



THE XERCES SOCIETY
FOR INVERTEBRATE CONSERVATION



Natural
Resources
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United States
Department of
Agriculture



Conservation Cover (327) for Pollinators

New Jersey

Installation Guide and Job Sheet



September 2013

The Xerces Society for
Invertebrate Conservation

www.xerces.org

Photo: Bumble bee on Virginia Spiderwort, Jolie Goldenetz Dollar, Xerces Society

Acknowledgements

This guide was written by Mace Vaughan, Eric Mader, Jessa Guisse, Jolie Goldenetz-Dollar, Brianna Borders, and Kelly Gill of the Xerces Society for Invertebrate Conservation and Rachael Winfree and Molly MacLeod of Rutgers University Department of Ecology, Evolution and Natural Resources. The authors would like to thank Hank Henry (USDA NRCS East National Technology Support Center) and Paul Salon (NRCS Big Flats Plant Materials Center). We also thank Tim Dunne, Betsy Clarke, Evan Madlinger, and Chris Miller for their review of this document and support of pollinator conservation work in New Jersey. Please contact Mace Vaughan (mace@xerces.org) to improve this publication.

Financial support to the Xerces Society for the development of this guide was provided by an NRCS Conservation Innovation Grant awarded to Rutgers University, the CS Fund, the Turner Foundation, the Disney Worldwide Conservation Fund, the Aveda Earth Fund, the Sarah K. de Coizart Article TENTH Perpetual Charitable Trust, the SeaWorld and Busch Gardens Conservation Fund, the Wildwood Foundation, and Xerces Society members.



(Photo: Mace Vaughan, Xerces Society)

The Xerces Society for Invertebrate Conservation

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Conservation Cover for Pollinators: New Jersey Installation Guide

Purpose

These instructions provide in-depth guidance on how to install nectar and pollen habitat for bees in the form of wildflower meadow plantings. To plan a specific project, use this guide with the Practice Installation Job Sheet found at the end of this document.

Client Conservation Objectives

Depending on landowner objectives and project design, pollinator habitat may also provide food and cover for other wildlife, reduce soil erosion, protect water quality, and attract other beneficial insects such as predators and parasitoids of crop pests.

Key Site Characteristics

Site selection for pollinator habitat should take the following into consideration:

- **Pesticide Drift:** Habitat must be protected from pesticides (especially insecticides and bee-toxic fungicides and herbicides). Only sites with no to very low risk for pesticide drift should be established as new habitat. This includes some pesticides approved for use on organic farms.
 - **Accessibility:** New habitat should be accessible to equipment for planting and maintenance operations.
 - **Sunlight:** Most wildflowers and native shrubs grow best in full sunlight.
 - **Slope:** Steep or highly erodible sites should not be disturbed. For re-vegetating such sites, consider Critical Area Planting (342) or other suitable Practice Standards.
 - **Weed Pressure:** Areas with high weed pressure will take more time and effort to prepare for planting. It is also important to note the primary weed species composition. Knowing the most abundant weed species on site, their reproductive methods, and whether they are grass or broadleaf, perennial or annual, and woody or herbaceous will help significantly in planning for site preparation and follow up weed management during establishment.
 - **Site History:** Factors such as past plant cover (e.g., weeds, crops, grass sod, and/or native plants), use of pre-emergent herbicides or other chemicals, and soil compaction can affect plant establishment. It is also important to know if sites may have poor drainage, or may flood, as such conditions make habitat establishment more difficult and require a plant mix adapted to the site.
 - **Soils and Habitat:** Most plants listed in the Appendix of this guide are tolerant of many soil conditions and types, however all plants establish better when matched with appropriate conditions.
 - **Irrigation:** To establish plants from plugs, pots, or bare root will require irrigation. Irrigation is generally not needed for plantings established from seed.
 - **Other Functions:** The site may offer opportunities to serve other functions, such as run-off prevention, stream bank stabilization, wildlife habitat, or windbreaks. Those factors can influence plant choice and/or design.
-

Plant Selection

Native Plants: Plant species selection should be limited to plants providing pollen- and nectar-rich forage resources for bees. The inclusion of warm-season bunch grasses is appropriate at a low percentage of the mix by seed per square foot (e.g., 25% or less), but may limit options for use of grass selective herbicides if grass weeds are a primary concern. The Appendix provides example seed mixes for dry and wet sites, and a master list of acceptable plants for various locations and/or environments in New Jersey.

If you are designing a custom plant list, individual species should be chosen so that there are consistent and adequate floral resources throughout the seasons. In order to achieve this goal, a minimum of three species from each blooming period (early, mid and late season), should be in-

cluded. Plant mix composition (i.e., percent of each species) can be designed to complement adjacent crop bloom time or other abundant species in the landscape, with more plants blooming immediately before and after adjacent crops.

Non-Native Plants: Plant selection should focus on pollen and nectar rich native plants, but non-invasive, non-native plants may be used when cost and/or availability are limiting factors. Please see the Appendix for acceptable non-native plants. Non-native plants such as buckwheat or clover, may be planted as part of a crop rotation or in a perennial crop understory using the Cover Crop Practice Standard (340), to increase the value of crop fields to pollinators.

Alternate Pest or Disease Hosts: In most cases, native pollinator plants do not serve as alternate hosts for crop pests

or diseases, but selected plants should be cross-referenced for specific crop pest or disease associations. Research indi-

cates that weedy borders harbor more pests than are found in diverse native plantings.

Site 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 more than one season of effort to reduce competition from invasive, noxious, or undesirable non-native plants prior to planting. *In particular, site preparation should focus on the removal of perennial weeds* (there are more options to address annual or biennial weeds after planting). Regardless of whether the objective is to establish herbaceous or woody vegetation, more effort and time spent eradicating undesirable plants prior to planting will result in higher success rates in establishing the targeted plant community. Site preparation methods and instructions are provided in **Table 1**.

Note: If weed pressure is high, then the weed abatement strategies detailed in **Table 1** should be repeated for an additional growing season. High weed pressure conditions are characterized by:

- Persistent year-round cover of undesirable plants (covering the entire surface of the site);
- Sites where weeds have been actively growing (and producing seed) for multiple years;
- Sites dominated by introduced sod-forming grasses and rhizomatous forbs (e.g., Canada thistle).

Previous cropped lands (those that have been cultivated for several years) are generally lower in weed pressure.



