

Flower-rich foraging habitats for pollinators.

Massachusetts Pollinator Activity Sheet

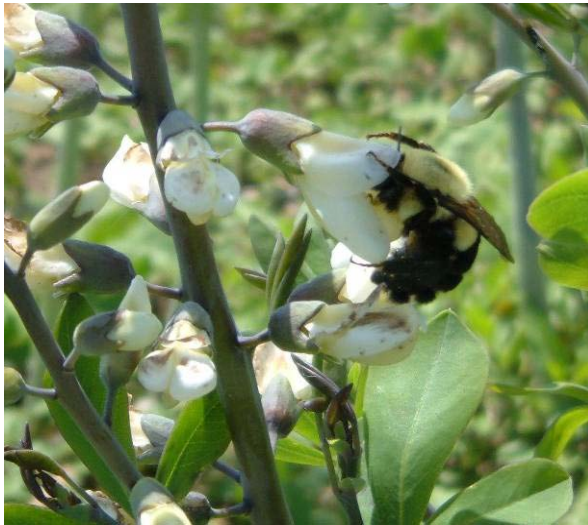


Photo: Eric Mader, The Xerces Society.

Definition

Establishing and maintaining areas of diverse shrubs and wildflowers, with a focus on native species, to create flower-rich forage habitat (primarily offering nectar and pollen) for native bees, honey bees and other pollinators.

Purpose

This activity/fact sheet is provided as a component of a resource conservation plan. This activity may be applied to land taken out of agricultural production, to land adjacent to agricultural land, or any area dedicated to habitat for beneficial pollinators. It contains detailed guidance that will allow existing prescriptions, such as Conservation Cover, Field Border, Hedgerow Planting, and Riparian Herbaceous Cover, to provide habitat for beneficial pollinators and enhance biodiversity.

Where Used

This activity applies on lands requiring permanent protective cover that are adjacent to or within 1500 feet of an agricultural field, are being converted from agricultural production, or any other location that is suited for pollinator habitat. Examples of appropriate locations include farm field or cranberry bog margins, road edges, and areas within or adjacent to the agricultural fields that are unsuitable for production, such as steep slopes, open upland habitat, reclaimed sand pits, forest edges, etc.. Although larger areas of habitat (1/2 acre or more) will provide resources to support more pollinators, flower-rich habitat can be created in small patches or strips and still provide benefits for pollinators. When identifying planting sites, habitat patches that are bigger, closer together, or interconnected will support more abundant populations of pollinators than small, isolated patches. Also, remember that you should take existing areas of high quality pollinator habitat into account when planning pollinator habitat and aim to fill holes in the flowering phenology.

General Criteria and Specifications

Conservation Practices

Many existing NRCS conservation practices may be used to implement and/or manage habitat for pollinators. Below are some of the most appropriate practices.

- Field Border
- Conservation Cover
- Upland Wildlife Habitat Management
- Riparian Herbaceous Cover
- Tree/Shrub Establishment
- Hedgerow Planting
- Early Successional Habitat Development / Management
- Critical Area Planting

Selection of Plant Species

Native wildflowers shall be planted to promote a diversity of flowering plants over the growing season and provide habitat for pollinators. Special care should be taken to establish plantings that complement the bloom period of adjacent crops.

Tables 1 and 2 provide recommended mixes to be used; however, due to yearly changes in seed availability some seeds may not be available. As a result, the following guidelines should be applied to every seed mix used:

1. A minimum of one warm season bunch grass and nine flowering forb or shrub species shall be planted. Grasses shall comprise less than 10% of the total composition of the seed mix.
2. Plant species selected should provide pollen and nectar resources for the entire growing season. At least three plants from each grouping (early, mid, or late season blooming) will be included in the mix.
3. The final combined seeding rate for all species will not be less than 30 pure live seeds (PLS) per square foot.
4. No more than 15% of the composition of the mix can be composed of species considered non-native in Massachusetts.

