



What's Working:

Vegetation Establishment & Maintenance

July 2016

Pollinator Habitat

2016 Information

- **Herbicide Free Methods:** Solarization is one method that the Xerces Society and others have been trialing in the Upper Midwest in recent years. The goal of solarization is to trap heat under plastic, raising the temperature of the soil high enough to kill existing vegetation and also impact the viability of weed seeds. Solarizing the existing vegetation with clear UV stabilized plastic is an effective way to reduce weed competition on small patches of land ($\leq 1/4$ acre) in full sun (Sarah Foltz Jordan, Xerces Society).
- **Herbicide Free Methods:** "In our trials in MN, solarization has performed well on dry soils in full sun, but poorly on wetter soils, or sites with shade" (Sarah Foltz Jordan, Xerces Society).
- **Herbicide Free Methods:** "It should be noted that the heat generated by solarization is not effective against all weed seeds. In cool climates (e.g., Upper Midwest), you can expect to see abundant weed growth following solarization. That said, solarization can often be used in cooler climates to change the weed community such that native plants are easier to establish—we have seen solarization remove dense stands of smooth brome grass (*Bromus inermis*), leaving lambs quarters (*Chenopodium album*), purslane (*Portulaca oleracea*), and other annual weeds that are much easier to manage. In other cases, solarization has been found to be ineffective against weeds like Canada thistle (*Cirsium arvense*) and yellow nutsedge (*Cyperus esculentus*)—especially in wetter soils, and when soils were cultivated prior to solarizing. Research into the response of different weeds is ongoing" (Sarah Foltz Jordan, Xerces Society).



Follow these steps for solarizing:

- In early to mid spring, remove all vegetation by mowing and clearing the site, and raking off debris, if necessary. If you get the plastic down in spring, there is a flush of weed germination under the plastic, which helps to flush weed seed out of the system. Cultivating the soil before laying the plastic is optional. Do not till if you have weeds that benefit from cultivation (e.g., Canada thistle) (Sarah Foltz Jordan, Xerces Society).
- After smoothing the site lay down UV stabilized plastic (such as 6mil high tunnel greenhouse plastic). Note that this new plastic is very costly. A cheaper solution is to locate used plastic- often available from farmers replacing high tunnel plastic. When choosing used plastic, be prepared to

use greenhouse repair tape to patch rips and holes. Trench and bury the edges to prevent airflow between the plastic and the ground. Any airflow between the plastic and the ground will lower soil temperatures, allowing more weed seed to survive. Weigh down the center of the plastic if necessary to prevent the wind from lifting it, however, weights should be used minimally as they can have a cooling effect. Use greenhouse repair tape for any rips that occur during the season. Do not use this method if deer pressure is high, as deer can easily puncture plastic beyond repair.

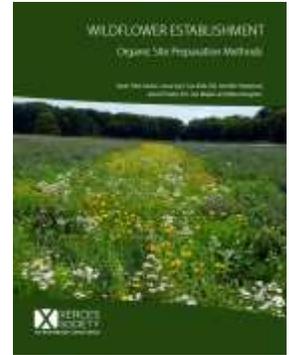
- Remove the plastic in early fall before the weather cools and the area beneath the plastic is recolonized by nearby rhizomatous weeds.
- Hand weed any problematic weeds and immediately plant your seed mix.

(Upper Midwest Pollinator Meadow Installation Guide. 2015 Publication, Xerces Society)

http://www.xerces.org/wp-content/uploads/2013/01/InstallGuideJobSheet_UpperMidwest_CnsrvCvr.pdf



