	5.25	7.04	7.90
Cobra	2SL	lactofen	126.00 gal	6 fl oz	8 fl oz	12.8 fl oz	5.90	7.85	12.60
Concert	12.5 + 12.5DF	thifensulfuron + chlorimuron	7.50 oz	0.5 oz	-	0.5 oz	3.75	-	3.75
Confront	2.25 + 0.75EC	triclopyr-tea + clopyralid-tea	105.00 gal	1 pt	1.5 pt	2 pt	13.15	19.70	26.25
Crossbow	1 + 2SL	triclopyr + 2,4-D	50.00 gal	1 qt	3 qt	6 qt	12.50	37.50	75.00
Curtail	0.38 + 2SL	clopyralid-aka + 2,4-D-aka salt	37.00 gal	2 pt	4 pt	8 pt	9.25	18.50	37.05
Curtail M	0.42 + 2.35SL	clopyralid acid + MCPAioe	41.00 gal	1.75 pt	2 pt	2.33 pt	9.00	10.25	11.95
Dakota	0.234 + 2.84EC	fenoxaprop + MCPAe	57.00 gal	16 fl oz	-	21.3 fl oz	7.20	-	9.60
Degree	3.8ME	acetochlor-ME	- gal	3.25 qt	4 qt	4.25 qt	-	-	-
Degree Xtra	1.34 + 2.7L	atrazine + acetochlor(ME)	- gal	2.4 qt	2.9 qt	3.7 qt	-	-	-
Desiccate II	2SL	endothall	38.00 gal	1.5 qt	-	2 qt	14.25	-	19.00
Dimension	1EC	dithiopyr	130.00 gal	1 qt	1.5 qt	2 qt	32.50	48.75	68.00
Diquat	2SL	diquat	79.00 gal	1 pt	2 pt	4 pt	9.90	19.75	39.50
Discover + DSV		clodinafop + PO adjuvant	- gal	3.2 fl oz	-	4 fl oz	-	-	-
Distinct	50 + 20WDG	dicamba-Na + diflufenzopyr-Na	2.00 oz	4 oz	6 oz	8 oz	8.00	12.00	16.00
Diuron	80WDG	diuron	5.00 lb	0.75 lb	2 lb	6 lb	3.75	10.00	30.00
Domain	24 + 36WDG	flufenacet + metribuzin	- oz	9 oz	13 oz	16 oz	-	-	-
DoublePlay	1.4 + 5.6EC	acetochlor + EPTC	30.00 gal	4.5 pt	6 pt	7 pt	16.90	22.50	26.25
Drexel Defol	6SL	sodium chlorate	6.50 gal	0.5 gal	-	1 gal	3.25	-	6.50
Dual II Magnum	7.6EC	metolachlor	105.00 gal	1.33 pt	1.67 pt	2 pt	17.45	21.90	26.25
Epic	48 + 10DF	flufenacet + isoxaflutole	1.90 oz	8 oz	14 oz	20 oz	15.20	26.60	38.00
Eptam 7E	7EC	EPTC	32.00 gal	2.3 pt	4 pt	6.75 pt	9.20	16.00	27.00
Eptam 20G	20G		1.05 lb	15 lb	18 lb	22.5 lb	15.75	18.90	23.65
Eradicane EC	6.7EC	EPTC + safener	27.00 gal	4.75 pt	6 pt	7 pt	16.00	20.30	23.65
Eradicane 25G	25G		1.00 lb	16 lb	20 lb	24 lb	16.00	20.00	24.00
Escort	60DF	metsulfuron	22.00 oz	0.33 oz	1 oz	2 oz	7.25	22.00	44.00
Everest	70WDG	flucarbazone	- oz	0.4 oz	0.5 oz	0.6 oz	-	-	-
Exceed	32.3 + 32.3WDG	prosulfuron + primisulfuron	11.20 oz	0.88 oz	-	0.88 oz	9.85	-	9.85
Express	75DF	tribenuron	17.50 oz	0.08 oz	0.25 oz	0.33 oz	1.40	4.40	5.80
Extrazine II	67.5 + 22.5DF	cyanazine + atrazine	4.75 lb	1.4 lb	3 lb	5.3 lb	6.65	14.25	25.20
Extreme	1 + 3SL	imazethapyr + glyphosate	- gal	1.5 pt	2.25 pt	3 pt	-	-	-
Fallow Master	1.1 + 0.5SL	glyphosate-ipa + dicamba acid	17.50 gal	22 fl oz	33 fl oz	44 fl oz	3.10	4.60	6.15
Far-Go EC	4EC	triallate	38.00 gal	1 qt	1.25 qt	1.5 qt	9.50	11.90	14.25
Far-Go 10G	10G	triallate	0.88 lb	10 lb	12.5 lb	15 lb	8.80	11.00	13.20
Finesse	62.5 + 12.5DF	metsulfuron + chlorsulfuron	13.50 oz	0.2 oz	0.25 oz	0.3 oz	2.70	3.40	4.05
FirstRate	84WDG	cloransulam	23.75 oz	0.3 oz	0.6 oz	0.75	7.15	14.25	17.80
Flexstar	1.88EC	fomesafen + adjuvants	90.00 gal	0.75 pt	-	0.75 pt	8.45	-	8.45
Freedom	2.67 + 0.33EC	alachlor + trifluralin	12.75 gal	2.75 qt	3.25 qt	4.5 qt	8.75	10.35	14.35
Frontier	6EC	dimethenamid	80.00 gal	15 fl oz	20 fl oz	32 fl oz	9.45	12.60	20.15
Frontier X2	6EC	isomer of dimethenamid	- gal	8.3 fl oz	11 fl oz	17.6 fl oz	-	-	-
FulTime	2.4 + 1.6L	acetochlor (ME) + atrazine	26.00 gal	2.5 qt	2.7 qt	3 qt	16.25	17.55	19.50
Fusilade DX	2EC	fluazifop-P	120.00 gal	6 fl oz	10 fl oz	12 fl oz	5.65	9.40	11.30
Fusion	2 + 0.66EC	fluazifop + fenoxaprop	132.00 gal	6 fl oz	10 fl oz	12 fl oz	6.20	10.30	12.35
Galaxy	3 + 0.67SL	bentazon + acifluorfen	60.00 gal	2 pt	-	2 pt	15.00	-	15.00
Gallery	75DF	isoxaben	115.00 lb	0.66 lb	1 lb	1.33 lb	75.90	115.00	152.95
Garlon	4EC	triclopyr	100.00 gal	1 qt	2 qt	4 qt	25.00	50.00	100.00
Garlon	3AS		78.00 gal	2 qt	1 gal	2 gal	39.00	78.00	156.00
Glyphomax	3AS	glyphosate	- pt	0.5 pt	2 pt	4 pt	-	-	-
Glyphomax Plus	3AS	glyphosate	- pt	0.5 pt	2 pt	4 pt	-	-	-
Glyfos	3SL	glyphosate - ipa salt	40.00 gal	0.5 pt	2 pt	4 pt	2.50	10.00	20.00
Goal	2EC	oxyfluorfen	90.00 gal	4 pt	6 pt	8 pt	45.00	67.50	90.00
Gramoxone Extra	2.5SL	paraquat	31.00 gal	0.8 pt	2 pt	3 pt	3.10	7.75	11.65
Grazon P+D	0.54 + 2 S	picloram + 2,4-D	25.00 gal	2 qt	3 qt	4 qt	12.50	18.75	25.00
Guardman	2.33 + 2.67L	dimethenamid + atrazine	34.00 gal	2.5 pt	3.75 pt	5 pt	10.65	15.95	21.25
Harmony GT	75DF	thifensulfuron	10.50 oz	0.33 oz	0.5 oz	0.67 oz	3.45	5.25	7.00
Harmony Extra	50 + 25DF	thifensulfuron + tribenuron	11.50 oz	0.15 oz	0.3 oz	0.6 oz	1.75	3.45	6.90
Harness EC	7EC	acetochlor + safener	70.00 gal	1.25 pt	2 pt	3 pt	10.95	17.50	26.25
Harness 20G	20G		2.00 lb	8 lb	10 lb	12 lb	16.00	20.00	24.00

