

**Basic Guide to the Identification
of Wheatgrass, Wildrye, and Squirreltail Florets:
*Agropyron, Elymus, Leymus, Pascopyrum,
Psathyrostachys, Pseudoroegneria, and Thinopyrum***



by

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The 2021 edition contains new information and revised common names as they appear in the AOSA Rules for Testing Seeds (AOSA 2019) and scientific nomenclature updates in accordance with the USDA GRIN Database (USDA ARS 2021). Both authors are retired from the California Department of Food and Agriculture, Plant Pest Diagnostics Center, Seed Science Laboratory.

Photographs are by J. Effenberger and D. J. Lionakis Meyer

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Basic Guide to the Identification of Wheatgrass, Wildrye, and Squirreltail Florets: *Agropyron*, *Elymus*, *Leymus*, *Pascopyrum*, *Psathyrostachys*, *Pseudoroegneria*, and *Thinopyrum*

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Included in this guide are basic floret characters for the following species: *Agropyron cristatum* (fairway crested wheatgrass), *A. desertorum* (standard wheatgrass), *A. fragile* (Siberian wheatgrass), *Elymus canadensis* (Canada wildrye), *E. elymoides* (bottlebrush squirreltail), *E. lanceolatus* (including subspecies thickspike wheatgrass, streambank wheatgrass and Great Lakes wheatgrass), *E. repens* (quackgrass), *E. trachycaulus* (slender wheatgrass), *E. virginicus* (Virginia wildrye), *Leymus cinereus* (basin wildrye), *Pascopyrum smithii* (western wheatgrass), *Psathyrostachys juncea* (Russian wildrye), *Pseudoroegneria spicata* (beardless or bluebunch wheatgrass), *Thinopyrum intermedium* (including subspecies intermediate wheatgrass and pubescent wheatgrass), and *T. ponticum* (tall wheatgrass). Within the grass family, these species are assigned to the tribe Triticeae. In the past forty or so years there has been considerable reassignment of scientific names, thus making it difficult to track species among different floristic and taxonomic publications. For example, tall wheatgrass has been moved from *Agropyron* to *Elymus*, to *Elytrigia*, and finally to *Thinopyrum*. When using older, yet excellent, identification resources, such as Henry (1927), Musil (1942, 1948, 1950, 1963), and West (1951), you will need to carefully check the nomenclature used.

The florets of many of these species are similar looking and often difficult to identify in their natural state. Once harvested and conditioned, many important features are lost making the task of identification much more challenging. In the past, it was considered acceptable to simply identify an unknown from this group as either *Agropyron* sp. or *Elymus* sp., but now with the same number of species spread among at least seven genera that practice is no longer practical. Key points to remember when attempting to identify individual florets of this group are:

- Rachilla length and width is dependent upon floret placement within the spikelet (i.e., lower florets usually have shorter and thicker rachillas, while upper florets usually have longer and thinner rachillas).
- Floret length can be dependent upon floret placement within the spikelet (i.e., lower florets tend to be longer than upper florets).
- Awns, hairs, and tips of the lemma and palea are often removed or partially removed during post-harvest conditioning rendering these characters unreliable.
- Certain characters of a given species can be highly variable (e.g., lemma hairs of bottlebrush squirreltail – no hairs, very short stiff hairs, short soft hairs; palea tip in quackgrass – truncate, obtuse, or with broad shallow notch).
- Some species are known to hybridize. For a comprehensive account see Barkworth et al., 2007.

This guide is limited in scope and primarily includes species in commercial seed trade. When attempting to identify species from wild collections or unknown sources it is recommended that you use a more inclusive reference, such as Flora of North America (Barkworth et al., 2007).

***Agropyron cristatum* (L.) Gaertn., fairway crested wheatgrass**



Floret: Compressed laterally throughout.

Lemma: 5 – 9 mm long, 1 mm wide; keeled; glabrous to sparsely pubescent.

Awn: 1 – 6 mm long.

Palea: Concavity deep V-shaped; keel hairs stout and widely spaced.

Sinus: U-shaped.

Rachilla: Flared at apex.

Callus: Uniformly narrow across entire width.

Anther: 3 – 5 mm long.

***Agropyron desertorum* (Fisch. ex Link) Schult., standard crested wheatgrass**



Floret: Compressed laterally throughout.

