

CALAMAGROSTIS UTSUTSUENSIS (POACEAE),  
A NEW SPECIES ENDEMIC TO STEENS MOUNTAIN, OREGON, U.S.A.

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ABSTRACT

A reedgrass growing on Steens Mountain, Oregon (U.S.A.), is here described as a species, ***Calamagrostis utsutsuensis*** Otting & B.L. Wilson. This plant has been confused with *C. purpurascens* R. Br., *C. koelerioides* Vasey, and *C. tacomensis* K.L. Marr & R.J. Hebda. An identification key is provided to distinguish the Steens Mountain plant from these species and from all other *Calamagrostis* of the Pacific Northwest and northern Great Basin.

RESUMEN

Una gramínea que crece en las Steens Mountain, Oregon (U.S.A.), se describe aquí como especie, ***Calamagrostis utsutsuensis*** Otting & B.L. Wilson. Esta planta se ha confundido con *C. purpurascens* R. Br., *C. koelerioides* Vasey, y *C. tacomensis* K.L. Marr & R.J. Hebda. Se aporta una clave de identificación para distinguir la planta de las Steens Mountain de estas especies y de todos los otros *Calamagrostis* del noroeste del Pacífico y parte norte del Great Basin.

INTRODUCTION

Steens Mountain is an isolated “sky island” (Brown 1978; Heald 1951) in the northern Great Basin, reaching an elevation of 2360 m (9337 ft), some 1675 m (5500 ft) above the surrounding lowlands. The nearest alpine areas of that size are at least 320 km away. On Steens Mountain, the typical shrub-steppe flora of the Great Basin ranges meets an unusual mix of taxa more common in the Rocky Mountains, the Cascade/Sierra axis, and higher latitudes. Since the end of the last ice age, the alpine vegetation on Steens Mountain has been isolated from its counterparts in the Rocky and Wallowa Mountains, the Cascade Range, and the mountain ranges of the Great Basin. Steens Mountain has a relatively extensive area (75 km<sup>2</sup>) of land over 2400 m in elevation, enough space to support substantial populations of alpine plants through climatic variations. As a result, Steens Mountain is home to several endemic taxa and subtaxa, such as *Castilleja pilosa* (S. Watson) Rydb. var. *steenensis* (Pennell) N.H. Holmgren, *Cirsium peckii* L.F. Henderson, *Draba cusickii* B.L. Rob. ex O.E. Schulz var. *cusickii*, and *Eriogonum ovalifolium* Nutt. var. *rubidum* (Gand.) Reveal & Mansfield. Here we report on a Steens Mountain endemic *Calamagrostis*.

For decades, botanists have been aware of a glaucous, cespitose reedgrass with dense inflorescences on Steens Mountain. It has been identified as *Calamagrostis purpurascens*, and *C. koelerioides*. The poor fit of the Steens Mountain grass to these species descriptions has been recognized by previous workers (Mansfield 2000). When *Calamagrostis tacomensis* K.L. Marr & Hebda was described (Marr & Hebda 2006), the Steens Mountain plants were included in that species. The fit was better, but consistent differences between the Steens Mountain plants and *C. tacomensis* of Washington and northwest Oregon were noted in the literature (Marr & Hebda 2006; Marr et al. 2011). However, time constraints and a paucity of specimens from Steens Mountain precluded research into the possible error when the Poaceae treatment of Flora of North America was being written (Marr et al. 2007; Kendrick Marr, pers. comm.). The confusion surrounding the identity of this species

is hardly surprising. *Calamagrostis* taxonomy is complicated by polyploidy, hybridization that occasionally produces new species, and asexual as well as sexual seed production (Greene 1980). Species are often distinguished by a combination of overlapping traits rather than by a clear difference in a single trait.

Independent of Marr et al. (2011), *Carex* Working Group members (co-authors of this paper) found that the Steens Mountain plants differed morphologically from known *Calamagrostis*, though they were similar to *C. tacomensis*. We found that *C. tacomensis* itself was a smaller plant of lower elevations, differing from the Steens Mountain plants in habitat, general appearance and in details of foliage and floral morphology (Table 1). Here we describe the Steens Mountain grass as a distinct species, compare it to the species with which it has been confused, and provide an identification key for distinguishing it from all other *Calamagrostis* in its region.

