

Manual Maintenance

There are non-herbicide methods to control weeds and woody plants in a native planting. These methods require extra physical exertion and time, but can be the least damaging to the surrounding native plants. The severity of the infestation and the stamina of the land manager will dictate whether these methods are practical.

Hand weeding

The best time to hand weed is immediately after a rainstorm when the ground is soft and a large portion of the root can be extracted. Perennial rhizomatous weeds like Canada thistle and leafy spurge will require several pullings in the same year and may require weeding two or more years. Wear thick gloves - Canada thistle plants are prickly and leafy spurge sap can cause dermal reactions.

Hoeing, spade shovel, hedge/pruning shears

Chopping works very well on biennial plants. Cutting the plant under the soil surface or near its base as it begins to flower will greatly reduce its ability to re-grow and produce seed.

A gas-powered heavy duty string trimmer (fitted with a steel brush blade or plastic knives) can selectively cut small weed patches and smaller diameter woody plants scattered throughout a planting. This piece of equipment can be dangerous to operate. Always wear proper safety equipment that should include gloves, long-sleeved shirt, safety glasses, hearing protection, hard hat, chaps, and steel-toed shoes. Read and follow recommendations in the owner's manual for safe operation.

Girdling

Girdling (like rabbits do to young trees and shrubs in the winter) can kill woody plants. Girdling is accomplished by scraping a thin layer of bark off the stem all the way around the plant near its base. Immediately inside the outer layer of bark is a very thin green layer (phloem) that must be removed. On young woody plants, the tissue can be scraped off fairly easily with a sharp pocket knife. Be careful not to girdle too deeply. Cutting too deep will stimulate the plant to produce new sucker shoots, which is the same plant response as when the stem is completely severed. Girdling stops nutrients generated in the leaves from moving into the roots. The result is that the roots starve and die. Be sure to girdle any new sucker shoots. Any shoots not girdled will allow the plant to survive.

To request copies, or for more information, call the Tallgrass Prairie Center at 319.273.3836.

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Note:

Always wear protective clothing and gloves to guard against thorns and plant compounds that can cause severe skin reactions.

Prescribed Burning

A prairie planting should be burned as soon as the site can carry a continuous fire. Proper use of prescribed fire will accelerate growth of most prairie plants and deter cool-season weeds and small woody plants. Typically, there is not enough fine fuel (grass leaves) to carry a fire in a one- or two-year old planted prairie due to frequent mowing. By the end of third growing season however, there should be enough grass growth to carry a fire. The first prescribed fire on a newly reconstructed prairie often is done in the spring to stimulate the warm-season prairie grasses. The management objectives should determine frequency and timing of prescribed fires for subsequent prescribed burning. Caution - Prescribed burning should only be done by trained and experienced personnel. To learn more about prescribed burning visit the Iowa Natural Resources Conservation Service (NRCS) website at nrcs.usda.gov/wps/portal/nrcs/ia/newsroom/factsheets/nrcseprd416059 to download a free copy of Prescribed Burning.

Irrigation

Irrigation can be an important management tool. Once a seed germinates, there is a critical phase of development between emergence and the time the seedling develops its first true leaf. While the plant is still in this cotyledon stage, it cannot survive an extended period of drought. If rainfall is not adequate, seedlings will benefit from being watered 1 to 2 inches every three days during the first growing season (Morgan 1995). Irrigation increases the probability that the plants will survive into the second growing season and beyond.

Fertilizers

Fertilizers are not recommended for native plantings. Most plants including natives benefit from fertilizers, but weeds benefit more, making fertilizers a poor management strategy. Fertilizing a newly planted prairie will disproportionately favor weedy species. Most native species are well adapted for nutrient poor soil. In some cases, fertilization may also damage or kill native seedlings.

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Lalonde, G., and B. Roitberg. 1994. Mating system, life-history, and reproduction in Canada thistle (*Cirsium arvense*; Asteraceae). *American Journal of Botany* 81:21-28.