Product	Formulation	Active Ingredient	Cost/Unit	Product/A			Cost \$/A		
				Low	Med	High	Low	Med	High
Harness Xtra 5.6L	3.1 + 2.5L	acetochlor + safener + atrazine	33.00 gal	1.4 qt	2.3 qt	3 qt	11.55	19.00	24.75
Herbicide 273	3SL	endothall	43.00 gal	0.67 pt	2 pt	4 pt	3.60	10.75	21.50
Hoelon	3EC	diclofop	64.00 gal	2 pt	2.5 pt	2.7 pt	16.00	20.00	21.60
Hornet	23.1 + 62.5DF	flumetsulam + clopyralid	3.80 oz	1.6 oz	2.4 oz	3.2 oz	6.10	9.10	12.15
Hyvar XL	2L	bromacil	60.00 gal	1.5 gal	3 gal	6 gal	90.00	180.00	360.00
Karmex	80DF	diuron	5.00 lb	1 lb	3 lb	6 lb	5.00	15.00	30.00
Kerb	50WSP	pronamide	30.00 lb	2 lb	3 lb	4 lb	60.00	90.00	120.00
Krenite	4L	fosamine	56.00 gal	1.5 gal	3 gal	6 gal	84.00	168.00	336.00
Krovar I	40 + 40DF	bromacil + diuron	10.00 lb	4 lb	15 lb	30 lb	40.00	150.00	300.00
Laddok S-12	2.5 + 2.5L	bentazon + atrazine	44.00 gal	1.3 pt	1.67 pt	2.3 pt	7.15	9.20	12.65
Landmaster BW	0.9 + 1.5SL	glyphosate - ipa + 2,4-D - ipa	20.00 gal	27 fl oz	40 fl oz	54 fl oz	4.30	6.40	8.65
Lariat	2.5 + 1.5L	alachlor + atrazine	18.00 gal	2.5 qt	3 qt	3.75 qt	11.25	13.50	16.90
Lasso EC/Microtech	4EC	alachlor	23.00 gal	2 qt	2.5 qt	3 qt	11.50	14.40	17.25
Lasso II 15G	15G		0.90 lb	16 lb	20 lb	26 lb	14.40	18.00	23.40
Liberty	1.67SL	glufosinate	0.78 fl oz	16 fl oz	20 fl oz	28 fl oz	12.50	15.60	21.85
Liberty ATZ	3.3 + 1L	atrazine + glufosinate	62.00 gal	20 fl oz	32 fl oz	40 fl oz	9.60	15.35	19.20
Lightning	70WDG	imazethapyr + imazapyr	11.00 oz	0.75 oz	1.00 oz	1.28 oz	8.25	11.00	14.00
Lorox	50DF	linuron	10.00 lb	1 lb	3 lb	6 lb	10.00	30.00	60.00
Marksman	1.1 + 2.1L	dicamba - K salt + atrazine	27.00 gal	2 pt	3 pt	3.5 pt	6.75	10.15	11.85
Matrix	25DF	rimsulfuron	12.00 oz	1 oz	-	1.5 oz	12.00	-	18.00
Maverick	75DF	sulfosulfuron	-	0.33 oz	0.5 oz	0.67 oz	-	-	-
MEC Amine D	4SL	mecoprop	28.00 gal	0.5 pt	1 pt	2 pt	1.75	3.50	7.00
MCPA amine	4SL	MCPA	18.00 gal	0.4 pt	1 pt	2 pt	0.90	2.25	4.50
MCPA ester	4EC	MCPA	18.50 gal	0.5 pt	1 pt	2 pt	1.15	2.30	4.60
MCPP 4K Turf	4SL	MCPA	22.00 gal	0.5 pt	1 pt	2 pt	1.40	2.75	5.50
MXL	4SL	MCPA	22.00 gal	0.5 pt	1 pt	2 pt	1.40	2.75	5.50
Moxy	2EC	bromoxynil	55.00 gal	1 pt	1.5 pt	2 pt	6.90	10.30	13.75
Moxy AT	2 + 1L	bromoxynil + atrazine	35.00 gal	1.5 pt	2 pt	3 pt	6.55	8.75	13.15
Muster	75DF	ethametsulfuron	25.00 lb	0.25 oz	0.33 oz	0.42 oz	6.25	8.25	10.50
Northstar	39.9 + 7.5WDG	dicamba + primisulfuron	2.20 oz	-	5 oz	-	-	11.00	-
Nortron SC	4EC	ethofumesate	183.00 gal	6 pt	7 pt	7.5 pt	137.30	160.15	171.60
OpTill	5 + 1EC	dimethenamid + dicamba acid	70.00 gal	24 fl oz	30 fl oz	36 fl oz	13.20	16.50	19.80
Oust	75DF	sulfometuron	12.00 oz	2 oz	6 oz	8 oz	24.00	72.00	96.00
Paramount	75DF	quinclorac	35.00 lb	0.17 lb	0.25 lb	0.33 lb	5.95	8.75	11.55
Partner	65WDG	alachlor	3.70 lb	3 lb	4 lb	5 lb	11.10	14.80	18.50
Peak	57DF	prosulfuron	11.00 oz	0.25 oz	0.38 oz	0.5 oz	2.75	4.20	5.50
Pendimax	3.3EC	pendimethalin	28.00 gal	2.4 pt	3 pt	3.64 pt	8.40	10.50	12.75
Pennant EC	7.8EC	metolachlor	110.00 gal	2 pt	3 pt	4 pt	27.50	41.25	55.00
Pentagon	60WDG	pendimethalin	5.75 lb	0.85 lb	2 lb	3.5 lb	4.89	11.50	20.15
Permit	75DF	halosulfuron	13.00 oz	0.67 oz	1 oz	1.33 oz	8.70	13.00	17.30
Pinnacle	25DF	thifensulfuron	37.00 oz	0.125oz	-	0.25 oz	4.65	-	9.25
Plateau	2SL	imazapic	2.25 fl oz	4 fl oz	8 fl oz	12 fl oz	9.00	18.00	27.00
Poast	1.5EC	sethoxydim	65.00 gal	0.5 pt	1 pt	1.5 pt	4.05	8.15	12.20
Pond Master	3SL	glyphosate	115.00 gal	0.38 pt	2 pt	4 pt	5.45	28.75	57.50
Pramitol EC	25EC	prometon and others	28.00 gal	5 gal	7.5 gal	10 gal	140.00	210.00	280.00
Pramitol 5S	5PS		2.50 lb	150 lb	200 lb	400 lb	375.50	500.00	1000.00
Prestige	1EC	sethoxydim	51.50 gal	0.75 pt	1.5 pt	2 pt	4.85	9.65	12.90
Princep Caliber 90	90DF	simazine	3.75 lb	1.8 lb	3 lb	4.4 lb	6.75	11.25	16.50
Princep 4L	4L	simazine	18.00 gal	2 qt	3 qt	4 qt	9.00	13.50	18.00
Prism	0.94EC	clethodim	86.00 gal	8 fl oz	10 fl oz	13 fl oz	5.35	6.70	8.70
Progress	0.6 + 0.6 + 0.6 EC	desmed + phenmed + ethofum	118.00 gal	0.8 pt	2 pt	3.3 pt	11.80	29.50	48.70
Prowl	3.3EC	pendimethalin	16.00 gal	2.4 pt	3 pt	3.64 pt	4.80	6.00	7.25
Puma	1EC	fenoxaprop-P	202.00 gal	0.33 pt	0.4 pt	0.67 pt	8.35	10.10	16.90
Pursuit WDG	70WDG	imazethapyr	9.50 oz	0.72 oz	1.07 oz	1.44 oz	6.85	10.20	13.70
Pursuit 2AS	2SL	imazethapyr	450.00 gal	2 fl oz	3 fl oz	4 fl oz	7.05	10.60	14.10
Pursuit Plus	2.7 + 0.2EC	pendimethalin + imazethapyr	42.00 gal	1.8 pt	-	2.5 pt	9.45	-	13.15
Pyramin	67.7DF	pyrazon	14.50 lb	4.58 lb	7.4 lb	11.25 lb	66.40	107.30	163.15
Python	80WDG	flumetsulam	9.00 oz	0.8 oz	1 oz	1.33 oz	7.20	9.00	12.00
Ramrod 4L	4L	propachlor	18.00 gal	3 qt	4 qt	5 qt	13.15	17.50	21.90
Ramrod 20G	20G		1.10 lb	15 lb	20 lb	25 lb	16.50	22.00	27.50
Raptor	1SL	imazamox	500.00 gal	3 fl oz	4 fl oz	5 fl oz	11.70	15.60	19.50

