Collecting and Using Your Own Wildflower Seed

To Expand Pollinator Habitat on Farms

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Native wildflowers are the backbone of pollinator habitat on the farm. Field borders, filter strips, pastures, hedgerows, and other places where wildflowers (and grasses!) grow also provide us with natural pest control by sustaining predators of crop pests. Additionally, these plants help filter runoff from fields, and protect soil from erosion. Despite the benefits that native wildflowers and grasses provide, the cost of seed can be daunting. Fortunately, if you have native plant areas already established, they can provide you with a readily available source for additional seed.

While harvesting seed from existing wildflowers around the farm may not yield huge volumes, it can provide you with the raw material to gradually create more habitat on the farm. By collecting seed from plants already growing on your land, you are also focusing your efforts on species that are known to perform well on your soils. In this document we outline the basic steps of collecting native plant seed using readily available, non-specialized equipment. While our focus is primarily on wildflowers, many of these same techniques can be useful for collecting native grasses as well as seeds from trees and shrubs.

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Identifying Your Source Material 1

Existing pollinator habitat on your land can be a source for collecting native seeds. Native plant communities often require several years to fully establish and mature before seed can be harvested. It is best to not harvest seed during the early establishment years of a plant community, when species are building up seed reserves in the soil, to ensure the success of the planting. In the Midwest many wildflowers are perennials which are ready for harvest after species have established and flowered for multiple years (3–5 years). In other regions (e.g., California, Texas or Florida) where annual and biennial flowers dominate plant communities, seed will be available in the first and second years after planting.

Begin by selecting species for seed harvesting. Are there particular grasses and wildflowers that have established well on your land? Have you observed some species that are particularly attractive to pollinators? Are the species that you'd like to target for collection abundant in your planting? You'll want to make sure that your harvesting will conserve your target species in your existing pollinator habitat.

Some considerations for balancing seed harvest with species persistence in the existing habitat include:

- Determine if your target species flower once in their lifetime (e.g., annuals or biennials) or multiple times (e.g., perennials). This information can be found through the USDA PLANTS Database (see Additional Resources, page 9). Annuals and biennials can be highly dependent on the current year's seed to persist in the flowering habitat. Perennial plants can be harvested more often than annuals or biennials.
- Observe how abundant each species is in the planting. More seed can be harvested from abundant versus uncommon plants. Intensively harvesting rare plants can precipitate their loss from your original planting.
- As a rule of thumb, collect no more than 20% of available seed for any species per year.

Next, evaluate how much seed you need to collect to plant your new habitat area. Professional seed contractors carefully calculate seeding rates of planted pollinator habitat based on pure live seed, seed for which germination rates have been estimated, a process that is impractical if you are harvesting your own seed. In most cases, pollinator habitat can be successfully established from uncleaned seed given the wide range of acceptable seeding rates. As a general rule of thumb, most high quality pollinator plantings require 3–9 lbs of live, clean flower seed per acre to be successful, and in many regions, an additional 4–8 lbs of native grass. Keep in mind that you will need to plant greater amounts of seed when the seed has not been cleaned of stems, leaves, flowerheads and other waste material. Areas with poor establishment resulting from low seeding rates can be overseeded or reseeded in subsequent years.

Figure 1: Blooming native wildflower field border.

2 Recognizing Seeds Ready for Harvest

Figure 2: After dry down, seed can be harvested from field borders.

Figure 3: Native wildflower with mature seeds toward the top and flowers toward the bottom.

In addition to identifying plant species, seed collecting requires you to familiarize yourself with the seeds themselves. In some cases this is easier in theory than in practice since some plants such as mountain mint (*Pycnanthemum* spp.) and black-eyed Susan (*Rudbeckia* spp.) have seeds that are extremely tiny and difficult to distinguish from other parts of the seed head. While there are no comprehensive, illustrated seed identification resources, a few plant conservation organizations, such as the Rancho Santa Ana Botanic Garden, offer web site photo collections of many common native plants and their seed. Often a simple web search for images will reveal various photos for reference. In addition, a good hand lens or magnifying glass is a useful tool for examining crushed seed heads and identifying seeds among the chaff.

