

Weed Management in CREP Grasslands

OVERVIEW

- This publication will discuss weed management options for Conservation Reserve Enhancement Program (CREP) grassland acres enrolled in Conservation Practices CP1, CP2, and CP10. Areas designated otherwise (e.g., CP22, riparian buffers) are not discussed in this publication.
- Weeds can replace desirable plants, filling in gaps or voids and reducing stand longevity and overall quality of desirable vegetative covers.
- Biennial or perennial broadleaf weeds are generally the most common weeds in CREP areas.
- Certain weeds in CREP areas are invasive, noxious species and are required by law to be managed.

Weed Management Options for CREP

Cultural Management

- Provide a seedbed at planting that is free of live weeds through either tillage or the use of burndown herbicides (e.g., glyphosate, paraquat).
- Consider planting date, fertilization, planting population, and high-quality crop seed and choose adapted species and varieties.
- In established vegetative cover systems, prevention is the most important tool for managing weeds.
- Prevent dispersal of seeds or vegetative structures into uninfested areas and manage to prevent seed production in infested areas.
- Avoid planting species for the purpose of ornamentals, erosion control, or forage that could become invasive pests over large areas (e.g., purple loosestrife, giant hogweed, tree of heaven, Japanese knotweed, bush honeysuckles, privets, butterfly bush).

Mechanical Management—Mowing and Hand Removal

- Annual mowing of the entire CREP area is *not* allowed after the stand is established.

- Mowing may be used as necessary during the establishment period (first one to three years).
- After the establishment period, mowing is not allowed from April 1 to July 31.
- Spot mowing for weed control from April 1 to July 31 must be approved in advance by the Farm Service Agency. Only spot mowing may be approved.
- Approved mowing may occur from August 1 to August 31, but no more than one-third of the area may be mowed in most CREP contracts.
- If you see a new weed, dig it, pull it, or remove the seed head prior to seed dispersal.

Chemical Management—Herbicides

- In CREP areas, herbicides are an effective alternative to mowing to control unwanted vegetation.
- Spray biennial weeds in the rosette stage before they overwinter or prior to bolting in the spring.
- Perennials are most susceptible to control with systemic herbicides in the bud to bloom stage or in late summer/early fall; spring herbicide applications usually provide ineffective control.
- A single herbicide application will not eradicate a perennial weed problem; therefore, long-term, routine maintenance tactics are required for management.
- In CREP areas, spot spraying with a backpack or hand-held sprayer is usually the best and most economical method for scattered weed infestations.
- Weeds tolerant of the herbicide may invade the space left by susceptible species, ultimately creating a more severe weed problem.
- Most herbicides labeled for use on CREP grasslands may cause injury or kill many kinds of broadleaf plants. Refer to the herbicide labels for additional details.
- Refer to the section below titled “Herbicides for Use in CREP Grassland Areas” and Table 2 at the end of this publication for more information on herbicides and their effectiveness on selected weed species.

INTRODUCTION

Weeds in CREP areas are troublesome in many ways. They reduce the competitiveness of desirable plants by robbing water, light, space, and soil nutrients. Weeds can replace desirable plants, filling in gaps or voids and reducing biomass, stand longevity, and overall quality of desirable vegetative covers. Certain weeds can produce substances (allelochemicals) that inhibit the growth of crop plants. In addition, certain plants, such as Canada thistle, bull thistle, musk thistle, Johnsongrass, and multiflora rose, which may be common weeds in CREP areas, are on the noxious weed list and must be controlled per state law. To plan an effective weed management program, a landowner must be able to identify weeds present and understand how weed biology and ecology affect where weeds are found and how these ultimately impact management.

PROBLEM WEEDS IN CREP AREAS

Weeds are grouped into three categories—annuals, biennials, and perennials—based on their life cycles. *Annuals* complete their life cycle within one year and reproduce only by seed. Annuals may produce as little as 100 seeds per plant or as much as 500,000 seeds per plant, depending on species and growing conditions. Annual weeds are classified as winter or summer annuals. Winter annuals germinate in the fall, overwinter as a rosette or small clumps of leaves, and complete their reproductive cycle in the spring or early summer. These weeds are more likely to be found in perennial pastures or permanent vegetative covers where soils are not disturbed over the winter. Some examples of winter annuals are given in Table 1. Summer annuals germinate in the spring and set seed in late summer or fall. Summer annuals thrive where summer annual crops such as corn, soybean, or vegetable crops are grown. They can also be a problem during the establishment year for new spring CREP plantings or if established areas become thin or irregular. Some examples of summer annual weeds are provided in Table 1.