(Photos: Brianna Borders, Xerces Society)

Figure 1. The site on the left was prepared with a single glyphosate treatment, leaving a significant stubble layer and un-killed weedy grasses. It is not ready for planting. The site on the right was treated for an entire growing season with repeated glyphosate treatments (applied whenever new weeds appeared). The stubble has been removed with a flail mower and it is ready for planting. Neither site has been cultivated.

Table 1. Site Preparation Methods

METHOD: NON-SELECTIVE (NON-PERSISTENT) HERBICIDE	
Where to Use <ul style="list-style-type: none"> • Conventional farms and organic farms* • Areas with a low risk of erosion • Areas accessible to sprayer 	Timing <ul style="list-style-type: none"> • Total time: 6+ months • Begin: Early spring after the first weed growth • Plant: fall
Basic Instructions: <ol style="list-style-type: none"> 1. Mow existing thatch as needed before beginning herbicide treatments to expose new weed growth to the herbicide spray. 2. Apply a non-selective, non-persistent herbicide as per label as soon as weeds are actively growing in the early spring. 3. Repeat herbicide applications throughout the spring, summer, and early fall, as needed (whenever emerging weed seedlings reach 4 – 6 inches). 4. For any herbicide-resistant weeds, mow the area to prevent flowering and seed development as necessary. Spot-treat resistant weeds with a more effective herbicide, if available. 5. Plant pollinator seed mix (and any transplants) in the fall, waiting at least 72 hours after the last herbicide treatment. Refer to the Planting Methods section of this document for specific recommendations. <p><i>NOTE: Do not till. Avoid any ground disturbance that may bring up additional weed seed. An additional year of site preparation is recommended if weed pressure is particularly high. Avoid use of herbicides that are bee-toxic (e.g., Paraquat and Gramoxone).</i></p> <p><i>*Choice of herbicide must be acceptable to OMRI for organic operations or, if not, used outside of certified ground AND approved by an organic certifier.</i></p>	
METHOD: SOLARIZATION	
Where to Use <ul style="list-style-type: none"> • Organic and conventional farms • Areas with a low risk of erosion • Areas accessible to mowing equipment • Locations with full sun 	Timing <ul style="list-style-type: none"> • Total time: 6+ months • Begin: spring • Plant: fall
Basic Instructions: <ol style="list-style-type: none"> 1. Mow, rake or lightly harrow and smooth the site in the spring (raking off debris, if necessary). 2. After smoothing the site, lay UV stabilized plastic (such as high tunnel plastic) burying the edges to prevent airflow between the plastic and the ground. Weigh down the center of the plastic if necessary to prevent the wind from lifting it. Use greenhouse repair tape for any rips that occur during the season. 3. Remove the plastic in early-fall before the weather cools and the area beneath the plastic is recolonized by nearby rhizomatous weeds. 4. Immediately plant the pollinator seed mix. Refer to Planting Methods section of this document for specific bed preparation recommendations. <p><i>NOTE: Solarization may not be as effective in years when summer sun or high temperatures are limited. Do not till. Avoid any ground disturbance that may bring up additional weed seed. An additional year of site preparation is recommended if weed pressure is particularly high.</i></p>	

Planting Methods

Recommended planting methods are site-specific. Pre-project site conditions, especially weed competition, may affect planting success and should be addressed prior to planting. Factors such as equipment availability, weed pressure, and cost should be taken into consideration when choosing a planting method. Installing and maintaining habitat should fit into general farm-management practices as much as possible.

Seeding Wildflowers: Planting seeds, rather than plugs, can be a less expensive way to establish wildflowers. Seeding requires **excellent** site preparation to reduce weed pressure because weed control options are limited when the wildflowers start to germinate. **Seed of most native perennial wildflowers are best planted in late fall.**

If possible, seed should be ordered in individual lots, not as a mix. Individual lots help ensure that all species are accounted for and, because size of wildflower seed varies dra-

matically, seed separated by species gives you the greatest flexibility in planting method. For example, native seed drills have hoppers to accommodate seed of different sizes, and even when broadcasting seed it is useful to divide the seed into batches of small and large seed.

Grain drills, unlike native seed drills, are usually not designed to handle the wide variation in wildflower seed size. However, with simple modifications most types of grass-seed planters or granulated fertilizer spreaders can be used with good results, especially if you plant small seeds at one setting (gate opening) and large seeds at another. **Table 2** outlines several possible seeding methods, including broadcast seeding, drills and the use of transplants.

Newly planted areas should be clearly marked to protect them from herbicides or other disturbances.

Table 2. Methods for Planting Wildflower Seed

METHOD: BROADCAST SEEDERS OR HAND BROADCASTING (THROWING SEED)	
<p>Pros</p> <ul style="list-style-type: none"> • Inexpensive • Easy to use • Can often accommodate poorly cleaned seed • Many models and sizes of broadcasters are commonly available, including hand-held crank and larger tractor or ATV-mounted models 	<p>Cons</p> <ul style="list-style-type: none"> • Requires a smooth seed bed • Seed should be pressed into the soil after planting • Difficult to calibrate • Some models of broadcast seeders cannot accommodate large seeds
<p>Basic Instructions:</p> <p>Remove as much stubble as possible prior to seeding, creating a smooth, lightly-packed seedbed. The soil surface can be lightly hand-raked or harrowed to break-up crusted surfaces, but do not cultivate the site (cultivation will bring up additional weed seed).</p> <p>Seeds of similar sizes can be mixed together and bulked up with an inert carrier ingredient such as sand, fine-grained vermiculite, clay-based kitty litter, gypsum, or polenta (fine cornmeal). Use two to three parts bulking agent for each part seed by volume. These inert carriers ensure even seed distribution in the mix, visual feedback on where seed has been thrown, and make calibration easier.</p> <p>The broadcast seeding equipment used should have a flow gate that closes down small enough to provide a slow, steady flow of your smallest wildflower seed. Models with an internal agitator are also preferred. Planting should begin with the flow gate set to the narrowest opening, to allow at least two perpendicular passes over the seed bed for even distribution. Very large seed can be planted separately with the flow gate set to a wider opening.</p> <p>For small sites (e.g. less than 1 to 2 acres), seed can also be hand broadcast (similar to scattering poultry feed). When hand broadcasting, divide the seed into at least two batches, bulk the seed mix with an inert carrier, and sow each batch separately (scatter the first batch evenly over the site while walking in perpendicular passes across the site, and then walk in passes perpendicular to the previous passes to scatter the second batch) to ensure seed is evenly distributed.</p> <p>Regardless of how it is broadcast, do not cover the seed with soil after planting. A water-filled turf grass roller (available for rent at most hardware stores) or a cultipacker should be used to press the seed into the soil surface. Natural precipitation or light overhead irrigation can also help ensure good seed-soil contact. Floating row-cover can be used if necessary to protect seeds and small seedlings against predation.</p>	

Table 2. Methods for Planting Wildflower Seed (Cont.)