Lemma: 5 – 9 mm long, 0.75 – 1 mm wide; keeled; glabrous.

Awn: +/- awned.

Palea: Concavity deep V-shaped; keel hairs stout and widely spaced.

Sinus: U-shaped.

Rachilla: Flared at apex.

Callus: Uniformly narrow across entire width.

Anther: 3 – 5 mm long.

'Standard' crested wheatgrass originally referred to one particular seed lot (S. P. I. 19537) used as the standard for comparison of performance of other cultivars of crested wheatgrass (Barkworth, et al., 2007). *A. desertorum* is now placed under *A. cristatum* in Flora of North America. Both the GRIN and PLANTS databases recognize *A. desertorum* as separate from *A. cristatum*.

Agropyron fragile (Roth) P. Candargy, Siberian wheatgrass



Floret: Compressed laterally.

Lemma: 5 – 9 mm long, 1 mm wide; glabrous to sparsely pubescent.

Awn: Un-awned or mucronate.

Palea: Concavity deep V-shaped; keel hairs stout and widely spaced.

Sinus: U-shaped.

Rachilla: Flared at apex.

Callus: Nearly uniformly narrow across entire width.

Anther: 4 – 5 mm long.

[=*Agropyron fragile* (Roth) P. Candargy subsp. *sibiricum* (Willd.) Melderis; *Agropyron sibiricum* (Willd.) P. Beauv. var. *sibiricum*]

Elymus canadensis L., Canada wildrye



Floret: Dorsal-ventrally compressed; asymmetrical in outline

Lemma: 8 – 15 mm long, tapering to a narrow base; dull, coarsely granular, sparsely long pubescent especially on sides or uniformly villous.

Awn: 10 – 50 mm long, divergent.

Palea: 7 – 13 mm long; tapering to a notched apex; sparsely pubescent; keels rolled inward and flattened near apex; keel hairs with broad base.

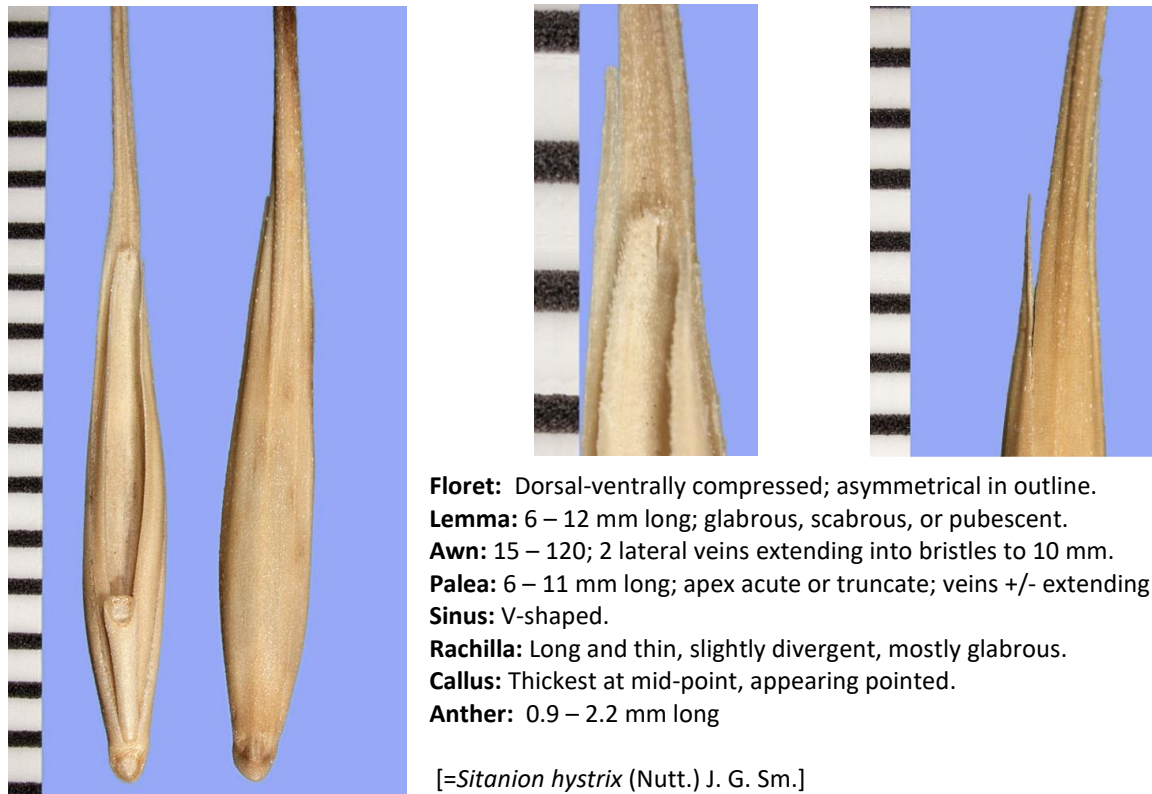
Sinus: U-shaped.

