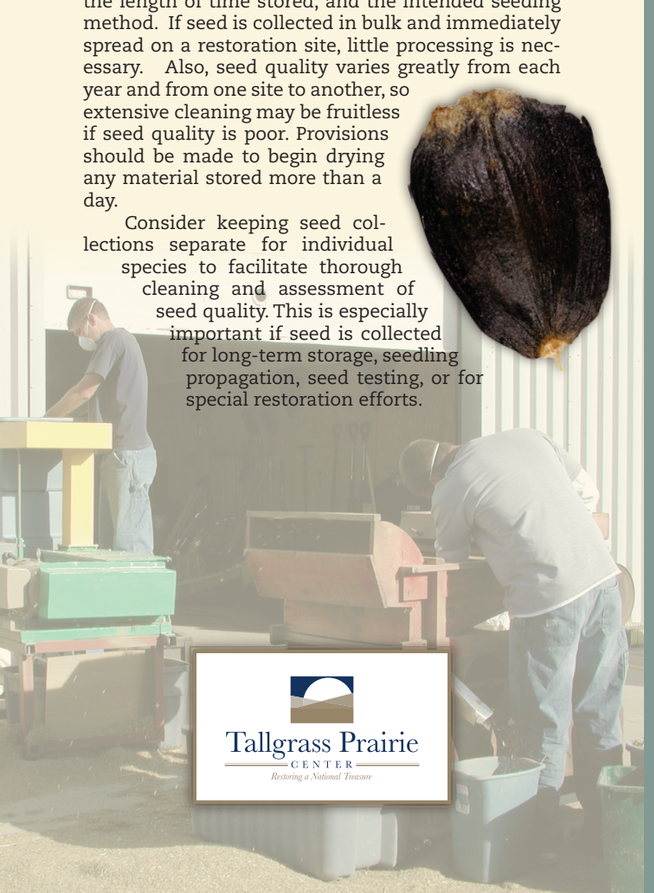
Tallgrass Prairie Center's Restoration Guide

Second in a Series

Drying, Cleaning, and Storing Prairie Seed

Collecting native seed requires a considerable investment of time, patience, and diligence. If the seed is to be stored for any length of time, the next step is to properly care for the harvest! Drying, cleaning and storage requirements for prairie seed after collecting will depend on how and which species are collected, the length of time stored, and the intended seeding method. If seed is collected in bulk and immediately spread on a restoration site, little processing is necessary. Also, seed quality varies greatly from each year and from one site to another, so extensive cleaning may be fruitless if seed quality is poor. Provisions should be made to begin drying any material stored more than a day.

Consider keeping seed collections separate for individual species to facilitate thorough cleaning and assessment of seed quality. This is especially important if seed is collected for long-term storage, seedling propagation, seed testing, or for special restoration efforts.



Tallgrass Prairie CENTER
Restoring a National Treasure

Equipment Needed

This is a basic list of equipment needed for drying, cleaning and storing native seed on a modest scale:

Drying

- **Clean, dry work space protected from the elements**
- **Newsprint (or tarps for spreading out larger quantities of seed)**
- **Low humidity and good air circulation**
- **Box-type fans**

Cleaning

- **Plastic tubs and other containers of various sizes**
- **Screens of various mesh-sizes and dimensions**
- **Leather gloves**
- **Good quality dust masks**
- **Good ventilation**
- **Heavy work boots for stomping**

Storing

- **Cool, dry, rodent proof storage area**
- **Refrigeration for long term storage (more than a year)**
- **Air-tight bags or containers for dried seed**

Much of the bulk material in native seed collecting is non-seed (inert) floral parts, leaves, and stems. The quantity of material collected will dictate the scale of time, tools, and equipment needed for efficient drying and processing of the seed. Some species are more challenging to process than others.

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Important Tips on Seed Drying

Drying bulk material immediately after harvest is critical for preventing mold and mildew. Drying will also allow some immature seeds to ripen and aid threshing of the seed out of seed heads or pods, and thus help maximize seed yield. Small amounts can be placed loosely in cloth or paper bags or spread out on screening or newspaper in a cool, dry place with good air circulation. If using paper bags, leave tops open and turn the contents once or twice daily. Take care not to pack collected bulk material into bags too tightly; keep it loose so air can circulate.

Breathable cotton bags full of seedheads in forced-air drying bins.

Larger quantities can be spread on tarps and turned once or twice daily with pitchforks. Place box fans strategically to keep air circulating over and around bulk material. **Do NOT use any form of direct heat!** It can damage and kill seeds. Drying may take several days to two weeks, depending on quantity and drying conditions.

Spiderwort spread on tarp with box fan.

Some Simple and Effective Cleaning Techniques

Simple techniques are available to effectively clean modest amounts of seed. Proper cleaning will remove much of the inert material and dust, and also remove empty, non-viable seed. These cleaning techniques involve various ways of threshing (knocking seed free of seedheads) and sorting seed using screens and airflow. Material should be properly dried before further cleaning.