Seedbed Preparation

Site preparation is one of the most important and often inadequately addressed components of project success. It is also a process that may require a year or more of effort to reduce competition from invasive, noxious or undesirable plants prior to planting. **In particular, site preparation should focus on the abatement of perennial weeds.** The more effort and time spent eradicating undesirable plants prior to planting will result in higher success rates in establishing the targeted plant community.

Suggestions for eradicating weeds are provided in Table 3. Most techniques depend upon the use of herbicides. However, several suggestions for organic operations are included as well. Any tillage operations should be done when the soil is moist, but not wet.

Seeding

All seed shall be labeled and the use of certified seed is preferred. Seed shall be kept cool and dry until planted. Species with hard seed coats (e.g., Baptisia, lupine) will benefit from scarification (scratching the surface of the seed coat). This should ideally be performed by hand, by scratching one side of the seed, one time, by rubbing it against coarse sandpaper. Seed should be planted no later than 60 days after scarification.

The appropriate seeding method will depend on the size of the habitat area and the available equipment. In small areas, seed may be broadcast by hand, or with a hand-held seed spreader. In larger areas, a drop seeder, or ATV-mounted broadcast seeder may be used. Standard row crop planters (for example, corn seed drills) may place wildflower seed too deep and should not be used. Alternatively, special native plant seed drills, such as those manufactured by Tye or Truax, may be used. Local wildlife agencies may have such seed drills available.

Whatever method is chosen, equipment should be calibrated prior to use to be sure that the seed is being sown at the recommended rate. Because the drop-rate can become inconsistent when the amount of seed in the equipment dispenser gets low, it is important to make sure an ample amount of seed is loaded into the equipment, both for calibration and actual seeding. Fine play sand, rice hulls, or dry peat moss can be mixed into seed mixes at a 50 / 50 ratio in order to facilitate equal seed distribution. This can be particularly useful when seeding small areas, or when broadcasting very small seed. In addition, irrespective of method employed, thoroughly clean all equipment before and after use to avoid planting seeds from previous jobs.

Prior to sowing, the soil should be prepared such that soil surface is clean of debris. However, DO NOT till more than an inch deep to avoid bringing additional weed seed to the surface. Once the seed has been spread, it should ideally be gently tamped down into the soil. Overhead irrigation can achieve this, as can timing the planting to occur directly before rainfall. A roller can also be used for this purpose. Hand-operated rollers can be useful for small areas.

Seeding can be performed during any of the following time periods:

1. Dormant Seeding - between late fall and late winter (**recommended planting time**). Mechanical planting methods must be performed on bare ground in late fall before the planting site is covered with snow. ATV or hand broadcast plantings can be performed as a frost seeding in winter directly into the snow cover. If frost seeding is used, warm the seed to indoor room temperature, so that it will melt through the upper crust of snow. As the snow melts in spring, the seed will settle into the soil surface and not require additional tamping. Where specialized planting equipment is not available frost seeding by hand is the recommended planting method.
2. Late Summer – when days are shortening and heavy dew is typical. The exact date is weather and soil moisture dependent but shouldn't typically exceed September 15th. This seeding period should only be used on soils not prone to frost heaving.
3. Spring – prior to June 1st – annual weeds will likely be a problem and the site will require mowing at least 3 times during the establishment year.

Other Considerations

Pesticide poisonings

Many insecticides are used in agricultural landscapes. If insecticide spraying is to occur, then it is critical that the pollinator planting area is outside of the crop area and/or protected from application and drift.

Site disturbance

Minimizing disturbance within these plantings creates conditions that are favorable for the development of nesting opportunities for bumble bees and other ground nesting bees. However, to maintain the open, sunny nature of the habitat, mowing or burning will be necessary on an infrequent basis. See Operation and Maintenance below for details.

Operation and Maintenance

Monitoring and controlling weeds and watering vegetation is critical in the first and second years. If the site is well prepared, then less effort will be required for weeding after project installation. Maintenance practices must be adequate to control undesirable woody plants, herbaceous weeds and noxious and invasive species. This is often performed through mowing or burning in the early spring prior to the emergence of desirable pollinator plants, or it may involve hand-hoeing or weeding, or spot spraying with herbicides.