Rachilla: Mostly glabrous.

Callus: Thickest at mid-point, appearing pointed; glabrous or short pubescent on the ends.

Anther: 2 – 3.5 mm long

***Elymus elymoides* (Raf.) Swezey, bottlebrush squirreltail or squirreltail**



Floret: Dorsal-ventrally compressed; asymmetrical in outline.
Lemna: 6 – 12 mm long; glabrous, scabrous, or pubescent.
Awn: 15 – 120; 2 lateral veins extending into bristles to 10 mm.
Palea: 6 – 11 mm long; apex acute or truncate; veins +/- extending into bristles.
Sinus: V-shaped.
Rachilla: Long and thin, slightly divergent, mostly glabrous.
Callus: Thickest at mid-point, appearing pointed.
Anther: 0.9 – 2.2 mm long

[=*Sitanion hystrix* (Nutt.) J. G. Sm.]

***Elymus lanceolatus* (Scribn. & J. G. Sm.) Gould subsp. *lanceolatus*, thickspike wheatgrass**



Floret: Dorsal-ventrally compressed; +/- asymmetrical in outline
Lemna: 7 – 12 mm long, 1.5 mm wide; not scabrous, moderately hairy, hairs stiff, shorter than 1 mm.
Awn: Un-awned or short awned.
Palea: Sub-equal to lemma; smooth or minutely pubescent; apex truncate or with shallow notch; keels rolled inward and flattened in lower half; keel hairs long and closely spaced.
Sinus: V-shaped to narrowly U-shaped.
Rachilla: Broad, villous.
Callus: Thickest at mid-point; hairs continuous across width or confined to the ends.
Anther: (2.5) 3 – 6 mm long

[=*Agropyron dasystachyum* (Hook.) Scribn.; *A. lanceolatum* Scribn. & J. G. Sm.]

Two other subspecies are described in Barkworth et al. (2007):
E. l. subsp. *riparius* (Scribn. & J. G. Sm.) Barkworth, streambank wheatgrass. Lemmas smooth, sometimes scabrous towards apex, mostly glabrous, sometimes the margins hairy in lower half.

E. l. subsp. *psammophilus* (J. M. Gillett & H. Senn) Á. Löve, Great Lakes wheatgrass. Lemmas densely hairy, hairs flexible, many longer than 1 mm. Paleas hairy between the keels, keels hairy in lower half.

***Elymus repens* (L.) Gould, quackgrass**



Bulge

- Floret:** Dorsal-ventrally compressed; symmetrical in outline
- Lemma:** 8 – 12 mm long, 1.25 – 1.75 mm wide; glabrous, lustrous, +/- scabridulous distally; with bulge above callus.
- Awn:** Un-awned to awns 0.2 – 4 mm, straight.
- Palea:** 7 – 9.5 mm long; smoothly concave or longitudinally ridged in lower half; glabrous or sparsely pubescent; keel hairs short with broad base, sometimes curved, not closely spaced; apex truncate, obtuse or with broad shallow notch, not folded at apex; margins +/- visible.
- Sinus:** U-shaped.
- Rachilla:** Not concealed by lemma margins; sides parallel or only slightly divergent in basal florets; glabrous to scabrous.
- Callus:** Thickest at mid-point; glabrous or with a few hairs near callus ends.
- Anther:** 4 – 7 mm long.

