

PERENNIAL WEED MANAGEMENT

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- P1. Perennial weeds are usually more difficult to control than annuals because they persist and spread by vegetative means as well as seeds. Stems, roots and tubers store food and produce new shoots whenever the top growth is killed by control practices or freezing temperatures. The spreading growth of a perennial's roots or stems enlarge weed patches and tillage implements start new infestations by transporting and transplanting reproductive plant parts throughout the field. As with annual weeds, seeds produced each year can be spread by wind, rain, animals or man, and initiate new infestations. Perennial weeds should never be allowed to produce seeds. The elimination of perennial weeds requires the killing of all plant parts that are capable of producing new shoots. If the plant parts are near the soil surface, tillage can be used to bring them to the soil surface to dry out and die. However, these plant parts are frequently located too deep in the soil to be reached with tillage. Most perennial weed infestations can be controlled in crops by the judicious integration of tillage, cultivation, crop selection, crop management and herbicide usage. Careful timing of tillage, planting, cultivation, fertilization and herbicide application is required to inflict the maximum injury to the weed with the least effect on the crop. In pastures and forages, proper management to establish and maintain desirable forage species is critical to prevent or retard the successful establishment of perennial weeds and brush. Herbicides should only be used in conjunction with proper forage species selection, maintaining soil pH, fertility, and clipping or grazing schedules. The reduction or elimination of perennial weed infestations requires more than the prevention of seed production in crops. In addition, the control of shoot growth must be continued throughout the year. The prevention of vigorous shoot growth in the fall after crop harvest is especially important in blocking the replenishment of underground food reserves. If permitted, the replenishment of underground food reserves will result in continued vigor of the weed infestation the next year. Usually, repeated suppression of perennial weed growth by tillage, cultivation or herbicide treatment for two or more years is required for eradication of perennial weed infestations.

Characteristics of Troublesome Perennial Weeds

- P2. **Canada thistle.** Canada thistle, a Minnesota "Primary Noxious Weed," is the most prevalent broadleaf perennial weed in the state. It is found in all crops and pastures and develops into highly competitive dense patches of shoots arising from spreading horizontal roots. Canada thistle shoots should be destroyed before mature seeds are produced. The deep root system stores food reserves and produces new shoots. Control depends on destruction of the root system or depletion of the food reserves. Destruction of the root system with single a herbicide treatment or tillage operation is seldom achieved. However, depletion of food reserves by using repeated tillage or herbicide applications to prevent the development of vigorous shoots can be accomplished. Programs that eliminate vigorous Canada thistle shoot growth for two years, both in crops and in the fall after crops have been harvested, usually result in Canada thistle elimination.
- P3. **Common milkweed.** Common milkweed is a perennial native to Minnesota that is on the increase because of its tolerance to most herbicides combined with the poorer suppression of this weed obtained by the reduced tillage systems now in use. Milkweed infestations are common in both cropland and non-cropland throughout Minnesota. Common milkweed spreads by windborne seeds, creeping roots that can grow 10 feet radially per year, and root segments which are transported and transplanted by tillage implements. Frequent tillage and competitive crops, such as alfalfa and winter wheat, greatly reduce the vigor of milkweed. Herbicides are relatively ineffective on this weed so suppression in crops with herbicides is poor.
- P4. **Field bindweed.** Field bindweed, also called "creeping jenny" or "morningglory", a Minnesota "Primary Noxious Weed", is found throughout the state, but the heaviest infestations are in the western half. It spreads by seeds and rootstocks that are transported and transplanted by tillage implements. Shoots are vines up to 7 feet long with arrow-shaped leaves and large white or pink funnel-shaped flowers. The roots penetrate the soil to a depth of 20 to 30 feet and store vast quantities of food which must be depleted by tillage or with herbicides to eliminate this weed. Vigorous shoot growth must be prevented throughout the growing season using a combination of competitive crops, such as alfalfa, herbicide treatments in the crop and after harvest, and tillage or cultivation.
- P5. **Leafy spurge.** Leafy spurge, a Minnesota "Primary Noxious Weed," is present throughout the state with the heaviest infestations along the western border. It is more prevalent in permanent pastures and non-crop areas, and is occasionally a problem in cropland. New shoots arising from root buds, begin growth early in the spring, which gives this weed a competitive advantage over crops. Spread of an infestation is by creeping roots, seeds and the transport and transplanting of root segments by tillage implements. Control depends on depletion of food reserves in the extensive root system which often extends beyond 8 feet deep, by preventing vigorous shoot growth throughout the growing season with tillage or herbicides. Biological control insects, primarily *Aphthona* species, have been successfully established in Minnesota in non-cropland areas. These insects may eventually reduce spurge populations, reducing the amount of herbicide use.
- P6. **Perennial sowthistle.** Perennial sowthistle, a Minnesota "Primary Noxious Weed", is found throughout the state with the heaviest infestations in the west and north. It spreads by windborne seed and from buds on underground roots which produce dense patches of this weed and are transplanted to new areas by tillage implements. Much of the root system extends several feet below the plow layer so it cannot be reached by

- tillage. Reducing infestations requires the prevention of vigorous shoot growth over two or more years; using herbicides in crops and herbicides or tillage when a crop is not present.
- P7. Quackgrass.** Quackgrass, present in both cropland and pastures, is the most prevalent perennial grass weed in Minnesota. Shallow underground stems, called rhizomes, give rise to new shoots and are the major means of survival and spread of this weed. Tillage may increase or decrease quackgrass infestations. Tillage implements can drag rhizome segments to the soil surface where they dry out and die, or can drag the rhizomes to uninfested areas where they take root and start new infestations.
- P8. Wirestem muhly.** Wirestem muhly is a perennial grass found on limited acreages in southern Minnesota. It spreads by seeds and short rhizomes. Growth starts later in the spring than quackgrass with the smooth, very tough leafy stems reaching a height of 2 to 3 feet. Growth from the rhizomes forms a dense sod. Since the roots and rhizomes are very shallow, tillage can be used to bring these parts to the soil surface where they dry out and die. However, tillage implements spread the infestation by carrying plant parts to other parts of the field. Since growth starts later in the spring, small grains planted early greatly suppress the growth of wirestem muhly.
- P9. Yellow nutsedge.** Yellow nutsedge is a perennial weed that propagates from seeds and from underground tubers (nuts) which are formed on short rhizomes. It is on the increase in Minnesota. The grass-like leaves of nutsedge are light green and the seedheads are yellow to brown. The nuts are 1/8 to 1/2 inch in diameter and tan to brown in color. The stems are triangular in cross section. Nutsedge usually becomes established in wet areas of fields. The weed is spread by tillage operations which scatter the seeds and tubers into uninfested areas.
- Nutsedge can be controlled, but usually not eliminated, by using a combination of cultural practices and chemicals. Infested areas in fields should be tilled separately from the remainder of the field to avoid transporting plant parts to clean areas of the field. Nutsedge is not tolerant to shading so growing crops with a dense canopy such as narrow-rowed soybeans helps suppress nutsedge. Repeated cultivations are usually needed to destroy regrowth and new seedlings, even when chemicals are used. Fallowing has given effective control of yellow nutsedge in dry years, but, in wet years, the tubers are just transplanted and continue to grow. Disking or dragging about every 3 weeks or when sprouts appear should considerably reduce the nutsedge population in a dry year.

