

Tips in Ordering and Testing Seed for USFS Region 2 Rehabilitation Projects

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Before You Purchase

Prior to purchasing seed, follow these guidelines to insure a smooth transaction and quality product.

Use contract specifications to order seed whenever possible. Most seed dealers are reputable, but some are not, and mistakes happen. Be aware of buying on trust – get everything in writing. If ordering over the phone, make sure you document exactly what the order is. When ordering seed, you are the client and you have the right to receive EXACTLY what was specified, no more, no less. Any deviation not agreed upon in advance does NOT need to be accepted by you, and probably should not be. Work with the contractor in advance to plan how rejected seed will be dealt with and who should pay for it. Normally, any rejected seed should be replaced by the contractor free of charge, including shipping, but this should be spelled out in a contract specification.

In your contract specifications, it is best to establish minimum purity and viability standards for the seed you are purchasing. Alternatively, minimum PLS (Pure Live Seed) may be established, as it allows more flexibility to the vendor while still accomplishing your needs. Also, establish a zero tolerance for noxious weeds: prohibited *and* restricted. This will prevent seed dealers from ‘off-loading’ poor quality seed on your project.

Be aware of buying “carry over” seed (i.e., old seed) with reduced viability. You can always ask how old the seed is before you buy it. Similarly, be aware of buying seed that is “too young” and can have reduced viability because the embryos are under-developed. This is lot-specific. Also, some species, like Indian ricegrass (*Oryzopsis hymenoides*) may actually have greater *germination* potential if older, say 6 or 7 years old, allowing for the dormancy mechanisms to break down. It is useful to know the best “age” of the seed for the species you are buying. If this information cannot be obtained, a seed test can confirm the quality of the seed independent of its age and maturity.

Placing the Order

Buying By PLS (Pure Live Seed)

NEVER buy seed in bulk pounds (gross amount pounds). **Buy seed in PLS pounds (Pure Live Seed, expressed in a percent by weight of the total seed) and based on a PLS price (expressed in \$/PLS pound).** Make sure you check to see you that received the total amount of bulk seed needed to match the PLS seed amount ordered. If the PLS is 50%, and you ordered 10 pounds PLS, you need twice as much bulk seed, i.e., 20 pounds, to meet the PLS pounds desired (20 pounds bulk @ 50% PLS = 20 pounds X .50 = 10 pounds PLS).

PLS = purity X total viability. To calculate the PLS received, see the seed label and do this: PLS = PURITY X (GERM + HARD + DORMANT).

Example: The seed label reads 97% Pure Seed, 50% Germ, 42% Dormant (no HARD was present on this label; HARD is used only for certain legume species).

$$.97 \times (.50 + .42) = .8924 = 89.24\% \text{ PLS.}$$

This means 89.24% of the seed (by weight) in that bag or lot is what you wanted and is viable, the rest is “other stuff you don’t want” and/or is non-viable seed.

Use of Certified vs. Non-Certified Seed (Exhibits 1-3)

Certified seed means the seed is “true to its name” on the label (i.e., you are getting EXACTLY what the label says). This is because Certified seed is only the third generation removed from the original breeder stock seed. It can be identified because the seed bag must have a blue colored label/tag (Exhibit 1). Certified seed also has a quality standard component. Certified seed is regulated by the Association of Certified Seed Agencies (AOSCA), and to be a member each State must adhere to AOSCA standards. The first and second generations removed from the original breeder stock are called Foundation seed (this has a black-and-white label/tag) and Registered seed (this has a purple label/tag), respectively. You normally will not have a need to use such seed, but it could certainly be substituted for Certified seed if it is the only seed available. The color codes indicated are valid in all States in Region 2.

Use of certified seed is strongly encouraged, but you may use uncertified seed (Exhibit 2) if the seeding is less important, such as with commonly used non-native species, certain temporary annual nurse crops, or temporarily seeding an area that will then be re-disturbed and seeded later. **Use of uncertified seed is also appropriate if no certified seed is available, but you may want to consider switching to another species for which certified seed is available.**

Seed collected in the wild is not certified. Make sure you clearly know from the vendor the specifics of its source, purity, and viability. If possible, use Source Identified Seed

(this has a yellow label/tag). Note: Source Identified seed is usually not available in large quantities, and is better suited for smaller projects.

Other Important Notes

Cross-fertilization and contamination of seed stock can result from fields not being properly isolated. Pollen from one variety can contaminate another variety if the fields are too close together. You may want to ask the seed dealer if their supplier conforms to sufficient isolation procedures (which prevent cross-pollination). Pick those suppliers if you have a choice. Unfortunately, this information is usually not available, and is not relevant if you are purchasing VNS (Variety Not Stated) seed.