***Calamagrostis utsutsuensis*** Otting & B.L. Wilson, **sp. nov.** (Figs. 1–5). TYPE: OREGON, HARNEY CO.: Steens Mountain, headwater tributary of Little Blitzen River, 42.698354 N, 118.615726 W (WGS84), elev. 2397 m, 7 Aug 2012, *Otting 3449* (HOLOTYPE: OSC; ISOTYPES: CIC, MO, NY, SRP, RENO, US, UTC, V, WS, WTU).

A glaucous grass, similar to *C. tacomensis*, but taller, with longer and wider leaf blades and panicles, and with shorter spikelets, lemmas and awns.

**Plants** caespitose, rhizomes generally lacking, if present about 2 cm. **Culms** 41–95 cm tall, phyllopodic, surrounded basally by a pale orange-brown prophyll and similar bladeless leaf sheaths. **Leaf sheaths** and collars smooth or papillose to scabrous between veins, margins minutely scabrous distally; **ligules** evenly scabrous on dorsal side, lacerate, those of innovation leaves 2.5–5.5 mm; those of distal culm leaves 3–6.3 mm; **leaf blades** (3.7)7–43 cm × 1–4.5 mm, flat, glaucous, both surfaces scabrous or smooth. **Panicles** 5–18 cm × 0.7–2.8(5) cm, loosely contracted, erect to slightly nodding, shiny green, purple, or brown; branches (0.7)1.5–6 cm, scabrous or with hairs to 0.1 mm, spikelet-bearing to base or nearly so. **Spikelets** 3.2–5.8 mm; rachilla prolongations 0.9–2.1 mm, with hairs exceeding apex by 0–1 mm, apex attenuate to blunt. **Glumes** subequal, differing by 0–0.5 mm, with dark purple patch near the base and usually more or less purple elsewhere on back and near tip, keeled, usually antrorsely scabrous to minutely ciliate on distal 75% of keel, elsewhere usually scabridulous, rarely smooth. **Calluses** with hairs 1.2–3 mm, 30–60% as long as the lemma, abundant. **Lemmas** 2.9–4.2 mm, 0.5–1.5 mm shorter than the glumes; veins drawn out to form minute attenuate teeth; **lemma awns** 2.9–6.6 mm, attached to the lower (0)10–33% of the lemma, exserted 0.5–2.3 mm beyond the glumes, easily distinguished from callus hairs, strongly bent. **Paleas** 2.4–3 mm, apex with minute teeth. **Anthers** (1)1.6–2.5 mm.

**Habitat, Range.**—Small headwater streams, seeps, springs, and rivers from near the tops of cirque walls to mouths of gorges, full sun or less often in shade, elevations 1700–2760 m, on Steens Mountain, Harney County, Oregon.

**Phenology.**—Flowering late July to early September.

**Etymology.**—The specific epithet is derived from “utsutsu,” the Northern Paiute name for Steens Mountain and “-ensis,” Latin for “of, pertaining to.” This grass is endemic to Steens Mountain. Steens Mountain is considered a sacred mountain by the Northern Paiute people. In their tradition, the mountain is where the world began. Therefore, all forms of life can be found throughout its many habitat zones: elk, deer, bighorn sheep, pronghorns, and marmots, as well as the sage grouse, who saved fire atop this mountain from the great flood. The mountain is also home to many types of medicinal and food plants that supported the Northern Paiute on this land. The many geographical features represent the actors in ancient stories. The pictographs and petroglyphs of Steens Mountain attest to its importance to the ancient Northern Paiute people. Steens Mountain is as holy to the Northern Paiute as Mt. Sinai in the Middle East is to followers of the three main Abrahamic religions (W. Wewa, pers. comm.).

**Discussion.**—*Calamagrostis utsutsuensis* has been identified as *Calamagrostis purpurascens* R. Br. based on its high elevation habitat, caespitose growth form, and geniculate, more or less exserted awns (Mansfield 2000). The most distinctive trait of *C. purpurascens* is the densely short-haired upper surface of the leaf blades. The Steens Mountain *Calamagrostis* lacks this, but its densely scabrous blades are similar enough for misidentification (Table 1).