METHOD: DROP SEEDERS OR FERTILIZER SPREADERS (DROPPING SEED)	
<p>Pros</p> <ul style="list-style-type: none"> • Inexpensive • Easy to use • Even seed dispersal • Can accommodate both large and small seed • Many models and sizes are commonly available (hand-powered turf grass seeders are most common, but larger tractor-drawn “pasture-seeder” models also exist) 	<p>Cons</p> <ul style="list-style-type: none"> • Requires a smooth, level seed bed • Seed should be pressed into the soil after planting • Hand-powered models are time consuming for large areas (over ½ acre) • Calibration requires trial and error
<p>Basic Instructions:</p> <p>Remove as much stubble as possible prior to seeding, creating a smooth, lightly-packed seedbed. The soil surface can be lightly hand-raked or harrowed to break-up crusted surfaces, but <u>do not cultivate the site</u> (cultivation will bring up additional weed seed).</p> <p>Seed of similar sizes can be mixed together and bulked up with an inert carrier ingredient such as sand, fine-grained vermiculite, clay-based kitty litter, gypsum, or polenta (fine cornmeal). Use two to three parts bulking agent for each part seed by volume. These inert carriers ensure even seed distribution in the mix, visual feedback on where seed has been thrown, and make calibration easier. Planting should begin with the drop gate set to the narrowest opening, to allow at least two perpendicular passes over the seed bed for even distribution. Very large seed can be planted separately with the drop gate set to a wider opening.</p> <p>Do not cover the seed after planting. A water-filled turf grass roller (available for rent at most hardware stores) or a cultipacker should be used to press the seed into the soil surface. Natural precipitation or light overhead irrigation can also help ensure good seed-soil contact. Floating row-cover can be used if necessary to protect seeds and small seedlings against predation.</p>	
METHOD: NATIVE SEED DRILLS (DRILLING SEED)	
<p>Pros</p> <ul style="list-style-type: none"> • Convenient for planting large areas • Seed box agitators and depth controls are designed specifically for planting small and fluffy native seeds at optimal rate and depth • Can plant into a light stubble layer • Seeds are planted in even rows, allowing for easier seedling recognition • Does not require seed to be pressed into soil surface after planting (e.g., cultipacking) 	<p>Cons</p> <ul style="list-style-type: none"> • Expensive and not readily available in some areas • Difficult to calibrate for small areas (less than 1 acre) • Requires a tractor and an experienced operator to set planting controls • Seed with a lot of chaff can clog delivery tubes
<p>Basic Instructions:</p> <p>Plant only when the soil is dry enough to prevent sticking to the coulters. Under wet conditions, small seed is likely to stick to mud-caked parts of the drill, rather than the ground.</p> <p>Keep seed separated by species until ready to plant. Prior to planting, seed should be organized into batches of large smooth seed, small smooth seed, and tufted seed that does not flow easily. Loosely fill seed boxes (do not compact seed into them) with the appropriate seed batch for each box. Seed quantities that do not cover the agitator should be planted using some other method, since the drill is difficult to calibrate for small volumes of seed.</p> <p>As a general rule, the planting depth for a particular seed should be no more than 1.5x its diameter. To achieve this for most wildflower seed, set the depth controls to plant no deeper than ¼ inch (consult with the seed vendor for specific guidelines on very sandy soils). Small wildflower seed should be planted on the soil surface. Stop periodically to check planting depth.</p>	

Table 2. Methods for Planting Wildflower Seed (Cont.)

Operate the drill at less than 5 mph, stopping to check periodically for any clogging of planting tubes (usually observed as a seedbox that is remaining full). Clogging is most common with fluffy seed, or seed with a lot of chaff. Avoid backing up the drill as it will likely cause clogging.

For information on native seed drill calibration, see NRCS publication:

<http://www.plant-materials.nrcs.usda.gov/pubs/mipmctn10591.pdf>

METHOD: TRANSPLANTING FORBS AND WOODY PLANTS

Pros

- Provides mature nectar and pollen resources more quickly
- Does not require specialized planting equipment (except for large trees)
- Preferred for plants with limited seed availability, which are expensive or difficult to establish from seed
- Transplants can be established more easily in weedy sites with adequate mulching

Cons

- Expensive and time consuming for large areas
- Transplants typically require irrigation during establishment

Basic Instructions:

Regular shovels are adequate for transplanting most container stock. However, dibble sticks or mechanical transplanters are sometimes helpful for plug-planting. Power augers and mechanical tree spades can be helpful for larger plants.

Plant size at maturity should be considered when planting. Most woody shrubs can be spaced on 4' – 10' centers (depending upon size at maturity), with most herbaceous plants spaced closer on 2' – 3' centers. It is helpful to measure the planting areas prior to purchasing transplants, and to stage the transplants in the planting area prior to installing them in the ground.

Transplanting can occur any time the ground can be worked, but should be timed to avoid prolonged periods of hot, dry, or windy weather. Regardless of when planting occurs however, the transplants should be irrigated thoroughly immediately after planting. Holes for plants can be dug and pre-irrigated prior to planting as well. Follow-up irrigation is dependent upon weather and specific site conditions, but generally even native and drought tolerant plants should be irrigated with at least 1" of water per week (except during natural rain events), for the first two years after establishment. Long, deep watering is best to encourage deep root system development and shallow irrigation should be avoided. Drip irrigation is useful, and other methods that allow for deep watering can be successful. It is advisable to irrigate at the base of plants and avoid overhead irrigation that would encourage weed growth. Once plants are established, irrigation should be removed or greatly decreased. Non-native plants may require more frequent irrigation, and may still require supplemental irrigation once established.

Most of the plants in the Appendix are adapted to a variety of soil conditions and do not need any specific amendments. However, in areas where the soil is compacted, degraded, or depleted, compost should be used during planting. Compost should be free from weed seeds, aged properly, and mixed thoroughly with soil in the holes during planting.

In cases where rodent damage may occur, below ground wire cages are recommended. Similarly, plant guards may be needed to protect plants from above ground browsing or antler damage by deer. **Newly planted areas should be clearly marked to protect them from herbicides or other disturbances.**

Mulching is recommended to reduce weed competition and to retain moisture during the establishment phase. Recommended materials include wood chips, bark dust, weed-free straw (e.g., rice straw), nut shells, grape-seed pumice, or other regionally appropriate mulch materials that contain **no** viable seeds.

