

PERENNIAL WEED CONTROL

T1. Field bindweed. Facet L (quinclorac) is the most effective herbicide for field bindweed control. Apply in fallow, postharvest, or preplant in spring prior to seeding wheat, including durum. Wheat and sorghum have a 0 hour plant back restriction. Apply in fall prior to a killing frost to bindweed at least 4 inches long. For best long-term bindweed control, make yearly fall applications of Facet at 28 to 32 fl oz/A. Use the higher rates for dense populations or large plants. Apply with MSO adjuvant at 1 to 1.5 pt/A plus UAN at 1 gal/A to bindweed at least 4 inches long.

T2. Curly dock is a perennial broadleaf weed in the buckwheat family. It typically grows in moist soils, in areas such as roadside ditches, wetlands, and low-lying areas in cropland and pastures. The plant has a large, fleshy, yellow-orange colored taproot. The plant grows initially as a rosette (like a dandelion) and eventually produces an erect stem that ranges from 1- to 3-feet tall. Flowers are green and are present primarily during early summer. It reproduces primarily from seed (range of 100 to over 60,000 seeds per plant) but can also emerge from root fragments. Seedlings emerge from late spring through early fall. Perennial regrowth begins in April to May from taproots. The plant turns rusty-brown at maturity. Tillage that completely destroys the taproot will control curly dock. Mowing will prevent seed production and reduce top growth. Spring application of labeled herbicides will control seedling plants. Herbicide application in the fall is the best timing for controlling perennial (established) plants. Herbicides that contain glyphosate (>1.25 lb ae/A at bud to early flower stage or in the fall after a light frost); thifensulfuron (> 0.33 oz ai/A); tribenuron (>0.1875 oz ai/A) plus thifensulfuron, 2,4-D, or MCPA; aminopyralid; bromoxynil; or clopyralid can effectively control curly dock. Other SU herbicides, Callisto, Huskie, Laudis, Liberty, and Sharpen can suppress curly dock. See herbicide labels for use, application rates and procedures, crop rotation restrictions, etc.

T3. Canada thistle is a major problem in ND due to reduced tillage, wet weather, lack of persistent control strategies, and expense of control. NDSU research has shown that Stinger* and Curtail* provide the best long-term Canada thistle control in crop. Glyphosate alone or with 2,4-D gives good control applied pre- and post-harvest. However, control is reduced under dry conditions. Dicamba and Express* give only season-long control. In small grains, applying Express* plus 2,4-D* and dicamba enhances control. 2,4-D applied at jointing followed by Curtail* applied post-harvest to rosette thistle provides good long-term control. Pre-harvest glyphosate treatments also give good control. glyphosate applied alone is similar in control to Curtail* but provides less control than glyphosate plus 2,4-D.

Stinger*, Curtail*, glyphosate, and 2,4-D have the greatest activity on Canada thistle in annual cropping systems. Highest rates should be used without interfering with next years cropping pattern. Apply high rates of herbicides to patches before thistle infestations increase. Timing is a critical factor. Herbicides applied after a light frost may enhance control but application to leaf tissue destroyed by frost may result in less control due to lack of herbicide uptake.

Tillage can be a critical factor. Delaying tillage 1 to 2 weeks after application in late fall increases control and may add an additional 30 to 40% control for herbicide treatments that gave 30 to 50% control without tillage. If lower herbicide rates or less effective herbicides are used, tillage is very important. If tillage is not planned, implement a program of multiple applications of the most effective herbicides at the highest rates practical. Spray rosettes of actively growing plants using the rosette technique described below.

Milestone effectively controls Canada thistle, but is labeled only on noncropland, such as pastures, rangeland, and CRP. Milestone is

generally safe around most tree species except those in the legume family and can be used near but not in streams and ditches with flowing water.

Rosette Technique. The rosette technique maximizes long-term Canada thistle control by encouraging root buds to break dormancy but not initiate flowering. These vegetative shoots provide better absorption, translocation, and activity than flowering shoots. Greatest control occurs when herbicides are applied in the fall to new growth of Canada thistle in the rosette stage. Periodic tillage in fallow controls Canada thistle shoots and other weeds until mid 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. Apply glyphosate, Stinger*, Curtail*, or WideMatch* to rosettes in late September or early October. For in-crop control, use herbicides and between-row tillage to prevent bolting. Continue cultivation until canopy closure in soybean and until early July in corn. Apply effective post-harvest herbicides until early October. Herbicides fall-applied to rosette Canada thistle provide greater control and root kill compared with treating bolted thistle.