Biennial weeds live during two growing seasons and reproduce only by seed. The first year consists of vegetative growth during which the plants produce a rosette or loose clump of leaves and a fleshy taproot. The second year involves both vegetative and reproductive growth whereby an elongated flower stalk is produced. Because these weeds require two years to complete their life cycles, they are found in areas of low soil disturbance such as waterways, pastures, hay crops, noncrop areas, and fencerows. Examples of several biennials are provided in Table 1. The key to managing biennials is to control them before they overwinter.

Perennial plants live for more than two years and generally reproduce by vegetative structures and seed. Vegetative reproduction occurs through structures such as rhizomes, tubers, bulbs, or budding roots. However, not all perennials reproduce vegetatively. Simple perennials reproduce only by seed production and emerge from the same vegetative structure every year. Dandelion is an example of a simple perennial (Table 1). Creeping perennials often reproduce by both vegetative structures and seed production. Canada thistle is an example of a creeping perennial (Table 1). Finally, woody perennials may be either simple or creeping, but they also produce secondary growth or a woody structure that enables them to become very large and usually aggressive. Multiflora rose is an example of a woody perennial that is also creeping (Table 1).

Because of limited weed management options, CREP areas are often ideal environments for the growth and spread of perennial weeds. Managing perennial weeds is generally more difficult because of their multiple reproductive systems. Consider both vegetative structures and seed when dealing with perennials. (Refer to the "Herbicides" section below for more information on perennial weed management.)

Table 1. Selected examples of annual, biennial, and perennial weeds that can infest CREP areas.

Annuals		Biennial	Perennials		
Winter Annuals	Summer Annuals		Simple Perennials	Creeping Perennials	Woody Perennials
Common chickweed	Jimsonweed	Common burdock	Dandelion	Smooth groundcherry	Multiflora rose
Horseweed/marestail	Pigweed species	Poison hemlock		Johnsongrass	Autumn olive
Downy brome	Shattercane	Spotted knapweed		Yellow nutsedge	Tartarian honeysuckle
		Bull thistle		Quackgrass	Tree of heaven
		Musk thistle		Canada thistle	
		Plumeless thistle		Mugwort	

Competition

Without question, weeds can directly compete with permanent grass and/or legume covers in CREP areas to reduce growth and stand longevity. In general, biennial and perennial weeds are probably the biggest weed problems for CREP landowners. Biennials and many perennials produce seed each year, potentially starting new infestations. In addition, perennial weeds such as Canada thistle, multiflora rose, and horsenettle reproduce from underground roots or rhizomes. Perennial rooting structures can survive for several years in the soil and are often unaffected by occasional mowing. Weeds invading CREP areas should be assessed for competitive ability (potential to reduce desirable cover species), invasiveness (potential to multiply and increase), and cost and effectiveness of control (cultural, mechanical, and chemical).

The following are general rules about weeds in CREP:

- Weeds that emerge with the crop in the spring are generally more destructive.
- Control problem weeds for the first 60 days after seedling establishment and monitor and suppress if necessary with mowing or herbicides annually until stand is established.
- Broadleaf weeds that are biennial or perennial are generally more competitive than grassy weeds.
- State law requires noxious weeds to be managed.

WEED MANAGEMENT

Managing weeds in CREP begins long before crop establishment. Certain types of weeds are potentially serious problems in permanent covers, so eliminating them in advance is important. In particular, perennial broadleaves and grasses such as multiflora rose, dandelion, Canada thistle, and quackgrass are much easier to manage prior to CREP establishment. Certain weeds, such as multiflora rose, must be controlled before enrolling in CREP. In addition, biennial weeds, including musk thistle and burdock, should be eliminated before CREP establishment. If these weeds are not removed before the seeding is made, they can persist for many years. The cost of controlling weeds before or at the time of seeding should be considered an investment that will be returned for the life of the permanent CREP cover.

Cultural Management

Cultural practices that aid in the control of weeds include anything that makes the crop more competitive against weeds. In the establishment year, these include soil testing, proper seedbed preparation, optimum planting date, proper fertilization, using the correct seeding rate, choosing high-quality crop seed that is free of weeds, and selecting adapted species and varieties for the region. In general, perennial grasses are more competitive with weeds than legumes.

