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Large-Scale Harvesting of Prairie Seed

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Customized farm implements enable an organization to increase harvests – and decrease the cost – of diverse mixes of prairie seeds

A recurring problem for restorationists seeking to create communities that resemble native "model" communities as closely as possible is the availability and cost of seed.

We at Applied Ecological Services, Inc. are dealing with this problem in part by harvesting our own prairie seed using a number of standard farm implements and equipment fabricated or especially modified for this purpose.

Most modifications are relatively simple adjustments of standard equipment that can be accomplished by a moderately skilled mechanic working with ordinary hand tools. Only a few involve specialized equipment and skills such as welding. Typically, modifications are inexpensive relative to the cost of the original equipment.

The several items of equipment described here are the key elements in a program of mechanization that has allowed us to scale up our harvest and handling of prairie seeds considerably in recent years, from only a few hundred pounds of grass and forb seed per year in 1985, when we relied principally on hand harvesting, to more than 27,000 kg (60,000 lb.) in 1987.

At the same time, the cost of harvesting has fallen dramatically, from an average of about $14.00 per pound for all seed harvested in 1985, to as low as 20 cents per pound for some species harvested mechanically.

We see this as a major step toward our goals of producing large quantities of inexpensive, locally-collected seed in mixtures that reflect the species composition of native communities.

Combine

Central elements in our collection of mechanized prairie seed-harvesting equipment have been several Allis Chalmers combines with a 20-foot grain head, which we use principally for harvesting grass, some wildflowers, and some wetland sedges.

Although the use of a combine to harvest seed of prairie grasses is not new, we were soon confronted by problems. The questions we asked were only partially answered by major seed producers in the western United States and even less satisfactorily addressed by equipment manufacturers.

The most serious of these are related to cutting the plants cleanly and to seed loss during separation. To cut efficiently the sickle and guards must be sharp. Specially made "after-market" sickles with twice the number of cutting edges work much better than standard sickles. A pick-up reel is generally needed to pull downed or tangled plants into the cutting head. And for proper threshing, the cylinder bars and concave bars need to be in good shape to maintain consistent clearances. On smaller machines, the fluffy, bulky seed of many native plants tends to plug the augers. We have found that this

problem can be reduced by reinforcing the ends of the flighting on the auger and lengthening them slightly to help the material discharge completely.

Probably the most important modification is the relatively simple one of reducing the amount of air being blown through the separation area so that seed is not blown out the back of the combine. Most combine companies offer devices to restrict air flow, and we have also made our own. Depending on the equipment, a small panel (sometimes just a piece of cardboard) over the intake does the job. But it is important to keep in mind that small changes here may make a large difference in air flow, so that adjustment of this system may take some careful fine-tuning.

Seed of some species may plug the adjustable chaffer, and removing every other louver may be necessary in extreme cases to prevent this. It may also help to flatten any protruding edges that are catching or restricting seed flow.

Because the grain bin will not unload fluffy seeds effectively, it is best not to fill it over half full. A two-inch square or round pole several feet long can be used to work the seed into the discharge auger. But be very careful to stay clear of any moving parts!

Costs associated with this piece of equipment have turned out to be modest. One combine, a Gleaner Model F, was purchased second-hand, in good condition for $5,000. Modifications cost $1,500 for parts and an estimated 60 hours of labor. Operating costs for harvesting, including labor, insurance, depreciation, maintenance and fuel, have so far run between about $15 and $40 per hour at a harvest rate of 3-7 acres per hour.

Performance has been highly satisfactory. The combine handles a wide variety of grasses, wetland sedges, wildflowers and other flower seeds. It can also operate under a variety of conditions and on difficult terrain, including slopes of as much as 20-30 degrees.

Operating under optimum conditions (dry weather and a dense stand of good prairie in mature condition) this piece of machinery can bring in as much at 1,500-2,000 lbs. (680-910 kg) of bulk seed per hour. Operated on single species stands in an artificially established “seed orchard,” it has brought in yields as high as 1,000 lbs. (450 kg) per hour for Indian grass and 1,500 lbs. for big bluestem.