T4. Rough cinquefoil can develop as an annual, biennial, or short-lived perennial. Rough cinquefoil leaves are alternate and compound with 3 leaflets at the end of a petiole. Individual leaflets have serrated margins. Stipules are at the base of the petiole where it attaches to the stem. Rough cinquefoil has yellow flowers with 5 petals and plants are often confused with wild strawberry, which has more smooth leaf margins. Chemical control of rough cinquefoil in cropland is limited. Glyphosate at 0.75 lb ae/A provides fair to good control and tank mixing with Sharpen in a burndown did not improve control. Wheat or row-crop herbicide labels do not list cinquefoil. Some Trimec labels for lawns list cinquefoil as controlled, but can not confirm control. In non-cropland, use Tordon, Milestone, 2,4-D, or Ally for control or suppression. High rates are required restricting cropland use.

T5. Dandelion is a simple perennial weed that is most associated with undisturbed sites such as lawns, road ditches, and minimum- and no-tillage fields. The plant is easily recognized for its bright yellow flowers on a leafless stem that turn into a fluffy round ball when seeds reach maturity and that are dispersed by wind currents. Above-ground foliage is arranged as a rosette (many leaves on a very short stem). Long-established dandelion have a large and deep taproot with multiple dormant buds that grow any time a root is damaged by herbicide or cut. Dandelion is extremely difficult to control because of extended germination from early spring into the fall. Dandelion over-winter and grow from rootstock. Dandelion growing from seed generally does not emerge until later spring or early summer after POST herbicides have been applied. Manage dandelion with tillage and herbicides, including glyphosate, Express, 2,4-D, or dicamba applied in late fall. Spring applications can control dandelion, but are not as effective as fall applications. Post-harvest applications typically provide better control than pre-harvest applications. Do not tank mix glyphosate with Group 14 herbicides such as Sharpen, Spartan, Valor, or Aim if dandelion is a primary target for weed control because these herbicides will reduce glyphosate absorption resulting in reduced dandelion control. Refer to the following sources for biology and management of dandelion: Paragraph B2.

T6. Common milkweed has become a weed problem 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 control measures. Common milkweed is tolerant to most herbicides. Control requires multiple herbicide applications. Preventing establishment and spread of 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. Common milkweed seedlings becomes perennial (capable of reproducing from underground roots) approximately 3 weeks after emergence. New shoots develop from established roots and 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.

Common milkweed control and management.
NDSU Research. Herbicides applied in June.

Herbicide	Rate	Months after application	
		3 mo.	12 mo.
	pt/A	--- % control ---	
2,4-D ester*	4	36	48
Dicamba	2	71	61
Dicamba + 2,4-D	0.5 + 2	26	15
Curtail	4	13	6
Glyphosate	1.5 lb ae	56	99

Express* + 2,4-D + dicamba controls only top-growth.

Glyphosate at 1.5 lb ae/A applied preharvest will reduce milkweed densities 85 to 95% compared to in-crop applications, which reduce milkweed densities by less than 40%. Apply herbicides when milkweed is in the late-bud to flowering stage and actively growing. Control patches when small. Patch-spray glyphosate at 1.5 to 2 lb ae/A. Apply glyphosate with AMS at 8.5 lb/100 gallons of water.

T7. Fall-applied herbicides can be effective for controlling perennial weeds provided most 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 with auxin herbicides even after several light frosts when the leaves are green or red and still firmly attached to the stem. Milestone provides superior control to Tordon when applied in late fall (October).

T8. 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. Preharvest herbicide treatment should precede harvest by at least 5 days to allow adequate herbicide translocation in perennial weeds. Fortunately the minimum PHI for many preharvest treatments meets or exceeds this guideline.

PERENNIAL WEEDS IN CROPS

T9. Perennial weed control systems in crops should include in-crop (conventional and particularly Roundup Ready crops if available), preharvest, and postharvest herbicide applications. Regardless of application, retreatment once or twice per year will be required for successful control of perennial weeds. Once large patches are controlled, seedlings will require treatment annually with registered in-crop herbicides. Glyphosate use in Roundup Ready corn, soybean, canola, and sugarbeet is a very effective system to control perennial weeds. NDSU research has shown good control of established Canada thistle patches with glyphosate applied preharvest. For postharvest herbicide applications to be effective, treatment of new plant growth is required. Tillage combined with any herbicide treatment enhances control. Tables for each crop or perennial weed listed in this guide gives most effective herbicide choices, rates, and application information.