Planting Method Photos



(Photos: Brianna Borders, Xerces Society)

Figure 2. For broadcast seeding, seed of **similar size** is mixed together (left). Sand or another inert carrier is added (at a ratio of at least 2:1) and then mixed (middle left), and the mix is divided into separate batches (middle right) for broadcasting in perpendicular passes over the planting site. When hand-broadcasting seed, walk in perpendicular passes over the entire planting area (right).



(Photos: Brianna Borders, Xerces Society)

(Photo: Regina Hirsch, University of Wisconsin)

Figure 3. Native wildflower seed should be planted directly on the soil surface (left). After broadcasting, roll the site with a cultipacker (middle) or turf roller (right).



(Photos: New Hampshire NRCS)

Figure 4. Hand-crank “belly grinder” type seeders (left) are low cost and can broadcast seed more evenly than hand-scattering on larger sites. Similarly, lawn fertilizer spreaders (right) are another commonly available tool for broadcasting seed. In both cases, models with internal agitators are preferred to prevent clogging. For best results divide the seed into separate batches, grouping seed of similar sizes for planting together with the flow gate adjusted accordingly. It can be difficult to plant very large and very small seed together in a single seed mix using mechanical broadcasters. Use an inert carrier (such as sand) and walk in at least two perpendicular paths to ensure the most even seed distribution possible.

Planting Method Photos



(Photo: Eric Mader, Xerces Society)

Figure 5. Native seed drills are the ideal tool for large planting sites (5+ acres). Typical models can plant in a light stubble layer, have depth controls for optimal seed placement, and have separate seed boxes for different sizes of seed. **Such drills need an experienced operator and careful calibration.**

Maintenance During Establishment (Short-Term)

Weed control is critical in the first and second years after planting. If the site is well prepared, then less effort will be required for weeding after project installation. Maintenance practices must be adequate to control noxious and invasive species and may involve tools such as mowing, burning, hand hoeing, or spot spraying with herbicides.

Weeds should be prevented from going to seed in, or adjacent to, the project area during the first two years (and possibly three) after planting to help ensure long-term success. Familiarity with the life cycle of weeds will facilitate appropriate timing of management activities. Since young wildflower and weed seedlings may look alike, care should be taken to properly identify weeds before removal. Common weed-management strategies include:

Mowing / String Trimming: Mowing or string trimming can be utilized to keep weedy species from shading out other plants, and to prevent them from going to seed. Mowing is especially useful when establishing wildflower plots of perennial species. When planted with perennial seed mixes, sites can be mowed **occasionally (ideally at 8 inches or higher)** during the first year after planting to prevent annual and biennial weeds from flowering and producing seed. Perennial wildflowers are slow to establish from seed, and are usually not harmed by incidental mowing in the first year after planting. Mowing can also be used on plots of re-seeding annuals at the end of the growing season to help

shatter wildflower seedpods, and to reduce woody plant encroachment. Mowing and string trimming can also be useful around woody transplants to manage nearby weeds.

Spot Spraying: Spot spraying with herbicides can be effective, relatively inexpensive, and require minimal labor, even on larger project areas. Ensure that herbicides do not drift or drip onto desirable plant species. Spot spraying is usually performed with backpack spraying, or occasionally with rope-wick implements (when weed growth is substantially taller than newly established wildflowers).

Selective Herbicides: Grass-selective herbicides can be used to control weedy grasses in broadleaf plantings. Contact a local crop advisor or Extension specialist for appropriate herbicide selection and timing.

Managing Irrigation: Most wildflowers established from seed thrive with little or no supplemental irrigation. Keeping irrigation to a minimum helps native wildflowers out-compete non-native weedy species that sometimes have higher soil moisture requirements. Similarly, when irrigation is needed for transplants, it should be supplied at the base of the transplant when possible (through drip irrigation, for example) to avoid watering nearby weeds.

Hand Weeding: Hand-weeding (including hoeing) can be effective in small areas with moderate weed pressure. Hand-weeding will likely be necessary in forb plots to eliminate broadleaf weeds during the first few seasons.



(Photos: Eric Mader, Xerces Society)

Figure 6. Short Term: In the first spring after seeding the previous fall, this planting site is dominated by annual and biennial weeds like wild radish (left). Mowing the site periodically during the first year (ideally at 8 inches or higher) will prevent these short-lived weeds from producing more seed, and allow sunlight to reach the slower-growing natives (right), which are generally unharmed by the occasional mowing.



(Photo: Don Keirstead, New Hampshire NRCS)

Figure 7. Long Term: Flourishing wildflowers and pollinator habitat in year 2 after planting.

Operations and Maintenance (Long-Term)

Control herbivores as needed, but remove tree guards or other materials that could impede plant growth as soon as possible after establishment. In most cases, irrigation can be removed from transplants by the end of the second year after planting. Continue to protect habitat from pesticides and herbicides except when necessary to control noxious or invasive plants. On-going herbicide use (spot-treatment) or occasional hand weeding may be necessary to control noxious weeds. Maintain the long-term plant diversity of pollinator habitat by re-seeding or re-planting as necessary.

Wildflower plantings generally 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. If mowing is used, be sure all equipment is clean and free of weed seed. Do not mow or burn during critical wildlife nesting seasons (consult your state wildlife biologist for specific guidance). After establishment, no more than 30% of the habitat area should be mowed or burned in any one year to ensure sufficient undisturbed refuge areas for pollinators and other wildlife.

Finally, note that some common farm-management practices can cause harm to bees and other beneficial insects. Insecticides are especially problematic, including some insecticides approved for organic farms. Therefore, if insecticide spraying is to occur on the farm, it is critical that the Conservation Cover planting area is outside of the sprayed area and/or protected from application and drift.

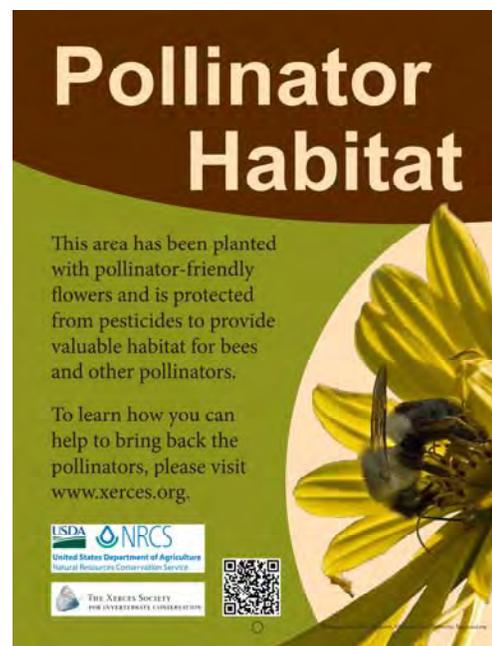


Figure 8. Newly planted areas should be clearly marked to protect them from herbicides or other disturbances. Using signs such as the one on the above can be a useful tool to designate protected pollinator habitat.

