

2. Stand Enhancement (Interseeding)

Stand enhancement techniques are often applied to sites that are dominated by grasses with few to no prairie forbs. Stand enhancement adds native grasses and forbs without eliminating the established vegetation.

Option 1: Direct Interseeding

Seed is sown into the established vegetation without disrupting the established vegetation. Prairie plant establishment can be low in stands of persistent perennial plants and non-native vegetation can persist for many years after seeding. Any seeding method can be used. This site preparation option is quick and can be done without any specialized equipment, but will require patience.

Option 2: Repeated Mowing and Interseeding

- » Remove standing dead material and thatch by prescribed burning in fall or by late summer haying.
- » Seed in fall or in early spring with a no-till drill.
- » Mow from late April to early September, four inches high every two or three weeks the first growing season.

Option 3: Spray, Mow and Interseed

- » Remove standing dead material and thatch in spring by prescribed burning, haying, or mowing.
- » Spray 50 percent of the stand with a grass herbicide when there is four to six inches of new growth.
- » Seed in fall or in early spring with a no-till drill.
- » Mow once in early summer in the first growing season.

Option 4: Disk and Interseed

- » Remove thatch and standing dead material in late summer by grazing, haying, or mowing.
- » Lightly disk (to the four-inch depth) 50 percent of the site in early fall.
- » Seed in late fall or in early spring. Any seeding method can be used.
- » Mow in late spring and in mid-summer in the first growing season.

The "Screwdriver Method" For Compacted Soil

Soil compaction is a condition when there is a decrease in air space between soil particles. Heavy machinery operation, or human or livestock trampling can cause soil compaction. Compacted soil can severely reduce establishment of natives by preventing seeds from being planted at a proper depth and by inhibiting root penetration of newly germinated seedlings. To check for soil compaction near the soil surface, stick a large flat screwdriver into the soil at multiple spots in the compacted region. If the screwdriver cannot be pushed more than 2 inches into the soil in at least half of the spots, there is a good chance that the soil surface is too compacted. To eliminate surface compaction, rototill the site to loosen the upper 4 inches of soil. Any large (greater than 1/2 inch) dirt clods need to be broken into smaller pieces. To reduce clod size, harrow the site using a drag harrow or a piece of chain link fence with some weight added.

Removing Trees and Shrubs

The species composition of a planted prairie will change over time if volunteer trees and shrubs are not eliminated. Shade from trees and shrubs will create cooler and moister conditions under the canopy, favoring shade-tolerant plant species and displacing full-sunlight prairie species. In addition, woody plants that are left on the site will spread by suckering and seed, further displacing prairie plants. Woody plants can also interfere with no-till drilling and broadcast seeding of the natives.

Some practitioners leave a few clone groups of native trees like wild plum and chokecherry on the site for habitat. However, native trees and shrubs like boxelder (*Acer negundo*), red cedar (*Juniperus virginiana*), and gray dogwood (*Cornus foemina*) should be removed because they can aggressively spread in a planted prairie (Table 1). We recommend the removal of all non-native trees and shrubs.



Herbicides are very effective at killing woody plants. Smaller trees and shrubs can be foliar-sprayed. Trees greater than 1/2-inch diameter need to be cut and the stump chemically treated to prevent resprouting (Table 1). Herbicide should only be applied to the inner bark (cambium layer) of the cut surface. The inner bark region of the cut stump is a thin layer adjacent to the outer bark of the tree. Because of the high concentration of chemical in stump-treatment herbicides, it is important to be careful not to dribble herbicide off the cut surface onto the ground. Coniferous trees (pines and cedars) do not need to be treated after being cut because they will not re-sprout, but all deciduous trees will need to be treated. Stumps need to be cut flat and as close to the ground as possible to prevent interference with seeding equipment.

Persistent perennial plants that should be killed prior to planting prairie vegetation.

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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7 Site Preparation

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PRAIRIE RESTORATION SERIES

Site preparation alters the existing vegetation and soil structure in advance of seeding, increasing emergence, growth and survivorship of the seeded natives by removing thatch, improving seed to soil contact, and reducing weeds. From construction sites to cornfields, site conditions can be drastically different and require specific site preparation techniques. There are two broad categories of site preparation: one associated with bare soil sites, and one with vegetated sites.

Caution - most of the site preparation methods described in this publication should NOT be used if remnant prairie vegetation (prairie plants that were not planted) are present at the site. Restoration techniques should be applied if remnant prairie plants are present.



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Site Preparation For “Bare Soil” Sites

Construction Sites

In many construction sites, the original soil profile has been altered during the construction process. Some areas within the site may have compacted soil from construction equipment (see Assessing for Soil Compaction). Many construction sites have large clods and compacted soil. An ideal seedbed for a native seeding should consist of friable soil particles (1/2 inch or smaller) in the top 1 inch of the soil.



Dirt clods too large to plant into.



Cultipacking to reduce clod size.

- » Rototill or shallow disk (4-inch depth) prior to seeding for compacted soil or if clods are greater than 1/2 inch.
- » Seed in fall or in early spring.
- » Cultipack the site before seeding if a no-till seed drill is used. Cultipack the site after seeding if the site is seeded with a drop seeder.



Row-Cropped Sites

Cornfield with too much stubble to use a no-till grass drill.

Sites that have been row-cropped may require different kinds of site preparation. The amount of site preparation needed depends upon the quantity of crop residue (see Assessing Crop Residue section) left on the field and the type of seeding equipment used.