- **Chemical Free Methods:** For a new, comprehensive review of organic site prep methods, watch for this new document from the Xerces Society (estimated release date: November 2016). Seven methods are covered, including solarization, smother cropping, mechanical weed management strategies, and sod removal.
- **Site Selection:** Planting in blocks rather strips can help reduce the creation of chemical drift “traps”. If planted in strips, they should be at least 20 feet wide. (Farm Bill Partnership Staff).
- **Site Selection:** Pollinator plantings should be placed in areas protected from insecticide exposure (Xerces Society). There is strong evidence that neonicotinoid insecticides can readily move into native plants in pollinator habitat situated adjacent to conventional row crop agriculture where these chemicals are used (Sarah Foltz Jordan, Xerces Society).
- **Seeding Methods:** Seeding can be done via broadcasting or drilling. If broadcasting, seed should be mixed with an equal or greater volume of slightly damp inert materials such as peat moss, sawdust, polenta, or rice hulls. The inert material helps provide proper species distribution within the seed mix, and gives a visual representation of how evenly the seed mix is being spread across the planting area. When broadcast seeding, divide the mixture into two equal quantities, applying half of it to the planting area in one direction. Then, spread the second half of the mixture onto the planting area in a direction perpendicular to the initial sowing. This will result in fairly equal seed distribution throughout the site. (Establishing Pollinator Meadows from Seed. 2013 Publication, Xerces Society)
- **Management for Wildflower Mixes:** If the majority of your seed mix is perennial wildflowers, the best way to control annual weeds during the first growing season is be regular mowing or string trimming of the seedbed. The exact number of times you have to mow will depend on your particular weed species, and how much rainfall is received. Plan on mowing every time the vegetation reaches a height of 12”, or when a large number of weed begin to flower. This will prevent most annual weeds from re-seeding, while leaving your natives untouched. (Establishing Pollinator Meadows from Seed. 2013 Publication, Xerces Society)
- **Long Term Management:** After the meadow is mature, you should only mow or burn part of the planting in a single season – ideally only one-third or one-fourth of the overall area. No single area should be burned or mowed more frequently than every two years, to protect dormant insects such as butterfly pupae or stem nesting bee larvae. Leaving patches untreated will ensure a population of insects to recolonize treated areas of the site. (Establishing Pollinator Meadows from Seed. 2013 Publication, Xerces Society)
- **Seeding:** When interseeding for increasing diversity, you may have to get some disturbance in the site a few years after the interseeding took place to actually get those newly planted forbs and grasses to grow. Disturbance options include: burn, graze, mow, hay, or any combination of those things. Prairies developed under the disturbance of fire and grazing. Burning and grazing sites can really help the growth of the native plants. When you disturb your native prairie planting it allows the forbs and annual species to grow well which will provide better habitat for wildlife as well as a better control of the invasive weeds. Mowing the site for a couple years after the interseeding may be necessary.



Interseeding Preparation Steps:

- Hay the site off in late summer as short as possible to remove some of the vegetation and/or
 - Spray the site with 2 quarts of glyphosate per acre in late summer/early fall
 - Make sure if you mix other herbicides in there is no long lasting residual
 - Use prescribed fire in late summer/early fall to remove the vegetation and duff layers
 - If you can't burn the site mow it down very short
 - Next step is to seed the site, fall dormant seeding (After Nov 1st) works best
 - Seed site as early as possible in the spring (Farm Bill Partnership Staff)
- Seeding: For interseeding you can broadcast the seed but you will want to use 1 ½ times the normal amount of seed. It works best for interseeding to drill the seed. Even planting into existing sod, it is not necessary to use a no-till drill; you just need to use a drill that can plant native fluffy seed. It is important to plant early successional species along with a mix of mid to late successional species. And try to have a mix of species that flower in the spring, summer, and fall to provide good pollinator forage.
 - 1st summer after planting, mow 1 to 2 times (depending on site conditions)
 - Set mower at 10" to 12" high
 - May need to spot mow a second time in areas
 - 2nd Summer after planting, mow 1 to 2 times (depending on site conditions)
 - Set mower at 10" to 12" high
 - May need to spot mow a second time in areas (Farm Bill Partnership Staff)
 - Pheasants Forever has developed several informative "Habitat Tips" about prairie establishment. You can view videos on the foundation of habitat success, top 10 pollinator plants, the life history of monarch butterflies and more on their You Tube channel:
<https://www.youtube.com/channel/UCewuixyOzH169u5cSyrDz5Q>
 - Monarch Habitat: Because monarch larvae can only feed on milkweed, getting more milkweed plants in the landscape, especially within the cornbelt states, is a key part of restoring the monarch population. It's likely that more than a billion additional milkweed plants will be required to stabilize the monarch population. Increasing milkweed populations to that extent will require a wide range of strategies. In addition, protecting and restoring the wildflower-rich grasslands and other natural areas that provide food for adult monarchs, as well as for thousands of bee and other pollinator species, is also vitally important.
 - Monarch Habitat: One clear strategy to benefit monarchs is to plant more milkweed species in gardens, parks, roadsides, nature centers, farms, and many other sites. In the north-central U.S., milkweed species such as common (Asclepias syriaca), showy (A. speciosa), and swamp milkweed (A. incarnata), are known to be favorites. You can find sources of seeds and plants at Monarch Watch or from the Xerces Society's Project Milkweed website:
<http://www.xerces.org/milkweed/>. Sites like monarchgard.com can help with garden and landscape design ideas.



