



Prairie Seed Harvesting

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INTRODUCTION

The prairie ecosystem has been an area of special interest when it comes to restoration efforts. The restoration of the prairies in the Midwest have played a leading role in the development of the craft of restorations on a variety of ecosystems (Packard and Mutel, 1997). The restoration of a prairie, however, is a complex process. Many restorations involve planting a diverse mixture of species that are native to the area and are collected close to the planting site. Using seed from local remnant prairie populations helps to maintain the diversity of the prairie species and the prairie community. The availability of the local ecotypes of prairie seed is often a major concern to native prairie restorations (Knapp and Rice 1994). Because the availability of seed often plays a vital role to restoration efforts, it is often necessary to collect seed for each individual prairie restoration project. The seed that is collected may be immediately sown onto restoration site, used to create nursery propagules, or used to establish nursery seed stock. The methods used for collection of the seed ranges from hand collecting to harvesting with machines.

Restorationists obtain seed for projects either by purchasing it from a commercial vendor or by collecting it themselves. The option of buying seed from a respected supplier of locally derived seed has several advantages. These suppliers are often able to produce large quantities of seed below the cost of seed collected by the restorationist. Purchased seed often has less chaff and trash which often results in reduced overall bulk. The supplier also may provide such information as pure live seed (PLS) and the number of seeds per ounce. This type of information is important when deciding the amount of seed needed for a specific project (Packard and Mutel, 1997).

Since purchasing seed for restorations is not always possible, it may be necessary to collect seed. Restorationists cite several advantages to collecting seed for individual prairie restoration projects. First, the prairie seed that can be collected by hand and/or mechanical means for a specific site may not be readily available commercially or from local nurseries. In order to ensure that the desired species or mix of prairie species is obtained for a restoration it is often necessary to collect the seed. Secondly, the seed obtained from a supplier may not be genetically suitable or appropriate for the restoration site. Prairie restoration efforts are generally more successful when seed is collected from sites that are similar to the restoration in terms of soil type and topography. The seed used for restorations should be locally derived. The question of how *local* remains open to debate. Several individuals suggest that seed should be collected within 100 miles north or south and 200 miles east or west of the restoration site. Others recommend that seed is collected as local as 25 miles or less. The feasibility of collecting adequate amounts of seed within these limits may be an issue for many restorationists. A general guide to keep in mind is that seed should be collected as close as possible to the restoration site (Packard and Mutel, 1997; Morgan and Collicutt, 1994; and Thompson, 1992). Finally, an advantage of collecting seed for restoration efforts is that the process can be a worthwhile and interesting

experience for those involved. The process helps to increase and maintain interest and support for the project.

When collecting seed for prairie restorations there are several *ethics of seed collection* that need to be considered. Collectors should always seek permission from landowners of the site, whether the land is public or private. The amount of seed collected from a specific site should be a consideration when collecting. No more than 10 to 75 percent of the seed heads should be collected depending on whether the species is in short supply or whether it is a common species that is locally abundant. Leaving an adequate amount on the site helps to maintain ecological integrity of the prairie community and continued growth of selected species (Shirley, 1994 and Morgan et al., 1995). The seed collector must always be aware of the impact the collection has on the prairie. The seed should not be collected in large amounts from the same site in consecutive years. Instead, the area should be left alone for at least one year before going back to collect more seed (Morgan et al., 1995).

When considering what method to use for harvesting prairie seed it is often helpful to have a set of criteria to follow. The best method for a project should: 1) be efficient at collecting specific species and mixes of prairie seed; 2) have minimal impact on the prairie being harvested and; 3) be flexible in terms of timing and location of the collection especially in areas that have rough or steep terrain (Morgan and Collicutt, 1994). Various techniques and equipment are often needed to collect prairie seed. A general rule for selecting a collection method is that the techniques that use the least expensive equipment are usually the least efficient, though the most selective. On the other hand, methods that use more expensive equipment tend to be more efficient but less selective (Packard and Mutel, 1997). The objectives for the restoration project as well as the resources available also play a role in determining which method to select. The restorationist needs to consider whether the restoration site is intended to resemble a remnant prairie or just have a specific mix of species. The quantity and quality of the seed will determine where the seed is obtained from and what method is used. The amount of seed required to plant one acre of prairie depends on the specific species and mix of species. For example an acre plot of just big bluestem (*Andropogon gerardi*) would require about 6.17 kg of seed (1,742,400 seed/acre). The planting of a mix of prairie seed would alter this amount depending on the ratio of grass to forb species. A prairie restoration may include a mix of 10 species or more than 100 species.