Make sure the seed variety (cultivar) is the one ordered and that it is the APPROPRIATE variety to use given its ecological amplitude and the site growing conditions. The variety is identified by name, often in single quotes, such as ‘Nezpar’ Indian ricegrass or ‘Appar’ Lewis flax. In some cases, the variety name identifies genetic origin—usually the name of the area in which the original seed was collected or cultivated (e.g., ‘Ephraim’ crested wheatgrass). Using the wrong variety for the wrong site can make the difference between seeding success and failure. There are resources available that outline ecological amplitudes and sometimes other factors (e.g., seedling vigor), and the seller may be able to read you some over the phone when placing an order.

Make sure the seed variety (cultivar) is stated for those species where variety matters. Do NOT use seed stated as “Variety: VNS” (Variety Not Stated) unless variety is unimportant, such as with commonly used non-native species, certain temporary annual nurse crops, hand-collected seed, or temporarily seeding an area that will then be re-disturbed and seeded later to a final crop. Often the variety of a non-native plant *is* important in terms of the initial success and long-term persistence it will have given the site growing conditions. With VNS, you have no guarantee of what variety you are getting. Note: many native species have not been through a formal breeding process, and varieties for these species have not been developed. If the seed dealer only offers VNS seed, ask them if a stated variety exists for the species you want. If not, use of VNS seed is appropriate—but it would be best to verify the origin of the seed so that you can be assured its ecological amplitude will match growing conditions where you want to plant it. You may have to do your own research. Folks who regularly order seed and perform rehabilitation often know the nuances of regularly used varieties.

Buying Checklist:

- I have selected the right species and varieties for growing conditions. If I am ordering VNS (Variety Not Stated), it is because no varieties exist on the market or variety is not important for this particular order.
- I am ordering certified seed (if applicable; the most common situation).
- I am ordering the right amount of seed expressed in PLS pounds, not bulk pounds.

- The minimum %PLS I am ordering has been identified for each lot.
- I have clearly stated or delivered contract specifications, if there are any.
- I have clearly stated what level of *restricted* noxious weeds I am willing to accept, if I am willing to accept any (it is recommended none be accepted); I will never accept *prohibited* noxious weeds (and none should ever be sold to you).
- I have clearly stated whether or not I am allowing treated seed (e.g., fungicides or fertilizers) to be acceptable, and what types of treatment are allowed.
- I have my order and delivery date confirmed in writing.

Before You Seed

Prior to planting the seed, follow these guidelines to insure you purchased a quality product.

Seed Testing – An Important Step

ALWAYS test purchased seed before or after it is delivered to make sure 1) you received the right type of seed, 2) in the right amounts, 3) that the viability and purity information is accurate, and 4) that there are NO noxious weed seeds, or that *restricted* weed seeds are below acceptable limits. **If possible, have the seed tested BEFORE you purchase it. This will allow you more flexibility if certain lots need to be rejected. To insure that a proper sample is taken, you may choose to contact your State Department of Agriculture. For a fee, they will send a State Inspector to perform your seed samples for you. The Inspector will then mail the samples to the lab, so that the chain of custody is maintained. You may wish to sample and test the seed AFTER its arrival to the USFS. Make sure to verify that the seed delivered has the same lot numbers that you purchased, and that every bag has a label.** Seed companies are not obligated to keep seed tests on file, nor are they obligated to show them to customers.

ALWAYS use an appropriate seed testing lab. The lab must be a member of the Association of Official Seed Analysts (AOSA), such as the Colorado Seed Laboratory at Colorado State University. **Verify that the lab you are using is a member of AOSA before submitting your sample(s).**

When YOU collect a seed sample for testing: The number of seed bags to test for EACH seed lot is 5 bags minimum (if you have less than 5 bags test them all) plus 10% of the lot, not to exceed 30 bags per lot. If you have 100 bags, test 5 + 10 (10% of 100) for a total of 15 bags. Each lot needs to be tested. A “lot” is any bunch of bags you receive having the exact same seed mix, and hence the same “lot number” should be present on each bag. Sample random bags, and pull the seed from different areas throughout the bag

(not just the edge or just the center). Seed probes are recommended for free-flowing seed, all others should be sampled by hand using specific approved seed sampling methods. Seed sampling is the most important part of a seed test—you **should be trained to do it properly**. You can also have a State Seed Inspector (from your State's Department of Agriculture) test your seed.

ALWAYS use seed that has been found to be FREE of *prohibited* noxious weed seed or that contains *restricted* noxious weed seed within State tolerances (or your tolerances, if your tolerances are more restrictive). The seed bag label already states this, but mistakes can be made, and a **third party seed test will provide you with additional reliable information**.