Morgan, J., D. Collicutt, and J. Durant. 1995. Restoring Canada's Native Prairies - A Practical Manual. Argyle, M.B., Canada. *Prairie Habitats*.

Sheley, R., K. Goodwin, and M. Rinella. 2001. Mowing to Manage Noxious Weeds. *Agricultural Extension Publication. Weeds A-16 (Range and Pasture)*. Montana State University. Bozeman, Montana.

Williams, D., L. Jackson, and D. Smith. 2007. Effects of frequent mowing on survival and persistence of forbs seeded into a species-poor grassland. *Restoration Ecology* 15(1):24-33.

Table 1. Persistent Perennial Plants

Common Name	Genus-species	Phenology	Herbicide Class*	Application Method*	Application Time*
Kentucky bluegrass	<i>Poa pratensis</i>	grass	glyphosate	foliar applied	in spring at boot-to-early seedhead stage
Quackgrass	<i>Agropyron repens</i>	grass	glyphosate	foliar applied	6" - 8" tall
Reed canarygrass	<i>Phalaris arundinacea</i>	grass	glyphosate	foliar applied	in spring at boot-to-early seedhead stage
Smooth brome	<i>Bromus inermis</i>	grass	glyphosate	foliar applied	in spring at boot-to-early seedhead stage
Tall fescue	<i>Festuca arundinacea</i>	grass	glyphosate	foliar applied	in fall with 6" - 12" new growth
Bird's-foot trefoil	<i>Lotus corniculatus</i>	herbaceous	clopyralid, triclopyr	foliar applied	up to 5 leaf
Canada thistle	<i>Cirsium arvense</i>	herbaceous	clopyralid	foliar applied	in spring, rosette to bud
Crown vetch	<i>Coronilla varia</i>	herbaceous	triclopyr	foliar applied	up to 5 leaf
Leafy spurge	<i>Euphorbia esula</i>	herbaceous	picloram	foliar applied	in spring at true flower stage, or fall regrowth
Black locust	<i>Robinia pseudoacacia</i>	woody	triclopyr	cut stump or basal bark	anytime (except with snow or running water)
Box elder	<i>Acer negundo</i>	woody	picloram, triclopyr	cut stump or basal bark	anytime (except with snow or running water)
Common buckthorn	<i>Rhamnus cathartica</i>	woody	picloram, triclopyr	cut stump or basal bark	anytime (except with snow or running water)
Gray dogwood	<i>Cornus racemosa</i>	woody	picloram, triclopyr	cut stump or basal bark	anytime (except with snow or running water)
Green ash	<i>Fraxinus pennsylvanica</i>	woody	picloram, triclopyr	cut stump or basal bark	anytime (except with snow or running water)
Honey locust	<i>Gleditsia triacanthos</i>	woody	triclopyr	cut stump or basal bark	anytime (except with snow or running water)
Multiflora rose	<i>Rosa multiflora</i>	woody	picloram, 2,4-D	cut stump or basal bark	anytime (except with snow or running water)
Red cedar	<i>Juniperus virginiana</i>	woody	none needed		
Siberian elm	<i>Ulmus pumila</i>	woody	picloram, triclopyr	cut stump or basal bark	anytime (except with snow or running water)
Silver maple	<i>Acer saccharum</i>	woody	picloram, triclopyr	cut stump or basal bark	anytime (except with snow or running water)
Smooth sumac	<i>Rhus glabra</i>	woody	triclopyr	cut stump or basal bark	anytime (except with snow or running water)
Tartarian honeysuckle	<i>Lonicera tatarica</i>	woody	picloram, triclopyr	cut stump or basal bark	anytime (except with snow or running water)

* Always read and follow label directions.

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Initial Post Seeding

AND

EARLY RECONSTRUCTION MANAGEMENT

Content by Dave Williams

PRAIRIE RESTORATION SERIES

The establishment of a prairie plant community takes 3 to 5 years. Without early management of the vegetation during this critical time, weeds and woody plants will displace the emerging and newly established native plants, resulting in a weedy plant community that will persist for many years. The goal after seeding is to reduce unwanted plants (weeds) and stimulate establishment and growth of the native plants until the prairie plant community is established. A variety of early management techniques includes frequent mowing, herbicide use, manual maintenance (hand pulling, hoeing, and girdling), prescribed burning, and irrigation to control unwanted plants and enhance the natives.