Along with being able to identify the seeds of a plant, it's also essential to know when they are actually ready for harvest. In general, seeds of native grasses, as well as annual and perennial wildflowers, are ready for collection two to five weeks after peak bloom. Shrub and tree seeds can sometimes take two months or longer to mature. Mature seeds are dry and firm and are typically brown, tan, black, or grey in color. Seeds that are moist or pliable, and that are green, yellow, or white in color are likely to be immature and not ready for collection. Ripe seeds and pods should easily break off the plant with a gentle tug. Seed structures that bend, twist or otherwise appear firmly connected to the plant are likely unripe. Unlike crops, native plant seed often matures at variable times, which is a polite reminder from the plant to leave seed behind so that it can be re-seeded within its existing habitat. Once mature, seeds often disperse quickly or are consumed by animals, so seed collection of mature seeds should not be delayed.

Keep in mind that hot and dry weather can speed up seed maturity, while cool, moist weather can slow it down. It's a good idea to record weather conditions, as well as flowering, seed maturity and collection dates. This information will provide you with a useful reference guide for future collections.

Harvesting Seed 3

In many cases, it is easiest to simply collect seed by hand. Hand harvesting allows you to be selective, avoiding weeds and over-collecting from species that are not abundant. Hand collection can also allow you to target a diversity of species with varying heights and flowering times in your existing habitat areas.

Mechanical harvesting, using a forage harvester or combine, is less discriminating, sometimes collecting both desirable species and weeds alike. Similarly, mechanical harvesting does not always lend itself to situations where plants have variable seed maturity. However, mechanical harvesting is much faster than hand harvesting and under optimal conditions can help you collect significantly more seed.

Figure 4: Mechanical harvesting with a combine.

Factors in selecting the best harvesting strategy include the total area you want to harvest seed from, the accessibility of the habitat area, the diversity of the species you want to collect, the timing of seed maturity, and the equipment you have available.

Hand-Harvesting

When harvesting by hand, make sure to collect seed from plants scattered throughout the habitat area, rather than just collecting from a single clump of plants. By collecting seed from plants spread throughout the habitat you are more likely to maintain genetic diversity, ensuring that your seed will contain a wide variety of traits such as variable tolerance for different soil types. This genetic diversity is critical to the resilience of future habitat areas, helping the resulting plant community adapt to changes in climate, weather extremes, herbivores, weed encroachment and more.

When hand collecting, simply use your fingers to shake or pry seeds from seed heads. Experienced collectors typically tie a bag (or multiple bags when collecting multiple species) around their waist so that both hands are free to collect and bag seeds. It can be helpful to wear gloves, especially when collecting prickly seeds or handling barbed or bristly seed pods. When hand collecting seed, it is sometimes easy to separate the actual seed from chaff (fine plant material such as seed coverings) as you go. In other cases, you may prefer to use garden shears to clip seed heads from their stems for later separation of the seed from chaff, flower parts, and stems (see step 4, page 6).

Table 1: Advantages of Seed Harvesting Methods

BENEFITS TO HAND-HARVESTING	BENEFITS TO MECHANICAL HARVESTING
▸ Allows for targeted collection of seed that matures at different times (e.g., early maturing or late maturing) and of species that occur in patches or are less abundant ▸ Cleaning seeds after collection is easier because species can be kept separate ▸ Readily dispersing seeds can be captured easily (e.g., seeds with fluff) ▸ You can avoid collecting and replanting invasive seeds when they co-occur with natives	▸ Seed can be harvested quickly ▸ Seed can be harvested in high quantities ▸ Short time from harvest to planting ▸ Some equipment can break apart seed structures, which reduces time needed to clean seed ▸ Quickly harvest several distinct patches at different times

Figure 5: Harvesting seeds by hand. Clockwise from top: hand-harvesting native prairie plant seeds[1]; rubber bands contain ripening milkweed seed[2]; and knocking seeds out of a seed head[3].

Table 2: Equipment Options for Harvesting Seed by Hand or Mechanically

HAND-HARVESTING	MECHANICAL HARVESTING
▸ Gloves ▸ Scissors or pruning shears ▸ Bag or tubs ▸ Durable combs ▸ Gauze bags	▸ Forage harvester ▸ Rotary mower ▸ Combine harvester ▸ Pull-behind seed stripper (typically ATV-mounted)

Figure 6: Mechanical harvesting with a forage harvester set to a high cutting height (left) can result in additional biomass (right).

