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Plant Germplasm Development: Traditional and Alternative Approaches

The enclosed brochure entitled “The AOSCA Native Plant Connection” provides information on traditional (variety or cultivar) and alternative approaches (pre-variety releases) to release plants used in solving natural resource problems.

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THE AOSCA NATIVE PLANT CONNECTION



Association of
Official Seed
Certifying Agencies

THE AOSCA NATIVE PLANT CONNECTION

The Need for Native Plant Genetic Source Information

Large-scale natural and human-caused ecosystem disturbances generate a voluminous demand for native plant reproductive materials (most commonly seed) intended for restoration, revegetation, and stabilization of natural communities. This demand is enhanced by an increasing interest in establishing populations of native wildflowers, grasses, trees, and shrubs in parks, wildlife refuges, roadsides, tree farms and orchards, and residential landscapes.



Road cut stabilization and restoration.

The reproductive materials required to satisfy these planting needs have some special constraints. Most plant species consist of more or less continuous genotypic arrays reflecting differential adaptation to variation in soils, climates, and disturbance regimes across a species' range of distribution. Long-term success in restoring a species to a given site is dependent upon obtaining adapted plant materials. Adapted plant materials are most likely to originate from the same site or nearby sites with similar physical and biological environments, unless the species' population is known to be broadly adapted or particular accessions have proven to be widely adapted within the species' range of distribution.



Wasatch Mountain Range wildlands.

For some broadly adapted species characterized by copious seed production, wildland collection can supply a significant seed volume for direct plantings. For most species, however, accessions consisting of limited quantities of seed obtained from defined wildland stands must be increased in fields or nurseries. Unfortunately, accurate documentation of collection site and/or cultivated production has often been unavailable to those seeking site-appropriate native plant materials. This situation led to the expansion of AOSCA third-party inspection and labeling programs to specifically address the needs of the native seed and plant industry.



Collecting antelope bitterbrush with seed hopper.

How AOSCA is Meeting this Need

AOSCA has implemented certification requirements and standards that accommodate plant germplasm (whether newly acquired accessions or named varieties) of native grasses, forbs, and woody plants. These certification procedures provide third-party verification of source, genetic identity, and genetic purity of wildland collected or field or nursery grown plant germplasm materials. This bulletin defines AOSCA plant germplasm types, describes certification procedures and labeling, and summarizes supporting guidelines, tables, and flow charts.



Seeds of antelope bitterbrush.

Plant Germplasm Development: Traditional and Alternative Approach

The traditional approach for plant germplasm development is to produce varieties with known adaptability and proven superior or unique characteristics that are distinct, uniform, and stable. A typical variety (or synonymous term “cultivar”) originates from natural populations or genetically manipulated (i.e. mass selection, recombination, induced mutation, or biotechnological methods) populations of a species. These (1) unevaluated bulk populations form pools from which (2) breeding lines or clonal groups are selected on the basis of desirable traits; (3) inbred lines or clonal synthetic progenies are then developed with traits of interest proven to be heritable; and (4) a Variety/Cultivar is formally released with distinctive traits documented as uniform and stable when evaluated over multiple locations and years.

Bluebunch Wheatgrass seed heads.



As an alternative to formal variety release, AOSCA Pre-Variety Germplasm (PVG) categories facilitate orderly procurement, production, and distribution of plant germplasm materials. The PVG categories offer a parallel progression with the first three above numbered stages for variety development. They are respectively designated as (1) Source Identified Class (unevaluated germplasm identified only as to species and location of the wild growing parents), (2) Selected Class (germplasm showing promise of desirable traits,



Firecracker penstemon, wildland site.



*Indian
ricegrass seed.*



*Fourwing
saltbush
mature seed.*



Purple coneflower.

having been selected either within or as a common site comparison among accessions or populations of the same species), and (3) Tested Class (germplasm for which progeny testing has proven desirable traits to be heritable). This progression may also serve as a route leading to formal (4) Variety/Cultivar release if eligibility requirements are satisfied.

The four defined AOSCA plant germplasm types are thus based upon verification of species and source, and the extent of distinctive trait identification, selection, and stabilization documented for a given plant germplasm accession or population. Figure 1 illustrates the sequential progression of AOSCA germplasm types; the dual tracks are explained in the following section.