We carry out this operation with a trained operator for the combine and an assistant who handles unloading of the seed. Ancillary equipment for unloading includes a pneumatic seed evacuator (Hanlair Model 1400), which required certain modification s in order to handle prairie seeds effectively. These include sharpening of the air-lock rotor blade to prevent pinning of grass stems, which eventually results in clogging of the machine.

We unload seed from the combine directly into grain trucks, then deliver it to the company farm for unloading with the evacuator. After unloading the seed, we store it in storage facilities made from semi-trailers modified with forced-air ventilation systems for drying. After grass seed is debearded and hulled in a modified farm feed mill, it is unloaded into bins which gravity-feed into fanning mills. After cleaning, seed is bulk bagged or placed in bins for mixing.

We move our combine equipment long distances over highways using our own flat-bed trailer or we have implement dealers move the equipment. In this way we have carried out harvests at sites as much as 180 miles/300 km away from company headquarters at a cost of about $2 per mile.

Sweeper

Though highly effective at harvesting many species, our modified combine has limited value for many other prairie and wetland species, especially in wet or unstable areas on very steep slopes, or in areas with many trees.

In order to harvest seeds of these species more effectively, we have devised a seed sweeper which consists of a 24-inch diameter street sweeper-style brush mounted on an all-terrain vehicle (a standard four-wheel drive Honda Foreman, which cost around $3,500.00).

A framework attached to the front of the ATV holds the sweeper brush that can be raised or lowered to adjust to the height of vegetation by a winch unit with controls on the steering column of the ATV.

The device works rather like a power lawn mower attached to a vacuum cleaner. The spinning brush detaches seed and also creates a vacuum which draws the seed into a bin on the back of the unit for later bagging.

Like the combine, it is operated by one person, though it is helpful to have an assistant to help with unloading. Operating costs vary from $6.50 to $150.00 per hour, depending mainly on the amount of use, since much of the expense is due to fixed costs.

The all-terrain vehicle itself has been modified by being mounted on half-tracks. It produces a ground pressure of only about 0.4 pounds per square inch and is easily used in wetlands or on steep or rugged terrain. The low loading makes it non-destructive, even in relatively sensitive communities. In wetlands it rides across the surface of tussocks, and when driven across prairie leaves a barely visible track.

With this machine we have been able to harvest impressive amounts of seed rapidly and inexpensively from both tallgrass prairies and wetlands. Exemplary harvesting rates include 15 lbs. (7 kg) of blazing star (*Liatris cylindracea*) in an hour, and comparable quantities of such plants as *Carex vulpinoidea* or *Carex normalis* in the same time.

In 1986 and 1987 we harvested seed of nearly 250 species in sufficient amounts for use in restoration projects. Most of these were harvested with the equipment described above; some species are still best harvested by hand because they occur as isolated plants in sensitive areas or in areas where access is difficult or undesirable species abundant.

The machine-harvested seed does include a considerable amount of chaff and trash. We sometimes subject this material to further processing, using hammer and fanning mills. Generally, however, we favor the use of unrefined mixtures for restoration projects, since we feel that the added time and cost of refining seed of several hundred species is prohibitive. In addition, leaving seed mixed with trash has certain advantages, since once reduced in the hammer mill, leaf and stem parts have some value as a mulch, reducing the amount of additional mulch or protective cover crop needed to establish a planting.

We do label seed lots with information about species present, and generally subject mixtures to viability tests using tetrazolium chloride or germination before using them in restoration projects.

While our production of grass seed has increased, we are especially concerned about the production of seed of the more difficult prairie and wetland species, including sedges, forbs, and the less

abundant grasses. At present, our goal is to produce the equivalent of 10,000 lbs. (4,500 kg) of pure seed of these species within five years. Some of this will be harvested from natural stands, but a large fraction will be harvested from restored communities serving as seed "orchards." At present we are planting and harvesting on several hundred acres of planted prairie on reclaimed mined lands and other restored sites, including road shoulders, and are also harvesting on nearly 45 ha under leases with landowners. We will also be increasing available seed orchard resources by planting additional acreage, and through a program for the preservation and management of prairie, wetland and savanna remnants being carried out with the assistance of organizations such as the Wisconsin Prairie Enthusiasts. Profits from the sale of seed collected on these sites will be used to finance the acquisition of additional land, another example of how restoration efforts can support and extend the preservation of natural lands.