

## 2016 AOSA Rules Change Proposal 5

**Purpose:** To add *Elymus macrourus* (ELMA7, Tufted Wheatgrass) and *Elymus wawawaiensis* (ELWA2, Snake River Wheatgrass) Pure Seed Unit (PSU) standard, Purity Analysis minimums, Noxious-weed seed exam minimums, approximate number of seeds per gram and ounce standards to the AOSA Rules for Testing Seeds. These species will only be added to AOSA Rules for Testing Seed, Volume 1, and Table 2A.

**Present Rule:** *Elymus macrourus* (ELMA7, Tufted Wheatgrass) and *Elymus wawawaiensis* (ELWA2, Snake River Wheatgrass) are not in the AOSA Rules for Testing Seeds.

**Proposed Rule:** Table 2A. Weights for working samples

Pure seed unit #	Chaffy seed	Kind of seed	Minimum weight for Purity Analysis (grams)	Minimum weight for Noxious-weed seed or bulk examination (grams)	Approximate number of seeds per gram (number)	Approximate number of seed per ounce (number)
21	Yes	<i>Elymus macrourus</i> Tufted Wheatgrass	8	83	260 – 322 (291)	8415 - 8873 (8644)
21	Yes	<i>Elymus wawawaiensis</i> Snake River Wheatgrass	9	84	227 - 384 (305)	6649 - 10463 (8556)

### Harmonization and Impact Statement:

*Elymus macrourus* (ELMA7, Tufted Wheatgrass) and *Elymus wawawaiensis* (ELWA2, Snake River Wheatgrass) are not listed in the AOSA Rules of Testing Seeds (2014a), the Federal Seed Act Regulations (2001), the Canadian Methods and Procedures for Testing Seed (M&P) (2012) or the International Rules for Seed Testing (2015).

These species are sold in the native seed industry within the United States by Pure Live Seed (PLS) units. Within the State of Washington the cultivars ‘Secar’ and ‘Discovery’ (*Elymus wawawaiensis*) are collectively in 955 acres of production with the Certified Seed Program for seed stock (2014e). The GRIN database describes 99 *Elymus* species with 43 native to North America (2013a). Among these 43 species; *Elymus wawawaiensis* is native to Washington, Idaho and Oregon; and *Elymus macrourus* is native to Alaska and Northern Canada. Additional research explored the use of *Elymus* relatives for both cattle forage and conservation prairie planting (Rushing and Baldwin, 2013). These species are close tertiary relatives to wheat (2013a. 2013b. 2013c) and are named as ecologically important for the Great Basin Restoration Project (2004).

The Great Basin Native Plants Selection and Increase Project completed a landscape survey (2004) and three *Elymus* species were listed by National Tree Seed Laboratory Species as a priority for further research (2004). The approval of these species to the AOSA Rules for Testing Seeds will standardize results and add uniformity amongst seed laboratories that work with native grasses.

The new data presented is similar in content to already published data of related species. *Elymus elymoides* (ELELB2, Bottlebrush Squirreltail) is under the guidelines of the Federal Seed Act Regulations (2001) and published within AOSA Rules for Testing Seeds as indicated below:

Table 1. Weight of working sample (2001)

Name of seed	Minimum weight for purity analysis (grams)	Minimum weight for noxious-weed seed examination (grams)	Approximate number of seeds per gram
Bottlebrush-squirreltail	9	90	300

[25 FR 8769, Sept. 13, 1960, as amended at 30 FR 7888, June 18, 1965; 32 FR 12780, Sept. 6, 1967; 35 FR 6108, Apr. 15, 1970; 41 FR 20156, May 17, 1976; 46 FR 53635, Oct. 29, 1981; 59 FR 64492, Dec. 14, 1994; 65 FR 1707, Jan. 11, 2000]

Table 2A. Weights for working samples (2014b)

Pure Seed Unit #	Chaffy Seed <sup>a</sup>	Kind of seed	Minimum weight for purity analysis <sup>b</sup>	Minimum weight for noxious-weed seed or bulk examination	Approximate number of seeds per gram <sup>c</sup>	Approximate number of seeds per ounce <sup>d</sup>
			Grams	Grams	Number	Number
21	Yes	<i>Elymus elymoides</i> (Raf.) Swezey Bottlebrush squirreltail	9	90	190-520 (300)	5,400- 14,800

- a Refer to Section 14 for the application of tolerances for chaffy and non-chaffy seeds.
- b If it is necessary to conduct a noxious-weed seed examination, see section 2.3 to determine size of the working sample. For those kinds listed that show over 500 grams as the minimum weight for purity analysis, the actual amount given shall also be considered the minimum quantity to be examined for noxious-weed seeds. In no other cases does the amount examined for noxious-weed seeds need to exceed 500 grams.
- c Figures in parentheses are the average number of seeds per gram to be used in computations of special tolerances. See section 13.2
- d The number of seeds per pound or the weight of 1,000 seeds can be calculated in the laboratory for individual lots from the sample submitted.