Be aware of “filler” *non-seed material* (like sand or fluff/chaff) in the bags. Check to see that sand or fluff is not mixed in by checking a random bag. Don't buy expensive sand! Be aware of “filler” *seed material* (seed not ordered) in the bags. Check by inspecting a handful of seeds from a random bag against what the seed “should” look like (see a seed photo book). If you see a fair amount of a “different looking” seed that you think should not be there, the seed should be re-tested. **Testing the seed will identify these problems.**

What Tests Do You Request?

Always ask for a purity test, a noxious exam (specify which kind—All States, etc.), and a viability test. Requesting a purity tests usually automatically triggers a noxious exam as well. If time is a concern, ask the lab to perform a tetrazolium test (TZ test). Results should be available in 24 hours. **Note: a TZ test will not give you information about dormancy or hard seed—TZ is simply an expression of total viability.** When verifying labels, TZ is requested most often. If you have more time, or need to know information regarding dormancy or hard seededness, ask for a germination test. A germination (“germ”) test can take 2-3 weeks, and in some cases longer.

Store your sampled seed for testing properly (e.g., correct temperature, shade and humidity), and ship within a few days using mail that is delivered promptly (overnight mail is not required). Do not let seed become too hot or wet before mailing. **Include an order form and a copy of the seed tag.**

How to Read a Seed Label (Exhibits 2 and 3)

KNOW how to read a seed label (tag). EVERY tag must have clearly stated:

- Species (usually listed by common name)
- Variety (cultivar)
- Lot number
- Percent Purity, other crop, weeds, (this means common weeds, not noxious ones), and inert. Percents are by weight, and % pure + crop + weeds + inert must = 100%.

- Noxious weeds (prohibited and restricted, listed by species; if none found, this must say “none”)
- Percent Germination, Hard (if applicable), and Dormant (if applicable).
- Net weight (pounds often expressed with the symbol #, e.g., “50#” means “50 pounds”)
- Viability test date
- Origin (the origin of the seed in THAT lot)
- Seed company name and address.

“Weed Out” Noxious Weeds

If the seed label (tag) indicates that there are *restricted* noxious weed seeds present, make sure they are within State tolerances for the number of seeds per pound. Each restricted species present must be identified and its amount stated in seeds per pound. Each species may have a different threshold or presence allowed. You should NEVER use seed from bags that say there are *prohibited* noxious weed seeds present (and you should never see this on a label, but always look). **Note: in your contract specifications it is possible to request seed with zero presence of prohibited *and* restricted noxious weed seed. This is highly encouraged.**

When testing the seed yourself, make sure the noxious weed seed tests conform to the species YOU want tested. For noxious weed seed testing, always request an “**All States Noxious Seed Exam**” (which covers all noxious seeds in all 50 states, including Colorado, and also includes downy brome/cheatgrass, *Bromus tectorum*, because it is a noxious seed in Wisconsin). Note: there is a difference between a noxious weed *seed* and a noxious *plant*. There are two separate lists—and they have different species. For example, *Bromus tectorum* is a noxious weed *plant* in Colorado, but not a noxious weed *seed*. If you want all PLANTS listed as noxious in Colorado tested for, specify “**Noxious Plant List for Colorado**” in addition to an “**All States Noxious Seed Exam**.” If you want other particular species tested for, specifically request that species. You can customize the list of what species you want the lab to look for in the noxious exam.

Note: Federal rules and regulations regarding noxious weed seeds (the Federal Seed Act) only apply when shipping seed across State lines. If seed is grown and sold in Colorado, for example, federal rules do not apply. However, state noxious weed seed regulations *do* apply (Colorado Seed Act). You should know your state’s noxious weed plant and noxious weed seed regulations and lists.

Ordering Mixes

Premixed seed containing noxious weeds (or other label discrepancies) causes the entire mix to be rejected. Test the components of a mixture separately, BEFORE the seed is mixed. If one component has a contaminant, it can be rejected, and a new one can be substituted. This is very important. **Once you order a “custom” mix that arrives pre-mixed, it will be extremely difficult to return if a problem is discovered.** Seed cannot be “un-mixed,” and the seed dealer will not want to take the seed back. Standard premixed seed orders and orders that are unmixed can be easily returned if rejected.