Characteristics of Some Herbicides Frequently Used For Perennial Weeds

- P10. Accent (nicosulfuron)** at 0.031 lb/A effectively controls many annual grasses, quackgrass, and several broadleaf weeds. Accent may be applied as a single or a split application with 0.031 lb/A to be applied each time. For optimum performance and crop safety, apply broadcast to corn up to 20 inches or that exhibits 6 or fewer collars, whichever is most restrictive. For late or rescue applications, use drop nozzles to direct spray to weeds when corn is between 20 to 36 inches. **Do Not apply to corn that is in the 10-leaf stage or exceeds 36 inches as the risk of crop injury increases.** Always add a nonionic surfactant at a rate of 0.25% v/v (1 qt per 100 gal of spray solution) or crop oil concentrate at a rate of 1% v/v (1 gal per 100 gal of spray solution). Ammonium nitrogen fertilizer may be added to either nonionic surfactant or crop oil concentrate to improve weed control. See the label for proper adjuvant use when tank mixing with broadleaf herbicides. Crop injury potential from Accent can be minimized by spraying corn before it has reached the 10-leaf stage, avoid spraying during periods of cool weather (daily high temperature less than 50°F) or during periods of high relative humidity and temperature. Application of Accent to corn that has been treated with a band application of Counter 20 CR is labeled by BASF. However, on lighter soils or under certain environmental conditions, crop injury can occur. DuPont will not assume any responsibility for 20 CR-Accent interactions on soil less than or equal to 4% organic matter. Application of Accent to corn treated with other organophosphate soil insecticides is permitted but may result in temporary crop injury. **Do Not** apply a foliar application of an organophosphate insecticide or the herbicides bentazon (Basagran), bentazon plus atrazine (Laddok), or 2,4-D within 7 days before or after an Accent application. Accent may be used on certain sweet corn varieties grown for processing. See label for details.
- P11. Affinity BroadSpec (tribenuron + thifensulfuron).** Postemergence applications of Affinity BroadSpec will provide good season-long control of Canada thistle in wheat and barley. However, repeated applications over several years will be necessary for complete control. Affinity BroadSpec can be applied from to 2-leaf to jointing of the small grain. Use rate is 0.4 to 1 oz/A (0.019-0.032 lb a.i./A). Crop tolerance is good.
- P12. Clethodim (Select, Prism), Fluazifop (Fusilade), Sethoxydim (Poast), and Quizalofop (Assure II).** Postemergence applications of these grass herbicides will suppress quackgrass and wirestem muhly. Check label for labeled crops. One application of these herbicides will not eradicate quackgrass and wirestem muhly populations.
- P13. Banvel, Clarity (dicamba).** Dicamba, used postemergence, provides excellent shoot suppression of perennial broadleaf weeds in corn and small grains. Higher postemergence rates, used in grass pastures, non-crop areas or in cropland when a crop is not present, can severely reduce but seldom eliminate broadleaf perennial infestations. Two dicamba treatments per year for several years will eliminate many of the perennial broadleaf weeds that are more sensitive to dicamba, such as Canada thistle, perennial sowthistle, and field bindweed. Leafy spurge and common milkweed are more difficult to control with dicamba. Time the treatments to prevent the development of large vigorous shoots, capable of replenishing underground food reserves.