**Supporting Evidence:** See Appendix 5 for full content.

PSU #21 best describes members of the *Elymus* grass family as shown below:

Table 3A. Pure seed unit definitions (2014c)

PSU Number	Description of Pure Seed Unit
21	<p>Floret with attached empty floret(s) not extending to the tip of the fertile floret (excluding the awn), or single floret, provided there is a caryopsis at least one-third the length of the palea measured from the base of the rachilla.</p> <p>Caryopsis or piece of broken caryopsis larger than one-half of the original size.</p> <p>Special consideration:</p> <ul style="list-style-type: none"> <li>* A fertile floret attached to another fertile floret shall be separated.</li> <li>* Attached glumes and empty florets extending to or beyond the tip of the fertile floret shall be removed and classified as inert matter.</li> <li>* For <i>Bouteloua cutipendula</i>, this PSU only applies if the submitted sample consists primarily of single florets and caryopses. When the submitted sample consists primarily of multiple florets and spikelets, refer to PSU 23.</li> </ul>

Seed samples were first analyzed using the Pure Seed Unit (PSU) #21 definition of AOSA (2014c). Following the guidelines of Section 13.3 and 13.4 (2014d) the variance, standard deviation, and coefficient of variance were calculated. The mathematical formulas from AOSA Rules for Testing Seeds (2014d) are presented below:

Calculate the variance, standard deviation and coefficient of variation as follows:

$$\text{Variance} = \frac{N\sum x^2 - (\sum x)^2}{N(N-1)}$$

Where  $x$  = weight of each replicate in grams

$N$  = number of replicates

$\sum$  = sum of

**Standard deviation (s)** = square root of Variance

$$\text{Coefficient of variation} = \frac{\text{Standard deviation}}{\text{Mean weight of 100 seeds}} \times 100$$

All seed samples were counted into eight replicates of 100 seed, weighted and recorded for each species into an Excel table. The mathematical equations for variance, standard deviation, and coefficient of variance were applied as directed. Seed samples either passed or failed the tolerance (> 6.0) for coefficient of variance of chaffy seeds (2014d).

Table 4. Results for ELMA7 of variance, standard deviation and coefficient of variance calculation

<b>ELMA7</b>	<b>Sample 1</b>	<b>Sample 2</b>	<b>Sample 3</b>	<b>Sample 4</b>
Variance	0.0000693	0.0000762	0.0001443	0.0005766
Standard deviation	0.0083218	0.0087312	0.0120142	0.0240127
Coefficient of variance	2.6047402	2.5958748	3.6212034	7.1278101
Status (Pass or Fail)	Pass	Pass	Pass	Failed

Table 5. Results of ELWA2 of variance, standard deviation and coefficient of variance calculation

ELWA2	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6
Variance	0.000125	0.000076	0.000097	0.000111	0.00017	0.0005
Standard deviation	0.0112	0.0086	0.00983	0.01053	0.01312	0.0222
Coefficient of variance	3.8689	3.2083	2.8652	3.1627	3.0774	6.1826
Status (Pass or Fail)	Pass	Pass	Pass	Pass	Pass	Fail

An additional eight replicates of 100 seed for each sample with a failed coefficient of variance tolerance ( $> 6$ ) were counted, weighed and recorded as advised within AOSA Rules for Testing Seeds, Section 13.4.d (2014d). The results of 16 replicates were then calculated for an average 100 seed weight, Purity weight, Noxious-weed weight, mean seed per ounce, variance, standard deviation and coefficient of variance. Results were summarized in the supporting evidence, Appendix E. The Purity Analysis weight (2,500 seed), Noxious-weed seed exam weight (25,000 seed), approximate number of seed per gram, and approximate number of seed per ounce were calculated as directed within Section 13.4d (2014d).

**See additional supporting evidence, Appendix E.**

**Conclusion:**

This proposed new rule is reasonable. This proposal is similar in content to other the other 6 *Elymus* species already published within AOSA Rules for Testing Seeds (2014a) and the Federal Seed Act (2001). The addition of *Elymus macrourus* (ELMA7, Tufted Wheatgrass) and *Elymus wawawaiensis* (ELWA2, Snake River Wheatgrass) Pure Seed Unit, Purity Analysis minimums, Noxious-weed seed exam minimums, approximate number of seeds per gram and number of seeds per ounce to the AOSA Rules for Testing Seeds will establish uniformity among native grass seed laboratories.

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**Respectfully submitted**, Paula M. Moore, Graduate Student, Washington State University, Pullman, Washington, p\_moore@wsu.edu, 509-314-1032 (work) and Victor Shaul, Program Manager, Washington State Department of Agriculture, Commodity Inspection, Seed Program, Yakima, Washington, vshaul@agr.wa.gov, 509-249-6950 (work).

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