Checklist After Seed Arrives:

- Every bag in every lot MUST have a seed label.** Make sure that the right lot number is on the label. **Reject all bags without a seed label.**
- If any of the label's required items discussed above are not present on a bag's label, reject all such bags.**
- Check that all bags of the same order have the same lot number. Look for buried unlotted or improperly lotted seed bags hidden in the middle of piles or pallets of delivered seed bags – check **all** hidden seed bags for lot numbers and make sure each bag has the right lot number.
- If the %Weeds exceeds 2%, the lot should be rejected.**
- If *prohibited* noxious weeds are present, or *restricted* noxious weeds are present in greater quantities than the State or your tighter specified tolerances allow, the lot should be rejected. Remember that demanding zero presence of *restricted* weeds is encouraged, and bags containing any *prohibited* seeds should never be sold to you.**
- Make sure all the plant seed names you wanted in a seed mix are on the label in the right quantities.
- Make sure you understand the correct scientific name corresponding to the right common name. Seed tags often list only the common name. For example, “ryegrass” can refer to perennial *or* annual ryegrass, and the difference can be dramatic in terms of what you are receiving. Sometimes a seed company will add the scientific names for you to the tag if they are working on a specific order with you.
- Make sure you check that the viability test date is current and within State timelines. In Colorado, the last test must be within 12 months of the order date plus one month grace period. Viability decreases over time and eventually most of the seed will become non-viable and worthless.
- Make sure the % PLS is at or above what you ordered. Remember, PLS = PURITY X (GERM + HARD + DORMANT).
- Make sure you received the total amount of pounds of PLS ordered.** You will have to figure out what that translates to in total **bulk** pounds received. Remember, for example, that if the PLS is 50% as stated on the tags upon arrival and confirmed by seed testing, and you ordered 10 pounds PLS, you need twice as much bulk seed, i.e., 20 pounds, to meet the PLS pounds desired. That is, 10

pounds PLS ordered divided by 50% PLS = $10/0.50 = 20$ pounds bulk seed should have arrived. If you are short, that does not have to be acceptable to you.

- Finally, re-test the delivered seed yourself by a third party seed testing lab for viability and noxious weeds, if desired.**

Notes

If non-native seed is colored or dyed upon arrival, be aware, because that means the seed ordered is not from your eco-zone area. You may wish to clarify this prior to ordering. Presently, coloring/dyeing is not done for native seed.

Treated seed (fungicides or fertilizers) must be labeled as such, but not necessarily on the seed label; the information is often on another label affixed elsewhere on the bag.

The presence of smut or ergot on seeds, often appearing as a mildew-like dark-colored dust, is technically considered part of the “inert” contents, and it does not hurt your seed unless you store seed at greater than 10-15% humidity (usually not an issue in Region 2). It is *not* a reason for rejection.

Procedures to Follow Before Seeding Begins

Checklist:

- Protect seed against storage issues of humidity, breathability, herbivory, and time. Do not store seed too long (varies by seed type and seed lot: some can be stored for many years, some cannot). If seed bags are stored in sealed plastic tubs or airtight containers, make sure small breathable holes are present.
- Check for seed stratification (the sorting out and settling of seed into distinct homogeneous layers influenced by seed shape and weight) within a bag resulting from shaking and settling during delivery to you **or from your dock to the field site**. Remixing may be needed, possibly on site, before field application. Traveling of long distances, over bumpy roads, and in helicopters is notorious for causing seed stratification.
- Always keep some of your seed from the lot as “reserve” seed, in case you need to go back later and test the seed. Store the reserve seed properly. ALWAYS keep an actual seed tag from each lot in your project files.** The tag and the reserve seed is invaluable if you need to reconstruct what was delivered (for dispute resolution), for example if you find a noxious weed growing in a seeding that was not supposed to be there—did it come from the ordered seed?

Seed ordering, sampling, testing, and bag label/test interpretations can be confusing at first, but are relatively “easy” once you get the hang of it. Ask others for help. Go for it, the resources will appreciate you!

Take-Home Note about PLS (Pure Live Seed) – Understand and Use It!

PLS is the bottom-line of what you are getting for your money. The percentage of Pure Live Seed is the amount (% by weight) of total seed in that bag or lot that is “the stuff you ordered and is viable and expected to germinate now or eventually.”

PLS is usually *not* shown on a seed bag label and must be calculated. Remember, PLS = PURITY X (GERM + HARD + DORMANT).

Definitions of Information on the Seed Label

Pure Seed (“Pure”): Purity, the percent of pure seed present (by weight) in the lot. Pure seed is the species that you intended to purchase. Expressed in % Pure Seed.

Other Crop (“Crop”): Species that are usually involved in seed commerce but are not intended to be part of the seed lot being purchased. Contamination by these seeds is undesirable in the seed lot but not usually harmful. Expressed in % Crop, or % Other Crop.

Inert: The portion of the seed lot that is not seed. It usually consists of chaff, stems, and soil particles. Broken, damaged, or immature crop and weed seeds may also be classified as inert. The AOSA Rules for Testing Seed is explicit in this definition. Expressed in % Inert, or % Inert Material.