Threshing - Stomp method

Species with large, coarse seed heads that tend to hold the seed tightly can be threshed by stomping. This method is very effective on wild indigo *(Baptisia)*, rattlesnake master *(Eryngium)*, compassplant and rosinweed *(Silphium)*, sunflowers *(Helianthus)*, black-eyed susan and sweet coneflower *(Rudbeckia)*, golden Alexander *(Zizia)*. Using large plastic tubs, place a 2-in. layer of bulk material in the bottom and stomp. Toe kicks to the corners of the tub help break up any stubborn seed heads. Stomped material is then screened through a coarse ½-in. or ¼-in. screen into a second tub. Continue in batches, returning any intact seed heads remaining to the stomping tub. Pale purple coneflower *(Echinacea)* tends to be stubborn and may require machine threshing, unless it's collected late in the season after seed heads naturally begin to break apart.

Threshing - Shake Method

Many species have seeds that shake free of a capsule or open pod. This method can be effective for dried seedheads of Culver's root *(Veronicastrum)*, cardinal flower and great blue lobelia *(Lobelia)*, shootingstars *(Dodecatheon)*, mints *(Pycnanthemum, Monarda)*, and gentians *(Gentiana)*. Either hold dry seedheads upside down and tap against the inside of a tub or place in a bag and shake or beat gently to free seed. This method has the advantage of minimizing the amount of chaff and inert material in the seed.

Threshing - Screen Method

Hand clipped and dried seedheads of blazingstars *(Liatris)*, asters *(Symphyotrichum)*, and goldenrods *(Solidago, Oligoneuron)*, and spiderworts *(Tradescantia)*, for example, can be threshed by rubbing the seed heads over a large screen made of ½-in. or ¼-in. hardware cloth using gloved hands or aluminum scoop shovels. Elevate the screen on sawhorses over a tarp; fluffy seed will float down onto the tarp and can easily be scooped up for further processing.

Hand screening Stiff goldenrod.

February 2009

Graphic design:
Brent Butler

Screens

Screens are used for sorting by shape and size and are essential for cleaning. Any kind of mesh can be made into a ready-made screen including kitchen sieves, colanders, window screens, hardware cloth, decorative grating are just a few ideas. Commercially available screens are made in a wide range of pore sizes and shapes for specific purposes. Handheld pan-type screens are handy for small batches. Homemade screens of hardware cloth, available in 1/8, ¼, and ½ inch mesh attached to wood frames are effective for rough cleaning. Depending on the application, screens are classified as scalping, grading or sizing, and sifting, as described below.

Scalping

Scalping removes objects larger, longer, and wider than the desired crop seed. Screens used for scalping have pores larger than the seed. Most compassplant seeds will fall through a ½ inch mesh, for example, which scalps off larger bits of leaves, stems, and bracts. Scalping material through a much larger screen first, and then one closer to seed size is often more efficient, allowing material to flow more freely through each screen.

Grading or Sizing

Grading sorts desired seed, or "crop" seed by size. Any given species' seed will contain a range of seed sizes. Avoid intentionally grading seed intended for restoration plantings, since selection for seed size can happen in one generation, (i.e., large seeds will give rise to plants with large seeds), and may reduce genetic variability. Large rosinweed seeds, for example, may not go through a ¼ inch screen, but smaller rosinweed seeds will. Using a ¼ inch screen in this case would not be advisable.

Sifting

Sifting is the final screening step. Use a screen with pores just smaller than the seed to allow dust, broken seeds, etc. to fall through and yet retain desired seed on screen. For example, most compassplant seeds won't fall through a ¼ inch screen, but smaller bits of plant material will, especially the 'straw'.

This series of screening processes is effective in concentrating desired seed and removing most inert material. Not all seeds will be viable, however, even if they otherwise look normal. Some seeds will be 'light' in weight due to immaturity, underdevelopment or from being eaten from the inside by seed predators. These seeds will not be removed by simple screening. This "light" seed is removed with airflow, either by winnowing or aspiration.

Airflow - Winnowing

Winnowing uses horizontally moving air to separate heavy from light particles. Winnowing seed in a gentle breeze can be very effective in removing chaff and light seed. To achieve more control, place a tarp on the floor and an ordinary box fan at one end of the tarp. Pour seed gently in front of the fan. Heavier seed falls closer to the fan than light seed. Fine-tune the process by experimenting with fan speed and distance from fan. Once you find the most effective combination, continue to pour the seed in front of the fan in a consistent manner. The seed should now be laying somewhat fanned out on the tarp, with the heavier seed nearer to the fan and light or empty seed further away. Using a thumbnail, push down on the seed coats closest to the fan at first, repeating this test as you gradually move away from the fan. Heavy seed will feel firm and resist being crushed with gentle, downward pressure; empty seeds, on the other hand, will offer little resistance and crush easily. Make a determination where the heavy seed ends and the light or empty seed begins, and draw a line through the pile of seed at this point. Clean, heavy seed can then be swept up and stored for planting, while the rest is discarded.