In the case of native grasses, it is sometimes more efficient to use a fine-toothed metal hair comb to rake seeds from their stems than it is to strip them off by hand. Additionally, for plants such as milkweed that have light, wind-borne seeds that burst from their pods, or plants with pods that shatter and scatter their seed (such as lupines), a convenient option for seed collection is to bag the unripe seed pods with a small, fine-meshed gauze bag or hold the pod together using a rubber band. The bags can simply be left in place on the plant and then retrieved after the seed has matured and the pods begin to break open. Dry, well-ventilated areas quicken the opening of pods.

Mechanical Harvesting

There are a number of options for harvesting seed mechanically. Small grain combines are commonly used to harvest monocultures of native grass and flowers. However, combines are less effective for harvesting mixed species of plants given the variation in seed size and shapes and plant materials. It is challenging to adjust air settings and cylinder speeds for proper separation of seeds from stems for a variety of seeds without losing a portion of the harvested seeds.Another option is to collect plant material using a forage harvester set to a high cutting height (often 8" or more for many wildflowers), targeting the flowering structures. Alternatively, a rotary mower that bags the cut flowers can be used. The drawback with both of these methods is that the large amount of biomass you harvest can require significant cleaning to separate it from the seed. Note that as an alternative, you can simply spread all of the harvested material over a new planting area, although precise seed to soil contact will be harder to achieve and the resulting habitat may be less densely planted than optimal.

No matter the equipment you select, there are several considerations. First, it's important to ensure that equipment is clean of weed seeds from previous mowing or hay cutting. Scout areas where you are harvesting seed to avoid invasive species, and if necessary consider hand harvesting to avoid collecting and distributing weedy species. Second, when harvesting, keep disturbance to a minimum to reduce opportunities for non-native plants to invade your site. Avoid compacting soil and creating wheel ruts by harvesting from habitat areas only when the soil is firm. Similarly, whenever driving across your habitat areas, only turn equipment after you've driven off the habitat to avoid damaging established plants.

Spreading Seed Immediately

You can immediately plant the harvested material by hand or, in the case of large amounts of material, by using a forage wagon or manure spreader. If your new planting area runs along the original planting area, consider using the forage harvester to blow the seed into the new planting. Conventional wildflower meadow planting equipment such as a seed drill will not work well unless the seed has been thoroughly cleaned.

Figure 7: Manure spreaders[1] can be used to spread a mixture of seed and forage (inset)[2].

Drying Seed

Even when seeds are ripe and hard to the touch, they often still benefit from additional drying before you store them, to prevent mold from developing and to increase their longevity. The best approach to drying seed is to leave it in an open bag or bin where they receive good air circulation (plastic tarps or kids swimming pools are a good option for slightly larger volumes of seed). Hot locations, or areas that receive direct sunlight are not good for drying, and can kill otherwise viable seed. Additionally, it's good to remember to dry the seed where it will be protected from rain and animals; open barns or sheds are usually good options. Often just a few weeks of additional drying at ambient temperatures are sufficient.

Figure 8: Laying out large volumes of seed on plastic tarps (inset)[1] for drying should be done in areas that do not receive direct sunlight[2].

Cleaning Seed

Seed cleaning involves separating the seed from other plant parts such as dried flowers and stems (chaff). Seed cleaning can be a time consuming process, but by separating the seed from the chaff you can greatly reduce the storage volume needed, eliminate most seed-feeding insects or their eggs, and improve the planting *and* germination success of seeds that are enclosed in pods. The two basic steps in seed cleaning are to: 1) thresh the seed (mechanically break up the material) and 2) separate the seed from chaff using screens, fans, or both.

Threshing is necessary to remove seeds from tough flowerheads where the seeds may be deeply embedded (such as with *Echinacea* spp.), or where the seed is held within pods (such as lupines). Threshing methods can be as simple as carefully pulling the dry

Figure 9: The seed heads of some species, like rattlesnake master (*Eryngium yuccifolium*), need to be crushed to remove the seeds.

