

How to establish habitat for pollinators and other beneficial insects

A summary of the techniques demonstrated in 2018 by NYS Integrated Pest Management
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A - Spring transplanting into fallow ground

Spring is when most of us think about planting gardens, but it's not the best time to plant most perennials in the Northeast U.S. Unless you worked on weed control the previous year, spring planting also limits your weed management options.

1. **Kill weeds, but do not till.** We applied herbicide the previous fall and again in the spring because new weeds started to grow before we were ready to transplant. Read the label of any herbicide you use and make sure to wait long enough after applying it before transplanting your perennial habitat plants. And always follow all instructions on the pesticide label.
2. **Transplant the habitat plants into untilled soil.** Our transplants came in 50-cell flats and we spaced them about 18" apart. We planted into untilled ground. Larger plants might need more space. For a spring planting, watering the plants in is especially important. Timing your planting right before a nice soaking rain is ideal.
3. **Control weeds throughout the summer.** We weeded these plots twice during the summer (the second time, only lightly because there were too many weeds to pull everything). These plots were definitely *not* weed-free by September!

B - Spring transplanting and mulching

Again, spring is a traditional planting time. Putting some time and money into mulch up front can improve weed management and save you time on weeding later in the season.

1. **Kill weeds.** We applied herbicide the previous fall. Read the label of any herbicide you use and make sure to wait long enough after applying it before transplanting your perennial habitat plants. And always follow all instructions on the pesticide label.
2. **Till the soil.** Use any tools – from a shovel and rake to tillage equipment pulled by a tractor – depending on the area you will plant.
3. **Transplant the habitat plants.** Do this as soon after tilling the soil as possible. Our transplants came in 50-cell flats and we spaced them about 18" apart. Larger plants might need more space. For a spring planting, watering the plants in is especially important. Timing your planting right before a nice soaking rain is ideal.
4. **Spread mulch around the plants at least 3-4" deep.** When in doubt, err on the side of a little extra mulch, since rain might compact it a bit, depending on the type of mulch.
5. **Control weeds throughout the summer.** We weeded plots twice during the summer because some weeds grew through the mulch. For the amount of time we spent weeding, we achieved better weed control than with treatment A. By September, the plots were virtually weed-free.

C - Spring direct seeding

Seeds of perennial beneficial insect habitat plants are far cheaper than transplants, so establishing habitat from seed may work better for your budget. While spring is the right time to plant annual wildflowers from seed, it's not the best time to plant perennial seed in the Northeast. In part, this is because some of the species in a mix of wildflower and grass seeds require cold temperatures to stimulate germination.

1. **Kill weeds.** We applied herbicide the previous fall. Read the label of any herbicide you use and make sure to wait long enough after applying it before planting seed. And always follow all instructions on the pesticide label.
2. **Till the soil.** Use any tools – from a shovel and rake to tillage equipment pulled by a tractor – depending on the area you will plant. Be sure to create a high-quality seedbed (e.g., no big clumps).

3. **Plant the seed.** Do this as soon after tillage as possible, using the rate recommended by the seller. We used Ernst Seed's "Showy Northeast Native Wildflower and Grass Mix" at a rate of 0.5 lb/1000 ft². Since the volume of seed is pretty small compared to the area you need to cover, mix something with the seed to make it easier to spread. We mixed 3 cups of boiled rice hulls per 26 g of wildflower seed to cover a 5x23 foot plot. Clay-based kitty litter (50 lbs/A) also works. If you are hand-broadcasting, spread about half the seed walking in one direction, then spread the other half in a perpendicular direction. Gently rake the seed in (not too deeply), and stomp or roll it into the soil to achieve good seed to soil contact.
4. **Control weeds throughout the summer.** Your goal is to help the perennials you planted out-compete the annual weeds that will inevitably grow. To do this, every time the vegetation (both habitat plants and weeds) gets about 12-18" tall, mow them to a height of about 8". Because we used a small walk-behind lawnmower, we mowed when the vegetation was shorter (~12") to a height of ~4". This seemed to work okay for us. It prevented annual weeds from reproducing, but didn't kill our habitat plants (at least the blackeyed Susans or the partridge peas, which did germinate and bloom in spite of spring seeding). If you have a lot of perennial weeds in the area you're planting, you may need to adopt some additional weed management methods.
5. **Continue weed control next year.** Starting in Year 2, you can mow less frequently, but you need to continue to prevent annual weeds from setting seed.