- P14. Basagran (bentazon).** Postemergence bentazon treatments provide effective control of Canada thistle and yellow nutsedge in corn and soybeans. It is not effective on other perennial weeds. Crop tolerance is good and there are no problems of spray drift or carry over when bentazon is used. Bentazon controls shoot growth of these weeds, but does not eradicate the underground reproductive organs so retreatments are necessary.
- P15. Beacon (primisulfuron)** is labelled for grass and some broadleaf weed control in corn. Primisulfuron can be applied postemergence at 0.036 lb active ingredient/A (0.76 oz/A) to 4 to 8 inch quackgrass when field corn is 4 to 20 inches tall or post-directed to 10 to 48 inch tall inbred lines or popcorn. Beacon will also provide suppression of Canada thistle and Jerusalem artichoke. Beacon is sold in water soluble packets, and one packet will treat 2 acres at the standard use rate of (0.76 oz/A). The 0.76 oz/A rate may be applied as a single application or as a split application of 0.38 + 0.38 oz/A. The split application may give more effective perennial weed control. **Do Not** apply more than 0.76 oz/A in one growing season. Always apply with a nonionic surfactant at 0.25% v/v (1 qt/100 gals. of spray solution) or crop oil concentrate at 1 to 4 pts/A. **Do Not** apply Counter at planting, before, or within 7 days after applying Beacon as the likelihood of severe crop injury is increased. **Do Not** apply a foliar or soil application of an organophosphate insecticide within 10 days before and 7 days after a Beacon application. **Note**—these restrictions apply to all corn hybrids except the IR hybrids. See label for additional restrictions and use information.
- P16. Classic (chlorimuron).** Postemergence applications of chlorimuron to soybeans will control yellow nutsedge if applied before the 6-leaf stage of weed growth. Chlorimuron is not effective on other perennial weeds. **Do Not use chlorimuron where the soil pH exceeds 7.0. Read the label for appropriate rotational crops.**
- P17. Curtail (clopyralid + 2,4-D amine).** Postemergence applications of Curtail will provide good control of Canada thistle shoots in wheat, barley, and grass pastures. However, repeated applications over several years are needed for complete Canada thistle control. See label for recropping restrictions.
- P18. Curtail M (clopyralid + MCPA ester)** is a package mix for weed control in spring wheat, durum, winter wheat, barley and oats. Research has shown that Curtail M provides excellent shoot suppression of Canada thistle. However, repeated applications over several years is needed for complete Canada thistle control. Curtail M will control most annual broadleaf weeds, however, Curtail M is weak on smartweed. Curtail M will not control grass weeds. Curtail M can be applied from the 3-leaf stage to jointing stage of the small grain. The use rate is 1.75 to 2.3 pt/acre. Use the low rate for small weeds and light infestations of Canada thistle. Use the higher rate for heavy Canada thistle infestations. For best control, apply before annual weeds exceed three inches and apply to Canada thistle after the basal leaves have emerged, but before the bud stage. See label for recropping restrictions.
- P19. Distinct (diflufenzopyr + dicamba)** suppresses many perennial broadleaf weeds. Apply 6 oz/A on corn 4 to 10 inches tall and 4 oz/A on corn 10 to 24-inches tall. Maintain a boom height of 20 inches above the crops to ensure uniform application. Use nonionic surfactant at 1 qt/100 gals and 28% nitrogen at 1 qt/A or AMS at 1 lb/A. **Do Not** exceed a total of 10 oz/A/ growing season and allow a minimum of 15 days between sequential applications. Avoid spray drift onto soybeans or other sensitive crops.
- P20. Express (tribenuron).** Postemergence applications of Express will provide good season-long control of Canada thistle in wheat and barley. Repeated applications over several years will be necessary for complete control. Express can be applied from the 2-leaf stage until the flag leaf is visible. Use rate is 1/6 to 1/3 oz/A (0.008-0.016 lb a.i./A). Use higher rate for heavy Canada thistle infestations. Crop tolerance is fair to good.
- P21. Harmony Extra (tribenuron + thifensulfuron).** Postemergence applications of Harmony Extra will provide good season-long control of Canada thistle in wheat and barley. However, repeated applications over several years will be necessary for complete control. Harmony Extra can be applied from to 2-leaf to jointing of the small grain. Use rate is .3 to .6 oz/A (0.016-0.032 lb a.i./A). Crop tolerance is good.
- P22. Hornet (clopyralid + flumetsulam).** Postemergence applications of Hornet will provide suppression/control of Canada thistle in corn. Degree of control will increase as rate increases from 1.6 to 4 oz/A. Hornet at 1.6, 2.4, 3.2, and 4.0 oz/A contains the amount clopyralid in 2.7, 4, 5.3, 6.6 oz of Stinger. For in-season control of Canada thistle shoots apply Hornet at 2.4 to 3.2 oz/A. For control and stand reduction, apply Hornet at 4 oz/A plus Stinger 4 oz/A. See label for recropping restrictions.
- P23. MCPA.** Postemergence treatments of MCPA will give partial control of many broadleaf perennial weeds. However, 2,4-D is considered to be slightly more effective than is MCPA on most of them, except the perennial buttercups, which are more susceptible to MCPA than to 2,4-D.
- P24. Milestone 2S.** Apply 4 to 6 oz for tall buttercup, chicory, oxeye daisy, curly dock, orange and yellow hawkweed, or bitter sneezeweed, 5 to 7 oz to control Canada thistle or fireweed, and 6 to 7 oz to control absinth wormwood. For Canada thistle, apply when in the pre-bud to early bud stage, or apply to fall regrowth. Fall applications have been more consistent and efficacious than spring applications. The most effective herbicide in controlling Canada thistle in non-rowcrop areas.
- P25. Option (foramsulfuron)** Postemergence applications effectively suppresses quackgrass, in season of application. Apply Option to 6-12 inch quackgrass. **Always** add a methylated or ethylated seed oil at 1.5 pt/A and UAN (1.5-2 qt/A) or AMS (1.5-3 lb/A). **Do Not** apply to sweet corn or popcorn. Apply to corn between V1 and V6 growth stages. Option may be used on all types of field corn, Hi-lysine corn, and white and high oil corn. Consult with local seed company agronomists before using on seed corn.

