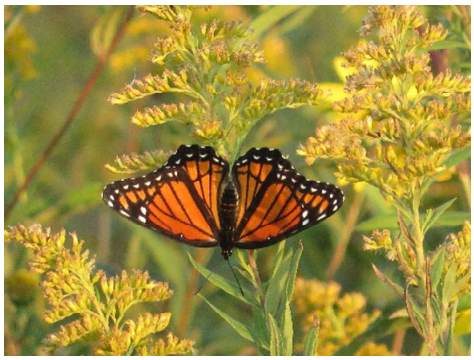
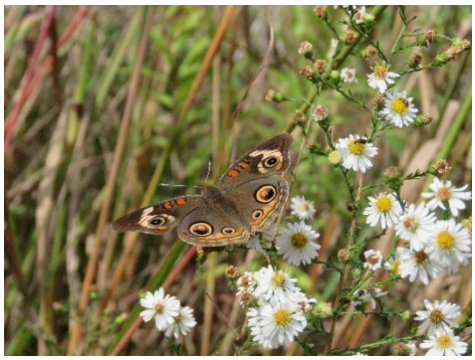
A GUIDE TO ESTABLISHING POLLINATOR HABITAT IN INDIANA





POLLINATOR PARTNERSHIP

Introduction

Pollinator habitat means different things to various people, organizations, and governments. This guide defines pollinator habitat as any planting that includes native wildflowers. Good pollinator habitat should be both diverse and species rich. Establishing pollinator habitat can be time-consuming. Proper site preparation, appropriate planting methods, and science-based plant selection and planting rates are all crucial for successful habitat establishment. If questions arise during the habitat establishment process, a wildlife biologist or local soil and water conservation district office should be consulted.

There are many reasons landowners choose to plant pollinator habitat. Some landowners want to provide habitat to pollinating insects and other wildlife. Some landowners plant habitat to improve the aesthetics of their property. Planting habitat can improve the pollination of crops and even bring in beneficial insects that prey upon crop pests. Pollinator habitat can be used to stop soil erosion or to retire unproductive farmland. It is important to identify the reasons pollinator habitat is being planted at the beginning of the planning process to ensure all landowner objectives are addressed by the plant species and planting rates selected.

Technical Assistance

Consult with a wildlife biologist or other qualified person to help plan pollinator habitat. Organizations and agencies that offer free technical assistance with pollinator habitat planning include, but are not limited to, Pollinator Partnership, the Natural Resources Conservation Service (NRCS), the United States Fish and Wildlife Service (USF&WS), the Indiana Department of Natural Resources (IDNR), Pheasants Forever and Quail Forever Farm Bill Wildlife Biologists, and county soil and water conservation districts (SWCD).

Financial Assistance

The agencies and organizations listed in the technical assistance section have financial assistance available or are familiar with where financial assistance can be applied for. All financial assistance programs have eligibly requirements for both the land and the applicant. Financial assistance is never guaranteed. Work on a project, including material purchases, should not begin if financial assistance is desired until after a contract or agreement is signed. Some programs deem projects that are already started ineligible for funding.

Site Preparation

Seeds and plugs should both be planted into firm, bare soil. **Inadequate site preparation is the primary reason for a failed planting.** If all vegetation in the planting area is not killed prior to planting, the new planting will likely not establish. Many native wildflowers take up to 4 years to advance from a seed to a blooming plant, while some species can take up to 10 years before they bloom. If there is heavy weed pressure in the field do not plant. Instead consult with a wildlife biologist or NRCS District Conservationist on how to proceed. Site preparation may need to continue until the next planting window. Converting farm fields that have been in consistent row crop rotation require the least amount of site preparation effort. Converting lawns, pastures, hayfields, and other areas established to non-native grasses and/or other invasive plants require the most site preparation effort. Preparing sites that often flood or pond can be difficult. Every time a site floods, new unwanted plant seeds are deposited on the site.