Product	Formulation	Active Ingredients	Cost/Unit	Product/A			Cost \$/A		
				Low	Med	High	Low	Med	High
Rave	8.8 + 50WDG	triasulfuron + dicamba-Na	- oz	2 oz	4 oz	5oz	-	-	-
ReadyMaster	2 + 1.5L	atrazine + glyphosate	- gal	1.5 qt	1.75 qt	2 qt	-	-	-
Reflex	2EC	fomesafen	82.00 gal	1 pt	1.25 pt	1.5 pt	10.25	12.80	15.40
Reliance STS	25DF	thifensulfuron + chlorimuron	6.00 oz	0.5 oz	-	0.5 oz	3.00	-	3.00
Rely	1.67SL	glufosinate	- gal	48 fl oz	-	48 fl oz	-	-	-
Resource	0.86 EC	flumiclorac	160.00 gal	4 fl oz	6 fl oz	8 fl oz	5.00	7.50	10.00
Rezult Copack	5SL / 1EC	bentazon + sethoxydim	35 to 43 gal	1.6 + 1.6 pt			14 to 17.20		
Rhonox MCP Ester	4EC	MCPA	19.00 gal	0.5 pt	1 pt	2 pt	1.20	2.40	4.75
Ronstar	2G	oxadiazon	1.50 lb	100 lb	150 lb	200 lb	150.00	225.00	300.00
	50WP		25.00 lb	4 lb	5 lb	6 lb	100.00	125.00	150.00
Rodeo	4SL	glyphosate - ipa salt	90.00 gal	0.38 pt	2 pt	4 pt	4.30	22.50	45.00
Roundup Custom	4SL	glyphosate - ipa salt	45.00 gal	0.5 pt	2 pt	4 pt	2.80	11.25	22.50
Roundup Original	3SL	glyphosate - ipa salt	37.00 gal	0.5 pt	2 pt	4 pt	2.30	9.25	18.50
Roundup Original RT	3SL	glyphosate - ipa salt	35.50 gal	0.5 pt	2 pt	4 pt	2.20	8.90	17.75
Roundup Ultra	3SI	glyphosate - ipa salt	38.00 gal	0.5 pt	2 pt	4 pt	2.40	9.50	19.00
Roundup Ultra RT	3SL	glyphosate - ipa salt	35.00 gal	0.5 pt	2 pt	4 pt	2.20	8.75	17.50
RU Private Labels	3SL	glyphosate - ipa salt	- gal	0.5 pt	2 pt	4 pt	-	-	-
Roundup Ultra Dry	65SG	glyphosate - NH3	- gal	0.29 lb	1.15 lb	2.3 lb	-	-	-
Roundup Ultra Max	3.7SL	glyphosate - ipa salt	- gal	- pt	- pt	- pt	-	-	-
Ro-Neet	6EC	cycloate	58.00 gal	4 pt	4.5 pt	5.33 pt	29.00	32.65	38.65
Sahara	7.78 + 62.2WDG	imazapyr + diuron	12.00 lb	5 lb	10 lb	15 lb	60.00	120.00	180.00
Scepter	70DF	imazaquin	6.75 oz	1.4 oz	-	2.8 oz	9.45	-	18.90
Scorpion III	9.3 + 25 + 50DF	flumetsulam + clopyralid + 2,4D	2.20 oz	0.25 lb	-	0.25 lb	8.80	-	8.80
Select	2EC	clethodim	175.00 gal	4 fl oz	6 fl oz	8 fl oz	5.45	8.20	10.95
Sencor/Lexone	75DF	metribuzin	19.00 lb	1.6 oz	0.25 lb	0.67 lb	1.90	4.75	12.75
Shotgun	2.25 + 1L	atrazine + 2,4-D acid	27.00 gal	1.5 pt	2 pt	3 pt	5.05	6.75	10.15
Sinbar	80WP	terbacil	27.00 lb	0.5 lb	2 lb	4 lb	13.50	54.00	108.00
Snapshot TG	2 + 0.5TG	isoxaben + trifluralin	1.50 lb	100 lb	150 lb	200 lb	150.00	225.00	300.00
Snapshot DF	20 + 60DF	isoxaben + oryzalin	50.00 lb	3.125 lb	4 lb	6.25 lb	156.25	200.00	312.50
Sonalan HFP	3EC	ethalfluralin	32.50 gal	1.5 pt	3 pt	4.5 pt	6.10	12.20	18.25
Sonalan 10G	10G		1.10 lb	6 lb	11.5 lb	17 lb	6.60	12.85	18.70
Spartan	75DF	sulfentrazone	2.80 oz	2.67 oz	4.25 oz	5.33 oz	7.50	11.90	14.90
Spike	20WG	tebuthiuron	11.00 lb	2.5 lb	5 lb	30 lb	27.50	55.00	330.00
Spirit	14.2 + 42.8DF	prosulfuron + primisulfuron	11.00 oz	1 oz	-	1 oz	11.00	-	11.00
Stampede	80EDF	propanil	4.50 lb	1.25 lb	1.3 lb	1.4 lb	5.65	5.85	6.30
Starane	1.5EC	fluroxypyr	85.00 gal	0.5 pt	0.67 pt	1 pt	5.32	7.12	10.63
Starane Plus Salvo	3.75EC	fluroxypyr + 2,4-D ester	46.00 gal	1 pt	1.33 pt	1.67 pt	5.75	7.65	9.60
Starane Plus Sword	3.55EC	fluroxypyr + MCPA ester	46.00 gal	1.125 pt	1.5 pt	2 pt	6.45	8.63	11.50
Starfire	1.5S	paraquat	- gal	11 fl oz	16 fl oz	22 fl oz	-	-	-
Status	2SL	acifluorfen	66.00 gal	1 pt	1.5 pt	2 pt	8.25	12.40	16.50
Steel	2.59EC	imazaquin + imazethapyr	45.00 gal	3 pt	-	3 pt	16.90	-	16.90
Stellar	0.7 + 2.4EC	flumiclorac + lactofen	190.00 gal	5 fl oz	7 fl oz	10 fl oz	7.40	10.35	14.80
Sterling	4SL	dicamba-dma salt	85.00 gal	2 fl oz	1 pt	4 pt	1.30	10.65	42.50
Sterling Plus	2.1 + 1.1L	atrazine + dicamba-K salt	27.00 gal	2 pt	3 pt	3.5 pt	6.75	10.15	11.80
Stinger	3SL	clopyralid - monoec salt	485.00 gal	0.25 pt	0.5 pt	0.67 pt	15.15	30.30	40.60
Storm	1.33 + 2.67SL	acifluorfen + bentazon	75.00 gal	1.5 pt	-	1.5 pt	14.05	-	14.05
Surpass EC	6.4EC	acetochlor + safener	65.00 gal	1 pt	2 pt	3 pt	8.15	16.25	24.40
Surpass 20G	20G		2.02 lb	4 lb	8 lb	12 lb	8.10	16.15	24.25
Surflan	4EC	oryzalin	75.00 gal	2 qt	3 qt	4 qt	37.50	56.25	75.00
Sword	5.2EC	MCPA	28.00 gal	3 fl oz	1 pt	2 pt	0.65	3.50	7.05
Synchrony STS	31.8 + 10.2DF	chlorimuron + thifensulfuron	8.00 oz	0.25 oz	-	0.5 oz	2.00	-	4.00
Telar	75DF	chlorsulfuron	- oz	½ oz	1 oz	3 oz	-	-	-
Thistrol	2EC	MCPB	35.00 gal	2 pt	4 pt	6 pt	8.75	17.50	26.30
Tiller	0.37 + 0.58 + 1.75E	fenoxaprop-P + MCPA + 2,4-D	87.00 gal	1 pt	1.2 pt	1.7 pt	10.90	13.05	18.50
TopNotch	3.2MC	acetochlor (microencapsulated)	32.00 gal	2 qt	2.5 qt	3 qt	16.00	20.00	24.00
TopSite	0.5 + 2G	imazapyr + diuron	2.75 lb	200 lb	250 lb	300 lb	550.00	687.50	825.00
Tordon 22K	2SL	picloram	84.00 gal	1 fl oz	-	1.5 fl oz	0.65	-	1.00
				1 pt	2 pt	8 pt	10.65	21.25	85.05
Touchdown	5SL	glyphosate - tms salt	51.00 gal	0.8 pt	1.6 pt	3.2 pt	5.10	30.20	60.40
Tough	5L	pyridate	57.00 gal	1 pt	1.5 pt	2 pt	7.15	10.70	14.25
Transline	3SL	clopyralid	325.00 gal	0.67 pt	1 pt	1.33 pt	27.20	40.65	54.05