Provide a seedbed at planting that is free of live weeds through either tillage or the use of a burndown herbicide (e.g., glyphosate, paraquat). If establishing a CREP permanent cover into an area that contains sod or is infested with perennial weeds, it is best to apply a systemic herbicide treatment (e.g., glyphosate plus 2,4-D or dicamba) during late summer/early fall of the year prior to spring planting. Also,

applying an additional burndown herbicide may be necessary in the spring prior to planting the crop. Emerging crop species must not be subjected to competition for limited nutrient and water resources as they try to gain a foothold in the early weeks of establishment. In addition, emerged vegetation can harbor certain insects or pathogens that could attack young susceptible crop seedlings. Date of planting can influence the kinds and numbers of weeds. Most grass and legume species are relatively slow to establish. Think about spring versus fall establishment of cool-season grasses and legumes based on weed history and what you might anticipate as problems. For example, if the field has been planted to corn or some other summer annual crop, then summer annual weeds will likely be the biggest weed threat during establishment. Late summer may be a better time for establishment in this situation. In spring seedings, plant early (before summer annuals emerge) to give the new crop seedlings every advantage. With late-summer seedings, plant before September—the month that winter annual weeds generally begin to emerge. The weed species present in a field along with its potential severity may help determine the best time for planting.

In established CREP systems, prevention is the most important tool for managing weeds. Research shows that weeds are controlled by increasing desirable crop competition. Crop growth rate is the single best measure of plant response to weed competition in CREP areas. Maintaining a dense competitive permanent cover is a key to preventing weed invasion and interference. Weeds are opportunistic. Germination and establishment is favored by open areas and by disturbance. Overseed with desirable cover species when necessary to keep open areas at a minimum. Test soils for nutrients and fertilize as needed to keep permanent stands healthy and competitive. Develop monitoring programs to locate infestations and place priority on controlling small infestations so they do not expand.

Preventing weed infestations also means averting dispersal of seeds or vegetative structures into uninfested areas. Some plant species, such as multiflora rose, Johnsongrass, and purple loosestrife, were originally introduced as an ornamental, erosion control, or forage but have since escaped and now are difficult to control and continue to spread; avoid planting such invasive species. Vehicles, humans, wind, water, birds, and other animals can spread weed seeds and rootstocks. Animals may disperse seeds by picking them up in their coats, fur, or between the pads of their feet.

Key points about cultural weed management:

- Consider seedbed preparation, planting date, fertilization, planting population, and high-quality crop seed and choose adapted species and varieties.
- In established vegetative cover systems, prevention is the most important tool for managing weeds.
- Overseed with desirable cover species when necessary to keep open areas at a minimum.
- Test soil for nutrients and fertilize to keep vegetative covers healthy and competitive.
- Prevent dispersal of seeds or vegetative structures into uninfested areas.

- Avoid planting species for the purpose of ornamentals, erosion control, or forage that could become invasive pests over large areas (e.g., purple loosestrife, giant hogweed, tree of heaven, Japanese knotweed, bush honeysuckles, privets, butterfly bush).

Mechanical Management—Mowing and Hand Removal

Annual mowing of the entire CREP area is *not* allowed after the stand is established. During the establishment period (first one to three years), mowing can be used as necessary to control competing vegetation. After the establishment period, mowing is only permitted on a site-specific basis to control establishment of noxious weeds or woody vegetation as it is written into the conservation plan. The CREP area can only be mowed to maintain stand health and diversity or to control noxious weeds; mowing simply for aesthetics is not permitted. In most CREP contracts, no more than one-third of the area or field can be mowed in any year. A system of mowing the area in alternating strips or blocks is best for wildlife. Approved maintenance mowing may only occur from August 1 to August 31. The minimum mowing height is 6 inches for cool-season grasses and 8 inches for warm-season species. Mowing is not allowed from April 1 to July 31, which coincides with the bird-nesting and brood-rearing season.

Mowing of forested stream buffers is only permitted during tree establishment. There is no maintenance mowing after tree establishment (first one to three years). Some three-year rotational mowing can be done outside the area planted to trees, if the entire buffer is not planted to trees. A better alternative to mowing is spraying with certain herbicides to control problem weeds (see the “Chemical Management—Herbicides” section below for additional details).

Finally, hand removal may be the easiest and most economical control of some weeds. When few plants are present or if you see a potential new weed, dig it, pull it, or remove the seed head prior to seed dispersal. This technique works particularly well for annuals and biennials. For perennials, effectively removing all vegetative structures may be difficult. Properly dispose of weeds after removal to prevent seed or vegetative structure dispersal. This may mean burning, burying, or transporting the weeds to the local landfills.

