

The Seed Project

Purpose

This project documents how seeds were collected, processed, evaluated for purity and planted to improve reseeding efforts in conservation reserve fields with different soil conditions.

The seeds and seed pods organized on this webpage were collected for a reseeding project planned for the farm. Some areas in the conservation reserves have difficulty growing plants in moist soil, while other reserve fields were supporting plants under similar conditions. The goal was to collect seeds from the areas that were doing well and plant them in the areas that were not. As the project progressed, seeds were also collected from drier areas for use in other locations with similar conditions. In all, twenty-five plant species were eventually used.

Seed Collection and Processing

The collection process began with seed pods. Individual pods or branches of pods were typically snipped and placed in boxes. Collection began in August and continued into December. The boxes were then taken home, where the seeds were removed from the pods and placed in small brown bags. This removal process became central to the project because it determined how the seeds would be handled, cleaned and counted.

For each collected seed type, the planting coverage needed to be estimated. The key question was how many square feet a collection of a particular seed could cover when planted. To answer that, the weight of the collected seed mix had to be measured, and the purity of the mix had to be estimated. In other words, the project needed to determine what portion of the collected material was live seed and what portion was unwanted material. Cleaner samples made the counting process more accurate and less difficult.

Bracts and Seed Structures

One term used throughout this project is “bract.” In this context, a bract is the tube-like structure that connects the seed to the flower and helps conduct nutrients from the plant to the developing seed. Bracts take many forms and

are commonly found with seeds when collected. The image below shows Thoroughwort bract next to a single seed.



Late-blooming Thoroughwort bract and seed; ruler marks one-tenth inch.

Filtering

After the collected stems and seed pods were brought home, the next step was to extract the seeds from the pods. This often required rough, abrasive methods that could damage the seeds and produce a large amount of chaff. Filters were used to separate seeds from unwanted material and to prepare cleaner samples for weighing and counting.



Seed filters and weighing scale.

Macro Photography

Macro photography helped reveal what remained inside the pods after gentle seed removal. Close-up views showed that many, if not most, seeds were still attached, so additional extraction would be needed. The camera assembly pictured here was used for inspecting small seed structures and for counting purposes.



Macro camera, flash units, and micro-adjustable tripod.

Blue Vervain Example

Blue Vervain provided a useful example of a relatively easy seed extraction process. Holding the stalk in one hand and rubbing it with the fingers of the other released more seeds, though it still produced chaff. The three-image sequence below shows the progression from stems to unfiltered seed mix and then to filtered seed mix.



Blue Vervain stems; darker stems are more mature. The ruler is marked in 1/10th inch units.



Unfiltered Blue Vervain seed mix.



Filtered Blue Vervain seed mix.

Together, these images show how filtering reduced bulky pod fragments and produced a cleaner seed mix for later weighing and counting.

Seed Damage During Filtering

Rubbing seed pods against filter mesh released additional seeds, along with many pieces of unwanted material. This method improved extraction but could also cut the seeds. The Grey-headed Coneflower image below highlights both a cut seed and a seed that separated naturally from the pod.

The picture shows that using filters with larger openings can be preferable when separating seeds from the pods. They can reduce damage while still serving the purpose of releasing the seeds from the pods.



Grey-headed Coneflower seeds; one cut seed and one naturally separated seed.

The comparison helped show why larger filter openings were sometimes preferable: they reduce damage while still separating much of the chaff.

Seed Tails

Filamentous seed tails create problems for seed extraction and dispersal. When seeds are broadcast over a large area, tails can be caught by the wind, making consistent coverage more difficult. Tails also affect the estimated weight of a collection of seeds. Although their contribution to the total weight is small, it still needs to be considered when calculating how much live seed was collected.

Removing the tails was not always straightforward. Grinding the seeds against a filter can cut off the tails, but it can also cut the seeds. Filters with larger openings help reduce that damage, but they also allow seeds with attached tails to pass through.



New England Aster seed with cottony tail.

Seed Counting and Coverage Estimates

Ultimately, seed samples had to be counted for live seed and particles of chaff. Macro photography made this possible with the display of enlarged images on a computer screen. The image below shows how visual markers were used to separate live seeds from unwanted material, with straight lines marking live seeds and circles marking other particles. In addition to live-seed percentage and seed weight, the calculation required two variables: the number of seeds per ounce and the number of seeds per square foot needed for planting. These numbers were obtained online from referenced sources and then combined with the visual count to estimate planting coverage. An example can be worked out using the Acorn Grey-headed Coneflower seed. In the image shown above, 131 live seeds and 59 unwanted particles were counted, giving a live-seed percentage of 69%.

The total weight of the collected seed mix was 0.21 ounce. Online sources reported that this type of coneflower has 28,500 seeds per ounce, so the collection contained about 4,130 live seeds: $28,500 \text{ seeds per ounce} \times 0.21 \text{ ounces of seed} \times 0.69 \text{ (percent of live seed out of the total mix)}$. A total of 28 seeds per square foot is recommended for adequate coverage. Dividing 4,130 live seeds by 28 seeds per square foot gives an estimated coverage of 146 square feet.



Live seeds marked with lines; unwanted material marked with circles.

Conclusions

Planting was recommended for late fall or winter. Alternating cold and warm periods help the seeds sink into the soil and stimulate germination. The seeds were broadcast on the morning of a very cold day. A winter storm was forecast that day. There was no snow on the ground, but the ground was frozen. Later that day, a storm buried the seeds under a foot of snow. Warmth from the ground and insulation from the snow allowed the seeds to begin the freeze-thaw cycle that supports germination. These were ideal planting conditions.

The project shows that careful collection, extraction and counting of the seeds and timing can turn small seed harvests into a sound reseeding effort. By measuring seed quality and estimating coverage before planting, the process made the reseeding work better organized and better informed.

How well did the methods I chose work out? The collection of seeds could be difficult. Trying to find the time at which the seeds are ready to be released often failed. If the pods were pulled too soon, the seeds could only be extracted with abrasive techniques that damaged the seed and created much unwanted debris that interfered with seed counting. If I waited too long, the seed was gone. Even a single day late may be too much.



Seeds, seed pods, and labeled paper sacks.

Trying to interpret field results was also difficult. I shook one Thoroughwort stem with flowers in the field to see if seeds were finally released. A cloud of what appeared to be seeds came out. I took the frond home and found when viewed using the macro lens that what was coming out was bract that connected the seed to the flower. The seed was already gone.

The macro lens itself proved quite useful in practice. Connecting the small world of seeds with plants growing in the reserves is a learning experience. Bract, seeds, seed pods and other particles became large objects on a computer screen. Much could be learned by simply observing this state of nature.

The filters were a remarkable tool as well. Size estimates could be made by seeing what passes the various openings of the mesh and what is trapped. Their use also helps refine the purity of seeds by filtering out unwanted particles. One seed when spread on a plate appeared to be nothing but the tiniest of observable particles, little more than dust. But this seemed to be surrounded by a halo of something else even smaller. With the use of the filters and the macro lens, the halo turned out to be immature seeds, identical in form to the grown seeds but much smaller and not living. They were the smallest particles that I observed, passing through even a filter of .15mm. That is about the size of a human cell or some microscopic protozoa.

Was the seed project a success? The results may not be fully known for several years. Seeds can take a year or more to establish before sprouting.

Whether they become part of this plant community remains to be seen. What is known, however, is that the seeds were live, in sufficient numbers and planted under good conditions. This gave them the opportunity to compete with nuisance and invasive plant species already established in the conservation reserves. It also gave me a window into the workings of nature. When viewed this way, the project was a success. Hopefully, others may share and learn from it as well.