- Do not apply any fertilizers or other nutrients to the planting area. Adding nutrients will encourage unwanted plants and provide no benefit for the native plants that will be planted.
- Tillage is not recommended as part of site preparation. Tillage can encourage a significant flush of plants that can outcompete new plantings. If the area is tilled, a cultipacker or lawn roller should be used to break-up soil

clods and make the ground firm prior to planting. Following packing, the field should be allowed to green-up and then be sprayed or solarized.

- Preparing areas to plant native grasses and wildflowers generally takes a minimum of a full year.
- Herbicide and solarization are the most effective site preparation methods.
- Site preparation methods such as occultation (covering with black plastic), repeated tillage, smother cropping, or a combination of these methods can result in a properly prepared seedbed but can take several years to be effective.
- The process for effective herbicide applications and effective solarization are outlined below.

Herbicide Applications

- Read the entire herbicide label and follow all instructions specified by it. The label is the law. Misuse of an herbicide is a violation of federal and state laws.
- It is recommended that a certified pesticide applicator is hired to apply herbicide.
- Factors like temperature, rain, and wind can affect the success of the treatment and the likelihood of impacting non-target plants.
- Water chemistry can impact the effectiveness of herbicide. Be sure to test water hardness when mixing water with herbicide. Excessively hard water may require the addition of ammonium sulfate to overcome hard water issues. If mixing certain herbicides with hard water, ammonium sulfate (AMS) will need to be added to the water prior to the herbicide to prevent the chemical from binding to the calcium in the water, which makes the chemical ineffective. For more information on water quality, read the Purdue publication, *The Impact of Water Quality on Pesticide Performance* found at www.extension.purdue.edu/extmedia/PPP/PPP-86.pdf.
- Be sure to use any necessary surfactants or other adjuvants as the label recommends.
- Herbicides should be sprayed on actively growing vegetation.
- Removing or reducing the amount of plant material, dead or alive can significantly improve the surface area coverage of an herbicide. This can be achieved by mowing, bailing, or burning the planting area and then allowing the vegetation to regrow to 4 - 6 inches prior to the herbicide application.
- Pay special attention when using herbicides with residual activity. Seeds and plugs must not be planted until the residual activity timeframe specified on the herbicide label has passed.
- A sample herbicide application plan can be found in the next section.

Sample Herbicide and Planting Plan

This sample herbicide plan is for reference only. A wildlife biologist or other qualified person should be consulted to develop a control plan tailored to each site's conditions and each landowner's objectives.

DATE	ACTIVITY
September 2024	Mow all vegetation to the ground and allow it to grow to 4 - 6 inches. This will increase the efficacy of the herbicide. Bailing, raking, or leaf-blowing the site after mowing is preferred, if feasible.
September or October 2024	Once vegetation reaches 4 - 6 inches in height, the site is ready for an herbicide application. Choose a broad-spectrum, systemic herbicide with no residual soil activity. Specific herbicide recommendations can be found on Page 11 of Purdue Extension Publication, *A Land Manager's Guide to Renovating Native Warm-Season Grass Stands for Wildlife,* in the section titled, *Controlling cool-season grass encroachment with herbicides.* Read and follow all label instructions. The label is the law.
May or June 2025	Once vegetation reaches 4 - 6 inches in height, the site is ready for an herbicide application. Choose a broad-spectrum, systemic herbicide with no residual soil activity. Specific herbicide recommendations can be found on Page 11 of Purdue Extension Publication, *A Land Manager's Guide to Renovating Native Warm-Season Grass Stands for Wildlife,* in the section titled, *Controlling cool-season grass encroachment with herbicides.* Read and follow all label instructions. The label is the law.
August 2025	The progress of the site should be evaluated by a wildlife biologist or other qualified professional. Adjustments to this plan may be necessary.
September or October 2025	Once vegetation reaches 4 - 6 inches in height, the site is ready for an herbicide application. Choose a broad-spectrum, systemic herbicide with no residual soil activity. Specific herbicide recommendations can be found on Page 11 of Purdue Extension Publication, *A Land Manager's Guide to Renovating Native Warm-Season Grass Stands for Wildlife,* in the section titled, *Controlling cool-season grass encroachment with herbicides.* Read and follow all label instructions. The label is the law.
December 2025 or January 2026	Broadcast seeds on snow.
May or June 2026	Plant plugs.
Spring 2026 and Beyond	Monitor the site twice a year and spot-treat all invasive plants to prevent establishment of non-native plants.