Confusion of *Calamagrostis utsutsuensis* with *C. koelerioides* reflects a general confusion of *C. koelerioides*

TABLE 1. Comparison of *Calamagrostis utsutsuensis* with the three species with which it has most often been confused. The length of the spikelets is the length of the glumes because the glumes exceed the floret. Measurements for *C. utsutsuensis* and *C. tacomensis* come from the authors' research; those of *C. koelerioides* and *C. purpurascens* come from Marr et al. 2007.

| Trait                                      | <i>C. utsutsuensis</i>                        | <i>C. koelerioides</i>        | <i>C. purpurascens</i>           | <i>C. tacomensis</i>                |
|--|---|-------------------------------|----------------------------------|-------------------------------------|
| Leaf blade width                           | 1–4.5 mm                                      | (2)2.5–4.5(8) mm              | 2–5(6) mm                        | (1.5)2–3(4) mm                      |
| Leaf blade, upper (adaxial) surface        | scabrous (smooth)                             | smooth or sparsely hairy      | densely (rarely sparsely) hairy  | usually smooth to slightly scabrous |
| Collars                                    | smooth or papillose to scabrous between veins | usually scabrous (or smooth)  | scabrous or hairy, rarely smooth | smooth or slightly scabrous         |
| Ligules, cauline leaves                    | 3–6.3 mm                                      | (1.5)2–4.5(7) mm              | (1.5)2–4(9) mm                   | (3)3.5–5.5(6.5) mm                  |
| Inflorescence branches                     | (0.7)1.5–6 cm                                 | (1.1)2.8–4(6) cm              | 1.3–3.5 cm                       | (2)2.3–4 cm                         |
| Spikelets (= glumes)                       | 3.2–5.8 mm                                    | (4)4.5–6(7) mm                | (4.5)5.5–6.5(8) mm               | (4)5.5–7 mm                         |
| Lemma length                               | 2.9–4.2 mm                                    | (3.5)4–5(6) mm                | (3.5)4–4.5(5) mm                 | (3.5)4–5.5(6) mm                    |
| Lemmas shorter than glumes by              | 0.5–1.5 mm                                    | 0.5–1.5 mm                    | (0)1–2.5 mm                      | (0.5)1–2(3) mm                      |
| Lemma awn length                           | 2.9–6.6 mm                                    | 4–5.5 mm                      | (4.5)6–7(9) mm                   | (5.5)7–12 mm                        |
| Awn exertion                               | 0.5–2.3 mm                                    | exserted, sometimes barely so | usually exerted                  | (2)3–5.5(7) mm                      |
| Anther length                              | (1)1.6–2.5 mm                                 | 2–3.5 mm                      | (1.3)1.7–2.5(2.9) mm             | 2–3(3.5) mm                         |
| Elevation                                  | 1700–2760 m                                   | (50)600–1500 m                | 15–4000 m                        | (475)957–1850 m                     |
| Distance to nearest <i>C. utsutsuensis</i> | N/A   | 345 km                        | 280 km                           | 450 km                              |
| Location nearest Steens                    | N/A   | southwestern Oregon           | northeastern Oregon              | Mountains of w WA and nw OR         |

with many other reedgrasses. Like *C. koelerioides*, the Steens plant has dense inflorescences, and its leaf width and most of its spikelet measurements overlap, though there are average differences and small qualitative differences (Table 2).

When *Calamagrostis tacomensis* was described (Marr & Hebda 2006), Steens Mountain plants were included in that species. The species was otherwise known only from the Olympic Peninsula and the Cascades of Washington and northwest Oregon, 450 km or more from Steens Mountain. The Steens grass was more similar to *C. tacomensis* of Washington and northwestern Oregon than any other grass, but consistent differences distinguish them (Table 3). *Calamagrostis utsutsuensis* has larger panicles with more, smaller, and more densely-arranged spikelets and larger leaves than *C. tacomensis*. *Calamagrostis tacomensis* seems to grow in dry habitats, unlike *C. utsutsuensis*.

An identification key is provided to distinguish *Calamagrostis utsutsuensis* from all other *Calamagrostis* species of the Pacific Northwest and northern Great Basin (see below).