Key points about mechanical weed management:

- Annual mowing of the entire CREP area is *not* allowed after the stand is established.
- Mowing may be used as necessary during the establishment period (first one to three years).
- After the establishment period, mowing is not allowed from April 1 to July 31.
- Spot mowing for weed control from April 1 to July 31 must be approved in advance by the Farm Service Agency. Only spot mowing may be approved.
- Approved mowing may occur from August 1 to August 31, but no more than one-third of the area may be mowed in most CREP contracts.

- Herbicides may be a better alternative than mowing for problem weed control.
- If you see a new weed, dig it, pull it, or remove the seed head prior to seed dispersal.

Chemical Management—Herbicides

Herbicides provide a convenient, economical, and effective way to help manage weeds. They allow fields to be planted with less tillage, allow earlier planting dates, and provide additional time to perform the other tasks that farm or personal life require. In CREP areas, herbicides are an effective alternative to mowing to control unwanted vegetation. A number of herbicides are available for broadleaf weed control in grass covers in CREP systems. Few selective herbicides are available for mixed grass-legume combinations or for the control of grassy weeds in permanent grass settings. Before establishment, herbicide choices are limited to controlling emerged vegetation. Preplant soil residual herbicides are not practical for CREP systems, except for native grasses (CP2) where Plateau or Journey can be used. Most herbicides for CREP should be applied postemergence to the weeds and crop once the permanent cover is well established. In CREP areas, spot spraying is usually the best and most economical alternative for scattered weed infestations. Depending on the area or amount to spray, backpack or handheld sprayers can be most versatile and useful for this application.

Remember, young annual weeds in the seedling stage are most susceptible to control with herbicides. The key to managing biennials is to control them before they overwinter. Biennials are more susceptible during the early rosette stage when less root energy is stored. Once biennials survive the winter, they are more difficult to control the next spring/summer. Spray biennial weeds in the rosette stage prior to bolting. Perennials are most susceptible to control with systemic herbicides in the bud to bloom stage or in early fall.

Perennials and herbicide application timing. Most perennial broadleaves can be suppressed or reduced after the grass stand is established. However, when possible, eliminate perennial weeds before seeding the vegetative cover. This is best achieved with an herbicide treatment during the fall of the year before spring planting. Whether it is during CREP establishment or maintenance periods, systemic herbicides should be applied to perennials that are actively growing during late summer/early fall and before a killing frost occurs. During the late summer/early fall, perennials are preparing for winter survival and subsequent regrowth the next spring by transporting carbohydrates into their large root systems. Herbicides applied during this period will be readily taken with the carbohydrates into the roots for a more effective kill. Another option to consider is a combination of mowing and herbicide application in the late summer and fall. According to your conservation plan, mow the allotted area in early August, then allow the perennial weeds to regrow, and apply systemic herbicides once the perennials reach 10 inches or taller (but before a killing frost). This can be quite effective on Canada thistle and other cool-season perennials. Another time to consider applying a systemic herbicide for

effective control is during the bud to bloom stage of perennial growth. However, during this period in the summer, making herbicide applications may be difficult due to thick, vegetative stands. Treatments applied at the bud stage can prevent seed formation and dispersal. If treated later than the bud stage, the seeds still may form and be viable despite herbicide treatment. Herbicides applied to perennials in the spring are less effective than mid or late summer because of insufficient weed growth and poor mobilization/translocation to vegetative structures. Even with a properly applied and timed herbicide application, perennials are very persistent and total eradication will not occur with a single treatment. Managing perennials is a long-term effort requiring routine maintenance tactics.

Most herbicides for broadleaf control in permanent grass systems should *not* be applied to seedling grass covers until visible tillers are present. Established, permanent grasses and legumes are more tolerant to herbicides than during the seedling stage.

A brief summary of herbicide options labeled for use in CREP grasslands and their efficacies are provided in Table 2. For specific herbicide recommendations and which plants will be controlled, consult current Penn State Cooperative Extension weed management publications or manufacturers' product labels. Herbicide product labels can be found online at several Web sites (e.g., www.cdms.net, www.greenbook.net). *Keep in mind, most of these herbicides will cause injury or kill many kinds of broadleaf plants.* Just because a plant species is not listed on Table 2 does not mean the herbicide will not injure or kill it.