Solarization

Solarization is the process of laying a clear plastic sheet over the ground to trap heat from the sun to kill weeds, seeds, and pathogens in the top few inches of the soil. Solarization is more feasible for smaller areas and is best suited for sunny, well drained planting areas. Solarization is not always effective when needing to kill rhizomatous and woody plants, or hard seeds.

1. Purchase UV Stabilized greenhouse polyethylene plastic with a thickness of 2-6 mil. Alternatively, used high tunnel plastic can be reused for solarization which may reduce project costs. If reusing plastic, repair any holes or tears with greenhouse plastic repair tape.
2. From mid-May to early June, mow the area that will be solarized. Then use a rake, leaf blower, or prescribed fire to remove existing vegetation.
3. Dig a 4-inch trench around the perimeter of the area that needs solarized.
4. Soak the area inside the trench prior to laying out plastic.
5. Spread out the plastic and stretch until it is tight.
6. Bury the edges in the trenches at least 4 inches deep. The plastic must be buried and not simply anchored with heavy objects. Burying the edges prevents airflow under the plastic which is necessary for successful solarization.
7. Check the plastic for holes or tears often and use greenhouse plastic repair tape to repair damage.
8. Keep areas around the planting area mowed to prevent weeds from going to seed.
9. Plastic should remain in place for 6 weeks.
10. Remove the plastic after 6 weeks and monitor the area every few days for new vegetation. If unwanted vegetation germinates in the area, repeat the solarization process for another six weeks starting in late July or early August.

Establishing Habitat from Seed

Seed Mix Design

Seed mix design can be intimidating. Wildlife biologists are available to help design a mix that is conducive to the conditions of the planting area, meets landowner goals, and maximizes the value of the area for pollinating insects and other wildlife. Do not hesitate to find a biologist with the Pollinator Partnership, United States Fish and Wildlife Service, Indiana Department of Natural Resources, or Quail Forever to help design seed mixes. If a planting is being established through a Farm Bill Program such as the Environmental Quality Incentives Program (EQIP) or the Conservation Reserve Program (CRP) all seed mixes must meet Indiana NRCS standards and specifications for specific programs and practices. All seed mixes used for Farm Bill programs should be approved by the NRCS District Conservationist responsible for the contract prior to purchase. The following bullet points outline seed mix specifications and best practices.

- All plants selected should be native to Indiana. Use Indiana's NRCS Wildlife Seeding Calculator to determine species and seeding rates.
- Seed mixes should result in 30-40 seeds being planted per square foot.
- The seeds of graminoids (grasses, rushes, and sedges) should make up between 25% and 50% of the mix and wildflower seeds should make up between 50% and 75% of the mix.
- Seed mixes for projects funded by the Farm Bill must include a minimum of 2 graminoid species and 9 native wildflower species. A minimum of 3 flowering species in each bloom period (early, mid, late) will be required.

- Mixes that contain more species than required are strongly recommended. More species does not mean higher costs. Instead of a lot of seeds of a few species, a few seeds of a lot of species are being planted. Try to plant 10 species of graminoids and 30 species of wildflowers.

Purchasing Seed

- If financial assistance from the Farm Bill is being used to fund a project, all species substitutions and seeding rate changes must be approved by a wildlife biologist or NRCS District Conservationist before seed is purchased. If changes are not approved, there is a risk of delayed or forfeited payment.
- Order seeds in ounces or pounds of pure live seed. Pure live seed considers germination percent, dormant seed, hard seed, and inert material. Typically, the bulk weight of the seed will be higher than the weight of pure live seed.
- A minimum of 3 quotes from native seed vendors should be solicited. Prices vary greatly between vendors. Be mindful of which vendors quotes are solicited from. Some native seed vendors grow their own seeds while others must buy seeds from another vendor. Seed can pass through many vendors before getting to the consumer. Each time seed passes through a vendor, there is a price mark-up.
- The Indiana Department of Natural Resources maintains a native seed vendor list. The list can be found at https://www.in.gov/dnr/fish-and-wildlife/files/fw-Seed_Suppliers.pdf
- If the project is being funded by a Farm Bill program, keep all seed tags and receipts. They will need to be submitted to the agency providing the financial assistance.