Common Weed Seed (“Weeds”): Seed of undesirable species that are excessively competitive, difficult to control or eradicate, poisonous, or simply not wanted. Expressed in % Weed. These are NOT the same species as “Noxious” weeds.

Noxious Weed Seed (“Noxious Weeds”): Seed of species that are particularly troublesome and objectionable. Such weed seed is defined in State seed law or regulation, and is usually defined in two categories, *prohibited* (“primary”) or *restricted* (“secondary”).

Germination: The emergence and development from the seed embryo of those essential structures which, for the kind of seed in question, are indicative of the ability to produce a normal plant under favorable conditions. You can think of this as the percentage of ordered seed that can be expected to germinate now or eventually. Expressed in % Germination.

Hard Seed: A type of dormancy where the seed coat is impermeable to water. Hard seeds are considered viable, and they are expressed in % Hard Seed. Occurs only in legumes (beans, alfalfa, clovers, etc.).

Dormant Seed: Viable seed that will not germinate, even under suitable environmental conditions. Expressed as % Dormant Seed. Dormant seed may be desirable if environmental or management conditions preclude immediate germination, or you desire germination across a long time period, say more than one growing season.

Total Live Seed (Total Viability): Calculate as Germination + Hard + Dormant. Use this to calculate PLS. A tetrazolium test (TZ Test) is always expressed in % **Total Viability**.

Net Wt.: Net bulk weight of that bag, usually expressed in pounds using “#.”

Example: “50#” = 50 pounds bulk seed.

Test Date (“Tested”): The date the *viability* was last tested. It’s OK if an updated test date sticker has been placed over the original date printed on the tag. Check your applicable seed act—in Colorado the test date must not be more than 12 months old (plus one month grace period) when received by you.

Origin: The origin of the seed in *that* lot, usually identified only to State or Province (Canada).

Exhibit 1. True-color life-size examples of (A) Registered, (B) Certified, and (C) Source Identified standard seed labels. Note that scientific name, origin County, State, and site parameters such as elevation and slope/soil are indicated for source-identified seed.

A. Label for Registered Seed.

REGISTERED SEED

EASTERN PLAINS SEED
5-999A

Grower: **5-999A** Kind: **WHEATGRASS WESTERN** Date Tested: **04/06**

County: **YUMA** Variety: **ARRIBA**

Lot No. **R05-111-999** Net Weight **50 LBS**

85.00	% Pure Seed
0.00	% Weed Seed
0.00	% Other Crop
15.00	% Inert
65	% Germination
	% Dormant Seed or Hard Seed
	% Total Viable

COLORADO SEED GROWERS ASSN.
 COLORADO STATE UNIVERSITY
 FT. COLLINS, COLORADO 80523

This certification is made by the Seed Certification Service of the Cooperative Extension as authorized by the State Board of Agriculture of the State of Colorado pursuant to 35-27-101et seq., C.R.S. 1984 Replacement Vol. 14 as amended. THE COOPERATIVE EXTENSION AND COLORADO SEED GROWERS ASSOCIATION ARE NOT SELLERS AND MAKE NO WARRANTIES EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR OTHERWISE. The seller warrants that the seed to which this certification is attached is from the lot shown on this certification, and that every portion or bag of which is uniform within reorganized tolerances for the analysis shown. THE SELLER MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR OTHERWISE. LIABILITY LIMITED TO PURCHASE PRICE OF SAID SEEDS.

UNDER THE "COLORADO SEED ACT", ARBITRATION IS REQUIRED AS A PREREQUISITE TO CERTAIN LEGAL ACTIONS, COUNTERCLAIMS, OR DEFENSES AGAINST A SELLER OF SEED. INFORMATION ABOUT THIS REQUIREMENT MAY BE OBTAINED FROM THE COLORADO COMMISSIONER OF AGRICULTURE.

MEMBER OF THE ASSOCIATION OF OFFICIAL SEED CERTIFYING AGENCIES

B. Label for Certified Seed.

CERTIFIED SEED

EASTERN PLAINS SEED
5-999A

Grower: **5-999A** Kind: **WHEATGRASS WESTERN** Date Tested: **04/06**

County: **YUMA** Variety: **ARRIBA**

Lot No. **C05-111-999** Net Weight **50 LBS**

85.00	% Pure Seed
0.00	% Weed Seed
0.00	% Other Crop
15.00	% Inert
65	% Germination
	% Dormant Seed or Hard Seed
	% Total Viable

COLORADO SEED GROWERS ASSN.
 COLORADO STATE UNIVERSITY
 FT. COLLINS, COLORADO 80523

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UNDER THE "COLORADO SEED ACT", ARBITRATION IS REQUIRED AS A PREREQUISITE TO CERTAIN LEGAL ACTIONS, COUNTERCLAIMS, OR DEFENSES AGAINST A SELLER OF SEED. INFORMATION ABOUT THIS REQUIREMENT MAY BE OBTAINED FROM THE COLORADO COMMISSIONER OF AGRICULTURE.