*Calamagrostis utsutsuensis* is endemic to small areas of suitable habitat in the gorges and cirques of Steens Mountain within an area of about 160 km<sup>2</sup>. The populations at lowest elevations are on cobble bars below the high water line along major streams. Although *C. utsutsuensis* can mature in these settings, these populations are probably ephemeral, destroyed by floods but re-established by seeds washed down from the headwater streams. The most stable populations are probably those along small headwater streams, many of them on the steep gorge walls. These sites are difficult to access, requiring long hikes and in some cases steep climbs.

Despite its very limited range, *Calamagrostis utsutsuensis* is probably secure at this time. It grows within the Steens Mountain Cooperative Management and Protection Area (CMPA) set up to preserve the unique Steens ecosystems while allowing responsible livestock grazing to continue in some areas. There is no reason to think that tall, cespitose *C. utsutsuensis* tolerates grazing well. Some 40,000 ha of the CMPA are protected from cattle grazing, and, although wild horses are present, their populations are controlled. Also, its steep habitat provides *C. utsutsuensis* with topographic protection from grazing. Effects of global warming on *C.*

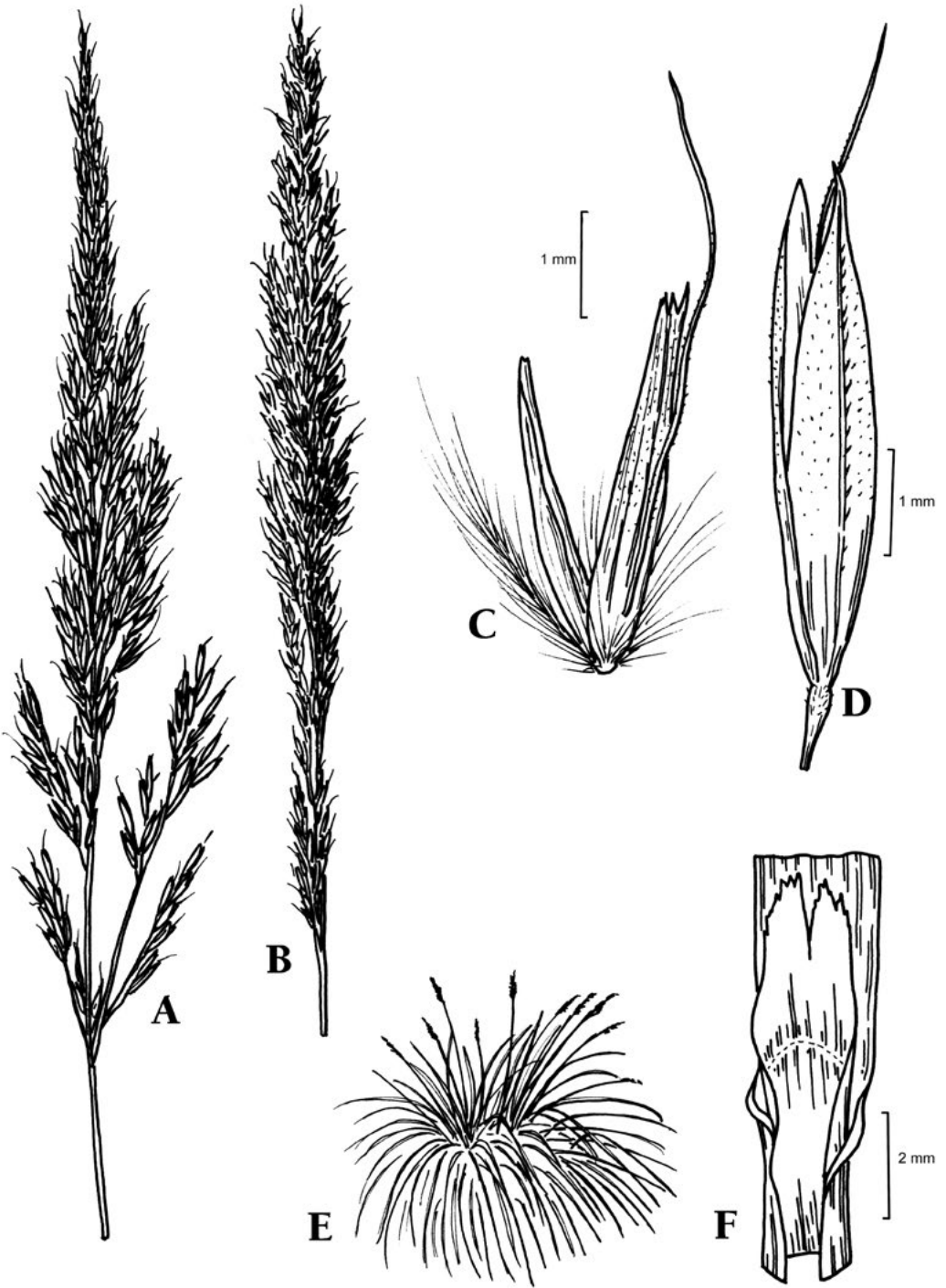


FIG. 1. *Calamagrostis utsutsuensis*. A & B. panicles. C. floret. D. spikelet. E. habit. F. distal part of leaf sheath and proximal part of leaf blade, showing ligule. Drawing by Cindy Talbott Roché.





FIG. 2. *Calamagrostis utsutsuensis* showing caespitose habit and headwater stream habitat. Photo 7 Aug 2012 by Nick Otting.

*utsutsuensis* may be buffered somewhat by its elevational range. However, a significant reduction in snowfall leading to reduced stream and groundwater flows could negatively impact this species.

