# BEST MANAGEMENT PRACTICES

## 1. NO CHEMICALS

Eliminate pesticide use, particularly those containing neonicotinoids. Herbicides and chemical lawn treatments can also be highly damaging to pollinators.

Avoid planting in areas previously contaminated by pesticides or without a spatial buffer from areas where pesticides are applied (at least 100 ft. wide forested buffer is recommended).

Ensure plants and seeds come from a clean, pesticide-free source. Many commercial nurseries treat their plants and seeds, oftentimes before retailers receive them. Some pesticides and most neonicotinoids persist in plants and soil for months to years.

## 2. DIVERSE NATIVE PLANTS

Plant straight native plant species. Cultivars and exotic plants largely do not support the pollen and nectar preferences of threatened and at-risk pollinators, and tend to be visited by common pollinator species whose populations are stable.

Include a range of plant types (trees, shrubs, forbs, grasses, sedges) with varying bloom times, to ensure pollen, nectar and host plants are available across the entire growing season. Remove and manage invasive species to ensure that native plant communities have adequate space and opportunities to flourish.

## 3. CREATE NESTING OPPORTUNITIES

Seventy percent of native bee species are ground nesting. Mulch using compost or natural materials (e.g. chopped leaves, seed-free straw, composted wood chips) and leave bare areas of well-drained soil in sunny locations. Thirty percent of native bees are cavity nesting. Allow dead trees, snags and pithy stemmed plants such as raspberries to remain standing.

To benefit bumblebees, maintain small brush piles. This will provide cover for rodents that will in turn create nesting habitat for bumblebees. Where possible, leave leaf litter in gardens and allow it to build up over time. This provides cover for overwintering queens. Barns with unbaled hay or a dry, protected cavity containing hay, straw, clumps of moss or grass located above or below ground are also ideal. As with other ground nesting bees, limiting or eliminating tillage practices will limit the potential of harming bumblebees.

## 4. BE MESSY

Skip the fall clean up, allowing dead stems, leaves and seed heads to stand over winter for overwintering pollinators. Wait until evening temperatures consistently reach 50 degrees before raking in the spring, so as not to disturb species who have not emerged yet.

Don't be overzealous when it comes to tidying up. Some weeds act as host plants for caterpillars, such as lambsquarters *(Chenopodium album)* for Common Sootywing *(Pholisora catullus)* and Queen Anne's lace *(Daucus carota)* for Black Swallowtail *(Papilio polyxenes)*.

## 5. IT DOESN'T STOP WITH PLANTING

That being said, with new plantings, water and weed regularly for the first two years.

To deter deer and rodents until plants fully establish, it may be helpful to construct temporary fencing or set up netting. Natural repellent sprays such as *Plantskydd* can be effective when applied regularly. Thorny plants such as roses can also deter deer browse and function as natural fences for more vulnerable plants.

## 6. LAST BUT NOT LEAST

Put something in place to catch rainwater, with a shallow dirt base to simulate a puddle and small rocks to perch on to avoid drowning. This provides pollinators necessary minerals. Make it last between rainy days.

Keep night skies dark for moths and other nocturnal insects: motion-detecting lights or lamps facing down instead of spotlights on all night.

Some plant species establish best by direct seeding: while late fall or early winter is the best time to sow, early spring seeding is also possible, although some species may not germinate until the following year.

# TURN YOUR LAWN INTO HABITAT

*Maintaining a manicured lawn can not only be expensive, it also oftentimes requires high water and chemical usage. Many turf lawns are habitat dead zones, as they are comprised primarily of non-native sod-forming grasses that spread by rhizome, outcompeting native vegetation and offering little opportunities for ground-nesting bees by carpeting the soil.*

*Lawns can be converted into habitat in a number of ways:*

## METHOD 1: OVERSEED A TRADITIONAL LAWN

STEP 1: Mow your lawn at one inch or less to improve seed to soil contact. Remove grass clippings to expose as much soil as possible.

STEP 2: Rake, scrape, score or use a spading fork to break up the lawn surface. This helps create good conditions for seed germination and healthy growth through seed to soil contact.