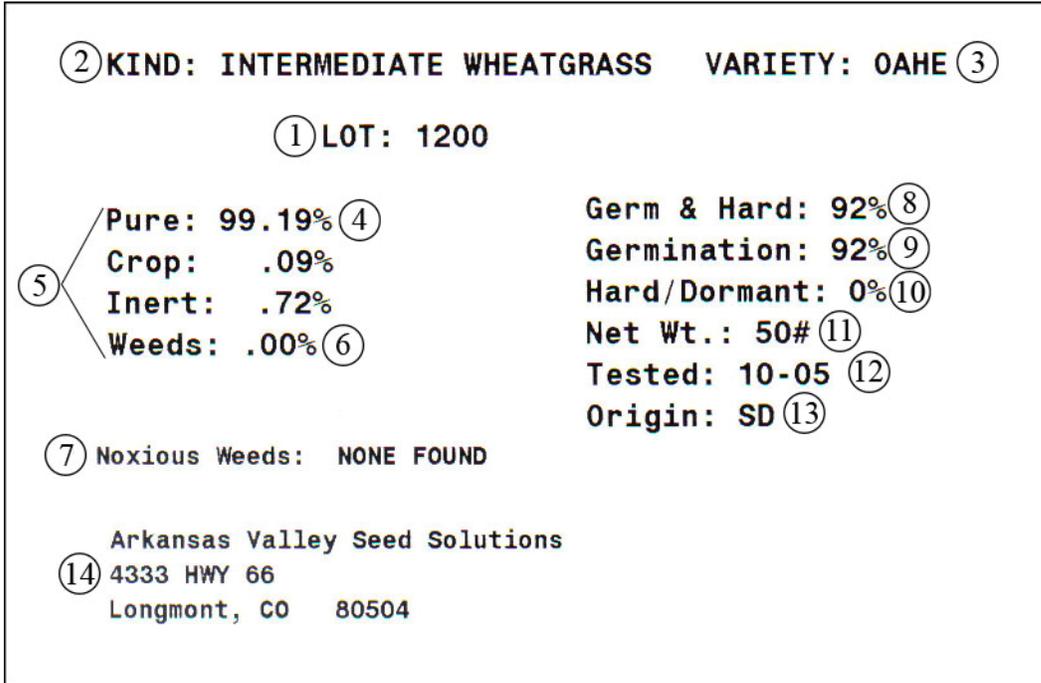
MEMBER OF THE ASSOCIATION OF OFFICIAL SEED CERTIFYING AGENCIES

Exhibit 1 continued.

C. Label for Source Identified Seed.

SOURCE IDENTIFIED SEED				
	Labeler	WESTERN SLOPE SEED 2006-A111	09/05 Date Tested	
	Scientific Name	PENSTEMON CYANEUS	63.39% Pure Seed	
	Common Name	BLUE PENSTEMON	0.10 % Weed Seed	
	County/St./Elev.	MONTEZUMA/CO/6200 FT	0.21 % Other Crop	
	Germplasm ID./Gen	G1	65 % Inert	
	Cert#/Lot#	S05-1-111	15 % Germination	
		0-2% SW / SILTY CLAY LOAM	80 % Dormant Seed or Hard Seed	
			% Total Viable	
	COLORADO SEED GROWERS ASSN. COLORADO STATE UNIVERSITY FT. COLLINS, COLORADO 80523	Slope/Soil Net Wt.	0-2% SW / SILTY CLAY LOAM 50 LBS	
	<p><small>This certification is made by the Seed Certification Service of the Cooperative Extension as authorized by the State Board of Agriculture of the State of Colorado pursuant to 35-27-101et seq., C.R.S. 1984 Replacement Vol. 14 as amended. THE COOPERATIVE EXTENSION AND COLORADO SEED GROWERS ASSOCIATION ARE NOT SELLERS AND MAKE NO WARRANTIES, EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR OTHERWISE. The seller warrants that the seed to which this certification is attached is from the lot shown on this certification, and that every portion or bag of which is uniform within reorganized tolerances for the analysis shown. THE SELLER MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR OTHERWISE. LIABILITY LIMITED TO PURCHASE PRICE OF SAID SEEDS.</small></p> <p><small>UNDER THE "COLORADO SEED ACT", ARBITRATION IS REQUIRED AS A PREREQUISITE TO CERTAIN LEGAL ACTIONS, COUNTERCLAIMS, OR DEFENSES AGAINST A SELLER OF SEED. INFORMATION ABOUT THIS REQUIREMENT MAY BE OBTAINED FROM THE COLORADO COMMISSIONER OF AGRICULTURE.</small></p>			
MEMBER OF THE ASSOCIATION OF OFFICIAL SEED CERTIFYING AGENCIES				

Exhibit 2. A standard life-size white label for uncertified seed.