Key points about chemical weed management in CREP areas:

- If weeds become a problem in CREP areas, several herbicide options are available. Few herbicides are available for control of broadleaf weeds in legume-grass mixtures or for control of grassy weeds in grass-based systems.
- In CREP areas, spot spraying with a backpack or hand-held sprayer is usually the best and most economical method for scattered weed infestations.
- Spray biennial weeds in the rosette stage before they overwinter or prior to bolting.
- Perennials are most susceptible to control with systemic herbicides in the bud to bloom stage or in early fall; spring herbicide applications usually provide ineffective control.
- Thin or irregular stands do not always thicken once weeds are removed. Be sure there are sufficient desirable species to fill in the gaps or overseed if necessary.
- Weeds tolerant of the herbicide may invade the space left by susceptible species, ultimately creating a more severe weed problem.
- Most herbicides labeled for use on CREP grasslands may cause injury or kill many kinds of broadleaf plants. Refer to the herbicide labels for additional details.

HERBICIDES FOR USE IN CREP GRASSLAND AREAS

Before Crop Establishment

Glyphosate Products (Preplant/Preemergence Burndown)

Glyphosate is available in several formulations and is marketed as numerous brands; therefore, rate requirements differ, depending on the product used. For example, 22 fl oz/A (or 0.75 lb ae/A) of Roundup WeatherMax 4.5L = 1 qt/A Roundup Original 3L. Glyphosate is a nonselective, systemic herbicide that controls numerous annual and perennial grasses and broadleaves. Fall application on perennials is more effective than spring. There is no soil residual activity. Glyphosate is commonly tank-mixed with 2,4-D or dicamba to broaden weed control spectrum and improve consistency. *Glyphosate spot treatments can be used in established stands, but desirable vegetation surrounding weeds may be severely injured or killed.*

Gramoxone Inteon 2L (2.5 to 4 pt/A) (Preplant/Preemergence Burndown)

Gramoxone (paraquat) is a nonselective, contact herbicide that effectively kills small annual weeds and suppresses perennial weeds prior to crop emergence. Good spray coverage is important. Gramoxone is commonly tank-mixed with 2,4-D or dicamba to broaden weed control spectrum and improve consistency. *Gramoxone spot treatments can be used in established stands, but desirable vegetation surrounding weeds may be severely injured or killed.*

2,4-D Ester 4E and/or Clarity 4S/Banvel 4S (Preplant)

Apply at least 20 days/pt ahead of planting. Both these herbicides are systemic broadleaf products with good activity on small annuals and some perennials. 2,4-D and dicamba can also be applied postemergence (see additional information below). Weedmaster 3.8L is a premix of 2,4-D and dicamba.

Crop Seedling or Established

2,4-D Amine 4S (0.5 to 4 pt/A) or 2,4-D Ester 4E (0.5 to 1.5 pt/A)

2,4-D is a systemic herbicide that controls annual, biennial, and perennial broadleaves. Apply after the seedling grass has at least five to six leaves and before the boot stage of growth. Use the lower rate for seedling grasses. During the seedling stage, cool-season grass species are more tolerant than warm-season species. The ester formulation is slightly more active than the amine and should not be used postemergence if temperatures are higher than 80°F. 2,4-D is commonly tank-mixed with other herbicides (e.g., dicamba) to improve control and broaden weed spectrum. *2,4-DB 2E (1 to 3 qt/A)* can be used in grass/legume stands during seedling year (grasses should have five to six leaves; legumes should have two to four trifoliates) or in established stands. *2,4-D will severely injure or kill underseeded legumes and many other desirable broadleaves and wildflowers.*

MCPA Ester 4E (1 to 3 pt/A)

MCPA is a systemic, broadleaf herbicide that is related to 2,4-D and has slightly better crop safety but less activity on some weeds. Apply after the grass has at least five to six leaves and before the boot stage of growth. Use the lower rate for seedling grasses.

Buctril 2E (1 to 2 pt/A)

Buctril (bromoxynil) is a contact-type herbicide with good crop safety that is active on many annual broadleaf weeds, especially lambsquarters and mustards, but is weak on pigweed, biennials, and perennials. Apply to grass after emergence while the broadleaf weeds are small.