Seeding Dates

In Indiana, native seeds should be planted from December 1st – June 15th. If the planting is being funded by a Farm Bill program, planting outside of this window could result in delayed or forfeited payment. Frost seeding during December or January is highly recommended. The seeds of many native wildflowers must go through a cold-wet stratification to germinate, meaning that until the seed gets wet and freezes, the seedcoat will not crack.

Broadcasting Seed

- All grass, rush, sedge, and wildflower seed should be planted at the same time.
- Seeds may be broadcast during the dormant and the spring seeding windows.
- Seeds can be broadcast using a broadcast seeder, fertilizer spreader, drop-seeder, or airflow seeder.
- Fields should be 70% - 100% bare if seed will be broadcast or dropped on the ground.
- If seeds are broadcast in the spring seeding window, use a cultipacker or a weighted lawn roller before and after broadcasting seed to increase seed to soil contact.
- Ground should be frozen or dry enough to operate equipment without causing ruts.
- Try to time seeding prior to a snow or when fluctuation temperatures will cause the ground to freeze and thaw. The freezing and thawing of the ground will incorporate the seed into the germination zone. If seed is spread on frozen ground and there is no snow or thaw for a while, seed can blow away.
- Since prairie grass and wildflower mixes require low seeding rates and contain very small seeds, a filler should be used to allow more even distribution of the mix across the field. Mix the seed with an inert filler like cracked corn, pelletized lime, or non-scented, non-clumping cat litter at a ratio of about 1-part seed to 5-parts filler by volume. More filler can be added, if needed. Some broadcast seeders will throw the heavier inert material farther than the seeds that are lighter. Be sure to account for this.
- It is recommended to calibrate the spreader with just the carrier before adding the seed mix.

- If time allows plant half of the seed in a North-South direction, and then plant the other half of the seed in an East-West direction. This will allow even coverage across the field and provide a failsafe if the seeding rate was too high.
- Do not put more than 25% of the seed in the broadcaster at a time to ensure that seed does not run out before the entire area is planted.

A cyclone spreader works well for broadcasting seeds in large areas.

Battery operated handheld broadcast spreaders work well for seeding small areas.

Planting Using a No-till Drill

- All grass, rush, sedge, and wildflower seed should be planted at the same time.
- A drill that was designed for planting native grasses and wildflowers must be used. The seeding mechanisms in the boxes are made specifically for planting small and fluffy native seeds. These drills are also fitted with depth bands that do not allow the seed to be planted deeper than ¼ inch.
- Some drills have a seed box for large seeds, a seed box for small seeds, and a seed box for grain. When using these drills seeds can be separated by size or all the seeds can be mixed with a filler such as cracked corn or non-clumping, non-scented cat litter and placed in the seed box for grain.
- After planting, some seeds should be visible on top of the ground.
- Unhooking every third tube to allow 1/3 of the seed to be broadcast on the soil rather than drilled can help ensure that the smallest seeds have a chance to be worked into the germination zone by the freeze-thaw cycle, instead of getting planted too deep.
- Since prairie grass and wildflower mixes require low seeding rates and contain very small seeds, a filler should be used to allow more even distribution of the mix across the field. Mix the seed with an inert filler like cracked corn or non-scented, non-clumping cat litter at a ratio of about 1-part seed to 5-parts filler by volume. More filler can be added, if needed.
- If time allows plant half of the seed in a North-South direction, and then plant the other half of the seed in an East-West direction. This will allow even coverage across the field and provide a failsafe if the seeding rate is too high.
- It is recommended to start with a low output and increase the seeding rate if needed and to not put more than 25% of the seed in the drill at a time to ensure that seed does not run out prior to seeding the entire site.
- Do not drill in muddy conditions.