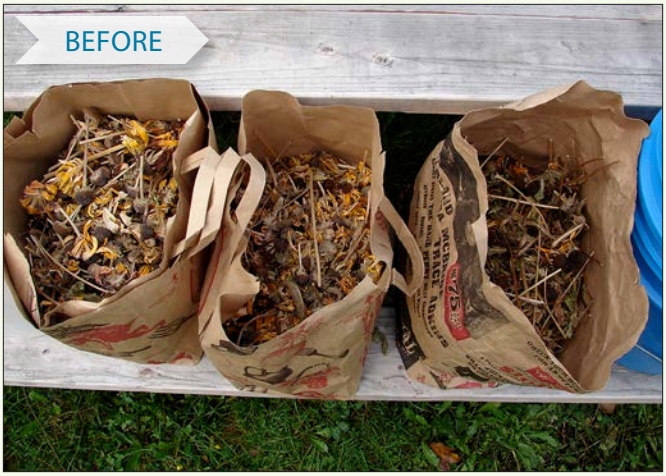
Figure 10: Cleaning Seed by Hand

1 In the screening method, first pour material onto screen, starting with the largest gauge screen.

2 Next, shake the screen so small seeds fall through and chaff is caught.

3 Use progressively smaller gauge screens (left) to further separate seeds from waste, continuing to shake each screen (right) until all the seeds have fallen through.

4 The collected seed will have a more manageable volume to store.



seed heads apart with gloved hands. Alternatively, tough seed heads can be broken apart using an old, dull kitchen food processor (pulsing the seed head a couple of times to chop it up). For larger volumes of seed, a common threshing method is to spread the seed heads out onto a tarp or place them in a large plastic bin, then step on them (boots with rubber soles are best) to break apart seed pods or detach the seed from various dispersal structures (such as awns or fluff). In the case of most wildflower species, it is hard to damage mature seeds simply by walking on them. Still, you may want to test your threshing method on small batches and inspect the seed to ensure it is intact before proceeding on a large scale.

After threshing, the resulting mix of seeds, chaff, and stems can be further separated with hardware cloth, window screens, and kitchen sieves of various mesh sizes. For example, shaking the mix of seed and chaff over screens with various sizes of mesh will allow seed to fall through into a bucket, while stems and larger chaff can be captured and discarded. In general you should not try to push or force seed through the screens as you will typically force much of the chaff along with it.

As a final step, seed can be separated from small bits of chaff by winnowing. This seed cleaning method takes advantage of the fact that seed is relatively heavy for its size, while chaff tends to be lightweight. To winnow seed, pour it from a bucket held several feet above ground into a bin positioned in front of a low speed fan (it is best to do this outside!). The heavier seed will fall into the bin despite the airflow, while lightweight dust and chaff will be blown beyond the bowl. Note that it is perfectly okay if some debris or inert material remains among the seed. This process can be repeated multiple times if necessary to remove large amounts of dust. Note that seed dust can exacerbate allergies for some people, and can contain spores of fungi such as *Aspergillus*, which may be harmful to breathe. Because of this we recommend wearing a dust mask when winnowing seed with a fan.

Figure 11: Winnowing seed in front of a low-speed fan.

Figure 12: Mechanical thresher (left)[1] and seed cleaner (right)[2] used to clean native wildflower and grass seeds for restoration projects.

In addition to this simple process, more sophisticated seed cleaning technology is available such as air screen cleaners, hammer mills, hullers and scarifiers, brush machines, and more. Such equipment is typically expensive and can take significant experience to use. However, for typical on-farm needs, the cleaning process described here is generally adequate and can yield surprisingly good quality and quantities of seed to expand habitat areas.

5 Storing and Sharing Seed

Once your seed is clean of larger debris, it should be stored in a sealed container in a cool location with low humidity, away from direct sunlight. Seed should never be stored in the freezer because the formation of ice crystals can damage seed. Similarly, avoid storing seed in an extremely hot environment, which can destroy seed. Seed should be stored in jars, paper bags, or envelopes, within a covered container to protect it from rodents or seed-feeding insects.