[=*Agropyron repens* (L.) P. Beauv., *Elytrigia repens* (L.) Desv. ex Nevski]

***Elymus repens* x *Pseudoroegneria spicata*, NewHy wheatgrass**

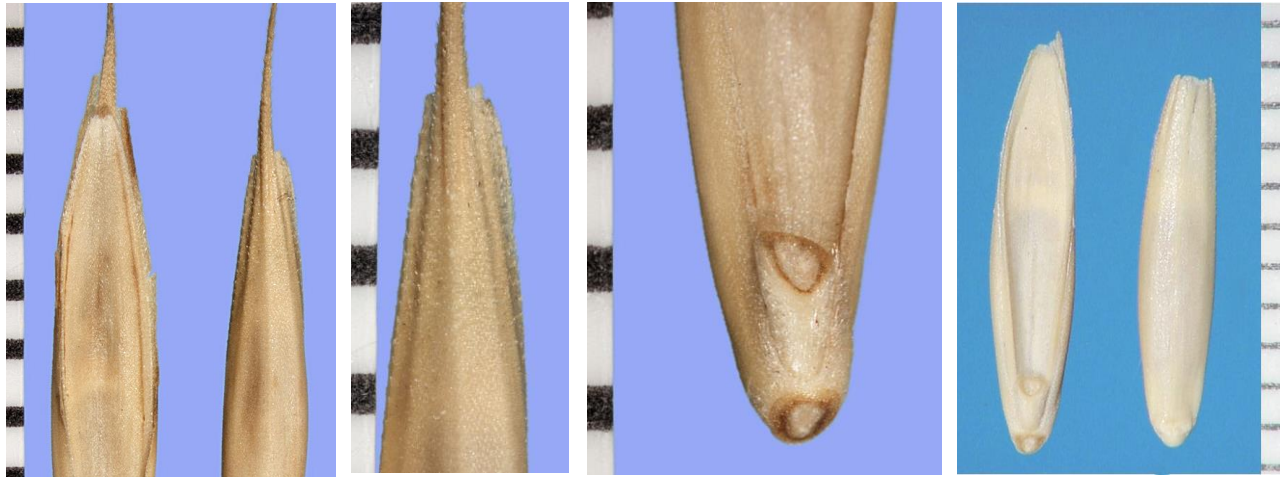


Because of its morphological similarity to quackgrass, NewHy wheatgrass can only be marketed as a class of certified seed.

Comparison of similar wheatgrasses
Bluebunch, NewHy, Quackgrass



***Elymus trachycaulus* (Link) Gould ex Shinnars subsp. *trachycaulus*, slender wheatgrass**



- Floret:** Dorsal-ventrally compressed; asymmetrical in outline.
- Lemma:** 6 – 13 mm long; rounded back; glabrous, usually smooth near base, often scabrous distally over the veins.
- Awn:** Apex of lemma acute or awned to 40 mm, straight to slightly curved.
- Palea:** Sub-equal to lemma; flat to sometimes longitudinally grooved; apex truncate to V-notched; glabrous and lustrous, sometimes minutely pubescent on upper portion; keel hairs short, fine, close together.
- Sinus:** V-shaped to nearly U-shaped.
- Rachilla:** Villous, sides divergent, not appressed to palea, base partially concealed by lemma margins; fine brown line around apex rim.
- Callus:** Thickest at mid-point; hairs continuous across width of callus.
- Anther:** (0.8) 1.2 – 2.5 (3) mm long.

[=*Agropyron tenerum* Vasey; *A. trachycaulum* (Link) Malte ex H. F. Lewis]

***Elymus virginicus* L., Virginia wildrye**



- Floret:** Dorsal-ventrally compressed; +/- asymmetrical in outline.
- Lemma:** 6 – 10 mm long, 1.5 – 2 mm wide; tapering to a narrow base; dull, coarsely granular, +/- scabrous to hirsute near apex; slightly indented above callus.
- Awn:** 5 – 25 mm long, straight, scabrous.
- Palea:** 5 – 9mm long; mostly longer than lemma; smoothly concave; glabrous or minutely pubescent at apex; keels rolled inward, flattened near apex; apex obtuse, truncate, shallowly notched.
- Sinus:** V-shaped.
- Rachilla:** Glabrous or hirsute.
- Callus:** Thickest at mid-point.
- Anther:** 2 – 3.5 (4) mm long.
- Glumes:** Persistent, remaining attached to basal floret.



Basal florets with attached glumes.