- P26. Overdrive (diflufenzopyr + dicamba)** (4 to 8 oz product/A. maximum 8 fl oz per season) improves control of perennial weeds compared to dicamba used alone via auxin inhibition by diflufenzopyr and unlike dicamba products. This mode of action diflufenzopyr is reported to improve the efficacy of other growth regulator herbicides when tank mixed with Overdrive.
- P27. Redeem R & P.** Apply 2.5 to 4 pts/A to control perennial sowthistle 3 to 4 pts/A when the majority of C. thistle basal leaves have emerged through bud stage, or apply to fall regrowth.
- P28. Roundup formulations (glyphosate).** Glyphosate is a non-selective herbicide that, when applied postemergence, is very effective on many broadleaf and grassy perennial weeds, especially quackgrass. However, it is not active through the soil. It will kill all emerged crops or weeds, but has no residual effects on plants that emerge after the glyphosate application. For the best results, apply to vigorous, well developed, shoot growth of perennial weeds. Research results indicate that applications of glyphosate to foliage wet with dew or rain are reduced in effectiveness. Late fall applications are effective if the weed foliage has not been injured by frost. **Glyphosate (Touchdown)** is a non-selective herbicide that is applied prior to crop emergence for annual and perennial weed control. It is not active through the soil and has no residual effects. Touchdown rates vary according to weed species and weed sizes; see label for details. Touchdown can be tank mixed with residual corn and soybean herbicides and 2,4-D and Banvel. Always add 2 qt of surfactant/100 gal of water and 17 lb of ammonium sulfate/100 gal of water.
- P29. Steadfast (nicosulfuron + rimsulfuron)** controls quackgrass. **Do Not** apply Steadfast to corn taller than 20-inches or exhibiting more than 6 collars. **Steadfast ATZ (nicoculfuron + rimsulfuron + atrazine)** should **Not** be applied to corn taller than 12-inches or exhibiting 7 or more collars. **Consult with the seed supplier** before applying to high-lysine, white-corn, or corn hybrids with a relative maturity (RM) less than 77 days. Applications to corn hybrids of 77-88 RM should be limited to 12-inch tall, or 5-collar corn, and tank mixtures with diacama should not exceed 0.125 lb ai/A of dicamba. **Do Not** apply to corn grown for seed, popcorn, or sweet corn. See label for weed height restrictions. Be prepared to cultivate if adequate (0.5 inch) rainfall is not received within 5 days after application. **Do Not** tank mix Steadfast with Basagran or Laddock herbicides or foliar-applied organophosphate insecticides as severe injury may occur. See the label for injury potential induced by soil insecticides. A tank mixture with 2,4-D may result in antagonism of grass control. Crop oil concentrate (1% v/v) plus ammonium nitrogen fertilizer is the preferred adjuvant system, however a nonionic surfactant (0.25-0.5% v/v) can be used, especially if this meets the adjuvant requirements of a broadleaf-herbicide tank mix partner. **Do Not** apply Steadfast when minimum high temperatures are below 40F or maximum high temperatures are above 92F. Applications made when daytime temperatures **Do Not** exceed 50F may decrease weed control and increase crop injury potential. When applying Steadfast ATZ **Do Not** exceed 2 lb ai/A of atrazine if no atrazine was applied prior to corn emergence. If atrazine was applied prior to corn emergence, the total atrazine applied may not exceed 2.5 lb ai/A.
- P30. Stinger (clopyralid).** Postemergence applications of Stinger will provide good control of Canada thistle and fair control of perennial sowthistle in corn, small grains, sugarbeets, and permanent pastures. Repeated applications over several years will be necessary for complete control. Use rate depends on when Stinger is used. See label for correct rate.
- P31. Tordon (picloram).** Picloram is one of the most effective herbicides for the control of perennial broadleaf weeds because of its long persistence in the soil. Postemergence applications kill emerged shoots and picloram residues will remain active in the soil and inhibit or kill regrowth, often for more than one growing season in Minnesota. While long persistence gives more effective control of perennial broadleaf weeds, it also limits much of picloram's use to non-crop areas and grass pastures. Picloram is a **Restricted Use Pesticide** because of its potential to injure susceptible, non-target plants. Careful site selection is required to avoid surface and ground water contamination. Most broadleaf crops are very sensitive to picloram, so avoid drift onto nearby broadleaf plants. Picloram (Tordon) use is limited to spot treatment in grass pastures and non-cropland areas when use rates exceed 1 quart per acre. For spot treatments, the total area treated in a single season should not exceed 25% of a landowner's acreage in any particular watershed. See label for recropping restrictions.
- P32. 2,4-D.** Postemergence application of 2,4-D has been the major herbicide practice on broadleaved perennials since the early 1950's. It provides excellent top growth control of many broadleaf perennials, but does not provide adequate kill or regrowth suppression of under ground buds due to its short persistence of only a few weeks, in the soil. Some 2,4-D tolerant weeds such as common milkweed, leafy spurge and germander are on the increase in Minnesota and more effective alternative herbicides should be used on these species. Lower rates of 2,4-D will suppress shoot growth and prevent seed production of many perennial broadleaves in corn and small grains. Higher rates of 2,4-D after crop harvest can be used to prevent vigorous fall regrowth. Higher rates of 2,4-D used in grass pastures and non-crop areas stop seed production and the vegetative spread of susceptible broadleaf perennials throughout the summer, but fall treatments should be used if regrowth occurs.
- P33. Wide Match (clopyralid + fluroxpyr)** will control many broadleaf weeds in spring wheat, durum, barley, oats and corn. Apply from the 3 leaf stage up to and including the flag leaf emergence in small grains. Apply to field corn up to and including V5 growth stage. Apply before annual broadleaf weeds are 4 inches tall. Apply at 1 to 1.33 pt/A for annual weed control. To obtain season-long control of perennial weeds such as Canada thistle, common milkweed, and dogbane apply when the majority of the basal leaves have emerged from the soil up to the bud stage.