Appendix: Example Seed Mixes, Plant Lists, and Resources

The following example seed mixes are formulated for a 1-acre planting area. For larger areas, increase the rate accordingly. To create custom seed mixes, see recommended species master list on page 14 and the references section for a downloadable seed mix calculator. 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 price for seed) or are not listed at all (due to lack of availability). Please see pages 14-16 for a complete list of plants which benefit pollinators.

Table 3. New Jersey Wetland Seed Mix

COMMON NAME	SCIENTIFIC NAME	% OF MIX	SEEDS / FT ²	LBS / ACRE	PRICE* / LB	TOTAL* PRICE	BLOOM TIME
Blackeyed Susan**	<i>Rudbeckia hirta</i>	1.0%	0.60	0.02	\$24.00	\$0.40	Early Bloom
Golden Alexanders	<i>Zizia aurea</i>	1.0%	0.60	0.15	\$180.00	\$27.35	Early Bloom
Tall White Beardtongue	<i>Penstemon digitalis</i>	2.5%	1.50	0.16	\$108.00	\$17.64	Early Bloom
Common Boneset	<i>Eupatorium perfoliatum</i>	10.0%	6.00	0.09	\$220.00	\$19.97	Mid Bloom
Common Milkweed**	<i>Asclepias syriaca</i>	0.5%	0.30	0.19	\$180.00	\$33.60	Mid Bloom
Culver's Root	<i>Veronicastrum virginicum</i>	10.0%	6.00	0.03	\$640.00	\$21.55	Mid Bloom
Dense Blazing Star	<i>Liatris spicata</i>	1.0%	0.60	0.26	\$180.00	\$47.04	Mid Bloom
Great Blue Lobelia**	<i>Lobelia siphilitica</i>	10.0%	6.00	0.03	\$280.00	\$9.43	Mid Bloom
Spotted Joe Pye Weed**	<i>Eupatorium maculatum</i>	4.0%	2.40	0.07	\$240.00	\$17.42	Mid Bloom
Narrowleaf Mountain Mint**	<i>Pycnanthemum tenuifolium</i>	12.0%	7.20	0.05	\$200.00	\$10.45	Mid Bloom
Swamp Milkweed**	<i>Asclepias incarnata</i>	1.0%	0.60	0.37	\$280.00	\$104.54	Mid Bloom
Wild Bergamot	<i>Monarda fistulosa</i>	10.0%	6.00	0.21	\$240.00	\$49.29	Mid Bloom
Blue Vervain**	<i>Verbena hastata</i>	10.0%	6.00	0.18	\$60.00	\$10.54	Late Bloom
Common Sneezeweed	<i>Helenium autumnale</i>	7.0%	4.20	0.12	\$160.00	\$19.99	Late Bloom
New England Aster**	<i>Symphotrichum novae-angliae</i>	4.0%	2.40	0.10	\$280.00	\$26.61	Late Bloom
New York Ironweed	<i>Verona noveboracensis</i>	1.0%	0.60	0.09	\$220.00	\$19.17	Late Bloom
Wingstem	<i>Verbena alternifolia</i>	2.0%	1.20	0.29	\$180.00	\$52.27	Late Bloom
Wrinkleleaf Goldenrod	<i>Solidago rugosa</i>	3.0%	1.80	0.18	\$320.00	\$25.09	Late Bloom
Fox Sedge	<i>Carex vulpinoidea</i>	5.0%	3.00	0.10	\$18.00	\$1.81	
Canada Bluejoint	<i>Calamagrostis canadensis</i>	5.0%	3.00	0.03	\$232.00	\$7.90	-
TOTALS	TOTALS	100%	60	2.81		\$522.06	

* Costs may vary by season and seed producer

** Species recommended by The Winfree Lab of Rutgers University (<http://winfreelab.rutgers.edu>)

Table 4. Coastal Plain Upland Seed Mix

COMMON NAME	SCIENTIFIC NAME	% OF MIX	SEEDS / FT ²	LBS / ACRE	PRICE / LB*	TOTAL PRICE*	BLOOM TIME
Blackeyed Susan**	<i>Rudbeckia hirta</i>	2.0%	1.20	0.03	\$24.00	\$0.80	Early Bloom
Hairy Beardtongue**	<i>Penstemon hirsutus</i>	6.0%	3.60	0.08	\$210.00	\$16.47	Early Bloom
Yellow Wild Indigo	<i>Baptisia tinctoria</i>	0.5%	0.30	0.16	\$440.00	\$71.87	Early Bloom
Butterfly Milkweed**	<i>Asclepias tuberosa</i>	0.5%	0.30	0.19	\$320.00	\$59.74	Mid Bloom
Common Milkweed	<i>Asclepias syriaca</i>	0.5%	0.30	0.19	\$180.00	\$33.60	Mid Bloom
Culver's Root	<i>Veronicastrum virginicum</i>	5.0%	3.00	0.02	\$640.00	\$10.78	Mid Bloom
Dotted Mint	<i>Monarda punctata</i>	12.0%	7.20	0.21	\$180.00	\$38.35	Mid Bloom
Lavender Hyssop	<i>Agastache foeniculum</i>	8.0%	4.80	0.14	\$172.00	\$23.38	Mid Bloom
Partridge Pea	<i>Chamaecrista fasciculata</i>	10.0%	6.00	4.02	\$10.00	\$40.21	Mid Bloom
Rattlesnake Master	<i>Eryngium yuccifolium</i>	0.5%	0.30	0.11	\$180.00	\$18.97	Mid Bloom
Virginia Mountain Mint	<i>Pycnanthemum virginianum</i>	10.0%	6.00	0.07	\$480.00	\$32.40	Mid Bloom
Wild Bergamot	<i>Monarda fistulosa</i>	10.0%	6.00	0.21	\$240.00	\$49.29	Mid Bloom

Table 4. Coastal Plain Upland Seed Mix (Cont.)

