



Native Plant Seed Collection and Seed Production for Reclamation

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There is an ever-increasing demand for a reliable supply of quality native seed as land managers face the challenge of revegetating vast tracts of disturbed lands. One option for increasing availability of native species is through the development of a wildland seed collection program. The process begins with identifying and selecting appropriate species, locating productive stands of target species, conducting wildland seed harvest, and planting under agronomic conditions for the purpose of seed increase. The success of native seed collection is influenced by seasonal climatic and environmental conditions, stand density, seed phenology, ripening uniformity, seed size, and experience of the collectors. Grasses are among the easiest to hand-harvest and repeated wildland collections in two National Parks of more than 20 species indicate that mountain brome consistently yielded the greatest amount and averaged 1.0 lb clean seed per person-hour of collection. Assuming standards of seed quality and typical planting techniques, approximately 9 hours of collecting is necessary to establish a 1-acre increase field of mountain brome. Species that are likely to average a smaller yield and require a greater commitment to person-hours of collection time include big bluegrass (3 hr), bluebunch wheatgrass (9 hr), bottlebrush squirreltail (29 hr), and needle-and-thread (85 hr). Wildflower seed collection is influenced by additional factors such as smaller stands, fewer plants in a stand, lighter and fluffier seed, and increased insect predation on the seed. Common yarrow averaged 2.6 ounces clean seed per person-hour of collection and approximately 1 person-hour of collection should provide enough seed to plant 1 acre. Blue penstemon may require 2 hours, hairy goldenaster 29 hours, northern sweetvetch 26 hours, and sticky cinquefoil would take 3 hours of collection to get enough seed to plant 1 acre.

Seed increase should be done on irrigated cropland under cultivated conditions to maximize seed production and to optimize seed viability and quality. Native perennial species rarely produce a seed crop the establishment year, so a minimum of 2 to 3 years lead-time must be factored in to achieve production goals. Soil conditions in the production area should be fertile, medium textured, moderately well drained, and low in soluble salts. The land should be level or sloped less than 8%. Planting time for most cool-season grass is in early spring, while the majority of wildflowers benefit from a late-fall, dormant seeding date. In Montana and Wyoming, the recommended guideline is before May 15 or after October 15. Proper seedbed preparation is critical for successful seed germination, seedling establishment, and stand development. The seedbed should be smooth, free of hard clods, absent of weeds, and firmly moist (footprints $\leq \frac{1}{4}$ inch deep). Row-spacing width may vary from 22 to 30 inches, and is dependent on the type of mechanical tillage equipment, planter, and method of irrigation. A double-disk drill, with depth bands and packer wheels, operated at a speed of < 2 miles-per-hour, is ideal for planting a uniform rate of 30 to 35 pure-live-seeds per linear foot, with depths to $\cong \frac{1}{2}$ inch for grass and $\cong \frac{1}{4}$ inch for wildflowers. Soil moisture must be high enough for continuous plant growth up to the time of flowering, and additional irrigation will be necessary after harvest and on into freezeup in the fall. Supplemental irrigation, in adequate amounts up to floral emergence and after flowering, will increase yields as much as 50% over dryland production. Fertilizer is not recommended during establishment, to avoid feeding the weeds. Soil fertility tests are strongly advised to reduce unnecessary expenses and nutrient input. After the first growing season, irrigated grass seed production fields are fertilized in early fall with nitrogen and phosphorus at a basic rate of 80 lbs/acre actual N and 40 lbs/acre actual P, and then irrigated to initiate development of floral primordia. Wildflower fields can either be fall or spring fertilized at 75 lbs/acre actual N and 50 lbs/acre actual P. Weed control is absolutely crucial to minimize competition for moisture and nutrients, and the most effective approach is an integration of several methods. Shallow ($\leq 1\frac{1}{2}$ inches), mechanical cultivation between rows should occur as soon as the crop is distinguishable and long before

the weeds are well developed. It may be necessary to mow grass seed fields several times throughout the first growing season, and two to three times after seed harvest to control late season weeds. Mowing wildflower fields once or twice after harvest to control late season weeds, or secondary flushes of weed growth, should be adequate. Manual removal of weeds or off-types (genetic variants) within the crop production row is commonly referred to as roguing and can constitute many hours of intensive hand weeding. Herbicides are used to control annual and perennial weeds in seed production fields, and rate and time of application are applied according to the manufacturer's label. Broadleaf weeds can be selectively controlled in grass seedlings at the one- to two-leaf stage with bromoxynil; clopyralid, dicamba, and 2,4-D can be sprayed after the four- to five-leaf stage. Chemical weed control in wildflower seed fields is more limited due to fewer choices of registered chemicals and potential damage to the crop. Cultivation, mowing, and hand weeding during the establishment year is recommended. After establishment, pre-emergent herbicide options include diuron, hexazinone, metribuzin, and trifluralin. Chemicals such as bromoxynil, imazethapyr, imidazolinone, and 2,4-DB may be options for post-emergent foliar sprays. Perennial weeds that are hard to kill may also be spot-sprayed with glyphosate. Insect infestations oftentimes reach a serious level before the problem is observed, and identification and control can be very difficult. All fields should be monitored on a regular basis and county weed specialists contacted for current information on insect control.

Seed maturity and readiness is determined by physical examination of the seed. Harvest should occur when the seed is in the firm to hard stage, and prior to shatter and dispersal. Depending on seed ripening characteristics, seed may be harvested mechanically with a seed stripper or direct combined. If the seed is extremely valuable, and/or the production field is less than one-quarter acre in size, a piece of plastic or canvas tarp may be fastened under the swather for direct catchment. This "diaper" attachment minimizes loss of seed due to impact and shatter, but careful handling and monitoring of the biomass is required. Hand-harvest may be necessary when the seed is particularly valuable and/or the field is too small or unsuitable for equipment. All harvested material must be allowed to completely dry to a moisture content of less than 14% before being processed or conditioned over seed cleaning machines for removal of inert matter, weed seeds, and/or immature crop seed. Seed is best stored in cloth or polyester-woven plastic bags, at optimal environmental conditions. To examine the ambient conditions of an existing facility for potential seed storage, a good rule of thumb is – when maximum temperature in degrees Fahrenheit is added to maximum percentage relative humidity, the total must be less than 100. High levels of humidity are especially detrimental to the long-term viability of seed from herbaceous plants. Even under good storage conditions, seed longevity is species-specific and varies from just a couple years to many, many years.

It is most economical to focus collection and production efforts on species with wide geographic amplitude, good seedling vigor and establishment characteristics, and ones that produce seeds that are easy to harvest and condition. In addition to growing seed for revegetation of a specific habitat or project, there may be opportunity to commercially market native seed for use outside the immediate targeted area.