1. Lot identification. Make sure EVERY bag has the proper lot identification.
2. Species common name (scientific names are usually not listed, so be sure to know the appropriate crosswalk).
3. Variety (or cultivar) name. Make sure that this is the variety you ordered.
4. Purity. The amount in the lot (% by weight) of the species that you intended to purchase.
5. Pure + Crop + Inert + Weeds must total 100%. All must be present on label.
6. These are common weeds. If a weed is not noxious and not a crop species, then it is a “common weed.” The individual names are not listed. In Colorado this number must not exceed 2%.
7. Noxious weeds found. There should never be any “prohibited” species found, and make sure that any restricted weeds found (they must be listed by species) are below your or the State’s thresholds. This is expressed in seeds/pound for each species.
8. Germination and hard seeds. Purity and germination must be present on the label along with hard/dormant seeds. **Use these to calculate PLS (Pure Live Seed):**
 $PLS = \text{purity} \times \text{total viability} = \text{Pure} \times (\text{Germ} + \text{Hard} + \text{Dormant})$
 $.9919 \times .92 = .9125 \times 100 = 91.25\% \text{ PLS of Intermediate wheatgrass.}$
 Make sure that the PLS is what you ordered. Be aware that PLS usually does not appear on the label, and must be calculated. PLS is expressed in percent by weight of the total seed.
9. Germination.
10. Hard/dormant seeds.
11. “50#” = 50 pounds bulk seed (not PLS seed): The weight must be labeled.
12. Most recent test date for viability. Check to be sure it is within acceptable time frames. In Colorado, for example, the viability must not be more than 13 months old (12 months plus a 1 month grace period). Stickers of new test dates covering former test dates are allowed.
13. Origin – the State or country where the seed in the bag came from. On this label, SD = South Dakota.
14. Company name and address must be identified.

Exhibit 3. A standard life-size white seed label for an uncertified custom seed mix.

② Kind: Special Pasture Mix		
① Lot: 2108489		
Mixture/Variety:		
③ Meadow Brome	④ Regar	
Smooth Brome, Lincoln		
Tetraploid Perennial Ryegrass, ⑤ VNS		
Timothy, Climax		
	⑪	⑫
	Pure%	Germ% Origin
	39.67	93 CAN
	27.60	90 NE
	19.70	90 OR
	10.00	95 CAN
⑦		
⑧ Crop: 0.33% Inert: 2.65% Weeds: 0.05% Net Wgt: 50#		
⑥ TEST DATE: 12-05	⑨ NOXIOUS WEEDS: NONE FOUND	
Remarks:		
⑬ Arkansas Valley Seed Solutions 4333 Hwy 66 Longmont, CO 80504		

1. Lot identification. Make sure EVERY bag has the proper lot identification.
2. Indicates a “special” or customized seed mix. Make sure that this is what you specified. Custom mixes are difficult to return.
3. Species common name (scientific names are usually not listed, so be sure to know the appropriate crosswalk).
4. Variety (or cultivar) name. Make sure that this is the variety you ordered.
5. VNS = Variety Not Stated. Be wary of this if variety does matter for the species you want. In this case, VNS is OK because this is a common non-native crop species and is clearly identified as a tetraploid perennial ryegrass, not just “ryegrass.”
6. Most recent test date for viability. Check to be sure it is within acceptable time frames. In Colorado, for example, the viability must not be more than 13 months old (12 months plus a 1 month grace period). Stickers of new test dates covering former test dates are allowed.
7. Pure + Crop + Inert + Weeds must total 100%. These must be present on the label.
8. These are common weeds. If a weed is not noxious and not a crop species, then it is a “common weed.” The individual names are not listed. In Colorado this number must not exceed 2%. In the above label, it equals 0.05%.
9. Noxious weeds found. There should never be any “prohibited” species found, and make sure that any restricted weeds found (they must be listed by species) are below your or the State’s thresholds. This is expressed in seeds/pound by species.
10. Net weight. “50#” = 50 pounds bulk seed (not PLS seed): The weight must be labeled.

11. Purity and germination must be present on the label along with hard and dormant (if any hard or dormant seeds are present). **Use these to calculate PLS (Pure Live Seed).** PLS = purity X total viability = purity X (germ + hard + dormant).