It is critically important to increase the number of swamp milkweed (*Asclepias incarnata*) and other milkweed species available for monarch egg-laying.

- Monarch Habitat: “In any plantings for monarchs, it is also important to include an abundance of high quality nectar plants for adult monarchs, such as meadow blazing star (*Liatris ligulistylis*) and native field thistle (*Cirsium discolor*)” (Sarah Foltz Jordan, the Xerces Society).
- Monarch Habitat: The Xerces Society has recently worked with researchers and field biologists to develop a list of exceptional nectar plants for monarchs; this list is available from the NRCS: http://www.nrcs.usda.gov/wps/PA_NRCSConsumption/download?cid=nrcseprd391623&ext=pdf
- Monarch Habitat: More milkweed in gardens and landscaping can make a big difference, but an even bigger part of monarch recovery needs to come from a change in the way milkweeds – and the weedy, edge habitats they thrive in - are perceived by the public. Elimination of milkweed from roadsides, field edges, and odd corners and margins of our landscapes happens because we are uncomfortable with the “messiness” of those areas if they aren’t frequently mowed and/or sprayed with herbicides to make them look uniform in height and composition. Allowing milkweed and other wildflowers to thrive in those odds-and-ends habitat areas can have a huge impact on monarchs and other pollinators, along with pheasants, song birds, and many other wildlife species. Reducing mowing frequency and spot-spraying truly invasive plants – instead of broadcast spraying to kill anything that’s not grass – in these habitats saves both money and time as well. (Chris Helzer, *The Prairie Ecologist* – “Monarch Conservation Strategies”).
- The Fond du Lac Band of Lake Superior Chippewa’s Resource Management division conducted a mini-experiment in the summer of 2015 trying three different site-prep methods to establish a small pollinator garden in front of their office building. The Fond du Lac Forester, Wildlife Biologist, and Environmental Educator, teamed up for this project. The goal was to kill the existing vegetation, mostly common weeds and grasses, over the course of the summer to prepare a seedbed to direct-seed a mixture of different pollinator plants in the fall and supplement with potted pollinator plants the following spring.

In mid-May 2015 a 2,000 square foot patch of ground was divided up into three equal areas. Area 1 was treated with the herbicide glyphosate (Round Up, 3% final strength), area 2 was covered in clear plastic that was weighed down and sealed with rocks, and area 3 was treated with household (not horticultural strength) vinegar and dish soap. A back pack sprayer was used to apply the glyphosate and the vinegar.

The glyphosate treatment proved the easiest and most effective, requiring 1 full treatment in early summer and a few small spot treatments thereafter to kill newly established plants.

The clear plastic area, didn’t get hot enough to kill the majority of plants and enough moisture moved laterally from the outside perimeter to underneath the plastic (It may have helped to bury the edges of the plastic to trap heat, and have only minimal weights on the plastic, since these have a cooling effect).



First glyphosate treatment in spring of 2015 showing initial undesired vegetation. The vinegar side has not yet been treated.

The vinegar treatment was effective within hours at top killing most, but not all plants. Perennial plants and grasses, such as common tansy and quackgrass were largely unaffected and quickly re-sprouted from the roots. Many gallons of vinegar were applied several times throughout the summer and early fall. As a side-note, the vinegar mixture kills many insects on contact. We sprayed two dozen forest tent caterpillars crawling along the stem of a choke cherry and killed them immediately. The effect would probably be the same with desired insects such as monarch caterpillars.

It wasn't thought that stronger vinegar (11% horticultural grade vs. 4% household strength) would have made a large difference as it still would have only top killed many plants.



Early fall 2015 after glyphosate treatment and subsequent spot-treatment as well as numerous vinegar treatments. Glyphosate treatment on the right, vinegar treatment is on the left.



Shallow rototilling completed just prior to direct seeding in late fall of 2015.