***Leymus cinereus* (Scribn. & Merr.) Á. Löve, Basin wildrye**



- Floret:** Dorsal-ventrally compressed; symmetrical in outline.
Lemma: 6.5 – 12mm long, 1.5 mm wide; glabrous to hairy along sides and base, hairs 0.1 – 0.3 mm.
Awn: Up to 3 mm long.
Palea: Sub-equal to lemma; deep v-notch at apex.
Sinus: V-shaped.
Rachilla: Long and slender, villous; fine brown line on rim.
Callus: Thickest at mid-point; hairs continuous across width of callus.
Anther: 4 – 7 mm long.

[=*Elymus cinereus* Scribn. & Merr.]

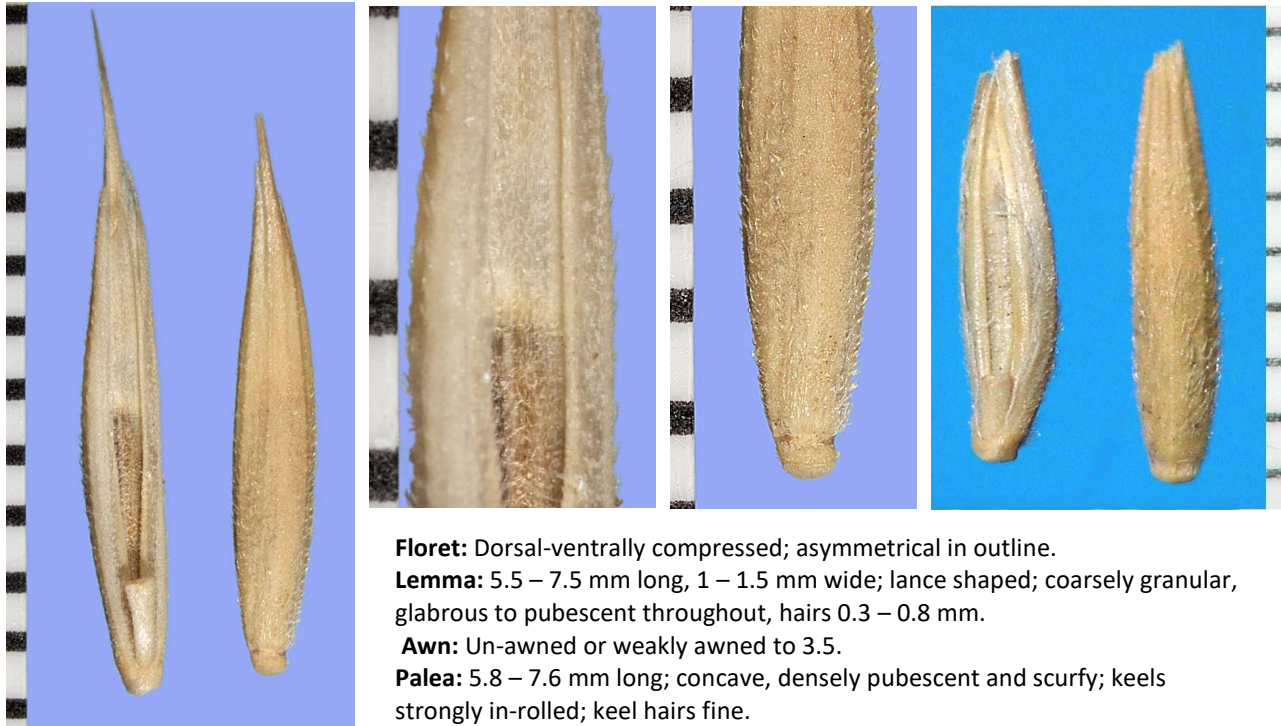
***Pascopyrum smithii* (Rydb.) Barkworth & d. R. Dewey, western wheatgrass**



- Floret:** Dorsal-ventrally compressed; +/-asymmetrical in outline.
Lemma: 6 – 14 mm long, 1.5 – 1.75 mm wide; dull, coarsely granular, sparsely stout hispid; indented over callus.
Awn: Un-awned or short awned.
Palea: Smoothly concave; longitudinally grooved in lower half; dull, coarsely granular, scurfy and sparsely pubescent; apex V-notched, deeply folded; keel hairs irregular in length, longer and finer than in *E. repens*.
Sinus: V-shaped to slightly U-shaped.
Rachilla: Thick, sides divergent, short pubescent; base partially concealed by margins of lemma.
Callus: Thickest at mid-point, hairs usually confined to ends.
Anther: 2.5 – 6 mm long.