Habitats dominated by wildflowers and grasses will also need to be managed over time to maintain open, early successional characteristics. The actual management will depend on the size and location of the habitat. Possible management tools/techniques include mowing or burning. Conduct site management on only a fraction (1/3rd or less) of the site each year, at any time of year that is convenient and won't disrupt nesting birds. Rotate management and maintenance activities throughout the pollinator habitat areas to maximize spatial and temporal diversity. For example, if possible, apply management practices to only one-third or less of the site per year on a three or four year cycle. Also, if mowing is used to manage the habitat, be sure all equipment is clean and free of weed and/or grass seed prior to being used in the pollinator habitat.

Table 1: Dry Site Pollinator Mix

Species	% composition in mix	Bloom Color & Period		
		Early	Mid	Late
<i>Aquilegia Canadensis</i> (Eastern columbine)	5			
<i>Baptisia australis</i> (Blue false indigo) *	10			
<i>Baptisia tinctoria</i> (Horseflyweed)	5			
<i>Pentstemon digitalis</i> (tall white beard tongue) *	5			
<i>Tradescantia ohioensis</i> (Ohio spiderwort)	5			
<i>Asclepias syriaca</i> (Common milkweed)	5			
<i>Asclepias tuberosa</i> (Butterfly milkweed)	10			
<i>Chamaecrista fasciculata</i> (Partridge pea)	10			
<i>Monarda fistulosa</i> (wild bergamot)	5			
<i>Pycnanthemum virginianum</i> (Virginia mountain mint)	2			
<i>Solidago juncea</i> (early goldenrod)	3			
<i>Aster leave</i> (smooth aster)	10			
<i>Aster novae-anglae</i> (New England aster)	10			
<i>Aster pilosus</i> (heath aster)	5			
<i>Solidago nemoralis</i> (gray goldenrod)	5			
<i>Schizachyrium scoparium</i> (little bluestem)	5			

* non-native to Massachusetts

- To calculate seeding rates, utilize the Massachusetts Pollinator Seed Rate Calculator -

Due to yearly changes in seed availability, some seeds may not always be available. Therefore, if the seed mix needs to be altered, the following guidelines should be applied to every seed mix:

1. A minimum of one warm-season bunch grass and nine flowering forb or shrub species shall be planted. Grasses shall comprise less than 10% of the total composition of the seed mix.
2. At least three plants from each grouping (early, mid, or late season blooming) will be included in the mix.
3. The final combined seeding rate for all species will not be less than 30 pure live seeds (PLS) per square foot.
4. No more than 15% of the composition of the seed mix can be comprised of species considered non-native in Massachusetts.

Table 2. Wet Site Pollinator Mix

Species	% composition in mix	Bloom Color & period		
		Early	Mid	Late
<i>Penstemon digitalis</i> (tall white beard tongue) *	12			
<i>Tradescantia ohioensis</i> (ohio spiderwort)	15			
<i>Trifolium incarnatum</i> (crimson clover) *	3			
<i>Asclepias incarnata</i> (swamp milkweed)	10			
<i>Eupatorium maculatum</i> (spotted joe pye weed)	10			
<i>Eupatorium perfoliatum</i> (boneset)	5			
<i>Lobelia cardinalis</i> (cardinal flower)	3			
<i>Pycnanthemum virginianum</i> (Virginia mountain mint)	2			
<i>Verbena hastata</i> (blue vervain)	5			
<i>Aster novi-belgii</i> (new York aster)	5			
<i>Aster umbellatus</i> (parasol whitetop)	5			
<i>Helenium autumnale</i> (common sneezeweed)	5			
<i>Aster novae-angliae</i> (new England aster)	10			
<i>Solidago patula</i> (rough leaved goldenrod)	5			
<i>Panicum virgatum</i> (switchgrass)	5			

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4. No more than 15% of the composition of the seed mix can be comprised of species considered non-native in Massachusetts.