Product	Formulation	Active Ingredients	Cost/Unit	Product/A			Cost \$/A		
				Low	Med	High	Low	Med	High
Treflan HFP	4EC	trifluralin	32.00 gal	1 pt	2 pt	4 pt	4.00	8.00	16.00
Treflan G	5G	trifluralin	0.80 lb	10 lb	25 lb	40 lb	8.00	20.00	32.00
Treflan TR-10	TR10G	trifluralin	0.95 lb	5 lb	10 lb	20 lb	4.75	9.50	19.00
Trific	60DF	trifluralin	4.50 lb	0.83 lb	2 lb	3.33 lb	3.75	9.00	15.00
Trilin	10G	trifluralin	0.85 lb	5 lb	10 lb	20 lb	4.25	8.50	17.00
Tri-4	4EC	trifluralin	30.00 gal	1 pt	2 pt	4 pt	3.75	7.50	15.00
Trifluralin/Trust	4EC	trifluralin	25.00 gal	1 pt	2 pt	4 pt	3.15	6.25	12.50
Trimec Classic	3.32EC	2,4-Da + MCPP + dicamba	25.00 gal	3.25 pt	3.8 pt	4.33 pt	10.15	11.90	13.55
Trimec Plus	2.88EC	MSMA + 2,4-Da + MCPPa	31.00 gal	2 qt	3 qt	4 qt	15.50	23.25	31.00
Trimec Super	4.5EC	2,4-De + 2,4DPe + dicamba	52.00 gal	2 pt	2.5 pt	3 pt	13.25	16.60	19.90
Turflon Ester	4EC	triclopyr	100.00 gal	1 pt	1.5 pt	2 pt	25.00	37.50	50.00
Turbo	6.55 + 1.45 L	metolachlor + metribuzin	64.00 gal	2 pt	3 pt	3.5 pt	16.00	24.00	28.00
UpBeet	50DF	triflurosulfuron	45.00 oz	0.25 lb	0.3 lb	0.5 lb	11.25	13.50	22.50
Velpar	75DF	hexazinone	22.50 lb	0.67 lb	1.33 lb	2 lb	15.10	29.95	45.00
Weed Blast	4 + 4G	bromacil + diuron	2.75 lb	40 lb	50 lb	60 lb	110.00	137.50	165.00
Phenoxy O88	2.8EC	2,4-D acid + ester	24.00 gal	0.67 pt	2 pt	3 pt	2.00	6.00	9.00
Weedone 638	2.8EC	2,4-D acid + ester	24.00 gal	0.67 pt	2 pt	3 pt	2.00	6.00	9.00
Brash	2.87 + 1SL	2,4-D + dicamba	32.00 gal	0.5 pt	2 pt	4 pt	2.00	8.00	16.00
Weed Master	2.87 + 1SL	2,4-D + dicamba	32.00 gal	0.5 pt	2 pt	4 pt	2.00	8.00	16.00
2,4-D amine	3.8SL	2,4-D	13.00 gal	0.5 pt	2 pt	4 pt	0.80	3.25	6.50
2,4-D ester	3.8EC		16.00 gal	0.4 pt	2 pt	4 pt	0.80	4.00	8.00
LV ester	5.7EC		22.00 gal	0.33 pt	2 pt	4 pt	0.90	5.50	10.00
AGSCO 400	4EC		19.00 gal	0.5 pt	2 pt	4 pt	1.20	4.75	9.50
Formula 40	4SL		15.50 gal	0.5 pt	2 pt	4 pt	0.95	3.90	7.75
Hi-Dep	4SL		19.00 gal	0.25 pt	2 pt	4 pt	0.60	4.75	9.50
Saber	4EC		16.00 gal	0.2 pt	1 pt	2.25 pt	1.60	8.00	18.00
Salvo	5EC		28.50 gal	0.5 pt	2 pt	4 pt	1.80	7.10	14.25
Savage	79DS		3.25 lb	0.5 lb	0.75 lb	1.5 lb	1.65	2.45	4.90