[=*Agropyron smithii* Rydb., *Elymus smithii* (Rydb.) Gould]

***Psathyrostachys juncea* (Fisch.) Nevski, Russian wildrye**



- Floret:** Dorsal-ventrally compressed; asymmetrical in outline.
Lemma: 5.5 – 7.5 mm long, 1 – 1.5 mm wide; lance shaped; coarsely granular, glabrous to pubescent throughout, hairs 0.3 – 0.8 mm.
Awn: Un-awned or weakly awned to 3.5.
Palea: 5.8 – 7.6 mm long; concave, densely pubescent and scurfy; keels strongly in-rolled; keel hairs fine.
Sinus: U-shaped.
Rachilla: Mostly long and slender; glabrous to short pubescent.
Callus: Uniformly thick across entire width.
Anther: 2.5 – 5.1 mm long.

[=*Elymus junceus* Fisch.; *E. desertorum* Kar. & Kir.]

***Pseudoroegneria spicata* (Pursh) Á. Löve, beardless or bluebunch wheatgrass**



- Floret:** Dorsal-ventrally compressed; symmetrical in outline.
Lemma: 9 – 14mm long, 1.25 – 1.5 mm wide; linear oblong; Nerves visible near apex.
Awn: +/- awned 0 – 25 mm, divergent.
Palea: Deeply concave; glabrous, lustrous; keel hairs short and closely spaced.
Sinus: V-shaped to narrowly U-shaped.
Rachilla: Mostly long and slender except for basal florets; fine brown line around apex rim; finely pubescent.
Callus: Thickest at mid-point; hairs at ends.
Anther: 4 – 8 mm long.

[=*Agropyron spicatum* (Pursh) Scribn. & J. G. Sm., *Elymus spicatus* (Pursh) Gould; *Elytrigia spicata* (Pursh) D. R. Dewey]

***Thinopyrum intermedium* (Host) Barkworth & D. R. Dewey *subsp. intermedium*, intermediate wheatgrass**



Floret: Dorsal-ventrally compressed; asymmetrical in outline.
Lemma: 7.5 - 10 mm long, 1.75 – 2 mm wide; obtusely pointed; slightly narrowed at base; barely exceeding the tip and sides of palea in upper 1/3; lustrous, glabrous; indented above callus.
Awn: lemma acuminate or short awned.
Palea: 7 – 9.5 mm long, broad and obtuse; concavity V-shaped, at least in lower portion; lustrous, glabrous or minutely pubescent; keel hairs uniformly short and evenly spaced; margins visible to near base.
Sinus: U-shaped
Rachilla: Glabrous; ca. 1/3 the length of the palea; sides slightly divergent
Callus: +/- uniformly narrow; glabrous or hairs short and sparse.
Anther: 5 – 7 mm long.

[=*Agropyron intermedium* (Host) P. Beauv., *Elytrigia intermedia* (Host) Nevski subsp. *intermedia*]

Additional subspecies described in Barkworth et al. (2007):
T. i. subsp. *barbulatum* (Shur) Barkworth & D. R. Dewey, pubescent wheatgrass. Lemmas with hairs, sometimes only on the margins, hairs 1-1.5 mm long.

[=*Agropyron trichophorum* (Link) K. Richt.; *Elytrigia intermedia* (Host) Nevski subsp. *barbulata* (Schur) Á. Löve

***Thinopyrum ponticum* (Podp.) Barkworth & D. R. Dewey, tall wheatgrass**



Floret: Dorsal-ventrally compressed; asymmetrical in outline.
Lemma: 9 – 12 mm long, 1.75 – 2.5 mm wide; obtusely pointed; slightly narrowed at base; markedly exceeding the tip and sides of palea in upper 1/3; dull, glabrous.
Awn: Short awned.
Palea: 7.5 – 11 mm long, broad and obtuse; concavity broad and shallow or with slight longitudinal crease near base; dull, scruffy, sparsely pubescent; keel, hairs closely spaced, fine, long, uneven; margins not visible at base.
Sinus: V-shaped to narrowly U- shaped.
Rachilla: Glabrous or with very short hairs; short and thick flaring at apex or long and strap shaped; sides strongly divergent
Callus: Thickest at mid-point.

[=*Agropyron elongatum* auct. nonn., *Elytrigia elongata* auct. nonn., *Thinopyrum elongatum* auct. nonn.]

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