Natural and Manipulated Genetic Tracks

Germplasm originating from a wildland (native, naturalized, or feral) stand is assigned a genetic status of either “manipulated-track” or “natural-track” (note the germplasm accession arrows in Fig. 1). The natural-track is reserved for those germplasm accessions that are an unrestricted representation of the intact wildland plant population on the original site. Additionally, genetic manipulation must be purposefully avoided when such accessions are increased in field or nursery production, compared with other accessions on common sites, and/or tested for trait heritability and adaptability.

Accessions that are purposefully or inadvertently hybridized with other accessions or selected for distinctive traits within the population (whether on the original site or in succeeding field or nursery generations) are routed to the manipulated-track. This routing is further illustrated by the center arrow portion of Fig. 1. If a germplasm following either track or at any stage of development is altered from its defined genetic identity, it reverts to bulk population status until granted approval as a newly defined germplasm on the manipulated-track.

Germplasm assigned to either track follows a similar progression relative to AOSCA germplasm types, and is appropriate for end use depending on the objectives for the planting site. To facilitate this germplasm status distinction, “natural-track” recognition as applicable to a specific germplasm should be so noted on certification tags (see Additional Label Information section).



Firecracker penstemon, seed field production.

Practical Application of AOSCA Plant Germplasm Types

Formal variety release is applicable when geographic adaptability and market potential are well defined, and is necessary when seeking protection under the Plant Variety Protection Act. Utilization of PVG categories is applicable when a) identification and propagation of species and/or ecotypes at various stages of evaluation are needed for timely (often immediate) restoration of specific geographic areas, b) market potential is limited beyond specific geographic areas, and/or c) accommodating consumer special plant material demands (refer to both sidebars in Fig. 1).



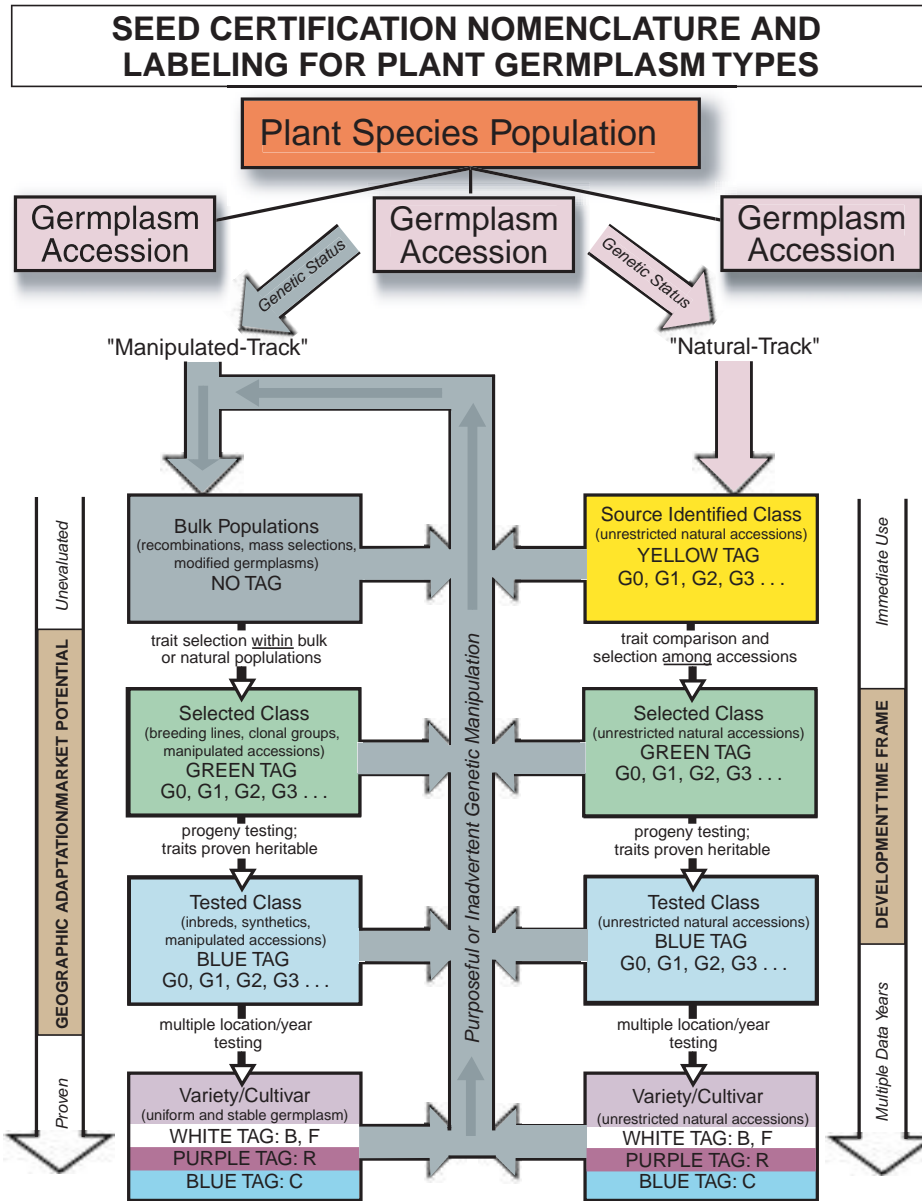
Conditioning wildland shrub seed.