## Herbicide Spray Additives

### Surfactants

Activate Plus	Agro	\$17.00 gal
Activator 90	Loveland	\$18.50 gal
Active-It	AGSCO	\$17.00 gal
Class Preference	Cenex	\$15.70 gal
Class Spray Booster S	Cenex	\$15.80 gal
Cornbelt Premier 90	West Central	\$18.50 gal
Induce	Helena	\$20.00 gal
LI-700	Loveland	\$20.00 gal
Purity 100	Rosens	\$21.00 gal
R-11	Wilbur-Ellis	\$18.00 gal
Sprayfuse 90	Cornbelt	\$16.00 gal
Unifilm 707	Custom Chem	\$16.00 gal
X-77 Spreader	Loveland	\$18.50 gal

### Surfactants with Silicone

Class Celexone	Cenex	\$85.00 gal
Galactic	Custom Chem.	\$95.00 gal
Kinetic	Helena	\$93.00 gal
Silkin	Agro	\$80.00 gal
Silwet L-77 (100% silicn)	Loveland	\$160.00 gal
Silenergy	Cornbelt	\$110.00 gal
Sylgard 309	Wilbur-Ellis	\$80.00 gal

### Surfactants + Fertilizer

Cayuse Plus	Wilbur-Ellis	\$11.00 gal
Chaser	Agro	\$4.50 gal
Class Act	Cenex	\$6.40 gal
Class Act II	Cenex	\$4.50 gal
Class APM-28	Cenex	\$4.25 gal
Class Prefer 28	Cenex	\$4.50 gal
Cornbelt Combo	West Central	\$5.50 gal
Cornbelt Combo II	West Central	\$5.00 gal

Dispatch	Loveland	\$5.90 gal
Dispatch 2N	Loveland	\$5.00 gal
Impressive DB	Rosens	\$0.90 lb
Patrol	Helena	\$6.00 gal
Recon	Rosens	\$6.50 gal
Surfate	AGSCO	\$14.50 gal
Surf Pro 10	Cornbelt	\$6.00 gal

### Water Conditioning Agents

AMS Plus	Agro	\$14.00 gal
Choice	Loveland	\$17.00 gal
Infactant	Custom Chem.	\$13.00 gal
Quest	Helena	\$20.00 gal

### Basic Blend

Breakout	Loveland	\$15.25 gal
Linkage	West Central	\$15.25 gal
Newtone	Cenex	\$15.25 gal
Quad 7	AGSCO	\$15.25 gal
Transactive	Helena	\$15.25 gal

### Basic Blend + MSO

FirstMate	Agro	\$15.00 gal
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### Petroleum Oil Concentrates

Agri-Dex	Helena	\$8.75 gal
Class 17% Concentrate	Cenex	\$5.00 gal
Crop Oil Concentrate	Cornbelt	\$6.00 gal
Crop Oil Plus	WilFarm	\$6.00 gal
DSV (Score)	Novartis - In co-pac with Discover	
Herbimax	Loveland	\$7.00 gal