D - Fall transplanting after a summer cover crop

Fall is a better time to transplant perennials because there is more moisture in the soil and cooler temperatures. If you're going to plant in the fall, why not use the summer to work on weed control? Planting buckwheat as a cover crop is a great choice, since it will smother a lot of weeds and also provide habitat and food for beneficial insects while you wait to plant in the fall.

1. **Kill weeds.** We applied herbicide the previous fall. Read the label of any herbicide you use and make sure to wait long enough after applying it before planting seed. And always follow all instructions on the pesticide label.
2. **Till the soil.** Use any tools – from a shovel and rake to tillage equipment pulled by a tractor – depending on the area you will plant. Be sure to create a high-quality seedbed (e.g., no big clumps).
3. **Plant the first buckwheat crop.** In NY, this should happen around late May (soil temps > 65 °C). Time your tillage so that the soil is recently tilled when you are ready to seed the buckwheat (at 70 lb/A if broadcasting, less if drilling). Spread about half the seed while walking in one direction, then spread the other half in a perpendicular direction. Gently rake the seed in (not too deeply), and stomp or roll it into the soil to achieve good seed to soil contact.
4. **Mow the first buckwheat crop.** Keep a close eye on the buckwheat starting about 5 weeks after planting. Once it is fully in bloom (no buds, all flowers are open), it's time to mow the buckwheat. If you mow it too soon, the plants will re-grow and re-bloom. If you wait too long, the plants will produce seed, and the buckwheat can become a weed.
5. **Plant a second crop of buckwheat.** Repeat steps 2-4 with a second crop of buckwheat.
6. **Transplant the habitat plants into the buckwheat stubble.** Do this as soon after mowing the second crop of buckwheat as possible. Plants from 50-cell flats should be spaced about 18" apart. Larger plants might need more space. Water the plants in, or plant before rain.

F - Fall direct seeding after summer solarization

Fall is also the best time to direct seed perennial wildflowers and grasses. Again, spending the spring and summer controlling weeds is recommended. One option that has shown promise in Maine is soil solarization. Yes, it is possible to heat the soil enough to kill weeds. This is done by covering the soil tightly with clear plastic (essentially creating a greenhouse effect).

1. **Kill weeds.** We applied herbicide the previous fall. Read the label of any herbicide you use and make sure to wait long enough after applying it before planting seed. And always follow all instructions on the pesticide label.
2. **Till the soil.** Use any tools – from a shovel and rake to tillage equipment pulled by a tractor – depending on the area you will plant. Be sure to create a high-quality seedbed (e.g., no big clumps). A smooth seedbed will help you lay the plastic close to the soil so that less air is trapped between it and the soil. This improves heat transfer.
3. **Ensure sufficient soil moisture.** Solarization works best on moist soil (because water conducts heat better than air). If the soil is bone dry, irrigate or wait for rain.
4. **Lay the clear plastic.** Cut a sheet of 6 mil clear plastic so that an extra 12-18” of plastic will extend from all four sides of the plot. Dig a trench around the edge of the plot. Stretch the plastic somewhat tightly over the soil. You don’t want it to “billow” on a windy day, but you don’t want it to stretch and rip. Bury the edges of the plastic 4-6” deep around the entire perimeter of the plot. Stomp the soil down over the edges to create a tight seal. If you notice any small holes in the plastic over the summer, seal them with packing tape to keep the heat in.
5. **Choose the right time to plant.** Wait until the day and night temperatures get cool enough that germination of the new seed is unlikely. Otherwise, some species like blackeyed Susans may germinate in the fall and be killed by frost. But be aware that fall also brings wetter soils. Especially if you need to bring equipment onto the field, don’t wait too long. We planted October 18th and 19th.
6. **Remove the plastic.** Cut it down the middle of each plot and pulling it up. Unfortunately, it’s probably not reusable. Cut off any weeds that managed to grow (e.g., purselane) at the soil line. Avoid disturbing the soil, as this can bring up more weed seeds from below the upper layer of soil that was solarized.
7. **Plant the seed.** Spread the perennial seed mix at the rate recommended by the seller. We used Ernst Seed’s “Showy Northeast Native Wildflower and Grass Mix” at a rate of 0.5 lb/1000 ft². Since the volume of seed is pretty small compared to the area you need to cover, mix something with the seed to make it easier to spread. We mixed 3 cups of boiled rice hulls per 26 g of wildflower seed. Clay-based kitty litter (50 lbs/A) also works. If you are hand-broadcasting, spread about half the seed walking in one direction, then spread the other half in a perpendicular direction. Gently rake the seed in (not too deeply), and stomp or roll it into the soil to achieve good seed to soil contact.
8. **Control weeds next year.** In 2019, we will follow a similar mowing strategy as we used this year in Treatment C. Ideally, every time the vegetation (habitat plants and weeds) gets about 12-18” tall, mow it to a height of about 8”. Because we use a small walk-behind lawnmower, we will mow when the vegetation is shorter (~12”) to a height of ~4”.

