

INTRODUCTION

Pollinators perform key roles in natural ecosystems and agricultural production systems. They help plants reproduce, which in turn maintains the plant communities that support wildlife, prevent erosion, and keep waterways clean and cool. More than two-thirds of the world's crop species are dependent on pollinators, with an estimated annual value of \$18 to \$27 billion in the U.S. alone. Apple, watermelon, and pumpkin are just a few examples of pollinator-dependent crops grown in Delaware.

SELECTING A MIX

The Delaware pollinator wildflower mixes were developed with consideration of species benefits, adaptability, diversity, persistence, and cost. The mixes contain a high proportion of wildflowers to grasses, usually in the range of 75 to 90 percent wildflowers. The mixes contain species that provide nectar and pollen throughout the growing season. Grasses included in the wildflower mixes, typically warm-season bunch grasses, are suitable for sites with low fertility and are relatively non-competitive in a wildflower mix. Selection of an appropriate mix of wildflowers should be based on site conditions.

ESTABLISHMENT

Excellent site preparation, proper planting techniques, and careful follow up management of annual weeds are the most important steps to ensure successful establishment of pollinator habitat. Perennial and annual weeds should be controlled prior to planting, usually by herbicide treatment. Sites with extensive weed problems may require additional time to control weeds before planting.

The majority of wildflowers in native pollinator mixes are perennial species that take a season or more to establish before flowering, and some species may take up to 3 years to become fully established. Therefore, especially during the first year after planting, it is important to protect the planting from being shaded out by weeds. During wildflower establishment, annual weeds need to be controlled by periodic mowing at a height of 8 inches or more **before they go to flower** during the growing season.



LONG-TERM MANAGEMENT

Once established, most stands need occasional treatments of mowing, disking, or prescribed burning every 2 to 3 years to keep trees and shrubs from invading. Treating only one-third of the planting in any one year will provide year-round wildlife food and cover. Targeted herbicide application may also be used alone or in combination with other methods to control perennial grasses, isolated noxious weeds, and woody vegetation.

The best time to implement management activities on wildflower stands is in early fall – the optimum time for germination and seedling development of perennial wildflowers, and also the time of year when control of perennial warm-season grasses and woody vegetation is most effective. Management activities should be conducted on an as-needed basis to achieve desired objectives. For optimum wildlife habitat, all management practices should be conducted outside of the primary nesting season for birds and ground-nesting wildlife (April 15 – August 15).

INSTRUCTIONS

The following schedule provides instructions for establishing, maintaining, and managing stands of native wildflowers for pollinators. Using proper planting and management techniques will significantly improve plant health, reduce weed problems, and increase the likelihood of success.

ESTABLISHMENT AND MAINTENANCE PLAN FOR HERBACEOUS POLLINATOR PLANTINGS

SITE PREPARATION AND PLANTING

Site Preparation

Site Without Existing Vegetation

- Site preparation not required (recently cropped, with no likelihood of aggressive weed problems).
- Site has history of noxious or aggressive weeds. Treat weeds with herbicide application/s.
- Site has history of erosion and/or aggressive weed growth. Plant a cover crop of buckwheat (for summer cover) or oats (for winter cover) to control erosion or suppress weed growth.

Site With Existing Vegetation – Mow or brush-hog the site and treat using the following method:

Herbicide Treatment – Begin mowing and herbicide application in early spring and repeat in spring, summer, and fall or whenever emerging weed seedlings reach 4 – 6 inches. Allow some regrowth of vegetation through thatch after mowing, then use an herbicide with low persistence (e.g., glyphosate) to kill existing vegetation. Wait a minimum of 72 hours after the last herbicide treatment before planting. If the existing vegetation is well-established dense turf or a weedy pasture, additional site preparation may be needed. Contact your local Agricultural Service Center to discuss alternative methods of site preparation.

Planting

Pollinator Seed Mix – Select an appropriate seed mix based on site characteristics from the Delaware Pollinator Wildflower Seed Mixes on pages 6 and 7. If a species or cultivar is not available, or to create a custom seed mix, contact your local Agricultural Service Center to discuss alternatives.

- Delaware Dry Site Pollinator Seed Mix
- Delaware Wet Site Pollinator Seed Mix
- Custom Pollinator Seed Mix
- Transplants

Transplants may be preferred when seed is not available, weed pressure is high, or a particular species is difficult to establish from by seed. Transplanting is usually most cost-effective when using plug plants.

Record transplants:

Nurse Crop – Use a nurse crop if needed for erosion control or weed suppression. For a spring planting of the pollinator mix, use oats as a nurse crop at the time of planting at a rate of 20 lb/ac. For a fall dormant planting of the pollinator mix, plant oats at a rate of 20 lb/ac during Sept 1 – Oct 15, then drill the pollinator mix into the oats during the dormant planting period, as listed below. Note: Oats may winter kill.