STEP 3: Spread native seed and plant plugs. Here are the recommended rates for overseeding lawn as depicted in Area 6 of the Birches School Toolkit (page 69):

- *Prunella vulgaris ssp. lanceolata* (Common selfheal) at 5 ounces per 1000 sq.ft
- *Schizachyrium scoparium* (Little bluestem) at 7 ounces per 1,000 sq.ft
- *Carex pensylvanica* (Pennsylvania sedge) at 1 plug per sq.ft of exposed ground
- *Pedicularis canadensis* (Canadian lousewort) at 1 plug per sq.ft of exposed ground
- *Viola spp.* (Violets) at 1 plug per sq.ft of exposed ground

Thoroughly mix the seed into a filler material such as sand or sawdust before applying. Use 4 gallons of filler per 1,000 sq.ft and hand broadcast the seed mix, leaving it on soil or snow surface.

WHEN TO DO IT

Late fall or winter are the best times to seed most native plant species, as many require cold stratification to germinate. Early spring is also possible, although some species will not germinate until the following year. If there is not adequate rainfall, areas recently seeded should be watered.

*Lawn containing Prunella vulgaris (Common selfheal). Photograph by Matt Lavin.*

## METHOD 2: CREATE A BLANK SLATE

STEP 1: To start you must first remove existing grass. Plan accordingly: large areas of bare soil are easily eroded by runoff and provide fertile ground for weeds to establish. Chemical herbicides are not recommended because of their negative impacts to pollinators and ecosystems as a whole. Below are several alternatives to chemical removal.

- SOD CUTTING is the quickest way to remove grass. Equipment rental companies and hardware stores rent walk behind sod cutters for $100-$150/day. In a few hours several thousand square feet of grass can be cut, rolled up and carted away. A lot of topsoil is lost in the process, but can be added back in with screened loam if necessary.
- SHEET MULCHING uses cardboard or newspaper to smother grass. It is best started several months before you want to use the planting area. Fall is an excellent time to sheet mulch as the material breaks down slowly over the winter and is ready for planting in the spring. The basic technique involves smothering grass and building organic matter in place by placing alternate layers of carbon materials and nitrogen materials directly on top of each other. Layers should be fairly equal to allow for even decomposition, approximately 1" thick.
- SMOTHERING/SOLARIZIATION is a method of site preparation that involves covering the planting area with black or clear plastic and allowing the sun and lack of water to kill unwanted vegetation. This takes a full growing season at a minimum, requires that the plastic is firmly secured in place all along the edges at all times, and may be best performed in sections rather than on a large scale.

STEP 2: Follow the previous directions to direct seed and plant plugs (seeding rates will be higher if starting with a blank slate).

MAINTENANCE

If you mow, keep your blades at least four inches off the ground; allow newly seeded and planted vegetation to fully establish before cutting. Once vegetation is established, mow no more than every two to four weeks. Taller lawns are beneficial in that they shade the ground, preventing moisture from evaporating while also discouraging weed seeds from sprouting. Refrain from mowing while flowers are blooming to increase the amount of forage available for pollinators and to allow plants to more fully establish by setting seed.

# SITE SELECTION

*There are numerous factors to consider before selecting a site for pollinator habitat implementation, deciding which plants to establish, and by what method. These pages present a process for making these decisions, listing relevant questions. As each site and situation are unique, different questions may arise which are not found here.*

*Once a site is selected, the following considerations can help define which Toolkit may be most suitable to implement.*

## EXISTING CONDITIONS

What are the physical and cultural characteristics of the site(s)?

## PLANTING REQUIREMENTS

What is needed to establish the desired vegetation?

## MAINTENANCE REQUIREMENTS

What management criteria may be required following installation?

*Diagram by Elan Bills.*

## EXISTING CONDITIONS are the ecological and cultural components that may influence a site. Assessing the following can help ensure that appropriate landscaping decisions are made, that the plants chosen are suitable for the site conditions present, and that the aesthetics of the design features are suitable for the location.