On this tag, PLS = Purity X Germination (there are no hard or dormant indicated):

$$\text{PLS of Meadow brome} \quad .3967 \times .93 = .369 \times 100 = 36.9\%$$

$$\text{PLS of Smooth brome} \quad .2760 \times .90 = .248 \times 100 = 24.8\%$$

$$\text{PLS of Ryegrass} \quad .1970 \times .90 = .177 \times 100 = 17.7\%$$

$$\text{PLS of Timothy} \quad .1000 \times .95 = .095 \times 100 = 9.5\%$$

Make sure that the PLS of each species is what you ordered. Be aware that PLS usually does not appear on the label, and must be calculated. PLS is expressed in percent by weight of the total seed.

12. Origin – the State or country where the seed in the bag came from. On this label, CAN = Canada, NE = Nebraska, OR = Oregon.
13. Company name and address must be identified.

ATTACHMENT
Printable checklists

Seed Buying Checklist

- I have selected the right species and varieties for growing conditions. If I am ordering VNS (Variety Not Stated), it is because no varieties exist on the market or variety is not important for this particular order.
- I am ordering certified seed (the most common situation).
- I am ordering the right amount of seed expressed in PLS pounds, not bulk pounds.
- The minimum %PLS I am ordering has been identified for each lot.
- I have clearly stated or delivered contract specifications, if there are any.
- I have clearly stated what level of *restricted* noxious weeds I am willing to accept, if I am willing to accept any (it is recommended none be accepted); I will never accept *prohibited* noxious weeds (and none should ever be sold to you).
- I have clearly stated whether or not I am allowing treated seed (e.g., fungicides or fertilizers) to be acceptable, and what types of treatment are allowed.
- I have my order and delivery date confirmed in writing.

Checklist After Seed Arrives

- Every bag in every lot MUST have a seed label.** Make sure that the right lot number is on the label. **Reject all bags without a seed label.**
- If any of the label's required items are not present on a bag's label, reject all such bags.**
- Check that all bags of the same order have the same lot number. Look for buried unlotted or improperly lotted seed bags hidden in the middle of piles or pallets of delivered seed bags – check **all** hidden seed bags for lot numbers and make sure each bag has the right lot number.
- If the %Weeds exceeds 2%, the lot should be rejected.**
- If *prohibited* noxious weeds are present, or *restricted* noxious weeds are present in greater quantities than the State or your tighter specified tolerances allow, the lot should be rejected. Remember that demanding zero presence of *restricted* weeds is encouraged, and bags containing any *prohibited* seeds should never be sold to you.**
- Make sure all the plant seed names you wanted in a seed mix are on the label in the right quantities.
- Make sure you understand the correct scientific name corresponding to the right common name. Seed tags often list only the common name. For example, “ryegrass” can refer to perennial *or* annual ryegrass, and the difference can be dramatic in terms of what you are receiving. Sometimes a seed company will add the scientific names for you to the tag if they are working on a specific order with you.
- Make sure you check that the viability test date is current and within State timelines. In Colorado, the last test must be within 12 months of the order date plus one month grace period. Viability decreases over time and eventually most of the seed will become non-viable and worthless.
- Make sure the % PLS is at or above what you ordered. Remember, PLS = PURITY X (GERM + HARD + DORMANT).
- Make sure you received the total amount of pounds of PLS ordered.** You will have to figure out what that translates to in total **bulk** pounds received. Remember, for example, that if the PLS is 50% as stated on the tags upon arrival and confirmed by seed testing, and you ordered 10 pounds PLS, you need twice as much bulk seed, i.e., 20 pounds, to meet the PLS pounds desired. That is, 10 pounds PLS ordered divided by 50% PLS = $10/0.50 = 20$ pounds bulk seed should have arrived. If you are short, that does not have to be acceptable to you.
- Finally, re-test the delivered seed yourself by a third party seed testing lab for viability and noxious weeds, if desired.**

Checklist of Procedures to Follow Before Seeding Begins

- Protect seed against storage issues of humidity, breathability, herbivory, and time. Do not store seed too long (varies by seed type and seed lot: some can be stored for many years, some cannot). If seed bags are stored in sealed plastic tubs or airtight containers, make sure small breathable holes are present.
- Check for seed stratification (the sorting out and settling of seed into distinct homogeneous layers influenced by seed shape and weight) within a bag resulting from shaking and settling during delivery to you **or from your dock to the field site**. Remixing may be needed, possibly on site, before field application. Traveling of long distances, over bumpy roads, and in helicopters is notorious for causing seed stratification.
- Always keep some of your seed from the lot as “reserve” seed, in case you need to go back later and test the seed. Store the reserve seed properly. ALWAYS keep an actual seed tag from each lot in your project files.** The tag and the reserve seed is invaluable if you need to reconstruct what was delivered (for dispute resolution), for example if you find a noxious weed growing in a seeding that was not supposed to be there—did it come from the ordered seed?