The most immediate threat to continued existence of *Calamagrostis utsutsuensis* is the relatively recent establishment of invasive rhizomatous grasses in the alpine zone of Steens Mountain. *Bromus inermis* Leys. grows at 2630 m along Steens Loop Road and *Alopecurus pratensis* L. grows at 2450 m near Kiger Gorge overlook and at approximately 2700 m in Little Blitzen RNA (B. Wilson, pers. obs., 2012 and 2014). The latter occurs in a seasonal stream like those occupied by *C. utsutsuensis*. Both these introduced grasses have the potential to be serious competitors for the native grasses of mesic to moist sites on Steens Mountain.

KEY TO CALAMAGROSTIS, REEDGRASS, OF THE PACIFIC NORTHWEST AND NORTHERN GREAT BASIN  
(modified from Hitchcock & Cronquist 2018 and Marr et al. 2007)

1. Callus hairs more than 1.3 times as long as lemmas; lemmas at least 2 mm shorter than glumes, long-acuminate; native to Eurasia, introduced to north America, mostly in eastern Canada but also southwest British Columbia and eastern Idaho, perhaps elsewhere \_\_\_\_\_ **C. epigejos** (L.) Roth
1. Callus hairs usually less than 1.2 times as long as lemmas; if callus hairs longer than lemmas, then lemmas less than 2 mm shorter than glumes and not acuminate; native species.
  2. Lemma awns geniculate, at least the longer awns exerted beyond glume tips by (1.5)2–11 mm.
    3. Lemma awns 10–16 mm, exerted from glumes 7–11 mm; panicle open, branches spreading; Columbia Gorge of Oregon and Washington \_\_\_\_\_ **C. howellii** Vasey
    3. Lemma awns 2.9–11(13) mm, exerted from glumes (1.5)2–5 mm; panicle open or congested, branches spreading to erect; range various.
      4. Wider leaf blades 6–13 mm wide; culms (47)60–120(150) cm tall; in Cascades of Oregon and Washington, east to Idaho and Montana \_\_\_\_\_ **C. tweedyi** (Scribn.) Scribn.
      4. Wider leaf blades 0.4–7 mm wide; culms (15)30–80(95) cm tall.
        5. Panicles open; leaf blades 0.4–1.7 mm wide; Mt. Hood and Mt. Jefferson, Oregon, also northern California \_\_\_\_\_ **C. breweri** Thurb.



FIG. 3. *Calamagrostis utsutsuensis* forming glaucous clumps in a seasonal stream high on Little Blitzen Gorge, Steens Mountain, 18 Jul and 7 Aug 2002. Photos by Nick Otting.