Premium Crop Oil Conc.	West Central	\$6.50 gal
Ortech	Rosens	\$7.00 gal
Paraspred	Custom Chem.	\$6.50 gal
Prime Oil	Agro	\$6.25 gal
ROC Crop Oil	Wilbur-Ellis	\$7.00 gal
R-Way	Rosens	\$6.00 gal

### Vegetable Oil Concentrates

EV Concentrate	Cenex	\$5.20 gal
Prime Oil II	Agro	\$6.25 gal
Veg-Oil	Loveland	\$7.50 gal

### Ethylated Seed Oils (ESO)

Hasten	WilFarm	\$16.00 gal
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### Methylated Seed Oils (MSO)

Destiny	Cenex	\$13.00 gal
Meth-Oil	Agro	\$15.00 gal
MSO	Helena	\$16.00 gal
MSO	Loveland	\$16.00 gal
Perform	United Supp.	\$16.00 gal
Scoil	AGSCO	\$15.00 gal
Soy-Stik	West Central	\$16.00 gal
Sundance II	Rosens	\$15.00 gal
Sundance HC	Rosens	\$25.00 gal
SunPro	Cornbelt	\$16.50 gal
Superb	Wilbur-Ellis	\$16.00 gal
Unifilm MSO	Custom Chem.	\$16.00 gal

### MSO + Water Conditioning Agent

Vortex	Loveland	\$43.00 gal
SuperCharge	Zeneca - In co-pac with Achieve	

### ESO/MSO + Organosilicone Surfactant

Dyne-Amic (MSO)	Helena	\$43.00 gal
Eth-N-Gard (ESO)	WilFarm	\$54.00 gal
Pearless (MSO)	Custom Chem.	\$40.00 gal
Phase (MSO)	Loveland	\$42.00 gal
Rivet (MSO)	Agro	\$42.00 gal

### Fertilizer

Ammonium sulfate (dry)	Various	\$0.32 lb
Ammonium sulfate (liq)	Various	\$3.00 gal
Actamaster (dry AMS)	Loveland	\$0.32 lb
Bronc (liquid AMS)	Wilbur-Ellis	\$5.00 gal
Imperial AMS	Rosens	\$0.35 lb
28% UAN	Various	\$4.00 gal
28% UAN (bulk)	Various	\$3.50 gal
Solubor	Various	\$0.82 lb
Surf	AGSCO	\$3.50 gal

### Drift Retardants

Chem-trol	Loveland	\$16.25 gal
Deposit	Loveland	\$15.00 qt
Drift Retardant	AGSCO	\$13.25 qt
Placement	WilFarm	\$26.00 gal
Sta-Put	Wilbur-Ellis	\$12.00 gal
Windbrake	Agro	\$13.00 gal

### Drift Retardants+Antifoam+Water Cond. Agents

Ultra-Gard	Loveland	\$48.00 gal
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### AMS Fertilizer + Drift Redardant

Array	Rosens	\$1.60 lb
Arrow	Agro	\$1.35 lb
Corral AMS Liquid	Cenex	\$5.40 gal
Placement Pro-Pak	WilFarm	\$15.75 gal
Surf Plus	AGSCO	\$4.25 gal

### AMS + Drift Retardant + Defoamer

Arrow 3	Agro	\$10.00 gal
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### Compatibility Agents

Combine	Agro	\$27.00 gal
Complete	Cenex	\$27.00 gal
EZ-Mix Compat	Loveland	\$28.00 gal
Uniblend	WilFarm	\$34.00 gal
Unite (compatibility)	Loveland	\$37.00 gal

### Spray Tank Cleaners

All Clear	Loveland	\$20.00 gal
Class Tank Cleaner	Cenex	\$9.00 qt
Incide-out	Precision Labs	\$15.25 gal
Medallion TC	Rosens	\$6.00 lb
Neutral Clean	Wilbur-Ellis	\$12.00 lb
Neutral Clean	Wilbur-Ellis	\$15.80 qt
Tank Cleaner	AGSCO	\$8.15 qt
Tank & Eq. Cleaner	West Central	\$4.70 lb
Tank & Eq. Cleaner	Loveland	\$4.75 lb
Wipeout	Helena	\$20.80 gal

## **Adjuvants and Rates for POST Herbicides:**

**Roundup Ultra/RT, Dry = No NIS**

**Roundup Original/RT, Glyphos, Private Labels, Touchdown:** Add NIS at 0.5% v/v

**Roundup Custom, Rodeo = Add NIS at 1% v/v**

**Basic Blend:** Linkage, Newtowne, Quad 7, Transactive = 1% v/v or 1gallon/100 gallons water

**Basic Blend + MSO:** FirstMate = 1% v/v

**Surfactants:** 1 to 2 pt/100 gallons of water or 0.125 to 0.25% v/v

**Surfactants with Silicone:** 0.5 to 1 pt/100 gallon of water or 0.0625 to 0.125% v/v

### **Surfactants + Fertilizer:**

Chaser	2.4 pt/A
Class Act	2.5 gallons/100 gallons water
Class Act II	2.5 to 4 gallons/100 gallons water
Class Act IIDB	22 lbs/100 gallons water
Class APM-28	5 gallons per 100 gallons water
Class Prefer 28	2.8 gallons per 100 gallons water
Cornbelt Combo	2.25 pt/A at 10 gpa, 2.5 pt/A at 15 to 20 gpa
Cornbelt Combo II	4 pt/A at 10 gpa, 6 pt/A at 15 gpa, 8 pt/A at 20 gpa
Dispatch	1.5 pt/A if <10 gpa, 2 pt/A if >10 gpa, Rec: 2.5 pt/A
Dispatch 2N	2.5 qt/A at 15 gpa
Impressive	2.5 lb/A at 10 gpa, 3 lb/A at 12 gpa, 3.5 lb/A at 14 gpa
Impressive HV	2.6 lb/A at 18 gpa, 2.9 lb/A at 20 gpa, 3.2 lb/A at 22 gpa
Patrol	3 to 4 pt/A
Recon	2.25 to 2.5 pt/A
Sensation	1 lb/A at 5 gpa, 2 lb/A at 10 gpa, 3 lb/A at 15 gpa
Surfate	1 gallon/100 gallons water
Surf Pro 10	2 to 2.5 pt if <10 gpa, 3 to 3.5 pt if >10 gpa

### **Apply Accent, Basis with:**

Cayuse plus, Class Act II, Class APM-28, Cornbelt Combo II, Dispatch 2N, Impressive, Quad 7, or SurfPro 5