Finally, don't forget to label your seed packages. Basic information such as the species, location of the harvested plant, and date of collection will help you, or other farmers nearby that you may share the seed with, keep track of the seed. Your records should also include information about the origin of the seed you originally purchased to plant your habitat. If you plan on sharing your seed, remember that seed should not be moved outside of the range (or zone) where the species is adapted to climatic and ecological conditions (see Additional Resources for a seed zone mapper).

When you are ready to plant, refer to the Xerces Society's *Habitat Installation Guides* (see Additional Resources, page 9), a series of regional documents to aide growers in planting and maintaining pollinator habitat.

Figure 13: Clean seed ready for storage.

Seed Saving and Sharing to Conserve Pollinators and Connect Communities

Saving and replanting seeds has long been a tradition in farming. Saving and spreading native plant seeds to expand pollinator habitat is a conservation legacy that can be passed down on the farm. Sharing these seeds in your community can spread pollinator habitat, connect neighbors, and benefit pollinators and entire farming communities.

Figure 14: Bagged and labeled seed collection.

Figure 15: A community seed swap hosted at a local library.

Additional Resources

Tallgrass Prairie Center
University of Northern Iowa
Prairie restoration and research, free downloadable publications, including seedling ID guides, seed collecting and cleaning pamphlets, and a prairie seed production manual.
www.tallgrassprairiecenter.org

Revegetation Equipment Catalog
Rangeland Technology Equipment Council
Descriptions, pictures, and sources for equipment used in seed harvesting and processing.
http://reveg-catalog.tamu.edu/12-Seed%20Processing.htm

Plants Database
USDA Natural Resource Conservation Service
Range locations, natural history information, special legal status, and taxonomy of native plants; federal and state noxious weed, invasive, and introduced plant lists; and links to more information.
http://plants.usda.gov

Biota of North America Program (BONAP)
Up-to-date county-level distribution maps of all plants, species status, federal and state noxious weed status, with links to more information.
www.bonap.org

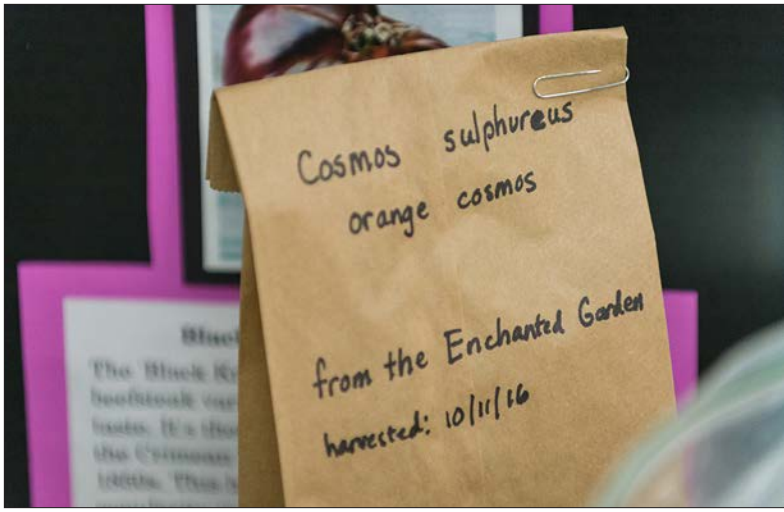
Flora of North America
Taxonomic descriptions and natural history of North American native plants.
http://floranorthamerica.org

Nursery Manual for Native Plants: A Guide for Tribal Nurseries
Guidance for managing a native plant nursery, including planning, seed harvesting, and crop production.
www.fs.fed.us/rm/pubs_other/wo_AgricHandbook730.pdf

Seed Zone Mapper
United States Forest Service
Map of regional boundaries where locally originating plants are adapted to climatic conditions and ecological communities.
www.fs.fed.us/wwetac/threat-map/TRMSeedZoneMapper.php

Pollinator Habitat Installation Guides
The Xerces Society
Guidance on wildflower meadows and hedgerows of flowering shrubs, recommended plant lists.
www.xerces.org/pollinator-habitat-installation-guides

Pollinator Conservation Resource Center
The Xerces Society
Online directory of information from Xerces and other leading conservation organizations and agencies, regionally appropriate lists of native plants for pollinator habitat, habitat conservation guides, nest management instructions, bee identification and monitoring resources, and more.
www.xerces.org/pollinator-resource-center



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