5. Panicles congested, narrow; leaf blades (1.5)2–5(8) mm wide.
6. Upper leaf surface with dense short hairs; lower leaf surface strongly scabrous; inflorescence branches with short spreading hairs; glume keels scabrous; awns (4.5)6–7(9) mm; central Siberia east to Greenland, south in North America to California and northern New Mexico \_\_\_\_\_ **C. purpurascens** R. Br.
6. Upper leaf surface glabrous, scabrous, or sparsely hairy; lower leaf surface glabrous or scabrous; inflorescence branches scabrous; glume keels smooth or slightly scabrous; awns 2.9–11(13) mm.
7. Glume apices long-acuminate, usually twisted distally; glume keels usually scabrous for entire length; western BC (Haida Gwaii and Vancouver Island), north and west to the Aleutian Islands and northeast Asia \_\_\_\_\_ **C. sesquiflora** (Trin.) Kawano
7. Glume apices usually acute, if acuminate, not twisted distally; glume keels smooth or sparsely scabrous on distal half; mountains of Washington and Oregon.
8. Glumes 3.2–5.8 mm; lemmas 2.9–4.2 mm; awns 2.9–6.6 mm, exerted from spikelet 0.5–2.3 mm; Steens Mountain, eastern Oregon \_\_\_\_\_ **C. utsutsuensis** Otting & B.L. Wilson
8. Glumes (4)5.5–7 mm; lemmas (3.5)4–5.5(6) mm; awns (5.5)7–12 mm, exerted from spikelet (2)3–5.5(7) mm; mountains of w Washington & NW Oregon \_\_\_\_\_ **C. tacomensis** K.L. Marr & Hebda
2. Awns straight or sometimes geniculate, exerted from glumes less than 1(1.5) mm.
9. Awn attached to the distal 40% of lemmas, 0.5–2 mm, straight; blades flat; panicles contracted, 0.7–2.5(3) cm wide; Idaho and Montana, south to Arizona and New Mexico \_\_\_\_\_ **C. scopulorum** Jones
9. Awn attached to the proximal 50(70)% of lemmas, 0.9–6(9) mm, straight or bent; blades flat or involute; panicles open or contracted, 0.4–5.5(9) cm wide.
10. Plants coastal; collars thickened, veins obscure or lacking; leaf blades thick and tough, (2)4–10(20) mm wide; coastal; Kamchatka to Aleutian Islands, south to southern California \_\_\_\_\_ **C. nutkaensis** (Presl.) Steud.
10. Plants inland or occasionally near the coast, especially on the Olympic Peninsula, WA; collars not thickened, veins evident; leaf blades not particularly thickened, 2–5(8) mm wide.
11. Callus hairs usually 20–50(60)% as long as lemmas.
12. At least some collars hairy, hairs longer than those of the adjacent blade or sheath; British Columbia to Saskatchewan, south to southern California and Colorado \_\_\_\_\_ **C. rubescens** Buckl.





FIG. 4. Inflorescences of *Calamagrostis utsutsuensis*, Steens Mountain, 7 Aug 2012. Photos by Barbara Wilson.