Airflow - Aspirating

Aspirating uses vertically moving air to suspend particles in a column. Lighter seeds are either captured in a pocket of the column, as in a South Dakota seed blower, or blown completely out of the column. Heavier seeds drop out of the column. Desired separation is achieved by adjusting airflow in the column.

Fanning mills and air/screen cleaners are machines designed to combine the screening and aspiration process and are very efficient once the proper screens and settings have been made. Old fanning mills, which both screen and aspirate seed, can sometimes be purchase at farm sales for a modest price, but require repairs.

Clipper Cleaner fanning mill.

What is Debearding?

Many grass species have seeds with "beards" (hair-like awns), and many forb species have "parachutes" (pappus) attached to seeds (e.g. fluffy seed of asters and goldenrods). These awns and pappus are adaptive and aid seed dispersal in nature. Debearding is the process of removing these hair-like appendages. The terms debearding and de-awning are sometimes used interchangeably and applied to both grass and forb seed.

A. 

B. 

A. Big bluestem with beard, top; caryopsis below.
B. Purple prairie clover with hull, top; dehulled below.

What is De-hulling?

Seeds of native legumes (bean family) are tightly held in small pods or hulls (e.g. prairie clover, showy tick trefoil, leadplant, roundhead bushclover). De-hulling removes seeds from these pods.

Are Debearding and De-hulling Necessary?

Debearding fluffy grass and forb seed and de-hulling legume seed isn't absolutely necessary for seed to germinate and grow, at least eventually, and are impractical to do by hand except on a small scale. These techniques do provide important benefits, however, and are used routinely by commercial native seed producers. Both of these techniques improve flowability of the seed allowing it to be cleaned to greater purity and germination. Seed will flow through a seed drill more efficiently when planted, and removing awns or hulls improves seed-to-soil contact important for timely germination.

In addition, mechanical de-hulling provides scarification, a process that prepares the hard seed coat of legumes to more readily absorb water for germination. Removing the hull also allows for more accurate laboratory seed testing, since hulls can mask seed quality.

De-awning or de-hulling small lots of seed by hand is time consuming and dusty, but can be done. It can be accomplished by rubbing fluffy seed over a small mesh screen with openings just large enough for the seed to pass through, then using air-flow to separate seed from chaff. A small gallon-sized Forsberg huller/scarifier machine is useful for de-awning small quantities of seed. This type of machine is very aggressive and only a few seconds of treatment are typically needed. Another inexpensive device is the Hoffman Mfg. hand deawner/debearder.

Forsberg Huller/Scarifier

Storage

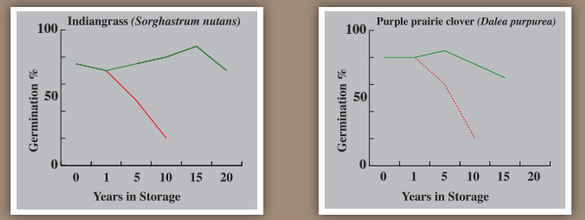
Proper storage of seed is essential to maintain viability (ability to germinate) and vigor (ability to successfully establish in the field). Seed can be kept in a cool, dry, rodent-proof place for up to a year. Longer-term storage requires a stable temperature- and humidity-controlled environment. Seed stored at 60˚F stays viable twice as long as seed stored at 70˚F. A good rule of thumb is that the sum of the temperature (degrees Fahrenheit) and relative humidity (RH) should not exceed 100. Examples would be storing seed at 50˚F and 40% RH or 40˚F and 50% RH, the addition of the two is less than 100. Relative humidity above 40% is especially detrimental to legume (oil based) seeds. Once seed has been dried properly, moisture resistant containers, such as glass or plastic jars, or 4-mil plastic bags (Ziplocs), will help protect it from collecting moisture.

Other Important Factors Affecting 'Shelf-life'

Important factors besides temperature and humidity can affect longevity of stored seed. Non-seed (inert) matter can harbor fungal and insect pathogens, which might damage seed during storage. Cleaning seed properly and thoroughly will extend viability. Overly aggressive cleaning, however, can damage seed and shorten longevity of stored seed. Care should be taken with debearding or de-hulling processes not to damage or break seed.

Storage Affects Germination

Generally, germination tends to increase slightly in some species stored up to a year after harvest as dormancy mechanisms break down. Germination then declines over the long term due to seed mortality during storage. Proper storage conditions will slow this decline.



Selected Prairie Resources

A Guide to Prairie and Wetland Restoration in Eastern Nebraska. Steinauer, G. 2003. Prairie Plains Resource Institute and Nebraska Game and Parks Commission. 82 p.

Tallgrass Prairie Center's Native Seed Production Manual. Houseal, G. A. 2008. A comprehensive guide to native seed propagation and nursery production for 50 tallgrass prairie species. 122 p.

Tallgrass Restoration Handbook. Packard S, and C. Mutel. 1997. Island Press. Washington, D.C. 463p.