Table P1. Summary of herbicides for perennial weed control

Herbicide / Formulation	Rate Range	Labeled Crops	Remarks
Canada Thistle and Perennial Sowthistle			
2,4-D Amine 4 S	0.5 to 2 qts	Corn, Small Grains, Pastures	Postemergence 12 inches tall to bud stage. See label for rates and spray timing on specific crops. Higher rates in pastures and after harvest in the fall.
2,4-D Ester 4 E (2,4-D)	0.5 to 2 qts (0.5 to 2 lb ai/A)		
Affinity BroadSpec 50 SG (thifensulfuron & tribenuron)	0.04 to 1 oz (0.019 to 0.032 lb ai/A)	Barley, Wheat	For Canada thistle suppression. Apply from the 2-leaf stage until jointing.
Banvel 2 S	0.5 to 1 pt	Corn, Small grains	Postemergence for thistle suppression. See specific crops for use rates and timing. Avoid spray or vapor drift onto soybeans or other sensitive crops
Banvel 4 S (dicamba)	0.25 to 1 pt (0.12 to 0.5 lb ai/A)		
Banvel 4 S (dicamba)	2 to 4 qts (2 to 4 lb ai/A)	Grass pastures, Non-crop areas, Post harvest	Postemergence when thistles over 8 inches tall. Important: See label for pasture grazing and rotational crop restrictions.
Basagran 4 S (bentazon)	2 pts (1 lb ai/A)	Corn, Soybeans	Postemergence on thistle shoots from 8 inches to bud stage. Repeat in 7 to 10 days if necessary.
Beacon 75 DF (primisulfuron)	0.76 oz (0.036 lb ai/A)	Corn	For Canada thistle suppression. Postemergence to 2 to 9 inch Canada thistle. Always use surfactant. See narrative and label for application and hybrid restrictions. Recropping restrictions, see narrative and label.
Clarity 4 S (dicamba)	0.5 to 1 pt (0.12 to 0.5 lb ai/A)	Corn, Small grains	Postemergence for thistle suppression. See specific crops for use rates and timing. Avoid spray or vapor drift onto soybeans or other sensitive crops
Clarity 4 S (dicamba)	2 to 4 qts (2 to 4 lb ai/A)	Grass pastures, Non-crop areas, Post harvest	Postemergence when thistles over 8 inches tall. Important: See label for pasture grazing and rotational crop restrictions.
Clopyr AG 3 S (clopyralid)	0.25 to 0.33 pt (0.09 to 0.12 lb ai/A)	Small Grains	See narrative for crop rotation restrictions and application information.
Clopyr AG 3 S (clopyralid)	0.25 to 0.67 pt (0.09 to 0.25 lb ai/A)	Corn, Surgarbeet	See narrative for crop rotation restrictions and and application information.
Clopyr AG 3 S (clopyralid)	0.67 to 1.33 pts (0.25 to 0.5 lb ai/A)	Permanent grass pastures	Apply before the bud stage.
Curtail 2.38 L (clopyralid & 2,4-D)	2 pts (0.59 lb ai/A)	Barley, Spring and Winter wheat	For Canada thistle suppression. Use rate is 2 pts/A. See label for recropping restrictions.
Curtail 2.38 L (clopyralid & 2,4-D)	2 to 3 qts (1.19 to 1.78 lb ai/A)	Grass pastures	The preferred product for Canada thistle control in permanent grass pastures. Grazing restrictions apply.
Curtail M 2.77 E (clopyralid & MCPA)	1.75 to 2.3 pts (0.6 to 0.81 lb ai/A)	Barley, Oats, Spring and Winter wheat	For Canada thistle suppression. See label for recropping restrictions.
Distinct 0.7 L (diflufenzopyr & dicamba)	4 to 6 fl oz (0.18 to 0.26 lb ai/A)	Corn	Postemergence for thistle suppression. Avoid spray drift onto soybeans or other sensitive crops.
Express XP 75 DF (tribenuron)	0.167 to 0.33 oz (0.008 to 0.016 lb ai/A)	Barley, Wheat	For Canada thistle suppression in. Apply from 2-leaf stage until flag leaf visible.
Harmony Extra XP 75 DF (thifensulfuron & tribenuron)	0.33 to 0.67 oz (0.016 to 0.032 lb ai/A)	Barley, Wheat	For Canada thistle suppression. Apply from the 2-leaf stage until jointing.
Hornet 68.5 WDG (flumetsulam & clopyralid)	0.15 to 0.25 lbs (0.136 to 0.21 lb ai/A)	Corn	For Canada thistle suppression.

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Canada Thistle and Perennial Sowthistle			
MCPA Amine 4 S	0.75 to 3 pts	Small grains, Pasture	Postemergence for thistle suppression. See label for rates and spray timing on specific crops.
MCPA Ester 4 E (MCPA)	1.3 to 3 pts (0.38 to 1.5 lb ai/A)		
Milestone 2 L (aminopyralid)	5 to 7 fl oz (0.078 to 0.11 lb ai/A)	Grass Pastures	For pasture and non-cropped areas apply 5 to 7 oz per acre. Apply when in the pre-bud to early bud stage, or apply to fall regrowth. Fall applications have been more consistent and efficacious than spring applications. The most effective herbicide in controlling Canada thistle in non-rowcrop areas.
Northstar 47.4 DF (primisulfuron & dicamba)	5 oz (0.148 lb ai/A)	Corn	For Canada thistle suppression. Postemergence to 2 to 9 inch Canada thistle. Always use surfactant. See narrative and label for application and hybrid restrictions. Recropping restrictions, see narrative and label. NorthStar at 5 oz/A contains the equivalent of .79 oz/A of Beacon and 4.2 oz/A of dicamba acid.
Overdrive 70 DF (diflufenzopyr & dicamba)	4 to 8 oz (0.18 to 0.36 lb ai/A)	Grass Pastures	For pasture use, tank-mix with clopyralid, picloram, or 2,4-D products. Not recommended over these other growth regulator products if not tank mixed.
Redeem R&P 3 S (triclopyr & clopyralid)	2.5 to 4 pts (0.094 to 1.5 lb ai/A)	Grass pasture	Apply 2.5 to 4 pts/A to control perennial sowthistle and 3 to 4 pts/A to control Canada thistle.
Roundup Original MAX 4.5 S	40 to 68 fl oz	Burndown, Non-cropland, Post harvest	For non-cropland, spot treatment of thistle patches, or on cropland before crop emergence or after crop harvest. Apply postemergence as a spray or with wiper applicators to thistles at or beyond the bud stage. Crops contacted by spray or drift will be injured or killed. Apply fall treatments before killing frosts. Check specific formulation label for rates and restrictions.
Roundup WeatherMAX 4.5 S (glyphosate)	40 to 68 fl oz (1.5 to 2.5 lb ai/A)		
Stinger 3 S (clopyralid)	0.25 to 0.33 pt (0.09 to 0.12 lb ai/A)	Small Grains	See narrative for crop rotation restrictions and application information.
Stinger 3 S (clopyralid)	0.25 to 0.67 pt (0.9 to 0.25 lb ai/A)	Corn, Sugarbeet	See narrative for crop rotation restrictions and application information.
Stinger 3 S (clopyralid)	0.67 to 1.33 pts (0.25 to 0.5 lb ai/A)	Permanent grass pastures	Apply before the bud stage.
Tordon 22K 2 S (picloram)	1 to 2 qts (0.5 to 1 lb ai/A)	Grass pastures, Non-cropland	For non-crop areas and grass pastures when thistles are actively growing. Spot treat only if using more than 1 qt/A. Restricted Use Herbicide. Available as Grazon, an economical pre-package mixture with 2,4-D. A preferred product for Canada thistle control in pasture and non-cropland areas if the concerns of picloram off-site movement are addressed.
Touchdown Hi-Tech 5 L	4.8 pts	Burndown, Non-cropland, Post harvest	For non-cropland, spot treatment of thistle patches, or on cropland before crop emergence or after crop harvest. Apply postemergence as a spray or with wiper applicators to thistles at or beyond the bud stage. Crops contacted by spray or drift will be injured or killed. Apply fall treatments before killing frosts. Check specific formulation label for rates and restrictions.
Touchdown Total 4.17 L (glyphosate)	5.1 pts (3 lb ai/A)		
WideMatch 1.5 E (clopyralid & fluroxypyr)	1 to 1.33 pts (0.19 to 0.25 lb ai/A)	Corn, Small grains	For control of most many broadleaf weeds and Canada thistle suppression. Apply after tillering and before the boot stage in small grain. Apply to field corn up to and including V5 growth stage. See label for additional information and recropping restrictions.