COMMON NAME	SCIENTIFIC NAME	% OF MIX	SEEDS / FT ²	LBS / ACRE	PRICE / LB*	TOTAL PRICE*	BLOOM TIME
Maximilian's Sunflower	<i>Helianthus maximiliani</i>	8.0%	4.80	0.97	\$36.00	\$34.80	Mid Bloom
New England Aster**	<i>Symphyotrichum novae-angliae</i>	8.0%	4.80	0.19	\$280.00	\$53.22	Late Bloom
Seaside Goldenrod	<i>Solidago sempervirens</i>	4.0%	2.40	0.15	n/a~	n/a~	Late Bloom
Showy Goldenrod	<i>Solidago speciosa</i>	5.0%	3.00	0.10	\$160.00	\$15.60	Late Bloom
Little Bluestem	<i>Schizachyrium scoparium</i>	10.0%	6.00	1.31	\$25.00	\$32.67	-
TOTALS		100%	60	8.13		\$532.21	

~ n/a (This information not available at time of this writing. Cape May NRCS PMC release of Seaside Goldenrod is in production at Ernst Conservation Seed.)

Table 5. Piedmont / Northern Region Upland Seed Mix

COMMON NAME	SCIENTIFIC NAME	% OF MIX	SEEDS / FT ²	LBS / ACRE	PRICE / LB	TOTAL PRICE	BLOOM TIME
Lance Leaved Coreopsis	<i>Coreopsis lanceolata</i>	15.0%	9.00	1.77	\$14.00	\$24.84	Early Bloom
Ohio Spiderwort	<i>Tradescantia ohiensis</i>	1.0%	0.60	0.02	\$160.00	\$32.67	Early Bloom
Common Milkweed	<i>Asclepias syriaca</i>	1.0%	0.60	0.37	\$180.00	\$67.21	Mid Bloom
Culver's Root	<i>Veronicastrum virginicum</i>	10.0%	6.00	0.03	\$640.00	\$21.55	Mid Bloom
Giant Sunflower	<i>Helianthus giganteus</i>	1.0%	0.60	0.16	\$300.00	\$46.67	Mid Bloom
Joe Pye Weed	<i>Eupatorium purpureum</i>	4.0%	2.40	0.16	\$240.00	\$37.34	Mid Bloom
Lavender Hyssop	<i>Agastache foeniculum</i>	8.0%	4.80	0.14	\$172.00	\$23.38	Mid Bloom
Partridge Pea	<i>Chamaecrista fasciculata</i>	10.0%	6.00	4.02	\$10.00	\$40.21	Mid Bloom
Purple Coneflower	<i>Echinacea purpurea</i>	4.0%	2.40	0.90	\$28.00	\$25.23	Mid Bloom
Virginia Mountain Mint	<i>Pycnanthemum virginianum</i>	10.0%	6.00	0.07	\$480.00	\$32.40	Mid Bloom
Wild Bergamot	<i>Monarda fistulosa</i>	9.0%	5.40	0.18	\$240.00	\$44.36	Mid Bloom
New England Aster**	<i>Symphyotrichum novae-angliae</i>	5.0%	3.00	0.12	\$280.00	\$33.26	Late Bloom
New York Ironweed	<i>Vernonia noveboracensis</i>	2.0%	1.20	0.71	\$220.00	\$38.33	Late Bloom
Showy Goldenrod	<i>Solidago speciosa</i>	10.0%	6.00	0.20	\$160.00	\$31.21	Late Bloom
Little Bluestem	<i>Schizachyrium scoparium</i>	10.0%	6.00	1.31	\$25.00	\$32.67	-
TOTALS		100%	60	9.80		\$531.34	

Master Plant Lists

Recommended Native Wildflowers for Pollinators

COMMON NAME	SCIENTIFIC NAME	LIFE CYCLE †	MATURE HEIGHT	WATER NEEDS	BLOOM COLOR	NOTES
Early Season Blooming Species						
Golden Alexanders	<i>Zizia aurea</i>	P	3 ft	High	Yellow	Adapted to disturbance; spreads by rhizomes
Yellow Wild Indigo	<i>Baptisia tinctoria</i>	P	5 ft	Medium	Yellow	
Wild Lupine	<i>Lupinus perennis</i>	P	2 ft	Low	Blue to Pink	Prefers sandy soil; host for Karner blue butterfly
Early to Mid Season Blooming Species						
Ohio Spiderwort	<i>Tradescantia ohiensis</i>	P	4 ft	Medium	Purple to Blue	
Golden Tickseed	<i>Coreopsis tinctoria</i>	P	3 ft	High	Yellow	
Smooth Penstemon	<i>Penstemon digitalis</i>	P	2 ft	Medium	Purple to Pink	Establishes quickly
Virginia Spiderwort	<i>Tradescantia virginiana</i>	P	2 ft	Medium	Purple to Blue	
Hairy Beardtongue**	<i>Penstemon hirsutus</i>	P	2 ft	Low	Pink to White	

† Life Cycle abbreviations: P = perennial, A = annual, B = biennial

Recommended Native Wildflowers for Pollinators (Cont.)