Table 3. This table contains several options for controlling competing, non-desirable vegetation prior to plant establishment. For all planned herbicide applications, records should indicate when the herbicide was applied to the field.

Option	Current Condition	Timing	Method
1 Herbicide	Fallowed land and/or medium to high weed pressure	Start site prep in fall of year 1 and plant in the fall of year 2.	<ol style="list-style-type: none"> 1. <u>Fall</u>: Apply broad spectrum herbicide. 2. <u>Spring (May)</u>: Mow existing vegetation as short as possible to clear site and rake off all clippings. 3. <u>Mid-May</u>: After plants/weeds grow 3 to 4 inches tall, apply non-selective herbicide (or appropriate targeted herbicide). 4. <u>Summer and early fall</u>: Repeat step 3 each time plants grow 3 to 4 inches tall. Do not allow annuals to flower. Assess need to use broad spectrum or targeted herbicide. A late summer application of glyphosate may be important for dealing with some resistant plants. 5. <u>Fall to winter (late October, through early March)</u>: Drill seed or broadcast wildflowers in fall. If broadcasting, roll or irrigate for good soil/seed contact.
2 Herbicide	Low to medium weed pressure	Start site prep in spring and plant in the fall.	<ol style="list-style-type: none"> 1. <u>Spring (May)</u>: Mow existing vegetation as short as possible to clear site and rake off all clippings. 2. <u>Mid-May</u>: After plants/weeds grow 3 to 4 inches tall, apply non-selective herbicide (or appropriate targeted herbicide). 3. <u>Summer and early fall</u>: Repeat step 2 each time plants grow 3 to 4 inches tall. Do not allow annuals to flower. Assess need to use broad spectrum or targeted herbicide. A late summer application of glyphosate may be important for dealing with some resistant plants. 4. <u>Fall to winter (late October, through early March)</u>: Drill seed or broadcast wildflowers in fall. If broadcasting, roll or irrigate for good soil/seed contact.
3 Organic	Site fallowed and/or weedy (medium to high weed pressure)	Start site prep in spring (year 1) and plant in fall (year 2).	<p><i>Modified from Cornell publication re: bringing idle land into production.</i></p> <ol style="list-style-type: none"> 1. <u>Spring</u>: Till (disk and harrow, or rototill) field when moisture is ideal for working the soil. 2. <u>Mid-May</u>: Harrow at about 2 weeks to break clumps and kill weed seedlings. 3. <u>Late May</u>: Surface harrow (no more than 1" deep) after soil is 65°. Sow buckwheat at 70 lb per acre (broadcast and scratched in) or 50 lb per acre (drilled). Don't leave gaps for weeds to grow. 4. <u>Early July</u>: Incorporate (disk) buckwheat 6 weeks after sowing (do not disk more than 1 inch deep) and reseed a few days later. 5. <u>Late Summer – Early Fall</u>: Incorporate (disk) buckwheat. Sow winter cover crop (e.g. oats by August 30 or annual rye by October 1). 6. <u>Spring</u>: Spring weeds will germinate. Remove weed seedlings with a surface harrow or use basket or tine weeder (no more than 1" deep) when moisture is ideal for working soil. 7. <u>Mid-May</u>: Surface harrow (no more than 1" deep) at about 2 weeks to kill weed seedlings. 8. <u>Late May</u>: Surface harrow (no more than 1" deep) after soil is 65°. Sow buckwheat at 70 lb per acre (broadcast and scratched in) or 50 lb per acre (drilled). Don't leave gaps for weeds to grow. 9. <u>Early July</u>: Incorporate (disk) buckwheat 6 weeks after sowing (do not disk more than 1 inch deep) and reseed a few days later.