- For help locating a native grass drill, contact a wildlife biologist or local soil and water conservation district office.
- Consult with the owner's manual of the drill for proper operation. All owner's manuals should be able to be located online by doing an internet search for the make and model on the drill.

A landowner planting native seeds using a Truax no-till drill.

Grass, rush, sedge, and wildflower seeds mixed with cracked corn and placed in a native plant drilll.

Post Seeding Maintenance

- Don't expect a seeding to look great the first couple of growing seasons. In fact, it is probably going to look terrible.
- Many biologists use the adage, ***In year 1 native plants sleep, in year 2 they creep, and in year 3 they leap.*** Sometimes that leap doesn't occur until year 4 or 5.
- During the first growing season, native wildflowers and grasses spend most of their energy developing a root system. Some seeds will sit in the ground for a year or more before breaking dormancy and germinating. Most pollinator habitat will look *messy or weedy* during establishment. Annual weeds including ragweed, foxtail, and marestail are great sources of food and cover for wildlife. These plants typically dominate plantings during the first year and are almost never a persistent problem. The weed pressure in most plantings will diminish by the 2nd growing season.
- Many biologists and other conservationists recommend mowing competing vegetation in the first growing season. Mowing, in some instances, may cause more problems than it will solve. Consulting with a wildlife biologist or NRCS district conservationist is recommended prior to mowing. If in doubt, not mowing an establishing site is safer than mowing it.
- The planted area should not be mowed shorter than 12 inches. Mowing native plants shorter than 12 inches may kill some of the establishing grasses, sedges, rushes, and wildflowers.
- The planting and adjacent areas should be monitored annually for invasive plants. Be familiar with the list of invasive plants found later in this document and be sure to control them as needed.
- Consult with a wildlife biologist or local soil and water conservation district for answers to all pollinator habitat maintenance questions.

Establishing Habitat Using Plugs

Plugs are small potted plants. Planting plugs typically costs significantly more than establishing habitat with seeds. Panting plugs is also more labor intensive than planting seeds. Planting plugs instead of seeding an area results in faster maturity of the pollinator habitat. Plug plantings are more feasible in areas less than ¼ acre. If quicker establishment is desired, consider planting plugs on the public facing edges of the planting and then seed the rest of the area.

- Projects funded by the Farm Bill must include a minimum of 2 graminoid species and 9 native wildflower species, one being a native perennial legume. A minimum of 3 flowering species in each bloom period (early, mid, late) will be required.
- More diverse and species rich plantings are strongly recommended.
- If the planting is being funded by a Farm Bill program, quantity and species of plugs will be determined using the Natural Resources Conservation Service's Indiana Wildlife Seeding Calculator - Plug Planting Worksheet. This is a great tool even if the planting is not being funded by a Farm Bill program.
- A list of entities that sell native plants can be found on the Indiana Native Plant Society's website at this link: indiananativeplants.org/landscaping/where-to-buy/.
- Do not purchase any plants that have been treated with any type of pesticide. Prior to purchase, verify with the seller that the plants have not been treated with a pesticide.
- Plugs can be planted from May 1st to June 30th and from August 15th to September 21st
- Plugs should be planted on a 1 square foot spacing.
- Laying down a measuring tape or a rope marked every foot can help with the 1-foot x 1-foot spacing.
- Using a small auger on a drill driver to dig the holes for the plugs can speed-up the planting process.

Plug Planting Maintenance

- Plugs need watered throughout the rest of the summer until the plants enter dormancy.
- Hand weed any unwanted plants as they emerge.
- The area can be mulched with natural materials. Do not allow mulch to touch the stem of the plants. Mulch touching the stem can cause the stem to rot.

Special Considerations for Small Native Plantings in Landscaping or Vegetable Production Areas

Selecting plants that are not going to aggressively spread through seeds or rhizomes is recommended when planting native plants into small areas such as landscaping beds and vegetable production beds. Select plants that grow to a height of 4 feet or less to reduce the likelihood of plants falling over into production beds or walkways. Plantings that are 4 feet or shorter also look tidier.

Three strips of perennial, native plants on a produce farm in Jasper County, Indiana.

