

If available seed sources are cultivars, either the seed company or the NRCS will have data for their sites of origin. In the case of some species, more than one cultivar is available. Learning the background of each cultivated variety will assist selection of a seed source more likely to be suited for your reclamation site. Choices will often be limited, however. For example, of the four available blue grama (*Bouteloua gracilis*) cultivars, three have origins in New Mexico, and one was collected in South Dakota (Fig. 2). If you wanted to plant a site in Wyoming, the choice to minimize geographic distance between the site and the seed source would be the cultivar from South Dakota. However, the highest elevation where those plants originally grew is 2,840 feet (Wyoming's mean elevation

is 6,700 feet). As an alternative, the New Mexico cultivars may be a closer match in elevation, but will unquestionably represent non-local genotypes if planted more than 500 miles north in latitude relative to their site of origin. Some risks are unavoidable, but the knowledge of those risks will improve decision making.

3. Do seed suppliers maintain records of seed origin and quality?

A reputable supplier should be able to provide data for the site of origin and quality (e.g. germination percentage and **pure live seed** pounds per bulk sample) of each species available for sale. This information is required by state law.



Commercial (left) and local (right) winterfat seedlings with origins in New Mexico and Wyoming, respectively. (note the NM winterfat is known to grow taller than plants with origins in Wyoming)

Selecting an Appropriate Seed Source: Wild Seeds

If reclamation projects are small or habitat quality is a high priority, there is potential for more control of the source of seeds used for revegetation. In these cases, field collections of seeds from wild populations would be desirable. This option also allows the inclusion in seed mixes of species that are not commercially available, improves the diversity of the seed mix and increases the potential for long-lived vegetation establishment at reclamation sites. As in the case of commercial seed sources, there are several points for consideration.

1. Do you have permission to collect seeds?

If the plants do not grow at the project site, permits are likely required for seed collections. In many cases, permits can be obtained for public lands if you contact the appropriate land management agency. Planning ahead will be necessary to receive permission to make collections during the correct time of year. Private land may also serve as a source of wild seeds if the landowner is contacted and agrees to seed collections.

2. Can you identify the species for collection?

Your team will need to include personnel who can identify native plant species. Many species are readily identified and located using plant keys and photo guides, but others can be very difficult to find and ID, and require the review of a specialist. It's important to note some plant species are threatened and endangered (or are agency species of concern) and those species should not be included in seed mixes for reclamation. Lastly, you will want to avoid contamination of reclamation seed sources with seeds from noxious or introduced weeds.

3. Are there suitable sites for seed collection?

It is important to assess collection sites to find the desired species in populations that are large enough (usually a minimum of 100 plants) to support collection without negatively affecting the source populations, either by reducing the total number of seeds for the next generation or by reducing the genetic diversity at that site.

4. Are you aware of sampling protocols?

Follow guidelines to improve the genetic diversity of your seed collections. Seeds should be collected from multiple plants across the collection site to represent a range of genetic diversity (and also adapted traits) of plants at that site. Genetic diversity of seed samples may be improved by collections of multiple sites near the project site and that represent similar environments.

5. Do you know your site and growing season?

An understanding of site and seasonal climate conditions is important for successful collections. Collect seeds when ripe but before the seeds fall to the ground or disperse with wind and animals. Many land managers are aware of the appropriate timing for collection and can advise you of the best dates for site visits.

6. Storage conditions and seed quality are key.

Seeds should be stored in paper or cloth bags in a cool, dry environment prior to cleaning and planting. This will prevent rotting and maintain seed quality. If desired, the Wyoming Seed Testing Laboratory in Powell can determine the germination rate of collected seeds, and those facilities might also clean the collections to remove debris (see <http://www.uwyo.edu/seedlab/>).

For more information regarding native seed collection protocols, we recommend the National Park Service "Seeds of Success" website (<http://www.nps.gov/plants/sos/protocol/index.htm>).

While local seed collections represent additional steps for reclamation, they are more likely to be suited to project site conditions and provide an important resource when desired species are not available via commercial production. These collections also support genetic diversity as well as native species diversity. Programs are now in place to improve the availability of native species and genetically appropriate seeds for reclamation (see box pg. 15). While not all native species are available commercially, and it takes time to match seeds to similar geographic locations and environmental conditions, knowledge of the different seed sources available for planting can improve decision making in reclamation. Land managers and reclamation practitioners can accomplish a great deal with a brief review of the site of origin of available seeds.