The timing of seed collection is dependent on when the prairie seeds ripen. In most plants the seed or seed heads will begin to dry and change color as they ripen. If the seed strips off easily by hand they are generally ready to harvest (Morgan et al., 1995). Individual plants species usually do not ripen all at the same time, but over a period of days and weeks. Collection of seed from a population at one sampling time may result in accidentally selecting for uniform traits such as the time of maturity. Natural populations usually have a mixture of plants maturing at different times. The variability in maturation is likely to have adaptive importance to the species and the prairie community. In order to achieve genetic variation in prairie seed it may mean that a particular site is collected from more than once (Knapp and Rice, 1994).

Peter Schaeffer, Nongame and Roadsides Wildlife Technician, with the MN DNR who has experience with prairie seed collection and restorations suggests that harvesting seed from a native prairie is a long-term process. He said that it may take many years to actually collect the

true diversity of species within a specific native prairie site. Prairies are dynamic communities; the abundance and diversity of the species are dependent on many conditions such as weather and soil conditions. Thus attempting to replicate a native prairie by collecting seed over one growing season may not be feasible because several years are needed to collect the diverse seed species and mixture that reflects the dynamics of the prairie community.

HAND COLLECTING

The hand collection of seed is an intensive method that involves walking through prairie sites and stripping seeds and/or seed heads from the individual plants. The harvest of seed is most efficient when bags or other containers are attached to the body allowing both hands to be free for seed collection. The prairie seed harvested may all be put in one container or it may be sorted into individual containers by species or location of collection.

The collection of seed by hand results in many more species than harvesting with machines or other methods. Hand harvesting is essential when attempting to separately collect individual species. The hand collection is ideal for seeds that require specialized treatments prior to sowing or if the seed is to be used for nursery propagation (Morgan et al., 1995). The technique used for collecting seed by hand varies from person to person and from species to species. The seed of some species such as Indian grass (*Sorghastrum nutans*) and prairie clovers (*Petalostemum* spp.) can be easily removed by grasping just below the seed head and then moving upward with a slightly open hand across the head. Others such as the columbines (*Aquilegia* spp.) and shooting star (*Dodecatheon meadia*) form their seeds in capsules which must be emptied. Collectors often use a scissors or pruning shears to cut off the entire seed head of species such as purple coneflower (*Echinacea angustifolia*), rattlesnake master (*Eryngium yuccifolium*), wild bergamot (*Mondarda fistulosa*), and the goldenrods (*Solidago* spp.) (Packard and Mutel, 1997).

Collecting seed by hand is a useful technique in areas where the plants are widely distributed and where the terrain or environmental conditions do not allow for machines to be utilized. Those species that are rare, uncommon, seed early or late in the season, or occur in isolated and small patches are usually best harvested by hand. The collection of seed by hand is a unique educational and rewarding experience and helps those who participate become intimately involved with the prairie restoration efforts (Morgan, J.P. et al., 1995)

There are, however, some disadvantages to using hand harvesting techniques versus other methods. Collecting seed by hand is quite time and labor intensive. Also, hand collecting usually does not provide the quantities of seed required for large scale prairie restorations. This method may also be a very expensive process unless volunteers assist with the process.

MACHINE HARVESTING

The main reason for using machines to harvest prairie seed is to increase the quantity of the species above what hand harvesting does. The machines that are used to harvest prairie seed can be categorized into two general groups: (1) small types of machines like the portable seed stripper that can be used to harvest isolated patches of plants or those plants that exist in areas with rough terrain and (2) large machines such as combines are often used to collect large

quantities of seed. Machine harvesting usually involves an investment into the equipment, operators, and maintenance. When considering on whether to use a mechanical harvester there needs to be a cost benefit analysis on the options available. The costs of the purchasing the required amounts of seeds should be weighed against the price of a harvester and the time and money required for collecting your own seed.