			10. <u>Fall</u> : Sow wildflower mix into frost-killed buckwheat. Avoid tilling by using no-till drill. Alternatively, very lightly till soil surface, broadcast wildflower seed, and roll.
4 Organic	Cropped land (very low weed pressure)	Start site prep in spring and plant in fall.	<p>Early plan (modified from Cornell publication re: bringing idle land into production)</p> <ol style="list-style-type: none"> 1. <u>Spring</u>: Till (disk and harrow, or rototill) field when moisture is ideal for working the soil. 2. <u>Mid-May</u>: Harrow at about 2 weeks to break clumps and kill weed seedlings. 3. <u>Late May</u>: Surface harrow (no more than 1" deep) after soil is 65°. Sow buckwheat at 70 lb per acre (broadcast and scratched in) or 50 lb per acre (drilled). Don't leave gaps for weeds to grow. 4. <u>Early July</u>: Incorporate (disk) buckwheat 6 weeks after sowing (do not disk more than 1 inch deep) and reseed a few days later. 5. <u>Fall</u>: Sow wildflower mix into frost-killed buckwheat. Avoid tilling by using no-till drill. Alternatively, very lightly till soil surface, broadcast wildflower seed, and roll. <p>Late plan. For soil that dries slowly in the spring (modified from Cornell publication re: bringing idle land into production).</p> <ol style="list-style-type: none"> 1. <u>June</u>: Till (disk and harrow, or rototill) field when the moisture is ideal for working the soil. 2. <u>June and early July</u>: Allow residue to decompose for 3-4 weeks. Harrow at about 2 weeks to break clumps and kill weed seedlings. 3. <u>Early to Mid-July</u>: Sow buckwheat at 70 lb per acre (broadcast and scratched in) or 50 lb per acre (drilled). Don't leave gaps for weeds to grow. 4. <u>Mid to Late August</u>: Mow six weeks after sowing. 5. <u>Late August to early September</u>: Sow oats combined with wildflower seed mix with no-till drill or broadcasting on the surface. Buckwheat should leave the ground clean so that the cover crop and wildflower seed will take with minimal tillage. (Alternatively, sow oats in August to early September, and then drill wildflower seed in Fall).

* NRCS does not require specific herbicides by trade name and recommendations on herbicides and specifications on rate and timing should come from an extension agent or a state licensed consultant.

Pollinator Habitat – Site Specific Recommendations

Client:	Farm #:	Tract #:
Conservation Practice:	Total Acres:	
Planned By:	Date:	
Purpose:		

Site Prep – select the appropriate site prep from Table 3 and enter any adjustments as needed.		
<i>Site #:</i>	<i>Site #:</i>	<i>Site #:</i>
<i>Method #:</i>	<i>Method #:</i>	<i>Method #:</i>
<i>Adjustments:</i>	<i>Adjustments:</i>	<i>Adjustments:</i>
Seed Mix – select the appropriate seed mix (Table 1 or 2) and enter any adjustments, if needed. Determine the actual seeding rates using the Massachusetts Pollinator Seed Rate Calculator.		
<i>Site #:</i>	<i>Site #:</i>	<i>Site #:</i>
<i>Method #:</i>	<i>Method #:</i>	<i>Method #:</i>
<i>Adjustments:</i>	<i>Adjustments:</i>	<i>Adjustments:</i>
Seeding Method – enter specifics on seeding method (broadcast/drill), seeding dates, etc.		
<i>Site #:</i>	<i>Site #:</i>	<i>Site #:</i>
<i>Method #:</i>	<i>Method #:</i>	<i>Method #:</i>
<i>Adjustments:</i>	<i>Adjustments:</i>	<i>Adjustments:</i>

Operation and Maintenance

Maintain original layout of pollinator habitat(s). Actively manage habitat to avoid establishment of woody plants, herbaceous weeds, and invasive plants. Mow, burn, or reseed as necessary to maintain plant density and vigorous plant growth. BE CAREFUL TO AVOID THE DRIFTING OF HERBICIDES AND PESTICIDES FROM NEARBY FARM OPERATIONS ONTO POLLINATOR HABITAT(S) AS THESE ARE OFTEN TOXIC OR HARMFUL TO THE POLLINATORS USING THE HABITAT(S).

List additional requirements:

Additional Specification or Details

Installation shall be in accordance with the specified drawings, specifications, and special requirements. **No changes are to be made in the drawings or specifications without prior approval from the technical specialist developing the plan.**