COMMON NAME	SCIENTIFIC NAME	LIFE † CYCLE	MATURE HEIGHT	WATER NEEDS	BLOOM COLOR	NOTES
Mid Season Blooming Species						
Blue Lobelia**	<i>Lobelia siphilitica</i>	P	3 ft	High	Purple to Blue	Prefers part shade and fertile soil
Butterfly Milkweed**	<i>Asclepias tuberosa</i>	P	3 ft	Low	Red	Prefers sandy soil; host plant for monarch butterfly
Common Milkweed	<i>Asclepias syriaca</i>	P	6 ft	Medium	Pink	Host plant for monarch butterfly
Culver's Root	<i>Veronicastrum virginicum</i>	P	6 ft	High	Purple to White	
Dotted Mint	<i>Monarda punctata</i>	P	3 ft	Medium	Yellow & Purple spots	Prefers sandy soil; establishes quickly
Lavender Hyssop	<i>Agastache foeniculum</i>	P	5 ft	Medium	Purple to Pink	Establishes quickly
Blackeyed Susan**	<i>Rudbeckia hirta</i>	P	3 ft	Medium	Yellow	
Joe Pye Weed	<i>Eupatorium purpureum</i>	P	6 ft	High	Pink	Prefers part shade and fertile soil
Marsh Blazingstar	<i>Liatris spicata</i>	P	5 ft	Medium	Purple	
Narrowleaf Mountainmint**	<i>Pycnanthemum tenuifolium</i>	P	3 ft	Medium	White	
Partridge Pea	<i>Chamaecrista fasciculata</i>	A	2 ft	Low	Yellow	Favors disturbed sites
Purple Coneflower	<i>Echinacea purpurea</i>	P	3 ft	Medium	Purple to Pink	Establishes quickly
Rattlesnake Master	<i>Eryngium yuccifolium</i>	P	6 ft	Low	White to Green	
Smooth Oxeye	<i>Heliopsis helianthoides</i>	P	5 ft	Low	Yellow	
Swamp Milkweed**	<i>Asclepias incarnata</i>	P	5 ft	High	Pink	Host plant for monarch butterfly
Virginia Mountain Mint	<i>Pycnanthemum virginianum</i>	P	3 ft	Medium	White	
Wild Bergamot	<i>Monarda fistulosa</i>	P	4 ft	Medium	Purple to Pink	Establishes quickly
Mid to Late Season Blooming Species						
Boneset	<i>Eupatorium perfoliatum</i>	P	5 ft	High	White	Prefers fertile soil
Bottle Gentian	<i>Gentiana andrewsii</i>	P	2 ft	Medium	Purple to Blue	Not drought tolerant; difficult to establish from seed, establish from transplants
Giant Sunflower	<i>Helianthus giganteus</i>	P	10 ft	Medium	Yellow	
Purple Giant Hyssop	<i>Agastache scrophulariifolia</i>	P	5 ft	Low	Pink to Purple	
Field Thistle	<i>Cirsium discolor</i>	P	6 ft	Medium	Pink	Short-lived; not aggressive
Mistflower	<i>Conoclinium coelostinum</i>	P	2 ft	Medium	Light purple	
Spotted Joe Pye Weed**	<i>Eupatorium maculatum</i>	P	7 ft	High	Pink to Purple	
Yarrow	<i>Achillea millefolium</i>	P	2 ft	Low	White	Very aggressive
Late Season Blooming Species						
Blue Vervain**	<i>Verbena hastata</i>	P	5 ft	High	Purple to Blue	
Calico Aster	<i>Symphotrichum lateriflorum</i>	P	4 ft	Medium	White	Prefers part-shade
Common sunflower	<i>Helianthus annuus</i>	A	9 ft	Medium	Yellow	
Cutleaf Coneflower**	<i>Rudbeckia laciniata</i>	P	8 ft	Low	Yellow	
Gray Goldenrod	<i>Solidago nemoralis</i>	P	2 ft	Medium	Yellow	
New England Aster**	<i>Symphotrichum novae-angliae</i>	P	4 ft	Medium	Purple	
Showy Goldenrod	<i>Solidago speciosa</i>	P	4 ft	Medium	Yellow	
Sneezeweed	<i>Helenium autumnale</i>	P	3 ft	High	Yellow	Prefers fertile soil; toxic to livestock
Stiff Goldenrod**	<i>Oligoneuron rigidum</i>	P	5 ft	Medium	Yellow	

Native Grasses and Sedges for Pollinator Seed Mixes

Note: Grasses and sedges should ideally comprise no more than 25% of seed mixes on pollinator sites.

COMMON NAME	SCIENTIFIC NAME	LIFE CYCLE †	MATURE HEIGHT	WATER NEEDS	NOTES
Big Bluestem	<i>Andropogon gerardii</i>	P	8 ft	Medium	Can be aggressive at high seeding rates
Fox Sedge	<i>Carex vulpinoidea</i>	P	3 ft	High	Tolerates occasional flooding
Indian Grass	<i>Sorghastrum nutans</i>	P	7 ft	Medium	Can be aggressive at high seeding rates
Little Bluestem	<i>Schizachyrium scoparium</i>	P	3 ft	Low	Considered a weed in cranberry bogs
Pennsylvania Sedge	<i>Carex pensylvanica</i>	P	1.5 ft	Medium	Prefers part shade
Tussock Sedge	<i>Carex stricta</i>	P	4 ft	High	Tolerates occasional flooding

Non-Native Plants for Insectary Meadows and Cover Crops

COMMON NAME	SCIENTIFIC NAME	LIFE CYCLE †	MATURE HEIGHT	WATER NEEDS	NOTES
Early Season Blooming Species					
Alsike Clover	<i>Trifolium hybridum</i>	A	2 ft	High	
Crimson Clover	<i>Trifolium incarnatam</i>	A	1.5 ft	Medium	Not freeze tolerant, spring seeded in cold climates
Hairy Vetch	<i>Vicia villosa</i>	A	1.5 ft	Medium	Fall seeded, aggressive at high seeding rates
Lacy Phacelia	<i>Phacelia tanacetifolia</i>	A	2 ft	Low	Not freeze tolerant, spring seeded in cold climates
Early to Mid Season Blooming Species					
Blue Flax	<i>Linum perenne</i>	P	2 ft	Medium	Blue Flax
Lanceleaf Coreopsis	<i>Coreopsis lanceolata</i>	P	2 ft	Medium	
Red Clover	<i>Trifolium repens</i>	P	1 ft	Medium	Aggressive at high seeding rates

Non-Native Plants for Insectary Meadows and Cover Crops

COMMON NAME	SCIENTIFIC NAME	LIFE CYCLE	MATURE HEIGHT	WATER NEEDS	NOTES
Mid Season Blooming Species					
Alfalfa	<i>Medicago sativa</i>	P	2 ft	Medium	Susceptible to frost heaving
Blanketflower	<i>Gaillardia aristata</i>	P	2 ft	Low	
Borage	<i>Borage officinalis</i>	A	1.5 ft	Medium	Not freeze tolerant, spring seeded in cold climates
Buckwheat	<i>Fagopyrum esculentum</i>	A	2 ft	Medium	
Yellow Sweet Clover	<i>Melilotus officinalis</i>	B	5 ft	Medium	
Mid Season Blooming Species					
Cosmos	<i>Cosmos bipinnatus</i>	A	5 ft	Medium	

Regional Native Seed Vendors and Native Plant Nurseries

Inclusion on this list does not constitute an endorsement or a recommendation. Other vendors not listed below may also have suitable plant materials. Before ordering, ensure that all plants or seeds purchased for pollinator habitat are **NOT** treated with systemic insecticides.