Table P1. Summary of herbicides for perennial weed control

Herbicide / Formulation	Rate Range	Labeled Crops	Remarks
<u>Common Milkweed</u>			
Roundup Original MAX 4.5 S	61 fl oz	Pasture, Non-cropland	Spot treatment at late bud to flower stage. Wiper application of 33% solution in crop to milkweed more than 6 inches taller than crop.
Roundup WeatherMAX 4.5 S (glyphosate)	61 fl oz (2.25 lb ai/A)		
Tordon 22K 2 S (picloram)	1 to 2 qts (0.5 to 1 lb ai/A)	Grass pastures, Non-cropland	Actual rate not specified on the label. Spot treat only if using more than 1 qt/A. Restricted Use Herbicide.
Touchdown Hi-Tech 5 L	4.8 pts	Soybean, Non-cropland	Spot treatment at late bud to flower stage.
Touchdown Total 4.17 L (glyphosate)	5.1 pts (3 lb ai/A)		
WideMatch 1.5 E (clopyralid & fluroxypyr)	1 to 1.33 pts (0.19 to 0.25 lb ai/A)	Corn, Small grains	For control of most many broadleaf weeds and common milkweed suppression in small grains and corn. Apply after tillering and before the boot stage in small grain. Apply to field corn up to and including V5 growth stage. See label for additional information and recropping restrictions.
<u>Field Bindweed</u>			
2,4-D Amine 4 S	2 to 3 qts	Grass pastures, Fence rows, Post harvest	Postemergence when bindweed shoots are actively growing. Repeat treatments for several years. Tank mixtures with dicamba or picloram may be used if label restrictions are observed.
2,4-D LV Ester 4 E (2,4-D)	1 qt (1 to 3 lb ai/A)		
2,4-D Amine 4 S	0.75 qt	Wheat, Barley, Corn	Postemergence suppression of bindweed.
2,4-D LV Ester 4 E (2,4-D)	0.66 qt (0.66 to 0.75 lb ai/A)		
Clarity 4 S (dicamba)	0.25 to 0.5 pt (0.12 to 0.5 lb ai/A)	Corn, Small grains	Postemergence for suppression. See label for specific rates and timing. Avoid spray and vapor drift onto soybeans and other nearby sensitive plants. Can replace part of dicamba with 2,4-D to reduce cost.
Roundup Original MAX 4.5 S	0.5 to 6.8 qts	Pasture, Non-cropland, Post-harvest	Postemergence on new bindweed shoots in fall or bud stage in spring. Follow label restrictions on grazing after treatment. For spot treatment in crops, pastures and non-croplands or to cropland before crop emergence or after harvest. Apply postemergence sprays to vigorous shoots in the fall or at the bud stage in the spring. Check specific formulation label for rates and restrictions.
Roundup WeatherMAX 4.5 S (glyphosate)	0.5 to 6.8 qts (0.5 to 8 lb ai/A)		
Tordon 22K 2 S (picloram)	1 to 3 qts (0.5 to 1.5 lb ai/A)	Grass pastures, Non-cropland	For non-crop areas and grass pastures when field bindweed is actively growing. Spot treat only if using more than 1 qt/A. Restricted Use Herbicide.
Touchdown Hi-Tech 5 L	6.4 pts	Non-cropland, Post harvest	Apply to actively growing plants beyond the fall bloom stage.
Touchdown Total 4.17 L (glyphosate)	6.8 pts (4 lb ai/A)		
<u>Leafy Spurge</u>			
2,4-D Amine 4 S	2 to 3 qts	Grass pastures, Non-cropland	Apply at bud to flower stage. Apply in the spring and again in the fall if actively growing shoots are present. Retreatment required.
2,4-D LV Ester 4 E (2,4-D)	1 qt (1 to 3 lb ai/A)		

Table P1. Summary of herbicides for perennial weed control

Herbicide / Formulation	Rate Range	Labeled Crops	Remarks
<u>Leafy Spurge</u>			
Banvel 4 S (dicamba)	4 to 8 qts (4 to 8 lb ai/A)	Grass pastures, Cropland after harvest, Non-cropland	Postemergence at flowering stage or on actively growing shoots in September gives suppression.
Banvel 2 S	0.5 to 1 pt	Corn, Small grains	Postemergence for suppression. See label for specific rates and timing. Avoid spray and vapor drift onto soybeans and other nearby sensitive plants. Can replace part of dicamba with 2,4-D to reduce cost.
Banvel 4 S (dicamba)	0.25 to 0.5 pt (0.12 to 0.5 lb ai/A)		
Clarity 4 S (dicamba)	4 to 8 qts (4 to 8 lb ai/A)	Grass pastures, Cropland after harvest, Non-cropland	Postemergence at flowering stage or on actively growing shoots in September gives suppression.
Roundup Original MAX 4.5 S	3.8 pts	Grass pastures, Non-cropland	Retreatments needed. For spot treatment in grass pastures and non-cropland. Postemergence to actively growing shoots in late summer or early fall. Will not give residual control. Retreatment needed. Severe crop injury is likely in pastures. Check specific formulation label for rates and restrictions.
Roundup WeatherMAX 4.5 S (glyphosate)	3.8 pts (2.25 lb ai/A)		
Tordon 22K 2 S (picloram)	1 to 3 qts (0.5 to 1.5 lb ai/A)	Grass pastures, Non-cropland	For non-cropland use and grass pastures when spurge is actively growing. Use lower rates in tank mix with 2,4-D. Retreatments required. Fall treatment more effective than spring. Spot treat only if using more than 1 qt/A. Restricted Use Herbicide.
Touchdown Hi-Tech 5 L	3.6 pts	Non-cropland	For spot treatment in non-cropland. Apply to actively growing plants greater than 12 inches tall in late summer or early fall.
Touchdown Total 4.17 L (glyphosate)	3.8 pts (2.25 lb ai/A)		
<u>Quackgrass and Wirestem Muhly</u>			
Accent 75 DF (nicosulfuron)	0.66 oz (0.031 lb ai/A)	Corn	For quackgrass suppression. Apply postemergence 4 to 10 inch quackgrass. Always use surfactant or crop oil concentrate. See narrative and label for application restrictions and recropping restrictions.
Arrow 2 EC (clethodim)	6 to 16 fl oz (0.094 to 0.25 lb ai/A)	Canola, Dry Bean, Flax, Soybean, Sargarbeet, Sunflower	For quackgrass and wirestem muhly suppression. Postemergence to shoots 4 to 8 inches tall. Use crop oil concentrate. Repeat treatment if regrowth occurs.
Assure II 0.88 E (quizalofop)	8 to 10 fl oz (0.05 to 0.06 lb ai/A)	Soybeans, Drybeans	For quackgrass and wirestem muhly suppression. Postemergence to shoots 6 to 10 inches tall in quackgrass and 4 to 8 inches tall in wirestem muhly. Use oil concentrate or nonionic surfactant. If regrowth occurs retreat with 7 oz of product per acre.
Beacon 75 DF (primisulfuron)	0.76 oz (0.036 lb ai/A)	Corn	For quackgrass suppression. Postemergence to 4 to 8 inch quackgrass. Always use surfactant. See narrative and label for application and hybrid restrictions. Recropping restrictions, see narrative and label.
Fusilade DX 2 E (fluazifop-P)	0.75 pts (0.19 lb ai/A)	Soybeans	For quackgrass and wirestem muhly suppression. Postemergence to shoots 6 to 10 inches tall. Use crop oil additive. Repeat treatment if regrowth occurs.
Kerb 50 W (pronamide)	2 to 3 lbs (1 to 1.5 lb ai/A)	Forage legumes	For quackgrass suppression. Fall applications after the last cutting. Observe grazing and harvest interval restrictions.
Northstar 47.4 DF (primisulfuron & dicamba)	5 oz (0.148 lb ai/A)	Corn	For quackgrass suppression. Postemergence to 4 to 8 inch quackgrass. Always use surfactant. See narrative and label for application and hybrid restrictions. Recropping restrictions, see narrative and label. NorthStar at 5 oz/A contains the equivalent of .79 oz/A of Beacon and 4.2 oz/A of dicamba acid.