Planting Dates – Use the appropriate planting dates based on your plant hardiness zone. For seeding wildflower mixes, a fall dormant planting of mainly perennial species is recommended.

Plant Hardiness Zone 7a and 7b

- Fall Dormant Planting: Dec 1 – Dec 31 (recommended)
- Spring Planting: Feb 15 – May 31

ESTABLISHMENT AND MAINTENANCE PLAN FOR HERBACEOUS POLLINATOR PLANTINGS

Planting Method –Recommended planting methods are site-specific. Factors such as equipment availability should be taken in to consideration. Pre-project site conditions, especially weed competition, should be addressed prior to planting. Seeding wildflowers requires **excellent** site preparation to reduce weed pressure since weed control options are limited once wildflowers start to germinate.

Grain drills, unlike native seed drills, are not designed to handle wildflower seeds due to the high variability in seed sizes found within wildflower mixes. However, with simple modifications, most types of broadcast seeders, grass-seed planters, or granulated fertilizer spreaders can be used with good results. **Newly planted areas should be clearly marked to protect them from herbicide or other disturbances.**

- Dropseeder.** Seed of similar sizes can be mixed and bulked up with an inert carrier (two to three parts bulking agent--such as fine vermiculite or fine cracked corn--for each part seed by volume). Begin planting with the drop gate set to the narrowest opening. Very large seed can be planted separately with the drop gate set to a wider opening. During planting, check periodically to make sure the seed stays well mixed with the bulking agent. Maximize seed-soil contact using a cultipacker, ring roller, or lawn roller.
- Broadcast seeding.** Hand or machine broadcast onto a firm seedbed and maximize seed-soil contact using a cultipacker, ring roller, or lawn roller.
- No-till planting with a native seed drill** into low/little residue or a clean seed bed.
- No-till planting with a native seed drill** into heavy residue or a spring cover crop. If the cover crop is tall or thick, mow it prior to planting. The cover crop may also be “burned down” with an herbicide prior to planting.

NOTE: Do not apply nitrogen because it is not needed and will only promote weed growth.

WEED CONTROL DURING ESTABLISHMENT

First Planting Year

In the **first** growing season after seed germination, it is very important to ensure that the wildflower seedlings do not get shaded out by weeds. Weeds are typically controlled by mowing, and in some cases by herbicide treatment, as follows:

- Mow the planting as needed during the summer months to control weeds and keep them from flowering. Mow at a height of 8 inches, or just above wildflower seedling height, but at a height that will clip off flower buds on the existing weeds. Do not let weeds get taller than 18 inches, at which point they may shade out the wildflower seedlings. **Do not let weeds set seed.** Nesting season restrictions on mowing do not apply during the first year of establishment but are applicable in subsequent years.
- Herbicides can be used to control weeds where application can be targeted in a way that does not kill the seeded wildflowers such as spot treatments or herbicides that selectively control grasses. Herbicide application may be useful for treating dense clumps of weeds, or where weeds are significantly taller than the wildflowers. Herbicides can be applied in a targeted manner with a backpack sprayer or a wick-bar applicator. Most wildflowers are susceptible to broadleaf herbicides (e.g., 2,4-D), so they should not be used in a wildflower planting **except as needed for spot treatment.** Be sure to read and follow herbicide label instructions. Contact your local weed control specialist for more information on herbicide application.

Second and Third Year after Planting

By the second growing season, the wildflowers should be fairly well established. If unwanted cool-season grasses or weeds comprise more than 50 percent of the stand, either treat with an appropriate herbicide or mow the area as necessary at the appropriate height to prevent them from going to seed. Annual weeds become less of a problem as perennial plants establish and discourage germination. **NOTE:** If using a herbicide that selectively control grasses to control unwanted non-native grasses, native grasses will likely be significantly reduced and may need to be inter-seeded back into the habitat area after the herbicide treatment.

ESTABLISHMENT AND MAINTENANCE PLAN FOR HERBACEOUS POLLINATOR PLANTINGS

LONG-TERM MANAGEMENT (OPERATION AND MAINTENANCE)

Weed Control

Wildflower plantings require periodic maintenance to control noxious and invasive weeds and prevent succession of woody vegetation. Control of noxious weeds (specifically, johnsongrass, Canada thistle, burcucumber, giant ragweed, Texas panicum, and Palmer amaranth) is required by state law.