In all cases, we strongly recommend maintaining detailed records of seed sources and the location where they are planted. Each reclamation program represents an experiment in restoration. If we maintain records of seeding success and corresponding data for seed sources, site conditions, and seasonal variation, the potential exists for improving protocols to increase the establishment of plants at reclamation sites and beat the odds to achieve reclamation success. Within the greater context of weather patterns and soil conditions, native species and adapted seeds represent resources to help you achieve your goals.

Glossary

Cultivar – (Derived from cultivated variety). A named variety selected within a plant species distinguished by any morphological, physiological, cytological, or chemical characteristics. A variety of a plant species produced and maintained by cultivation that is genetically retained through subsequent generations.

Ecological Site Description (ESD) – A compilation of information known about a particular ecological site. ESDs characterize physical attributes that define the site (i.e. soil, elevation, slope, aspect, landform, precipitation pattern and amount, growing season, temperature) and are typically accessed in conjunction with published soil survey data.

Ecotype – A genetically differentiated subpopulation (race) that is restricted or adapted to a specific habitat. Note that: 1) most differences among ecotypes are observed only when different ecotypes are tested in a common environment and 2) ecotypes are generally subdivided into races, e.g. edaphic, climatic (termed cline), or geographic (termed variety).

Genotype – The genetic constitution (or makeup) of an individual organism.

Major land use resource area – MLRAs are geographically associated land resource units usually encompassing thousands of acres. A unit may be one continuous area or several separate nearby areas. MLRAs are characterized by particular patterns of soils, geology, climate, water resources, and land use (Natural Resources Conservation Service).

Native species – A species that is part of the original fauna or flora of the area in question.
Syn. Indigenous. (compare to introduced and resident species)

Pure live seed – Purity and germination of seed expressed in percent; may be calculated by formula: P.L.S.= proportion germination x proportion purity x 100, e.g. (0.91 x 0.96) x 100 = 87.36%. Abbr., PLS or P.L.S. cf. seed purity.

Reference site – An ecosystem that serves as a model for restoring another ecosystem. This implies that: 1) the reference site has more intact, autogenic ecological processes, higher functionality, more complex structure, and greater diversity than the system to be restored, and 2) the biophysical site conditions of the reference site closely match those of the restoration site.

Swamping – In ecological restoration, swamping occurs when local plants are either outnumbered by introduced plants of the same species or cross pollination between introduced and local genotypes alters local genetic variation.

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Programs to address the scarcity of suitable native plant materials for restoration are developing throughout the West. Some of these efforts include:

- **The Uncomphagre Plateau Native Plant Program in Colorado and Utah**

http://www.upproject.org/up_project/current_nativeplant.htm

The Uncomphagre Plateau Native Plant Program (UP) has the objective to “develop an adequate supply of a variety of seed species native to the Colorado Plateau for use in restoration activities.” Now a partnership with the Bureau of Land Management (BLM) and Division of Wildlife in Colorado and Utah, this program aims to collect and increase native, local plant species for commercial production and sale. At this time, the UP program offers 13 different native species through commercial growers.

- **National Native Plant Material Development Program and Seeds of Success**

http://www.blm.gov/wo/st/en/prog/more/fish__wildlife_and/plants/1.html

Seeds of Success (SOS) was established by the BLM in cooperation with the Kew Botanical Gardens in 2000 to improve available plant materials for conservation and restoration. The SOS program has been very active in the West, and teams participate in annual efforts to improve wild seed collection with goals for archiving and increase of native plant materials available for land reclamation and restoration.

- **USDA Natural Resources Conservation Service (NRCS) Plant Materials Program**

<http://www.nrcs.usda.gov/wps/portal/nrcs/main/plantmaterials/about/>

The 27 Plant Materials Centers include nearby facilities in Meeker, Colorado, and Bridger, Montana. These centers “collect, evaluate, select and release plants which are intended for commercial production to solve resource conservation problems.” The NRCS is a primary resource for the development of cultivated varieties of native plant species, and protocols have changed in recent years to improve the genetic diversity of selected plant materials.

We encourage you to learn more about each of these programs and how they work to improve the availability of native plants for restoration.



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