Table P1. Summary of herbicides for perennial weed control

Herbicide / Formulation	Rate Range	Labeled Crops	Remarks
<u>Quackgrass and Wirestem Muhly</u>			
Option 35 DF (foramsulfuron)	1.5 to 1.75 oz (0.033 to 0.0385 lb ai/A)	Corn	For quackgrass suppression. Apply to 6-12 inch quackgrass. Always add methylated or ethylated seed oil at 1.5 pt/A and UAN (1.5 - 2 qt/A) or AMS (1.5 - 3 lb/A). Do Not apply to sweet corn or popcorn. Apply to corn between V1 and V6 growth stages.
Poast 1.5 E Poast Plus 1 E (sethoxydim)	2.5 pts 4 pts (0.5 lb ai/A)	Drybeans, Flax, Forage legumes, Soybeans, Sugarbeets, Sunflowers	For quackgrass and wirestem muhly suppression. Postemergence to shoots 6 inches tall. If regrowth occurs, treat again. Use crop oil additive.
Prism 0.94 E (clethodim)	0.75 to 2.1 pts (0.09 to 0.25 lb ai/A)	Canola, Dry Bean, Flax, Soybean, Sugarbeet, Sunflower	For quackgrass and wirestem muhly suppression. Postemergence to shoots 4 to 8 inches tall. Use crop oil concentrate. Repeat treatment if regrowth occurs.
Roundup Original MAX 4.5 S Roundup WeatherMAX 4.5 S (glyphosate)	20 to 40 fl oz 20 to 40 fl oz (0.75 to 1.5 lb ai/A)	Burndown, Post harvest	For quackgrass and wirestem muhly control in cropland before planting or after harvest. Postemergence to shoots 8 or more inches tall. A most effective quackgrass herbicide. No soil residual. Glyphosate can also be applied as a preharvest application in hard red spring wheat. Most effective with early September applications and when applied at application gallonages less than 20 GPA. Check specific formulaion label for rates and restrictions.
Select 2 EC (clethodim)	6 to 16 fl oz (0.094 to 0.25 lb ai/A)	Canola, Dry Bean, Flax, Soybean, Sargarbeet, Sunflower	For quackgrass and wirestem muhly suppression. Postemergence to shoots 4 to 8 inches tall. Use crop oil concentrate. Repeat treatment if regrowth occurs.
Select Max 0.97 EC (clethodim)	9 to 12 fl oz (0.068 to 0.09 lb ai/A)	Canola, Dry Bean, Flax, Soybean, Sargarbeet, Sunflower	For quackgrass and wirestem muhly suppression. Postemergence to shoots 4 to 8 inches tall..
Steadfast 75 WDG (nicosulfuron & rimsulfuron)	0.75 oz (0.035 lb ai/A)	Corn	For quackgrass suppression.
Targa 0.88 E (quizalofop)	8 to 10 fl oz (0.5 to 0.6 lb ai/A)	Soybeans, Drybeans	For quackgrass and wirestem muhly suppression. Postemergence to shoots 6 to 10 inches tall in quackgrass and 4 to 8 inches tall in wirestem muhly. Use oil concentrate or nonionic surfactant. If regrowth occurs retreat with 7 oz of product per acre.
Touchdown Hi-Tech 5 L Touchdown Total 4.17 L (glyphosate)	1.6 to 4 pts 1.7 to 4.3 pts (1 to 2.5 lb ai/A)	Corn, Soybeans	For quackgrass control in corn and soybean before planting or after harvest. Use low rate in less than 5 inch tall quackgrass retreatment may be required. Use high rate on quackgrass greater than 8 inches tall.
<u>Yellow Nutsedge</u>			
Basagran 4 S (bentazon)	1 qt (1 lb ai/A)	Corn, Soybeans	Postemergence when nutsedge shoots are 6 to 8 inches tall. Repeat if new shoots emerge or regrowth occurs.
Beacon 75 DF (primisulfuron)	0.76 oz (0.036 lb ai/A)	Corn	Always use surfactant. See narrative and label for application and hybrid restrictions. Recropping restrictions, see narrative and label.
Charger MAX 7.64 E (s-metolachlor & benoxacor)	2 to 3 pts (2 to 3 lb ai/A)	Corn, Soybeans	Preplant incorporation gives the best suppression of nutsedge.
Classic 25 DF (chlorimuron)	0.5 to 0.75 oz (0.008 to 0.012 lb ai/A)	Soybeans	Apply to nutsedge up to the 6-leaf stage. Use oil concentrate or nonionic surfactant. Do Not apply where the soil pH exceeds 7.0.