A germplasm accession may potentially be shepherded through PVG categories on either genetic track to achieve formal release. For most native plant accessions, however, germplasm evaluation and comparison are designed to facilitate native plant use in localized site revegetation rather than for advancement toward formal release. In this context, a germplasm designation within any PVG category (Source identified, Selected, or Tested) is a legitimate end product. Many public and private agencies follow internally established protocols for germplasm acquisition, study, development, and/or release, though such formality is not a basic requirement in utilizing PVG certification. Germplasm eligibility for a given PVG category must be supported by documentation submitted to and accepted by an AOSCA seed certification agency.



Western yarrow, seed field production.

FIGURE 1. Germplasm development flow chart.



Generation Limitation, Designation, and Labeling



Grayhead prairie coneflower.

The number of field or nursery increase generations allowed (as well as length of stand, isolation distances required, and seed purity and viability standards) for all germplasm types may be specified by AOSCA. Factors considered are the mode of reproduction, genetic stability, plant longevity, and seed characteristics of individual species. The AOSCA generation limit for sexually reproduced or apomictic Pre-Variety Germplasm is five (unless otherwise specified), while vegetative generations may be unlimited.

Natural-track wildland collected seed is by definition Generation zero (G0) since it is an unrestricted representation of an intact G0 parent population. For a manipulated-track germplasm the G0 parent plants, which by convention for cultivated populations produce G1 seed, must be formally defined by the developer in consultation with an AOSCA agency. As shown in the pre-variety germplasm class boxes in Fig. 1, generations are designated G0, G1, G2, G3, etc., which are analogous to the variety/cultivar generation designations of Breeder, Foundation, Registered and Certified.



Wildland seed analysis.

Variety/cultivar tags are color coded to signify generation (white for Breeder and Foundation, purple for Registered, and blue for Certified). PVG tags are color coded only according to category (yellow for Source Identified, green for Selected, and blue for Tested), so specific generation information must be listed on PVG tags (Figure 2). The notation specifies both the generation of the tagged material and the number of increase generations permitted, e.g. G1/3 or G4/5. An accelerated downgrading of generation for marketing purposes may be specified on the tag such that the material would not be eligible for planting stock, e.g. G3/3 or G5/5.

Additional Label Information

Though individual certification agency labeling formats may vary somewhat, other information listed on PVG tags (Fig. 2) normally includes a) the scientific and common species names; b) germplasm identification term (optional); c) production location (state and county or similar geographic description) and elevation of the field or nursery; d) source site (location and elevation of the defined G0 material); e) whether the defined G0 material is indigenous at its source site (yes, no, or unknown); f) whether the tagged material is “natural-track” in status (yes or no); and g) certification and/or seed lot numbers. Additional site characteristics, selection criteria, and/or testing results may be available from the germplasm collector/developer.

When a pre-variety germplasm is offered in commerce attendant with an optional germplasm identification term (i.e. accession number or notation of origin or specific trait), the word “Germplasm” must follow (e.g. ARS 2936 Germplasm Scarlet Globemallow; Southern Iowa Germplasm Canada Wildrye) to avoid misconstruing the term as an official variety/cultivar name.

Variety/cultivar tags (Breeder, Foundation, and Registered are similar in format to the Certified example shown in Fig. 2) provide little information beyond kind (species), variety name, and certification/lot number, since the formal release notice would supply pertinent variety source and development information. It is recommended, however, that “natural-track” status (if applicable) and known regions or zones of adaptation be listed on the tag for native plant varieties/cultivars.



*Palmer
penstemon,
seed field
production.*



*Aerial fire
rehabilitation
seeding.*

*Fire rehabilitation
seeding success.*



The AOSCA Process for Certified Production of Native Plant Seed

AOSCA seed certification agencies (acting as a third-party) require seed collectors/producers to follow established requirements, procedures, and standards to assure germplasm identity and purity for the seed consumer.