- What habitat and vegetation currently exists, and what life do they support?
  *What's doing well where? Are there any invasive species present?*
- Soil type, light conditions, and moisture levels.
  *Hours of sunlight, soil type and the water-holding capacity of the soil will determine which native plant species can grow where. A soil sample may be useful to send to a lab for analysis. A USGS Web Soil Survey can also be incredibly informative.*
- Parcel size and location.
  *Knowing the scale of the site to be planted, and its proximity to disturbed areas or protected habitat, can help guide site establishment and management methods, as well as the plant selection process. For example, establishing a 5-acre meadow entirely with plugs may prove to be too expensive; similarly, a wildflower meadow may not be possible in a sidewalk strip.*
- Land use history.
  *Is there a history of pesticide use, or environmental contamination on the site? Does anything show up in the lab soil test? Environmental remediation may be necessary, or choosing a different site for pollinator habitat restoration.*
- Current land use (and that of adjacent properties, if applicable).
  *You may not want to put those lowbush blueberries along a parking lot that gets salted in the winter.*

## PLANTING REQUIREMENTS are guidelines for establishing or enhancing native vegetation to support pollinators. This may be accomplished through multiple phases and at varying scales, in order to meet both short and long-term goals.

- What is needed to establish native vegetation to create or enhance pollinator habitat?
  *Is there lawn or are there invasive plants to be removed? Are soil amendments required? Is direct seeding possible? Should plugs be used instead?*
- If particular pollinator species are to be targeted, what are their preferred pollen sources or host plants?
- To attract and sustain a wide range of pollinator species, it is generally recommended to provide a variety of flowering plants that bloom from early spring to late fall, and therefore to include native shrubs, trees, bunching grasses and sedges.
- Increase floral abundance with at least three species of flowering plants for each portion of the season (early spring, late spring, early summer, late summer, early fall, late fall).
- Consider structural arrangements of plantings based on public use.
  *Formal or wild? Lower growth closer to sidewalks and foot paths?*
- Use mulch sparingly.
  *Ground nesting bees require bare, exposed pieces of ground to nest and overwinter, preferably in sunny, well-drained sites.*

## MAINTENANCE REQUIREMENTS are steps to follow for successful habitat establishment and long-term management.

- What kind of management is required following installation, and how often?
  *Mowing, brush hogging, watering, weeding.*
- Who will install it?
- Who will maintain it?
- Will staff education and training resources be provided?
- What is the short-term and long-term budget for maintenance of the site?

# CREATING A MEADOW

To support functionally diverse pollinator populations, a highly effective course of action is to establish a native meadow. This process consists of five steps:

1. SITE ANALYSIS
2. SITE PREPARATION
3. PLANT SELECTION
4. PLANTING TECHNIQUES
5. ONGOING MANAGEMENT

## SITE ANALYSIS

There are four main aspects to consider in analysis of a site. Item number one is light exposure. Full sun is a necessary requirement for meadow planting. Insufficient sunlight will favor woody species over herbaceous wildflowers and grasses causing an increase in maintenance requirements. Soil type will be your next consideration. It is imperative to understand and identify which soil you are working with (sand, loam, clay, etc.) in order to select plants that will adapt successfully to the site. If poor soils exist, a decision can be made to either amend the soil or narrow the plant list to those that will tolerate that specific condition. In some cases "bad" soil conditions, either poorly drained or very dry, can provide a competitive advantage to the meadow species. Fertilization should in most cases be avoided, as it will most likely favor weeds and invasives more than the desirable species.
Grade and topography can affect a number of decisions. A north slope may not be favorable to meadow plants, as they will receive less direct sunlight. If the meadow is in a low lying area and remains wet during spring thaw and rains, plants adaptable to these conditions should be selected. Micro variations within the site can be noted and considered.

Analyzing existing growth on and adjacent to the site can yield extremely valuable information relating to which plants will grow well on the site which what specific weedy species are likely to be a problem. If a problematic weed or invasive plant is existing on or near the site, it is highly recommended to eradicate it beforehand in order to avoid future infestations. Sod removal is relatively easy if the existing vegetation is predominantly low-growing turf grasses. On small patches of land, smothering or solarizing the existing vegetation with black or clear plastic is very effective.

## SITE PREPARATION

Site preparation begins with the elimination of existing growth. Sod cutting, smothering/solarizing or grubbing are the most common non-chemical methods. Tillage will bring to the surface dormant weed seeds which must be allowed to germinate and then repeatedly shallow cultivated for the extent of the growing season before planting. A no-till seeding is ideal for larger sites.
Creating a finely graded seed bed, incorporating the seed into the soil, tamping or rolling for good seed to soil contact and mulching with salt marsh hay or seed-free straw if on a slope. Sowing in the fall is preferable as many native species require a period of cold stratification to germinate.