Table P1. Summary of herbicides for perennial weed control

Herbicide / Formulation	Rate Range	Labeled Crops	Remarks
<u>Yellow Nutsedge</u>			
Dual II Magnum 16 G	12.5 to 18.7 lbs	Corn, Soybeans	Preplant incorporation gives the best suppression of nutsedge.
Dual II Magnum 7.64 E (s-metolachlor & benoxacor)	2 to 3 pts (2 to 3 lb ai/A)		
Harness 7 E (acetochlor)	2 to 2.75 pts (1.6 to 3 lb ai/A)	Corn	Preplant incorporation required to suppress nutsedge. Restricted Use Pesticide.
Lasso 10 G	30 to 40 lbs	Corn, Soybeans	Preplant incorporation required to suppress nutsedge. Restricted Use Herbicide
Lasso 4 EC	3 to 4 qts		
Micro-Tech 4 MT (alachlor)	3 to 4 qts (3 to 4 lb ai/A)		
Northstar 47.4 DF (primisulfuron & dicamba)	5 oz (0.148 lb ai/A)	Corn	Always use surfactant. See narrative and label for application and hybrid restrictions. Recropping restrictions, see narrative and label. NorthStar at 5 oz/A contains the equivalent of .79 oz/A of Beacon and 4.2 oz/A of dicamba acid.
Outlook 6 E (dimethenamid-P)	20 to 31 fl oz (0.94 to 1.46 lb ai/A)	Corn	Preplant incorporation required to suppress nutsedge.
Permit 75 DG (halosulfuron)	1 to 1.33 oz (0.047 to 0.063 lb ai/A)	Corn, Dry Beans	Postemergence when nutsedge is 4 to 12 inches tall. Dense infestations may require sequential applications and an earlier treatment.
Surpass 6.4 E (acetochlor)	2 to 3.75 pts (1.6 to 3 lb ai/A)	Corn	Preplant incorporation required to suppress nutsedge. Restricted Use Pesticide.

Table P2. Effectiveness of herbicides on perennial weeds

Herbicides	Canada Thistle	Common Milkweed	Field Bindweed	Leafy Spurge	Perennial Sowthistle	Quackgrass	Western Mully	Yellow Nutsedge
2,4-D, others (2,4-D)	F/G	P	G	F	F	N	N	N
Accent (nicosulfuron)	N	N	N	N	N	G	F	P
Affinity BroadSpec (thifensulfuron & tribenuron)	F/G	F	N	P	P	N	N	N
Arrow (clethodim)	N	N	N	N	N	G	F	N
Assure II (quizalofop)	N	N	N	N	N	G	G	N
Banvel (dicamba)	F	F	G	F	G	N	N	N
Basagran (bentazon)	G	N	N	N	N	N	N	G
Beacon (primisulfuron)	F	N	N	N	N	G	N	G
Charger MAX (s-metolachlor & benoxacor)	N	N	N	N	N	N	N	G
Clarity (dicamba)	F	F	G	F	G	N	N	N
Classic (chlorimuron)	N	N	N	N	N	N	N	G
Clopyr AG (clopyralid)	G	N	N	N	F	N	N	N
Curtail (clopyralid & 2,4-D)	G	P	P	P	F	N	N	N
Curtail M (clopyralid & MCPA)	G	F	P	P	F	N	N	N
Distinct (diflufenzopyr & dicamba)	F/G	G	G	F	G	N	N	N
Dual II Magnum (s-metolachlor & benoxacor)	N	N	N	N	N	N	N	G
Express XP (tribenuron)	G	F	N	P	P	N	N	N
Fusilade DX (fluazifop-P)	N	N	N	N	N	G	G	N
Harmony Extra XP (thifensulfuron & tribenuron)	F/G	F	N	P	P	N	N	N
Harness (acetochlor)	N	N	N	N	N	N	N	G
Hornet (flumetsulam & clopyralid)	G	N	N	N	F	N	N	N
Kerb (pronamide)	N	N	N	N	N	F	N	N
Lasso (alachlor)	N	N	N	N	N	N	N	G
MCPA, others (MCPA)	F	N	G	N	F	N	N	N
Milestone (aminopyralid)	G	F	F	P	G	N	N	N
Northstar (primisulfuron & dicamba)	F	P/F	G	P/F	F	G	N	G
Option (foramsulfuron)	N	N	N	N	N	G	F	N
Outlook (dimethenamid-P)	N	N	N	N	N	N	N	G
Overdrive (diflufenzopyr & dicamba)	F/G	G	G	G	G	P	P	P
Permit (halosulfuron)	P	N	N	N	N	N	N	G
Poast (sethoxydim)	N	N	N	N	N	F	G	N
Prism (clethodim)	N	N	N	N	N	G	F	N
Redeem (triclopyr & clopyralid)	G	F	N	N	F	N	N	N
Roundup (glyphosate)	G	F	G	F	G	G	G	F
Select (clethodim)	N	N	N	N	N	G	F	N
Select Max (clethodim)	N	N	N	N	N	G	F	N
Steadfast (nicosulfuron & rimsulfuron)	N	N	N	N	N	G	F	N
Stinger (clopyralid)	G	N	N	N	F	N	N	N
Surpass (acetochlor)	N	N	N	N	N	N	N	G
Targa (quizalofop)	N	N	N	N	N	G	G	N
Tordon 22K (picloram)	G	G	G	G	G	N	N	P
Touchdown (glyphosate)	F/G	F	G	F	G	G	G	F
WideMatch (clopyralid & fluroxypyr)	G	F/G	N	N	F	N	N	N

NOTE: G = Good; F= Fair; P = Poor; N = No control. Effectiveness ratings apply if herbicide is used according to label recommendations as to rate, time of application, etc., and favorable temperature and moisture conditions prevail. Degree of control is often the result of repeated applications.