**Apply Basagran, Blazer, Pinnacle with:** Dispatch, Impressive, or Recon

**Apply Pursuit or Raptor with:** Cayuse Plus, Chaser, Class Act II, Class Prefer 28, Dispatch/2N, Combo, Impressive, Patrol, Surf Pro 10, or Quad 7

**Apply Touchdown with:** Choice, Cayuse, Class Act, Dispatch/2N, Sensation, or Surfate

### **AMS Fertilizer + Drift Retardant**

Array	9 to 14 lb/100 gallons water
Arrow	9 to 14 lb/100 gallons water

### **AMS Fertilizer + Drift Retardant + Defoamer**

Arrow 3	2.5 gal/100 gallons water
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### **Water Conditioning Agents:**

AMS Plus:	2 pt/100 gallons water
Cayuse/Plus:	2 to 3 qt/100 gallons water
Choice:	2 qt/100 gallons water
Infactant:	4 pt/100 gallons water
Quest:	2 to 4 pt/100 gallons water

**Petroleum Oil Concentrates:** 2 to 4 pt/A

**Vegetable Oil Concentrates:** 2 to 4 pt/A

**Methylated Seed Oils (MSO):** 1.5 pt/A or 1% v/v

**Ethylated Seed Oils (ESO):** 1.5 pt/A or 1% v/v

### **ESO/MSO) + Organosilicone Surfactant:**

Dyne-Amic (MSO):	4 pt/100 gallon water
Eth-N-Gard (ESO):	2 pt/100 gallon water
Pearless (MSO):	3 to 5 pt/100 gallons water
Phaser (MSO):	1 qt/100 gallons water
Rivet (MSO):	4 pt/100 gallon water

**ESO + 28% UAN:** Eth-N-Ate: 4 pt/A

**MSO + Water Conditioning Agents:** Vortex 1.5 pt/A

# New Weed Control Guide Information for 2000:

2000 Edition of **Weed Control Guide** smaller with less text. Full version on web at:  
[www.ext.nodak.edu/extpubs/plantsci/weeds/w253/w253w.htm](http://www.ext.nodak.edu/extpubs/plantsci/weeds/w253/w253w.htm)

## NAMES FOR GLYPHOSATE (Roundup, etc):

**Roundup Ultra/RT, Roundup Ultra Dry, Roundup Ultra Max, Roundup Original/RT, Roundup Custom, Rodeo, Glyfos, Glyphomax, Glyphomax Plus, Touchdown, and Roundup Private Labels.**

## PREMIXES CONTAINING GLYPHOSATE(Roundup, etc) =

**Extreme** = glyphosate + Pursuit  
**Backdraft** = glyphosate + Scepter  
**ReadyMaster** = glyphosate + atrazine

**Touchdown, Glyphomax, Glyphomax Plus** = Allowed in Roundup (Glyphosate) Resistant Soybeans.

**Touchdown** = New registration including preemergence in wheat.

**Roundup Ultra/RT** = Preharvest and spot treatment in field pea, lentils, and lupins.

**Select** registration pending in sunflower, potato, canola.

**Banvel SGF** phased out in future.

**Sterling** = From Agro (Terra) but same as Banvel.

## Wheat Herbicides:

**Discover** = Wild oat, green and yellow foxtail control  
**Everest** = Wild oat, green foxtail, and suppression of yellow foxtail  
**Harmony GT** = 75DF - same as old Harmony  
**Maverick** = Cheat and downy brome control  
**Rave** = Amber + dicamba (Banvel/Clarity)

## Corn Herbicides:

**Axiom AT** = flufenacet + metribuzin + Atrazine  
**Celebrity Plus** = Accent + Distinct  
**Degree** = acetochlor (microencapsulated) - same as TopNotch  
**Degree Xtra** = Degree + atrazine  
**Epic** = Balance + flufenacet (in Axiom)  
**NorthStar** = Beacon + dicamba (Banvel/Clarity)  
**ReadyMaster** = Glyphosate + atrazine  
**Sterling Plus** = Dicamba + atrazine by Agro (Terra) but same as Marksman

## Soybean Herbicides:

**Domain** = Similar to Axiom but higher ratio of metribuzin  
**Authority** = Excellent mode of action for resistant and troublesome weeds  
**Rezult** = Poast + Basagran at a considerable cost savings.  
**Extreme** = Pursuit + glyphosate  
**Backdraft** = Scepter + glyphosate  
**Starfire** = Same as Gramoxone Extra but different formulation  
**Pendimax** = By Dow but same as Prowl