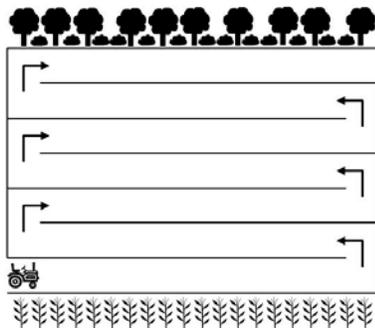
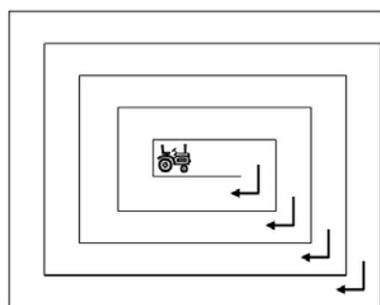
Control noxious weeds and other invasive plants by spot treatment using mechanical methods or approved herbicides. If it becomes necessary to control noxious weeds during the nesting season, contact your local Cooperative Extension office concerning recommendations for spot-treating the weed problem.

Control of Woody Growth

Methods to control woody growth in wildflower plantings include mowing, targeted herbicide treatment, and prescribed burning. Mowing is the most common method because of access to equipment. Herbicide treatment is a common and effective method of controlling brush, but care must be taken not to kill the wildflowers. Prescribed burning is probably the best method for controlling woody vegetation in a wildflower planting, but is not always a viable alternative because of issues with permits and availability of trained fire crew. Larger woody plant may need to be controlled or removed using weed wrenches or girdling.

Mowing

- Mow as needed, but preferably on a 2 to 3 year rotation, mowing only 1/3 to 1/2 of the planting each year. The remaining unmowed areas will provide year-round wildlife food and cover.
- Mowing in late summer or early fall, prior to leaves turning color, is most effective for controlling woody growth, because mowing at this time prevents woody vegetation from translocating nutrient reserves to their roots. Mowing in the non-flowering season (usually December – March) allows for use of late season flowers by pollinators and other insects, but is less effective at controlling woody vegetation.
- Do not mow during the primary nesting season (April 15 – August 15). Spot mowing of clumps of weeds may be required during the flowering season, but should only be conducted when necessary.



- Mow in a manner that will provide escape routes for wildlife at the time of mowing, such as mowing from the inside out (left), or mowing from the field side to the woods edge (right).
- Do not mow for cosmetic purposes.

ESTABLISHMENT AND MAINTENANCE PLAN FOR HERBACEOUS POLLINATOR PLANTINGS

Targeted Herbicide Application

Herbicide treatment is a common and effective method for controlling woody vegetation. However, because wildflowers are susceptible to most herbicides that control broadleaf plants, the use of herbicides in wildflower plantings should only be used in a targeted method that limits wildflower exposure to the herbicide. Methods vary depending on the type, size, and age of the target species, and the size of the treatment area.

Below are some general recommendations on the use of herbicides for woody vegetation control. For more specific information, contact your local Delaware Cooperative Extension.

- Small areas of woody vegetation can be treated using basal bark, foliar spray, or cut-surface treatment methods in which the herbicide is applied with portable sprayers and hand tools.
- Large areas of woody vegetation will likely require foliar application of a systemic herbicide using a wick bar applicator. Systemic herbicides (e.g., 2,4-D, glyphosate, and triclopyr) are absorbed by the plant and translocated to the roots. Woody vegetation may need to be mowed and allowed to re-grow to enable effective application of herbicide to foliar surfaces.
- Application of systemic herbicides in late summer or early fall, prior to leaf-drop, is typically more effective because the herbicide will be translocated to the roots.
- Check the pesticide label to determine the types of plants that are controlled or damaged by the herbicide.
- Always read and follow the pesticide label when applying herbicides.

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DELAWARE POLLINATOR WILDFLOWER SEED MIXES

The following Delaware pollinator seed mixes are formulated for a 1-acre planting area at a seeding rate of approximately 60 seeds per ft². Grasses should not compose more than 20 percent of the mix (based on seeds per ft², not on weight). The following factors were considered when compiling these seed mixes: 1) benefits to pollinators, 2) price, and 3) commercial availability. Therefore, some plants which greatly benefit pollinators are listed in low amounts (due to high seed prices) or not listed (due to lack of availability).

Delaware Dry Site Seed Mix

The species composition of this mix is appropriate for excessively-drained to well-drained soils.