G - Fall direct seeding after summer herbicide and tillage

Another option for summer weed control is repeated herbicide application and tillage. We alternated the two methods, but you could choose one or the other to use throughout the summer. This method allows weeds to germinate, then kills them before they have the chance to produce seed. The result is a reduction in the number of viable weed seeds in the soil.

1. **Kill weeds.** We applied herbicide the previous fall and again in the spring because new weeds started to grow before we were ready to transplant. Read the label of any herbicide you use and make sure to wait long enough after applying it before planting seed. And always follow all instructions on the pesticide label.
2. **Till the soil.** Use any tools – from a shovel and rake to tillage equipment pulled by a tractor – depending on the area you will plant. Be sure to create a high-quality seedbed (e.g., no big clumps).
3. **Allow weed seeds to germinate.** Wait for the weeds to grow at least 3” tall (but not set seed). Apply an herbicide (Always read and follow the label!) and wait for the weeds to die.
4. **Till the soil.** Wait until weeds have been killed by herbicide. This will hasten germination of new weed seeds.
5. **Repeat steps 3 and 4.** Do this as often as you are able until you are ready to plant habitat seed in the fall. After the initial spring tillage, we applied herbicide twice and tilled the plots twice due to time and weather constraints. More frequent tillage/application might have been better.
6. **Choose the right time to plant.** Wait until the day and night temperatures get cool enough that germination of the new seed is unlikely. Otherwise, some species like blackeyed Susans may germinate in the fall and be killed by frost. But be aware that fall also brings wetter soils. You should plan to till the soil shortly before you plant the seed, and you won’t be able to do this if the soil is too wet. We planted October 19th.
7. **Plant the seed into tilled soil.** Time your fall planting soon after tilling to create a nice seedbed. Spread the seed at the rate recommended by the seller. We used Ernst Seed’s “Showy Northeast Native Wildflower and Grass Mix” at a rate of 0.5 lb/1000 ft². Since the volume of seed is pretty small compared to the area you need to cover, mix something with the seed to make it easier to spread. We mixed 3 cups of boiled rice hulls per 26 g of wildflower seed. Clay-based kitty litter (50 lbs/A) also works. If you are hand-broadcasting, spread about half the seed walking in one direction, then spread the other half in a perpendicular direction. Gently rake the seed in (not too deeply), and stomp or roll it into the soil to achieve good seed to soil contact.
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Selected additional resources for establishing habitat for beneficial insects:

- NYS IPM pollinator website: <https://nysipm.cornell.edu/environment/pollinators/>
- Cornell pollinator-friendly gardening website: <http://gardening.cals.cornell.edu/garden-guidance/pollinator-protection/>
- Establishing pollinator habitat from seed: <https://xerces.org/establishing-pollinator-meadows-from-seed/>
- Habitat planning for beneficial insects: <https://xerces.org/habitat-planning-for-beneficial-insects/>
- Lists of plants by region that are good resources for pollinators (and probably also for other beneficial arthropods): <https://xerces.org/pollinator-conservation/plant-lists/>