Light bean residue.



Corn stover round-baled after harvest.



Cornfield cut for silage.

Field examples of light crop residue not needing any tillage prior to seeding natives with a no-till grass drill.



Light Crop Residue

Beanfield being harrowed.

- » No other site preparation needed if seeded with a no-till drill.
- » If broadcast or drop seeding, first cultivate with a spiked toothed harrow to roughen the soil surface.
- » Seed in fall or in early spring.
- » Cultipacking after seeding improves seed-to-soil contact.



Heavy Crop Residue

Disking cornfield.

- » Mow (chop) stalks if standing.
- » Remove crop residue by baling or by disking/cultivating the planting site to mimic a seedbed needed for a corn or soybean planting.
- » Seeding can be done in fall or in spring after removing crop residue.
- » Cultipacking after seeding improves seed-to-soil contact.



One disking pass.



Second disking pass.



Third disking pass.

Feedlots, Overgrazed Pastures

Bare soil can result from severe overgrazing and livestock trampling. By removing livestock from the site, vegetation can re-emerge from underground rootstock. Livestock should be removed for at least one entire growing season to allow the vegetation to recover and be identified. If remnant (not planted) prairie plants are detected, the site should be considered a prairie remnant and site preparation techniques for prairie remnants should be used. Typically, feedlots and overgrazed pastures will contain persistent perennial plants and high levels of weed seed in the soil. Manure can also contribute to high levels of nitrogen in the soil, which will stimulate weed germination and weed growth. If no remnant prairie plants are detected, use site preparation techniques from the Stand Replacement subsection of this publication.

Site Preparation For “Vegetated” Sites

Types of vegetated sites include: turf grass lawns, pastures, hayfields, and conservation plantings. Vegetation on these sites can vary from smooth brome/alfalfa hayfields and Kentucky bluegrass lawns to a dense stand of prairie grasses on a site enrolled in a federal government Conservation Reserve Program (CRP). Caution - if a site contains remnant (not planted) prairie plants, the site should be considered a prairie remnant and site preparation techniques for prairie remnants should be used.

There are two site preparation options - stand replacement (starting over) and stand enhancement (interseeding). Stand replacement site preparation techniques should be used to replace a current stand of non-native grasses and legumes with prairie grasses and wildflowers. Stand enhancement site preparation techniques are typically used when the goal is to add additional prairie species to sites that currently have some native plants or are dense stands of prairie and pasture grasses with few to no wildflowers.

1. Stand Replacement (Starting Over)

Stand replacement has three primary methods of site preparation. Select a site preparation technique based upon the speed in which you want to complete the project, the budget for the project, and the kind of equipment available to conduct site preparation activities.

Option 1: Spray and Plant

» Mow (4 inches high or less) in spring or in late summer or burn when the vegetation is dormant.

» Apply an appropriate herbicide(s) to actively growing vegetation when there is 4 to 6 inches of new growth. For legume/grass stands, a mixture of a broadleaf and grass herbicide, such as glyphosate and 2, 4-D should be used. It can take 2 to 4 weeks after mowing or burning for the vegetation to have enough new growth for a herbicide treatment. Re-spray any green plants after 14 days from the first herbicide treatment. Wait another 14 days after the last herbicide treatment to seed. Seed can then be broadcasted or drilled.



Small boom sprayer.



Large boom spraying.



Backpack spraying.

Option 2: Repeated Spray and Plant

This site preparation technique requires an entire growing season and is more expensive than option 1, but control of persistent perennial plants is greatly improved.

» Mow (4 inches high or less) or conduct a prescribed burn in early spring.

» Apply glyphosate to vegetation when there is 4 to 6 inches of new growth. Respray or spot treat each time it 'greens up' throughout the summer and into early fall.

» No further site preparation is needed if the site is seeded with a no-till seed drill. If seeding with a broadcast seeder or drop seeder, the area should be roughed up with a spiked toothed harrow before seeding, breaking apart thatch and loosening the surface soil. After seeding, the site should be cultipacked (rolled).

Option 3: Spray, Till and Plant

This method controls established persistent perennial plants and germinating weed seed in the soil. Caution - this option is not recommended for erosive sites as repeated disking will create bare soil.

» Mow (4 inches high or less) or prescribe burn in early spring.

» Apply glyphosate to actively growing vegetation when there is 4 to 6 inches of new growth.

» Wait 10 days after the herbicide application and disk the site at 3-4 week intervals for the entire growing season.

» Seed in fall or in early spring.

» Cultipacking after seeding improves seed-to-soil contact.

Assessing Crop Residue

Crop residue can be grouped into two categories - light or heavy. Light crop residue is defined as crop stubble no more than 4 inches high with residue on the surface not intertwined and some bare soil that can be seen through the residue. Light crop residues can include: soybean residue, corn residue after a silage harvest, corn residue after baling the residue, or cereal grain residue. Heavy crop residue is defined as crop stubble taller than 6 inches, intertwined and layered on the surface, with no bare soil visible. Heavy crop residues can include: corn or sorghum residue after a typical harvest and some cereal grains, such as winter wheat.

Assessing crop residue in the field must be done onsite. Walk in a line across the field and stop in ten spots of equal distance from end to end. Look down near your feet to see if bare soil is visible. Reach down and grab some residue; it is intertwined if a layer of residue larger than your hand comes off the ground. If intertwined residue is found and bare soil cannot be seen in more than five spots, consider the crop residue to be heavy.