T10. Glyphosate at 0.75 to 1.5 lb ae/A applied as a spot treatment will give season-long control of most perennial weeds in wheat, barley, oat, corn, and soybean. glyphosate is non-selective and will kill crop in the treated area. Avoid drift outside the target area. Glyphosate is non-residual so plants may emerge after treatment and unaffected rhizomes or roots from perennials will continue to grow. See label or tables for application stage and rates. Glyphosate at 0.75 lb ae/A applied preharvest gives good Canada thistle and quackgrass control. When tillage is used after harvest, glyphosate will give greater Canada thistle control when applied preharvest than post-harvest.

PERENNIAL WEEDS IN PASTURES (See Z1 for haying and grazing restrictions)

T11. 2,4-D ester or amine at 2 to 4 pt/A controls 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 where Tordon cannot, but avoid drift onto susceptible plants. Hi-Dep allows use at spray volumes as low as 1 gpa by ground or 0.5 gpa by air.

2,4-D formulations registered for use in water include Agriliance "AgriSolutions 2,4-D Amine 4", UAP "Savage" and "Amine 4 2,4-D Weed Killer", Nufarm "Weedar 64", Van Diest "Cornbelt 4 lb Amine" and "Cornbelt Navigate", and Helena "Opti-Amine". Use only 2,4-D formulations registered for use near or in water. Refer to 2,4-D labels for registered use and information.

T12. Crossbow (triclopyr & 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.

T13. Dicamba at 1 to 2 pt/A will suppress some perennials, especially field bindweed and weeds resistant to 2,4-D. Dicamba can be applied in 1 to 5 gpa in pasture, rangeland, and fallow. When applying dicamba at 2 pt/A or less, use 0.5% v/v surfactant or AMS at 2 to 6 lb/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. Dicamba 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.

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T14. Escort* (metsulfuron) at 0.1 to 0.3 oz 75DF/A or **Cimarron** products (metsulfuron & chlorsulfuron) can be applied in rangeland, grass pastures, and non-cropland for control of noxious and troublesome weeds. Spot treat at higher rates when practical. Spray foliage for thorough coverage but not to run-off. Add a NIS at 0.25 to 0.5% v/v or PO at 1% 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 to desirable grasses under stress, nor to grasses grown for seed. Products with 2,4-D, dicamba, and many other herbicides increase control and reduce risk of resistant weeds. Some brands of Ally* at 1 to 1.5 oz DF/A can be applied by air (helicopter and fixed wing) for weed control to utility and pipeline right-of-ways, military installations, and rangeland and pasture.

T15. Milestone (aminopyralid) at rates up to 14 oz/A per annual growing season may be applied as a spot treatment to not more than 50% of an area. Milestone has no grazing or haying restrictions but allow 3 days for animals to graze in untreated areas before transferring them to areas with sensitive broadleaf plants. May be applied to waters edge and in seasonally dry wetlands. Do not apply directly to water or to areas where surface water is present. Milestone can be applied to the soil under the canopy of several trees. Refer to label for list of tree species. Apply only as a directed spray under the canopy. Do not apply Milestone over-the-top of any tree. Legume plant and tree species are very susceptible to Milestone.

T16. Plateau (imazapic) with MSO adjuvant at 1 qt/A and UAN at 1 qt/A applied from early September to mid-October controls many grass and broadleaf weeds, including foxtail and leafy spurge in right-of-ways, pasture, rangeland, and CRP. Warm- season grasses are more tolerant than cool-season grasses. Highest rate provides longer control but increases grass injury. Plateau does not control absinth wormwood. Plateau does not injure desirable forage grasses or some 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*).

T17. 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 growth of perennial broadleaf weeds. Retreatment at the same rates is necessary the following year. The most cost-effective broadcast spring-applied 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 a restricted pesticide because it is toxic to most broadleaf plants. Spray drift will damage 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 water and drainage ditches or near shelterbelts, shrubs, or trees.

Do not cut grass for feed within 2 weeks after treatment at Tordon rates greater than 2 pt/A. Tordon is excreted in the urine which restricts transfer of 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. When the Tordon rate exceeds 2 pt/A, the total area treated should not exceed 25% of a land owner's acreage found in any particular

watershed.

T18. Mixture of Tordon + Plateau applied in June has provided greater leafy spurge control than Tordon + 2,4-D. Use of 2,4-D with Tordon + Plateau is not necessary but will increase the spectrum of broadleaf weeds controlled. Research by NDSU has shown improved leafy spurge control both in-season and the season following application when Tordon and Plateau are used.