In late-fall 2015 the entire area was very shallowly tilled (1-2" deep) to prepare a seedbed but not bring up deeply buried ungerminated weed seeds that may still be present. The area was hand seeded with pollinator plant seeds mixed with sand for easy dispersal. In May 2016 potted plants were planted to supplement what was seeded the previous fall.

As of July 2016, the area treated with glyphosate and the plastic-area that received a final glyphosate treatment have the least amount of non-desired plants. The vinegar treatment is still plagued by unwanted grass species that are inhibiting the successful establishment of the desired pollinator plants.

Fond du Lac Resource Management doesn't advocate the use of herbicides for all situations, but they may be the most efficient treatment in certain situations. Non-herbicide site-prep methods exist that weren't tried in this experiment such as smothering with cardboard, planting cover/smother crops, repeated tilling, and more. (Christian Nelson, FDL Reservation) (Photo credit to Mike Schrage, Fond du Lac Wildlife Biologist)

2013-2014 Information

- Using plant species functionally similar to Canada thistle such as yarrow, black-eyed Susan, gaillardia, yellow coneflower, tall cinquefoil, stiff goldenrod, prairie coreopsis, evening primrose, Maximilian sunflower, purple prairie clover, Canada milkvetch and hoary vervain in seed mixes were shown to effectively reduce the cover of Canada thistle the first two years after seeding prairie in North and South Dakota. These spike mixes had between 100-300 seeds per square foot and would provide high pollinator value (Jack Norland, NDSU from "Reduced Establishment of Canada Thistle Using Functionally Similar Native Forbs in Ecological Restoration 2013).



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- Wetlands can play very important roles as pollinator habitat as they often are part of larger, protected corridors, have water sources and high forb diversity (Dan Shaw, BWSR)
 - The basic needs of bees – flowers, nesting areas, hibernation sites, and no pesticides – can be easily provided in any location (Xerces Society Guide “Attracting Native Pollinators”).
 - Studies done in Western Europe show that the habitats that support the most diverse bee populations are old grasslands, heathlands, and hedgerows. All of these contain a diversity of flowers, dead wood, and areas of bare soil for nesting sites, as well as mud, resin, and other nest-building materials. Shady places, particularly conifer forests, provide fewer flowers; they are the least used by bees but may be important to moths and other insects (Xerces Society Guide “Attracting Native Pollinators”).
 - Dead trees, often considered an eyesore or hazard, should be retained wherever possible (Xerces Society Guide “Attracting Native Pollinators”).
 - “Before you jump into a pollinator conservation project, first take some time to plan ahead. Consider your options for where to create your habitat, how it will be maintained over time, the size of your budget, and the potential sources of funding or volunteer help for larger habitat projects (Xerces Society Guide “Attracting Native Pollinators”).
 - Consider that some otherwise unusable areas can be perfectly suited for new pollinator plantings. For example, septic fields can be planted in pollinator-friendly wildflowers. Shrubs can be planted on slopes that are too steep to mow. Similarly, small retention ponds around parking lots can be converted to flowering rain gardens, incorporating pollinator plants such as some species of native rose, willows, or Joe-Pye weed (Xerces Society Guide “Attracting Native Pollinators”).
 - Groupings of single flower species reduce the energy required for foraging because pollinators can spot the plant quickly (minimizing their search time). And within an abundance of flowers in one location, pollinators can move quickly and efficiently from flower to flower and collect a full load of pollen and nectar to bring back to the nest (Xerces Society Guide “Attracting Native Pollinators”).



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- To support crop pollination, habitat needs to be within a few hundred yards of the farm field (Xerces Society Guide “Attracting Native Pollinators”).
 - If you are starting your pollinator habitat from seed, the amount of grass should not exceed 30 percent of the overall seed mixture. Planting in the fall, rather than spring, favors wildflower development over grasses (Xerces Society Guide “Attracting Native Pollinators”).
 - Native plants are four times more likely than nonnative plants to attract native bees, and native plant genera support three times as many species of butterflies and moths as introduced plants do (Xerces Society Guide “Attracting Native Pollinators”).



2008-2012 Information

- Iowa has put together a good publication on incorporating prairies into working farms: www.extension.iastate.edu/Publications/PMR1007.pdf (DNR, Roadsides for Wildlife Program)