Prairie Plant Establishment And Weeds

Weed control in a newly seeded native planting should be a high priority in early reconstruction management. Fast-growing annual weeds can form a closed canopy over native perennial seedlings in less than 30 days, reducing light to a fraction of full sunlight. Low light intensity stunts native seedlings' development, making them susceptible to winter mortality (Williams et al. 2007).

Perennial weeds can also negatively impact native plant establishment (Table 1). Of most concern to resource managers are the perennial weeds that displace native plants and invade established prairie plantings. Perennial weeds and perennial prairie plants share many similar traits. Both produce seed, spread vegetatively, and occupy the same root zone and aboveground space. Some perennial weeds such as Canada thistle (*Cirsium arvense*) and leafy spurge (*Euphorbia esula*) form dense colonies that eliminate native plants (Butler et al. 2004). Methods to control perennial weeds must be used carefully because they will also have the same effect on the native perennials.



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Selective mowing of weeds in a first year prairie planting.

By the third growing season, most of the vegetative growth throughout the site should be prairie plants and mowing should not be needed. If there is a threat of a weed canopy in Year 3, a stand evaluation should be conducted to determine if there are adequate numbers of prairie plants remaining in the site (see Evaluating Stand Establishment in this series). If native plant establishment is less than 1 plant per square foot, we recommend using a stand enhancement technique to add more prairie grasses and forbs to the stand (see Site Preparation in this series).

Note:
Mowing is only partially effective at controlling persistent perennial weeds and woody plants. It will eliminate seed production and reduce weed canopy if implemented at the right time during the growing season but will have little effect or in some cases increase rhizomal spread (Lalonde et al. 1994). In those circumstances, herbicides may be needed to control persistent perennial weeds.



Figure 1. Crown vetch (green) can be sprayed in fall when adjacent prairie vegetation is dormant.

Herbicides, when used carefully at rates listed on the label, can be very effective at controlling persistent perennial weeds and woody plants (Table 1). Careless application will result in killing native species. Just how many weeds are considered 'weedy' in a native planting is a matter of personal preference, but addressing weed issues early can save heartache later on. There will be less damage to native plants if chemical control is used within the first few years of a seeding, when weeds are less abundant and can be spot sprayed. Waiting until the weeds are abundant in the planting can turn spot spraying into blanket spraying which is extremely damaging to natives. States require certification testing and licensing to purchase and apply certain pesticides. Contact your State Department of Agriculture to obtain more information on pesticide certification. Always read and follow label directions. The following are some strategies to minimize damage to native plants when using herbicides to control unwanted plants.

Plants that are allowed to grow high enough to create a closed canopy during the first few years of a prairie planting will reduce germination, growth, and survival of the perennial prairie plants (Williams et. al. 2007). This can create long-term maintenance problems. Frequent mowing is an effective technique to prevent a weed canopy from forming in a new prairie planting. Mowing can be done with any type of mower as long as the mower deck can be raised at least 4 inches. Some practitioners prefer using a flail-type mower because the biomass is cut into smaller pieces and does not leave a windrow (thick layer of thatch) on the surface. As a general rule of thumb, do not let the weeds and other vegetation get taller than knee-high in the first growing season. Mow to a height of 4 to 6 inches whenever the vegetation grows 12 to 18 inches high in the first growing season. Don't be concerned about damaging the natives by mowing. Most prairie seedlings will grow below the 4- to 6-inch mow height in the first growing season. The frequency and duration of mowing depends upon the weed density and climate conditions during the growing season. Typically in Iowa, with average precipitation, mowing may be needed every three weeks from early May to early September in the first growing season. This frequent mowing regime will curtail the growth and seed set of weeds while preventing thatch build-up that can smother native seedlings.