Clarity 4S or Banvel 4S (0.5 to 4 pt/A)

Clarity/Banvel (dicamba) is a systemic herbicide that controls many annual and biennial broadleaf weeds and provides suppression or control of numerous perennials. Apply after the grass has four to six leaves and before the boot stage. Do not use more than 1 pt/A on newly seeded areas. Clarity/Banvel is commonly tank-mixed with other herbicides (e.g., 2,4-D) to improve control and broaden weed spectrum. Overdrive 70WDG also contains dicamba in addition to diflufenzopyr (a synergist) and can be used in established grass (not seedling) stands to control numerous broadleaf weeds. The Overdrive use rate is 4 to 8 oz/A and can be tank-mixed with numerous herbicides. *This herbicide will severely injure or kill legumes and many other desirable broadleaves and wildflowers.*

Plateau 2AS (4 to 12 oz/A)

Plateau (imazapic) has both foliar/systemic activity to control existing weeds and soil/residual activity to control germinating weeds. It is an ALS-inhibitor herbicide that controls many annual and perennial grasses and certain types of broadleaves. Plateau is a unique herbicide that has various uses in noncrop areas and can be used pre- and postemergence on most native warm-season grasses (certain cool-season grasses are not as tolerant). Certain species of trees, shrubs, wildflowers, and legumes have tolerance to Plateau. When applying postemergence, include appropriate adjuvants [crop oil concentrate (COC) or nonionic surfactants (NIS)]. Plateau can be used on private and public lands; however, it can only be purchased by and marketed through government entities, so it may be difficult to obtain. Journey 2.25L (5.4 to 32 fl oz/A) is a premix containing imazapic (Plateau) plus glyphosate used as a burndown and residual herbicide before seeding. Since it contains glyphosate, Journey cannot be broadcast postemergence over established stands (*spot treatments can be used, but desirable crop may be severely injured or killed*). Journey can be purchased through agrochemical dealers. Both Plateau and Journey can be tank-mixed with other herbicides.

Pursuit 70DG (1.44 oz/A)

Pursuit (imazethapyr) is an ALS-inhibitor herbicide that controls certain annual grasses and broadleaves. It can be applied to grass and/or legume stands, including certain warm- and cool-season grasses and alfalfa, clover, crownvetch, and birdsfoot trefoil. Pursuit can be applied postemergence in

new seedlings (minimum three-trifoliate legumes and four-leaf grass seedlings) and established stands. Include COC or NIS in the spray mixture. Pursuit can be tank-mixed with other herbicides.

After Crop Establishment Only**Cimarron Plus 63DF (0.125 to 1.25 oz/A)**

Cimarron Plus (metsulfuron-methyl plus chlorsulfuron), a combination of two ALS-inhibitor herbicides, is applied post emergence and has systemic and residual activity. Cimarron Plus controls many annual, biennial, and some perennial broadleaf weeds, depending on the rate used. It can be used in established warm- or cool-season grass stands. For most grass species, do not apply until for a year (minimum of 6 months) after establishment; fescue requires a longer period. Do not use on timothy or Matua bromegrass. Cimarron Plus is an effective and commonly used herbicide in pastures, noncropland, and set-aside areas. It is often tank-mixed with 2,4-D or dicamba to increase activity and weed control spectrum. This combination provides good control of typical weeds found in CREP areas such as Canada thistle, multi-flora rose, bull and plumeless thistle, and spotted knapweed. COC or NIS must be included in the spray solution and thorough spray coverage on the weeds is necessary for effective control. *Cimarron will severely injure or kill legumes and many other desirable broadleaves and wildflowers.*

Crossbow 3E (1 to 4 qt/A)

Crossbow is a commonly used systemic herbicide that contains triclopyr plus 2,4-D ester and can be used on established cool- or warm-season grass stands to control a variety of annual, biennial, and perennial broadleaf weeds, as well as woody plants and brush. Garlon 4E and Remedy 4E are products that contain only the single active ingredient triclopyr. *Crossbow will severely injure or kill legumes and many other desirable broadleaves and wildflower species.*

Stinger 3E (0.33 to 1.3 pt/A)

Stinger (clopyralid) is systemic, controls certain broadleaf weeds, and is especially effective on thistles (e.g., Canada, musk, bull) and other aster-family species. Stinger can be costly if applied as a broadcast application; it can be more cost effective when used as a spot treatment. Other products that contain clopyralid include Curtail 2.38L (2 to 4 qt/A), which contains clopyralid + 2,4-D, and Redeem R&P 3L (1.5 to 4 pt), which contains clopyralid + triclopyr. Since these products are premixes with other herbicides, they control a wider range of broadleaf weeds and may be more cost effective. *Stinger can be used on established warm- or cool-season grass stands but will likely injure or kill most legumes and many other desirable broadleaves and wildflowers in the cover.*