## PLANT SELECTION

Based on your analysis of the site, you can now select the plant species that will form your seed mix. Several seed mixes have been created for the various Toolkit sites in this project, suitable for a range of environmental conditions.

In general, the plants that will afford the best long-term results will invariably be those that are found in conditions similar to your site and are native to your particular region. As in most naturally occurring meadows and prairies, graminoids should be a component of the plant mix, but for the benefit of pollinators, grasses and sedges should not comprise more than 25-35 percent of the mix by seed per square foot. Many grasses and sedges are larval host plants for butterflies, and provide nesting sites for certain bumblebee species and other bee and insect species. Clump-forming grasses are incredibly beneficial, including Big and Little Bluestem. A cover crop composed of Winter Wheat (fall seeding) or Wild Oats (spring seeding) should also be included at 100 lbs/acre to help secure the site from weed invasion and erosion during the first season.

### OCCUPY EVERY NICHE

An important concept to understand when combining plant species is the idea of *niche*. A study of a mature Midwestern prairie will reveal an

incredibly dense tapestry where every possible space is occupied. If all of these elements are present the meadow will have a strong capability to resist weeds. There is no place left for them to grow.

You also need to fill the niches in time. Some plants are active in warm weather while other plants are most vigorous during the cool seasons, particularly spring. By including both types there will be no seasonal opening for weed invasion. Some plants establish a cover during the first year, some during the first few years and some long-lived plants may not have a serious presence for many years.

## PLANTING TECHNIQUES

For forbs, particularly perennial species in New England, fall planting is often best. Many perennial plant seeds require exposure to cold temperatures and damp conditions before germination can occur. Winter precipitation also helps the seeds settle into the soil and will stimulate germination. Spring planting is possible, but typically favors grasses over flowers.

Due to the small size of many native seeds, it will be necessary to mix the seed with an inert material such as sawdust or sand before spreading. To achieve good seed to soil contact, the seed can be compacted into the ground with a standard lawn roller or the wheels of a tractor, or walked on.

## ONGOING MANAGEMENT

An understanding of ecological succession is important for the maintenance of a meadow. Ecological succession is the process by which a disturbed area progresses naturally from herbaceous vegetation (first annuals, then perennials) to woody shrubs and pioneer trees and finally to a mature forest. In establishing a permanent meadow in the northeast, where woods naturally predominate, we are arresting the process of ecological development at the herbaceous perennial stage.

Although a meadow, once established, will require substantially less maintenance than a mowed lawn, the first one to two years will require guidance in order to achieve success. A maintenance plan should be in place before starting, to insure that this crucial portion of the project is not later neglected.

For the first year or two after planting, it will be necessary to carry out a weed control program. As the process of ecological succession would suggest, the first year will bring a rapid cover of annual weeds while the perennial wildflowers and grasses are slowly developing underneath. This is to be expected, and if managed properly, is not a problem.

By mowing the meadow down to a height of 8 inches every time the vegetation reaches a height of 12 inches, you will not only prevent many annual weeds from seeding, but ensure that the young perennial plants growing below your mow height receive enough light for strong establishment. These perennials will emerge the following year far stronger than if they had been buried under 4 feet of annual foliage. This is why the inclusion of annual wildflowers in your seed mix can be detrimental to the long-term health of the planting.

During the second year the faster growing perennials will begin to provide color, and the entire planting should be well enough established to allow a decrease in weed control. You will need to monitor the planting for those weeds that can cause problems for the meadow. If needed, control can be obtained through spot herbicide or horticultural vinegar application, or manual weeding. If weeds and non-native grasses continue to dominate in the second growing season, continue with the above mowing regime. If not, transition to below schedule.

By the third year the native plants should be fairly dominant on the site and able to resist weed/invasive invasion with minimal management. Once the meadow is mature, you should only mow or burn part of the planting in a single season — ideally one-third or one-half of the overall area at one time, always between November 15 and April 1. No single area should be burned or mowed more frequently than every 1-2 years, to protect dormant insects such as butterfly pupae or stem-nesting bee larvae. For aggressive species, you may wish to remove seed heads in order to slow their expansion.

*Adapted from* Wildflower Meadows: Let's Get Real *by Larry Weaner and* Establishing Pollinator Meadows From Seed *by Mader et al.*