Scientific Name		% by Seed ¹	Approx. lb/acre for each species ²	Life cycle ³	Legume	Flowering Period											
						M	A	M	J	J	A	S	O	N			
Tall White Beardtongue	<i>Penstemon digitalis</i>	5.0%	0.33	P	N												
Virginia Spiderwort	<i>Tradescantia virginiana</i>	1.0%	0.15	P	N												
Butterfly Milkweed	<i>Asclepias tuberosa</i>	0.5%	0.19	P	N												
Common Milkweed	<i>Asclepias syriaca</i>	0.5%	0.19	P	N												
Dotted Mint	<i>Monarda punctata</i>	14.0%	0.25	P	N												
Lanceleaf Coreopsis	<i>Coreopsis lanceolata</i>	14.0%	0.19	P	N												
Partridge Pea	<i>Chamaecrista fasciculata</i>	5.0%	2.01	A	Y												
Wild Bergamot	<i>Monarda fistulosa</i>	10.0%	0.21	P	N												
Virginia Mountain Mint	<i>Pycnanthemum virginianum</i>	12.0%	0.08	P	N												
Dense Blazingstar	<i>Liatris spicata</i>	1.0%	0.26	P	N												
Heath Aster	<i>Symphotrichum pilosum</i>	5.0%	0.19	P	N												
New England Aster	<i>Symphotrichum novae-angliae</i>	8.0%	0.19	P	N												
Wrinkleleaf Goldenrod	<i>Solidago rugosa</i>	4.0%	0.10	P	N												
Purpletop	<i>Tridens flavus</i>	5.0%	0.28	P	N												
Broomsedge	<i>Andropogon virginicus</i>	5.0%	0.16	P	N												
Little Bluestem	<i>Schizachyrium scoparium</i>	10.0%	1.82	P	N												
Totals		100%	6.59														

Notes for Mixes

1 – Composition of this seed mix is calculated based on seeds per square foot, not percent by weight.

2 – Pounds per acre will vary significantly because of both the percent composition (seeds per square foot) and the wide variation in seed size.

3 – Life cycle categories include: P – Perennial; B – Biennial; A – Annual

Alternative native species may be substituted for species due to desirability or lack of availability. When possible, select an alternative that has flowering period that is similar to the species for which it is being substituted. To create a custom mix use the Xerces Society Seed Mix Calculator, available at <http://www.xerces.org/wp-content/uploads/2009/11/XERCES-SEED-MIX-CALCULATOR.xls>

DELAWARE POLLINATOR WILDFLOWER SEED MIXES

Delaware Wet Site Seed Mix

The species composition of this mix is appropriate for a range of soil moisture conditions from well-drained to somewhat poorly drained.

Scientific Name	Common Name	% by Seed ¹	Approx. lb/acre for each species ²	Duration ³	Legume	Flowering Period											
						M	A	M	J	J	A	S	O	N			
Golden Alexanders	<i>Zizia aurea</i>	1.0%	0.15	P	N		■	■	■								
Tall White Beardtongue	<i>Penstemon digitalis</i>	2.5%	0.16	P	N												
Virginia Spiderwort	<i>Tradescantia virginiana</i>	1.0%	0.15	P	N		■	■	■	■							
Bigleaf Mountain Mint	<i>Pycnanthemum muticum</i>	8.0%	0.04	P	N												
Common Boneset	<i>Eupatorium perfoliatum</i>	10.0%	0.09	P	N												
Common Milkweed	<i>Asclepias syriaca</i>	0.5%	0.19	P	N				■	■	■						
Culver's Root	<i>Veronicastrum virginicum</i>	5.0%	0.02	P	N				■	■	■						
Dense Blazing Star	<i>Liatris spicata</i>	1.0%	0.26	P	N					■	■	■					
Great Blue Lobelia	<i>Lobelia siphilitica</i>	10.0%	0.03	P	N						■	■					
Partridge Pea	<i>Chamaecrista fasciculata</i>	4.0%	1.61	A	Y				■	■	■						
Swamp Milkweed	<i>Asclepias incarnata</i>	1.0%	0.37	P	N				■	■	■						
Wild Bergamot	<i>Monarda fistulosa</i>	7.0%	0.14	P	N					■	■	■					
Narrowleaf Sunflower	<i>Helianthus angustifolius</i>	3.0%	0.08	P	N						■	■	■				
New England Aster	<i>Symphotrichum novae-angliae</i>	4.0%	0.10	P	N						■	■	■				
New York Ironweed	<i>Verona noveboracensis</i>	1.0%	0.09	P	N						■	■	■				
Showy Tickseed	<i>Bidens aristosa</i>	5.0%	0.08	A	N						■	■	■				
Sneezeweed	<i>Helenium autumnale</i>	5.0%	0.08	P	N						■	■	■				
Wrinkleleaf Goldenrod	<i>Solidago rugosa</i>	3.0%	0.08	P	N						■	■	■				
Blue Vervain	<i>Verbena hastata</i>	8.0%	0.14	P	N						■	■	■	■			
Broomsedge	<i>Andropogon virginicus</i>	5.0%	0.16	P	N												
Little Bluestem	<i>Schizachyrium scoparium</i>	4.0%	0.73	P	N												
Fox Sedge	<i>Carex vulpinoidea</i>	5.0%	0.56	P	N												
Purpletop	<i>Tridens flavus</i>	6.0%	0.34	P	N												
Totals		100%	5.65														

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