A. Wildland Collection

Wildland collected seed can be used for direct sales to end users, for establishment of field/nursery production, or for entry into plant germplasm development programs. Certification procedures include:

- Pre-Collection Application filed before harvest
- Proper permitting and/or permission for collecting on public and private lands
- Site Identification Log filled out during and after harvest
- Verification of the collection site and identification and evaluation of plant and seed samples before, during, and/or post harvest
- Tagging of the seed lot after compliance with applicable requirements and standards; seed purity and viability analysis may be required
- Germplasm accessions acquired within established protocols of recognized public or private agencies are normally eligible (with appropriate data on file in lieu of the above procedures) to enter the certification process as planting stock

B. Field/Nursery Production

Stock seed or plants for establishing certified field/nursery production must be of an eligible generation and have appropriate labeling. Certification procedures include:

- Application for Certification
- Verification of origin and generation of planting stock
- Seedling inspection
- Field inspection before harvest to check compliance with species requirements for isolation and genetic purity (control of prohibited and other specified weeds or other species may be required)
- Tagging of the seed lot after compliance with applicable requirements and standards; seed purity and viability analysis may be required

Native collector in mountain big sagebrush stand.



FOR FURTHER INFORMATION

Contact the official seed certifying agency in your country, state or province for further information, application forms, or help in following wildland plant materials certification procedures. A list of certifying agencies is available from the AOSCA Office:

Association of Official Seed Certifying Agencies
55 SW Fifth Avenue, Suite 150
Meridian, ID 83642-8638, USA

Telephone: (208) 884-2493
Fax: (208) 884-4201
Website: www.aosca.org

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*Harvesting basin
wildrye.*



*Prairie
restoration
project.*

FIGURE 2. AOSCA Pre-Variety Germplasm and Variety/Cultivar tag examples.

SOURCE IDENTIFIED SEED		
<div style="border: 1px solid black; width: 100px; height: 100px; margin: 0 auto;"> <p style="text-align: center; font-size: small;">Agency logo here</p> </div>	Species Name	<i>Sporobolus heterolepis</i>
	Common Name	Prairie Dropseed
	Germplasm ID, Gen.	G3/5
	G3 State, County, Elev.	WI, Dane, 800 ft.
	G0 State, Region, Elev.	WI, Southwest, 790 ft.
	G0 Indigenous?	Yes
	Natural-Track?	Yes
	Lot:	2999-SPOHET-3-SE; 03346
MEMBER OF ASSOCIATION OF OFFICIAL SEED CERTIFYING AGENCIES		

TESTED CLASS SEED		
<div style="border: 1px solid black; width: 100px; height: 100px; margin: 0 auto;"> <p style="text-align: center; font-size: small;">Agency logo here</p> </div>	Species Name	<i>Dalea candida</i>
	Common Name	White Prairie Clover
	Germplasm ID, Gen.	Antelope, G2/5
	G2 State, County, Elev.	MT, Carbon, 3350 ft.
	G0 State, County, Elev.	ND, Stark, 2400 ft.
	G0 Indigenous? Yes	Cert. #: 026962
	Natural-Track? Yes	Lot #: SFD-02-FLD20-1
	MEMBER OF ASSOCIATION OF OFFICIAL SEED CERTIFYING AGENCIES	

FIGURE 2. AOSCA Pre-Variety Germplasm and Variety/Cultivar tag examples.

SELECTED CLASS SEED		
Agency logo here	Species Name	<i>Krascheninnikovia lanata</i>
	Common Name	Winterfat
	Germplasm ID, Gen.	Northern Cold Desert, G2/3
	G2 State, County, Elev.	OR, Malheur, 2300 ft.
	G0 State, County, Elev.	ID, Bingham, 4100 ft.
	G0 Indigenous?	No
	Natural-Track?	No
	Cert. #:	00497
Lot #:	KL203	
MEMBER OF ASSOCIATION OF OFFICIAL SEED CERTIFYING AGENCIES		

CERTIFIED CLASS SEED		
Agency logo here	KIND:	Mountain Big Sagebrush
	VARIETY:	Hobble Creek, "Natural-track"
	CERT. #:	WC-1852
	LOT #:	ArTrVaHC-02001
MEMBER OF ASSOCIATION OF OFFICIAL SEED CERTIFYING AGENCIES		