Ernst Conservation Seed (Seed and Transplants) • Meadville, PA • 800-873-3321 • www.ernstseed.com

Cicconi Perennial Farm (Transplants Only) • Jackson, NJ • 732-363-1420 • <http://www.cicconifarms.com/>

New Moon Nursery (Transplants Only) • Bridgeton, NJ • 888-998-1951 • <http://www.newmoonnursery.com/>

North Creek Nurseries (Transplants Only) • Landenberg, PA • 610-225-0100 • <http://www.northcreeknurseries.com/>

Pinelands Nursery (Transplants Only) • Columbus, NJ • 609-291-9486 • <http://www.pinelandsnursery.com/>

Rare Find Nursery (Transplants Only) • Jackson, NJ • 732-833-0613 • <http://www.rarefindnursery.com/>

Redbud Native Plant Nursery (Transplants Only) • Glen Mills, PA • 610-358-4300 • <http://www.redbudnativeplantnursery.com/>

Toadshade Wildflower Farm (Seeds and Transplants) • Frenchtown, NJ • 908-996-7500 • <http://www.toadshade.com/>

Resources

New Jersey NRCS Pollinator Conservation Web Portal

You can find more information on the pollinator conservation work of New Jersey NRCS at <http://www.nj.nrcs.usda.gov/programs/whip/Pollinators.html>.

Xerces Society Seed Mix Calculator

Develop your own pollinator conservation seed mix using this seed rate calculator. <http://www.xerces.org/wp-content/uploads/2009/11/XERCES-SEED-MIX-CALCULATOR.xls>

USDA-NRCS Seedling ID Guide for Native Prairie Plants

Many of the plant species recommended in this guide are featured in a series of seedling photos in this downloadable resource. <http://www.plant-materials.nrcs.usda.gov/pubs/mopmcpu6313.pdf>

Bonestroo Prairie Seedling and Seeding Evaluation Guide

Many of the plant species recommended in this guide are featured in a series of seedling photos in this downloadable resource from the Midwest. The publication also includes guidelines for assessing establishment success of seeded native grass and wildflower plots.

Weeds of the Northeast

This PLANTS database collection highlights key weeds of the Northeast with species-level PLANTS profiles. Inclusion on the list is based upon references in multiple weed science publications. www.plants.usda.gov/java/invasiveOne?pubID=NEAST

Directory for Invasive Weeds of the Northeast

This database, compiled by the Penn State Department of Crops and Soil Sciences features links to multi-agency fact sheets and management guidelines for major region weed species. <http://extension.psu.edu/weeds/extension-info/invasive-plants#misc-dicots>

Soil Solarization: A Nonpesticidal Method for Controlling Diseases, Nematodes, and Weeds

This fact sheet, produced by the University of California Cooperative Extension discusses the solarization process, including plastic selection, installation, removal, and underlying principles. http://vric.ucdavis.edu/pdf/soil_solarization.pdf

Seed Quality, Seed Technology, and Drill Calibration

This Washington NRCS Plant Materials Technical Note (no. 7. 2005) features extensive information on calibrating native seed drills, and the use of inert carriers. www.plant-materials.nrcs.usda.gov/pubs/wapmctn6331.pdf

Attracting Native Pollinators: Protecting North America's Bees and Butterflies

This comprehensive book on pollinator conservation includes information about pollinator ecology, guides for identifying common bees, and habitat designs for multiple landscapes. www.xerces.org/announcing-the-publication-of-attracting-native-pollinators/

Pollinator Conservation Resource Center

For additional information on pollinator plant lists, conservation guides, pesticide protection and more. www.xerces.org/pollinator-resource-center

Conservation Cover (327) for Pollinators: New Jersey Practice Installation Job Sheet

Client:	Farm #:	Date:
Field(s):	Tract #:	Planned By:
Client Conservation Objectives:		

Purpose

This Practice Installation Job Sheet documents the process of establishing nectar and pollen habitat for bees in the form of wildflower meadow plantings. Other natural resources may also benefit, depending on your conservation objectives and the integration of this habitat with other conservation practices. Installation shall be in accordance with these requirements and any attached drawings. **No changes are to be made without prior approval from the technical specialist who approved the installation plan.**

For detailed instructions on each step in this Job Sheet, please see the *Conservation Cover (327) for Pollinators Installation Guide: New Jersey*.

Key Site Characteristics

Risk of pesticide drift on site? Low to high Very low to none

Weeds: weed pressure, and primary weed species of concern:

Site history: historic and current plant cover, past use of land, pre-emergent herbicide use, compaction, etc.:

Soils and habitat: soil texture (coarse to fine), drainage, and moisture level:

Irrigation: availability and method (necessary if transplants are to be used):

Other concerns or conservation goals that may affect plant choice or site preparation and planting:

Plant Selection: Wildflower Seed Mix

See the Appendix in the Installation Guide

Coastal Plain Seed Mix Piedmont Seed Mix Wetland Seed Mix Custom Seed Mix

Note any species substitutions here or attach copy of custom seed mix:

Transplants may be preferred when seed is not available, weed pressure is high, or a particular species is difficult to establish by seed. Transplanting can be most cost-effective when using plug plants. Conservation Cover can also include woody plants. See *Hedgerow Planting for Pollinators Installation Guide and Job Sheet: New Jersey* for suggested woody plants.

Note any woody or herbaceous species established from transplants here:

Site Preparation Method

Choose all options that apply and note any adjustments.

- Herbicide Solarization Severe weed pressure?*

* If so, an additional year of site prep or the use of transplants should be considered. See the *Installation Guide*.

Adjustments:

Planting Method

Choose all options that apply and note any adjustments.

- Broadcasting: by machine or hand Native seed drill
 Drop seeding Transplants

Adjustments:

Maintenance During Establishment

Choose all options that apply and note any adjustments.

- Mowing / string-trimming Managing irrigation
 Spot spraying weeds with herbicide Hand weeding and/or hoeing
 Grass Specific or other selective herbicide Other: _____

Adjustments:

Long Term Site Operations and Maintenance

Control herbivores as needed, but remove plant guards or other materials that could impede plant growth as soon as possible after establishment. In most cases, irrigation of transplants is no longer required by the end of the second growing season after planting. Maintain the long-term plant diversity of pollinator habitat by re-seeding or re-planting as necessary.

Finally, after establishment, no more than 30% of the habitat area should be mowed, grazed or burned in any one year to ensure sufficient undisturbed areas for pollinators and other wildlife. Do not mow or burn during critical wildlife nesting seasons (consult your state wildlife biologist for specific guidance). Continue to protect habitat from pesticide applications and drift (especially insecticides and bee-toxic fungicides). Herbicide spot-treatments and hand weeding may be used to control noxious or invasive plants.

Practice Checkout

Amount completed: _____ units. Mark as-built location on plan map and attach photos.

Remarks _____

This practice meets NRCS standards and specifications Yes No

Check out completed by: _____ Date: _____

Certified by: _____ Date: _____