Milestone 2L (3 to 7 fl oz/A)

Milestone (aminopyralid) is a newer active ingredient (similar to Stinger) especially designed for use in grass forages, CRP/CREP areas, noncroplands, and natural areas to control many annual, biennial, and perennial broadleaf weeds. It is effective on thistles (Canada, bull, musk, plumeless),

burdock, dock species, horsenettle, knapweed, sowthistle, ironweed, and others. Milestone can be tank-mixed with other herbicides, and the addition of NIS is recommended to enhance activity. Milestone is nonvolatile, unlike dicamba and 2,4-D. *ForeFront R&P 3L (1.5 to 2.6 pt/A)* is a premix of aminopyralid plus 2,4-D that can be used in CREP areas. *These products will severely injure or kill legumes and many other desirable broadleaves and wildflowers.*

Outrider 75WDG (0.75 to 2 oz/A)

Outrider (sulfosulfuron) is a postemergence, ALS-inhibitor herbicide that controls annual and perennial grasses and a few broadleaf weeds in perennial native grass stands. It is effective on downy brome, Johnsongrass, quackgrass, yellow nutsedge, horseweed, mustard species, and ragweed. Outrider can be tank-mixed with other herbicides, and the addition of NIS is required to enhance activity. If taking land out of CREP, be cautious of crop rotation restrictions—some crops can't be planted for up to 22 months after application. *This product will likely injure or kill legumes and many other desirable broadleaves and wildflowers.*

Before establishing vegetative covers on CREP areas, be sure that herbicides from previous crops will not interfere with the establishment of CREP seedings. Certain herbicides used in corn, soybeans, and pastures require lengthy intervals before planting certain grasses or legume crops. Check herbicide labels to determine appropriate crop rotation intervals.

Explanation of Table 2

Table 2 lists the efficacy of common foliar-applied herbicides that can be used in CREP grasslands. The weed species are grouped into the following three categories:

1. Must be controlled in CREP areas. According to state law and the CREP contract, all plant species listed on the "Pennsylvania Noxious Weed Control List" must be controlled. Noxious weeds are those species or group of species that have been legally designated by county, state, or federal agencies as pests. Therefore, it is illegal to propagate, sell, or transport these species in the state.

2. Should be controlled in CREP areas. These weed species should be controlled because of their aggressive nature and potential to easily spread and dominate field composition. Most weeds in this group are considered invasive species. Invasive species are those that can spread rapidly into areas where they are not native. This includes mostly nonnative species that escape or otherwise grow outside of cultivation. Not all nonnative (or exotic, alien, or nonindigenous) plants are invasive.

3. Not necessary to control in CREP areas. Weeds in this group are considered a nuisance in CREP grasslands. According to the CREP plan, it is not necessary to control these. However, they can become a problem if left unchecked.

CONCLUSION

Weeds have a controversial nature. Depending on their location and severity, weeds may or may not need to be managed. In a CREP setting, species such as goldenrod, milkweed, brambles, sumac, and wild carrot are considered critical and beneficial to the natural diversity of the conservation cover and provide habitat to a wide range of animal life. But, it is very important to manage the balance between these potentially aggressive plants and desirable vegetative cover. However, in a field crop setting, these same species would likely need to be managed properly to protect crop yields.

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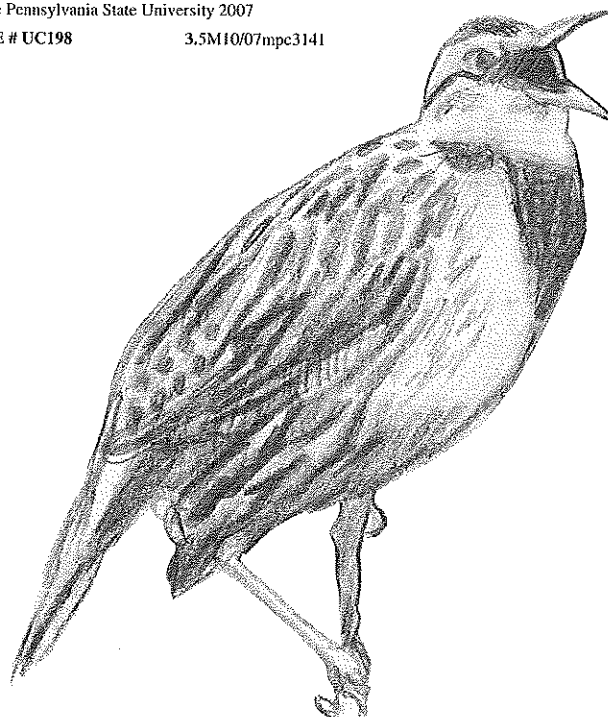


Table 2. Effect of some foliar-applied herbicides on selected weed species possibly found in CREP areas.