Native seed strippers

Native seed strippers include both *portable seed strippers* and the *pull-type seed strippers*. The seed strippers utilize a rotating reel that combs or sweeps the seed off plants and collects them into a hopper. These seed strippers work best when harvesting into the wind. These machines generally have minimal impact on the prairie landscape both in terms of the soil and the vegetation. The seed strippers leave the plant stalks erect which is essential for nesting cover and managed burns. Studies have found no negative effects on the condition of native prairie plant species when compared to unharvested controls. (Packard and Mutel, 1997)

The *portable seed strippers* are simple and efficient machines that are relatively inexpensive. This particular machine operates with the use of a rotating reel that combs the seed and/or seed head off the plant, throwing it into a hopper. Some individuals compare this particular model to a "weed whacker." The portable seed stripper is especially useful in areas that are difficult to access or are too sensitive in which to use other machinery. This machine is easily transported from site to site. Other than the impact of the operator of the machine walking through the prairie, there are virtually no detrimental effects on the sites being harvested. The low impact of harvesting allows the prairie to be harvested several times throughout the year, depending on the availability of ripe seeds. The portable seed stripper however has a limited height adjustment (ground level up to only 0.7 m) which hinders the ability to harvest tall prairie species (Morgan and Collicutt, 1994). This machine can harvest from 50 to 85 percent of the ripe seed in one pass and may harvest up to 8 kg of bulk seed per hour (Morgan and Collicutt, 1994).

The *pull-type seed stripper* is a machine similar to the design and function of the portable seed stripper. The pull-type consists of a nylon bristle brush, which is powered by a five-horsepower gasoline engine mounted on the unit. The brush sweeps the seed into the hopper leaving the plant stalks intact and erect. The harvester can be pulled behind a small tractor or an all-terrain vehicle. The machine's adjustable height, brush speed, and brush angle allows for the harvest of various prairie types and species. The pull-type seed stripper can harvest up to 30 kg of bulk seed per hour (Morgan and Collicutt, 1994).

Even though these strippers are larger than the portable ones they can be transported by pickup truck or on a small trailer. The resulting imprint left from the pull-type seed stripper is minimal, the machine tracks usually disappear within a few weeks. This stripper is ideal for larger prairie areas, where due to the terrain or sensitivity of the landscape other machinery such as combines cannot be permitted. However, it is important to avoid using the pull-type stripper when the soil is wet to avoid damaging the soil (Packard and Mutel, 1997; Morgan and Collicutt, 1994; Prairie Habitats Home Page). A disadvantage of the pull-type seed stripper is that it isn't as selective at harvesting prairie seed as the portable stripper and hand methods.

Combines

The need to increase the volume of prairie seed for large-scale restoration efforts has sparked an interest in using large machines such as combines. The use of combines in harvesting prairie seed is an option on large sites that are easily accessible. Most combines are designed to harvest heavy-seeded agricultural crops that often makes it difficult to harvest prairie seed that is light and fluffy. Modifications however have them much more efficient with collecting prairie seed. The combines may harvest up to 910 kg per hour of bulk seed (Faessler and Apfelbaum, 1988).

Because of their large size and weight, combines are often unsuitable for ecologically sensitive sites (areas that are easily damaged) as well as those with rough or steep terrain. Combines usually operate by cutting the plant stalks off near the ground, leaving little vegetation for nesting cover or fuel for managed burns. Thus, a prairie can usually be combined only once in a given season which results in only a small portion of the prairie species from being collected. However, individuals at Prairie Restorations Inc. have been able to modify the height at which they combine their seed (Bowen, personal communication)

There have been several modifications to the machines. The raising of the combine head results in more of the plant stalk remaining erect and intact; allowing for repeated harvesting in a given season.

Other Machine Harvesting Methods previously discussed. The modified seed strippers and other mechanical harvesters allow seed collectors to adapt their methods for harvesting prairie seed. Several of these machines have been modified to mount on the front of a small tractors or all-terrain vehicles. The device designed by Applied Ecological Services is said to work like a "power lawn mower attached to a vacuum cleaner" (Faessler and Apfelbaum, 1988). The spinning brush creates a vacuum that pulls the seed head into the brush, which removes the seed and deposits it into the hopper. These machines are similar to a combine but are more maneuverable and can be operated on rough land (Faessler and Apfelbaum, 1988; Packard and Mutel, 1997).

WHICH METHOD TO SELECT?

When collecting seed with the intention of restoring prairie sites it is important to remember that no one collection technique or period of time will provide all the seed species that are desired. It is important to be aware that very little about prairie restoration, specifically seed harvesting, has become routine or even commonly accepted (Packard and Mutel, 1997). The decision on whether to purchase seed or collect it for the restoration site is dependent on the goals and objectives. Oftentimes time and money dictate how the seed is collected and/or where it comes from. Also, which method to select is not an either or situation. Collection often involves a mixture of techniques which are selected by the restorationist.

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