Management

Once the vegetation is well-established, managing the site with rotational disturbance is recommended. Disturbance can prevent the site from succeeding to woody vegetation. Management should be performed on a 2 to 3-year rotation and should be limited to 1/2 (2-year rotation) or 1/3 (3-year rotation) of the total area in any given year. Prescribed burning is the best management option. **Every landowner must get a burn plan from a qualified person prior to burning. It is also recommended that a prescribed fire professional completes the burn.** Mowing can also be an effective management tool. Mowing should be done in late fall or winter and only on a maximum of 1/3 of the site per year. If the planting was funded by a Farm Bill program, consult with your local Natural Resource Conservation Service district conservationist prior to mowing to be sure it is an approved activity. Consult with a wildlife biologist or soil and water conservation district for site specific management recommendations.

Shrub and Tree Plantings

The importance of native shrubs and trees to the abundance and health of pollinating insects cannot be overstated. Many species of shrubs and trees bloom early in the spring and provide pollinating insects with valuable nectar and pollen during times when wildflowers are not yet blooming. Native shrubs and trees are host plants for caterpillars of many species of butterflies and moths. Shrubs and trees can be planted is strips along field, garden, and stream edges or as clump plantings.

- Consult with a forester, wildlife biologist, or soil and water conservation district for a shrub and tree planting plan that includes information on spacing between rows, spacing within rows, and a list of shrubs and trees that are suitable for the area being planted.
- Bare root stock (seedlings) should be planted in the spring after the ground thaws, but no later than June 1st.
- Container stock may be planted between October 1 and June 1 as local soil moisture and weather conditions permit.
- Shrubs and trees should be planted in soil that is bare, firm, moist, and unfrozen.
- Shrubs and trees should be planted in a vertical position with the root collars approximately at or slightly below the ground line.
- Control all weeds within a 3-foot circle around each tree or a 2-foot band along each side of each row.

Invasive Plants

Invasive plants are the biggest threat to habitat and native wildlife in Indiana. Listed below are 20 woody invasive plants and 20 herbaceous invasive plants found in Indiana. Get familiar with the plants on this list and remove them as they appear on the site. This is not an exhaustive list. For assistance identifying a plant, or for an invasive plant control recommendation, reach out to a wildlife biologist or local soil and water conservation district office. Many invasive plants were introduced to Indiana as landscaping plants. Always do a web search to make sure any plant being added to landscaping is not invasive.

Common Woody Invasive Plants in Indiana	**Common Herbaceous Invasive Plants in Indiana**
Ailanthus (Tree of Heaven)	Common Teasel
Amur Cork Tree	Bull Thistle
Autumn Olive	Canada Thistle
Black Alder	Chinese Silvergrass
Burning Bush	Crown Vetch
Bush Honeysuckle (Amur, Bell's, Morrow's, Tartarian)	Cut-leaved Teasel
Callery Pear	Dame's Rocket
Common Barberry	Giant Knotweed
Common Buckthorn	Japanese Knapweed
English Ivy	Japanese Knotweed
Glossy Buckthorn	Japanese Stiltgrass
Japanese Barberry	Musk Thistle
Japanese Honeysuckle	Non-Native Lawn, Hay, and Pasture Grasses
Multiflora Rose	*Phragmites* (Common Reed)
Norway Maple	Poison Hemlock
Oriental Bittersweet	Purple Loosestrife
Privet (Amur, Blunt Leaved, California, Chinese, Common)	Reed Canary Grass
Sawtooth Oak	Sericea Lespedeza
Siberian Elm	Spotted Knapweed
White Mulberry	Wild Parsnip

Summary of Key Points

- Get help from a wildlife biologist or other conservationist. Free help from a professional is always available.
- Proper site preparation, appropriate planting methods, and science-based plant selection and planting rates are all crucial for successful habitat establishment.
- Only plant native plants.
- Inadequate site preparation is the primary reason for a failed planting.
- Herbicide is a great site preparation option. Used properly, herbicides are safe and effective tools.
- Solarization is a great site preparation option.
- Patience is very important when establishing native plants. A planting can take 3-5 years to establish.

For pollinator habitat establishment assistance contact:
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