Herbicide/ Weed Species	Life Cycle	2,4-D	Banvel/ Clarity	2,4-D + Dicamba	Cimarron Plus	Cimarron Plus + Dicamba or 2,4-D	Cross- bow	Glypho- sate	Fore- Front	Mile- stone	Redeem R&P	Stinger	Plateau (Post)
Must Be Controlled in CREP Areas													
Marijuana	A	8+	8+	8+	—	—	8+	9	8+	—	—	—	—
Canada thistle	P	7+	7+	7+	7+	8+	7+	8+	9	9	8+	9	9
Multiflora rose	P	6	7	7	9	9	9	8	7	6	7+	6	—
Johnsongrass	P	N	N	N	N	N	N	9	N	N	N	N	6
Mile-a-minute	A	N	9	—	—	—	9	9	9	9	—	N	9
Kudzu	P	6	7+	8	8+	8+	8+	8+	8	8	8+	8+	—
Bull thistle	B	8+	8+	9	8+	9	9	9	9+	9+	9	9	8+
Musk thistle	B	8+	8+	9	8+	9	9	9	9+	9+	9	9	8+
Shattercane	A	N	N	N	N	N	N	9	N	N	N	N	7+
Jimsonweed	A	8	9	9	9	9	9	9	9	8	9	9	7
Purple loosestrife	P	7	—	—	8	8	8+	8+	—	—	—	—	—
Giant hogweed	B/P	7	7	8	—	—	8	9	—	—	8+	8+	—
Goatsrue	P	7+	8+	9	—	8	—	7	7	—	—	—	—
Should Be Controlled in CREP Areas													
Plumeless thistle	B	8+	8+	9	8+	9	9	9	9+	9+	9	9	9
Dandelion	P	9	7	9	6	8	9	8	8+	7	8+	8	6
Honeysuckle spp.	P	7	7	7+	7+	8	7	7+	7	6	6	N	—
Spotted knapweed	P	8+	8+	9	7+	8+	8+	8+	9	9	9	9	—
Japanese knotweed	P	7+	7+	8	6	7+	7+	8	7	6	7+	7+	—
Autumn olive	P	7+	7+	7+	6	7+	7+	7+	7+	6	7+	6	—
Tree-of-heaven	P	7+	7	7+	6	7	8	7+	7	6	7+	6	—
Japanese stitgrass	A	N	N	N	N	N	N	9	N	N	N	N	6
Horseweed	A	8+	8+	9	7+	8+	8+	8+	9	9	8+	8	—
Not Necessary to Control in CREP Areas (Nuisance Weeds)													
Field bindweed	P	8	8+	8+	6	8	8	8	7	N	N	N	6
Burdock	B	8+	7+	8+	8	8	9	9	8	7+	9	8+	—
Bedstraw, smooth	P	7	7	7	N	7	8+	9	9	9	8+	N	—
Dock spp.	P	7+	7+	9	8+	9	8+	8+	8+	8	8+	8	6
Horsenettle	P	8	8+	8+	9	9	8	8	8+	8+	7+	6	—
Poison ivy	P	7+	8	8+	6	7	8+	7+	7	—	8	6	—
Mugwort	P	6	7+	7+	7+	7+	7+	7+	6	—	8	8	—
Black locust	P	7+	7+	8+	7+	8	8+	7+	7	6	8+	6	—
Dodder	A	6	6	6	—	—	—	9	—	—	—	—	—

A = annual; B = biennial; P = perennial

Weed control: 10 = 95–100 percent; 9 = 85–95 percent; 8 = 75–85 percent; 7 = 65–75 percent; 6 = 55–65 percent; N = less than 55 percent or no activity; — = no data available or unknown

Other herbicides such as MCPA, 2,4-DB, Buctril, Pursuit, Journey, Garlon, Curtail, Overdrive, and Outrider also can be used on CREP grasslands to control various kinds of weeds. Refer to the specific herbicide labels for additional details about each product. [Herbicide labels can be found online (e.g., www.cdms.net, www.greenbook.net).]