Treatment	Product/A	Months after application		
		3	12	15
		----- % control -----		
Tordon + 2,4-D	1 pt + 1qt	75	48	0
Tordon + 2,4-D + Plateau + MSO	1 pt+1 qt + 4 oz+1 qt	92	83	75

MSO adjuvant is required.

Do not apply after July 1.

Bromegrass species occasionally have shown short-term injury.

T19. NRCS Policy on Noxious Weed Control in CRP.

Taken from ND NRCS Exhibit 3, 2-CRP Manual, para. 210.

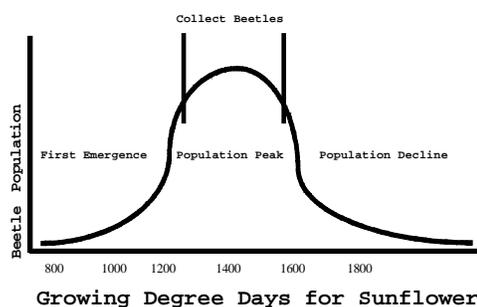
Established CRP Stands: Policy requires that no clipping or spraying of entire fields should be done during the primary nesting period (April 15 to August 1) for normal weed control. If noxious weeds are present and the critical control period for the weed falls in the primary nesting period, spot treatment of weeds is allowed. Herbicides chosen should maintain the grass and legume mixture. If this is not possible, control of the noxious weeds is a priority over maintaining legumes in the mix. Always notify your local USDA Service Center before making any herbicide applications.

New CRP Stands: Policy requires that weeds (noxious, common, volunteer grain, etc.) be controlled in CRP. Clipping and/or spraying during establishment should be used to control weed growth and reduce competition for the new seedlings. Clipping and/or spraying may be done at any time during the establishment period. If noxious weeds are present, control of noxious weeds is a priority over maintaining legumes in the mix. If the legume is killed after spraying and before the grass/alfalfa stand is established then a legume must be reseeded. Once the stand is established follow the above guidelines for established CRP stands. Always notify your local USDA Service Center before making any herbicide applications.

*Or generic equivalent.

BIOLOGICAL CONTROL OF PERENNIAL WEEDS

T20. Leafy spurge. Eight insect species have been released in North Dakota for biological control of leafy spurge. **Flea beetles** (*Aphthona* spp.) have been the most effective insects due to root feeding by larvae, rapid establishment, and increase after introduction, and ease in capture to transport to additional locations. Flea beetles are distributed through the ND Biological Control Program. Contact your county weed officer or board member for information. Release flea beetles on a well-drained south-facing slope with a moderate density of leafy spurge (60 to 90 plants/square yard) with minimal grass cover. Do not collect or move flea beetles, cultivate, burn site, or apply insecticide within 0.25 mile of release site for 3 to 5 years to allow establishment. During establishment, landowners should prevent expansion of the leafy spurge infestation by treating uninfested perimeters with herbicides. The best time to collect and distribute flea beetles is between 1000 to 1500 accumulated growing degree days (AGDD) for sunflower. Scout for establishment when the total AGDD for sunflower reaches 1100 to 1200. Flea beetle density prior to 1200 and after 1600 AGDD is low.



Use an insect sweep net to collect beetles to estimate density. Collect beetles from 10:00 am to 3:00 pm, greater than 70 F, little or no wind, sunny skies, and when leafy spurge foliage is dry. Sweep 5 times over an area of 1 m². Count the number of flea beetles by removing excess trash and non-flea beetle insects and pour beetles 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. 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 ft² 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/5 sweeps then re-infest the site with additional flea beetles. A portion of the release area can be treated with picloram plus 2,4-D (2 pt + 2 pt) from early to mid-September to reduce leafy spurge density and increase insect establishment.

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, thereby 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.

BIOLOGICAL CONTROL OF PERENNIAL WEEDS - T20 - 21

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; W-1088 Leafy Spurge Biology, Ecology, and Management W-1183; and 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 about 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, and prevailing markets at the time. Consult NDSU Extension Service Circular R-1093, Controlling Leafy Spurge Using Goats and Sheep, for further details.

T21. Purple loosestrife. Three insect species have been released into North Dakota for purple loosestrife control. 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 may not work well in urban areas because mosquito spraying severely reduces populations of biocontrol agents.

*Or generic equivalent.