Mowing in the second growing season depends upon the density of persistent perennial and biennial weeds. To avoid damaging the native plants, mowing height should never go below 12 inches in the second growing season. Time between mowing treatments can be monthly or longer depending upon the weed pressure. For scattered weed patches, consider spot mowing or hand pulling to minimize the impact upon developing prairie plants. If there is a flush of tall rank biennial weeds like Queen Anne's lace (*Daucus carota*), sweet clovers (*Melilotus spp.*) or wild parsnip (*Pastinaca sativa*), it is important to mow or pull just prior to flowering to severely curtail or eliminate the plant's ability to flower and go to seed (Sheley 2001).

1. Spray only the persistent perennial weeds and woody plants (Table 1). Over time prairie plants will exclude most other weeds from the planting.

2. Spray when the natives are dormant. Crown vetch (*Coronilla varia*) and leafy spurge remain green into fall and can be sprayed after most native plants are dormant (Figure 1).

3. Use herbicides that are species-specific. Some herbicides work better than others on individual weed and woody species. Cyclopyralid or chlorsulfuron is more effective at controlling Canada thistle than glyphosate. Fosamine can be foliar sprayed on woody plants without affecting native forbs (non-woody) and grasses. The Nature Conservancy has an extensive list of weeds and methods of controlling them on the web at tncinvasives.ucdavis.edu.

4. Spray the weeds at the proper stage of plant development. The label will indicate at what stage of development the weed species is most susceptible to the effects of the chemical. 'Rosette to bud,' 'Up to 5 leaf stage,' '1 to 3 leaf stage before vining,' and 'boot to early seedhead stage' are some examples of specific label recommendations for optimum spraying times.

5. Apply the herbicide at the rate specified by the label. The application rate will vary according to the weed species and severity of infestation.

6. Use spot spraying. To minimize over-spraying onto non-target plants, use a hand wand instead of boom sprayer. A backpack sprayer with a spray wand extension allows the operator to place the nozzle tip very close to the weed and minimizes over-spraying.



Backpack sprayer with wand extension spraying Canada thistle.



Closeup of backpack sprayer with wand extension spraying Canada thistle.

7. Use boom spraying only on large dense weed patches.

8. Avoid creating drift when spraying. Lower the spray pressure and increase the nozzle orifice size to reduce spray drift. Don't spray on windy days. Consider spraying in the early morning or early evening when the winds tend to be calm.

9. Cut rather than foliar spray woody plants. Many brush herbicides require complete coverage when foliar sprayed. There is the potential for excessive over-spraying onto non-target plants. A cut-stump herbicide to prevent the stump from resprouting can be applied precisely to where it is needed without damaging surrounding vegetation (Table 1).



Stump treatment of cambium with Tordon.

10. Do not apply a herbicide to a cut stump that is actively flowing with sap. Sap flow will cause the herbicide to run off the cut stump into the soil and kill nearby vegetation. This is often referred to as 'the ring of death.'

Stump Stick

Volunteer trees are a pesky nuisance in prairie plantings. It doesn't matter whether a planting is a multiple-acre field or a backyard prairie, trees will find their way in. One method to remove volunteer trees is by hand cutting and treating the cut stump with an appropriate herbicide listed for that use on the label. Tree size will determine what piece of equipment to use. Loppers and hand pruners can be used for trees less than 0.5 inches in diameter, a gas weed whip with a brush blade can handle trees up to 2 inches in diameter and a chain saw should be used for anything larger than 2 inches in diameter. It's a labor-intensive activity but it is highly effective and minimizes negative impacts to surrounding flora and fauna. To precisely apply herbicide to the cut stump and minimize off-target movement of herbicide, the Tallgrass Prairie Center has developed the "stump stick." The stump stick has many advantages: it is made entirely of PVC so it's resistant to herbicides that are acid and salt formulations, it is simple to construct and materials to make it cost less than \$15.00. The stump stick is easy to handle and applies herbicide on the cut surface of a plant without over-application to non-target plants. The best part is that you don't have to bend over to apply the herbicide — saving a backache after a full day of cutting trees! For more information on the stump stick visit our website.