## Others:

**Rely** = Potato vine desiccant but same as Liberty  
**Desiccate II** = New formulation of Desiccate

## Chick Pea/Garbanzo Bean

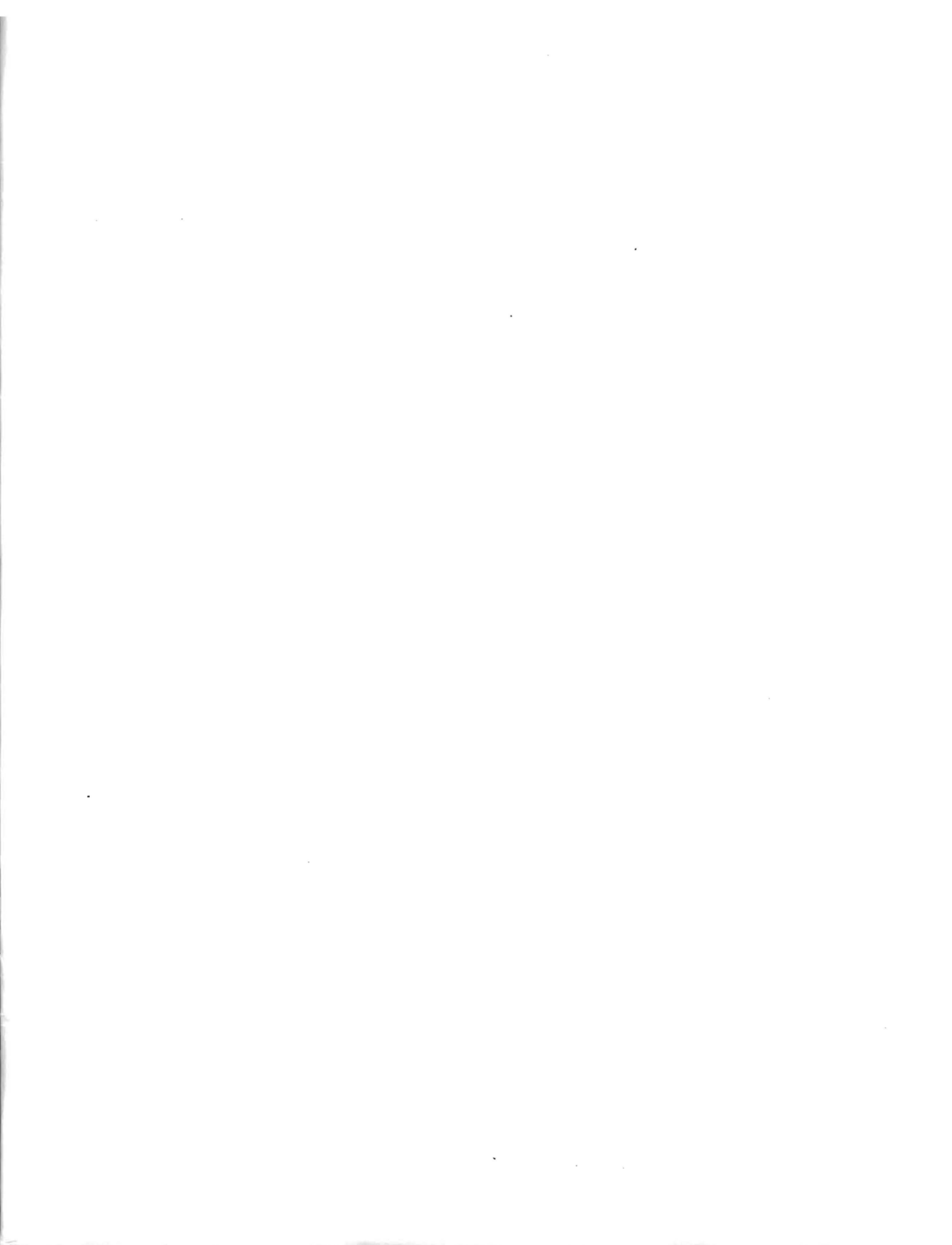
**Sonalan, Select, and Tough** added.

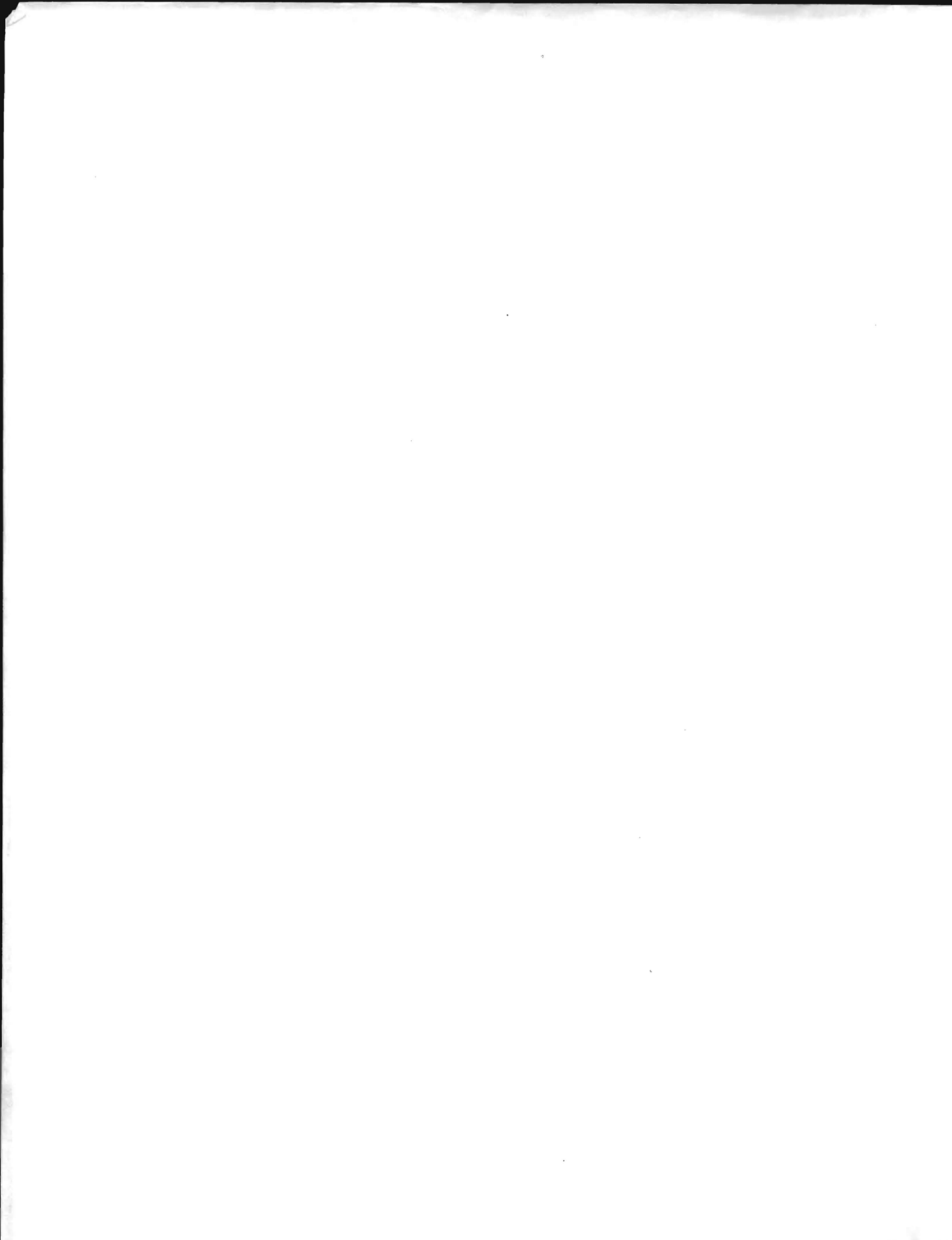
## Possible 2000 Section 18 registrations

**Curtail M** in flax  
**Raptor** in dry beans  
**Reflex** in dry beans  
**Spartan** in sunflower  
**Sonalan** in canola  
**Muster** in canola  
**Stinger** in canola and crambe  
**Raptor** in Clearfield canola  
**Liberty** in Liberty resistant canola

## IR-4 Projects for 2000

07558 Select on Flax  
07281 Permit on Potato  
03454 Harmony GT on Safflower  
06164 Glyphosate preharvest in Sunflower  
07223 Stinger/Curtail M on Flax  
07219 Raptor on Imi resistant Sunflower  
(Funded by ND Dept of Ag)  
07590 Thiamethoxam on Dry pea  
07258 Azoxystrobin Sunflower







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