12. Collars glabrous or if hairy, hairs no longer than those of the sheath or blade.
13. Leaves densely short-hairy on ventral surface, scabrous on dorsal surface; alpine and subalpine; central Siberia east to Greenland, south in North America to California and northern New Mexico \_\_\_\_\_ *C. purpurascens* R. Br.
13. Leaves scabrous to smooth on ventral surface, sometimes sparsely hairy, scabrous to smooth on dorsal surface; habitat various including alpine.
14. Plants 15–50(54) cm; leaves usually involute; awns (1)2–3(4) mm; eastern British Columbia and Manitoba south to Wyoming and Minnesota \_\_\_\_\_ *C. montanensis* (Scribn.) Vasey
14. Plants (26)40–100(120) cm; leaves usually flat; awns 2.8–6.6 mm
15. Anthers 2–3.5 mm; lemma awns 4–5.5 mm; lemmas (3.5)4–5(6) mm; elevation (50)600–1500 m; southwest Oregon south to southern California, reported north to southern British Columbia and Montana (doubtful) \_\_\_\_\_ *C. koelerioides* Vasey
15. Anthers (1)1.3–2.5 mm; lemma awns 2.8–6.6 mm; lemmas 2.5–4.2 mm; elevation 50–2800 m; range various.
16. Plants densely caespitose; rhizomes usually lacking or to 2 cm; foliage blue-green, glaucous; lemmas 2.9–4.2 mm; lemma awns 2.9–6.6 mm; rocky headwater streams and among cobbles and boulders on lower elevation streams; Steens Mountain, southeastern Oregon \_\_\_\_\_ *C. utsutsuensis* Otting & B.L. Wilson
16. Plants loosely caespitose; rhizomes usually present, often 15+ cm; foliage green, not glaucous; lemmas 2.5–3.5(4) mm; lemma awns 2.8–3.5(4.5) mm; open upland forest, less often sagebrush steppe or meadows; British Columbia to Saskatchewan, south to California and Colorado, but not on Steens Mountain \_\_\_\_\_ *C. rubescens* Buckley
11. Callus hairs usually 70–120+% as long as lemmas.
17. Culms usually scabrous, 15–50(55) cm; awns slightly bent; callus hairs 40–80% as long as lemmas; uplands; eastern British Columbia and Manitoba south to Wyoming and Minnesota \_\_\_\_\_ *C. montanensis* (Scribn.) Vasey



Fig. 5. *Calamagrostis utsutsuensis* along the Little Blitzen River low in Little Blitzen Gorge, Steens Mountain, 8 Aug 2017. Photo by Nick Otting.



17. Culms smooth to slightly scabrous, (10)35–112(180) cm; awns straight; callus hairs (50)70–120(150)% as long as lemmas; wetlands (stream margins, shorelines, marshes, and bogs); circumboreal, south in North America to California and Arizona.
18. Panicles relatively congested, rarely over 2 cm wide when pressed, branches erect or ascending, not readily distinguished; glumes mostly 3–4 mm long; blades usually 1.5–4 mm wide, involute or flat; callus hairs often only 50–75% as long as lemmas; awns stout \_\_\_\_\_ **C. stricta** (Timm) Koeler (with 2 spp.)
19. Ligules of upper culm leaves mostly 2–4 mm long, seldom lacerate; blades mostly 1.5–3 mm wide, flat to involute, scabrous chiefly on the margins; spikelets 2–3 mm; callus hairs 1–3 mm; lemmas very obscurely scabridulous-puberulent \_\_\_\_\_ **C. s. ssp. stricta**
19. Ligules of upper culm leaves usually (4)5–10 mm long, often lacerate; blades often over 3 mm wide, flat, usually strongly scabrous; spikelets 3–4(5) mm; callus hairs 2–4.5 mm; lemmas rather prominently scabridulous-puberulent \_\_\_\_\_ **C. s. ssp. inexpansa** (A. Gray) C.W. Greene
18. Panicles almost always open, mostly more than 2 cm wide when pressed, the branches tending to spread, rarely obscured; glumes often more than 4 mm long; blades sometimes well over 4 mm wide, usually flat; callus hairs subequal to the lemmas; awns delicate \_\_\_\_\_ **C. canadensis** (Michx.) P. Beauv. (with 2 var.)
20. Spikelets (3.5)4–4.5(5.2) mm; glumes usually scabrous over the entire surface, the scabrules on the keels often bent; glume tips distinctly acuminate \_\_\_\_\_ **C. c. var. langsdorffii** (Link) Inman
20. Spikelets 2.5–4 mm long; glumes smooth or scabrous, often scabrous only on keels; scabrules on keels straight; glume tips acute, rarely acuminate \_\_\_\_\_ **C. c. var. canadensis**

TABLE 2. Morphological differences between *Calamagrostis utsutsuensis* and *C. koelerioides*. The length of the spikelets is the length of the glumes because the glumes exceed the floret. Measurements for *C. utsutsuensis* come from the authors' research; those of *C. koelerioides* come from Marr et al. 2007.

| Trait                           | <i>C. utsutsuensis</i>                    | <i>C. koelerioides</i>                              |
|---------------------------------|---|---|
| Innovation leaf ligules, length | 2.5–5.5 mm                                | 1–3.5 mm  |
| Ligules, upper edge             | lacerate, sometimes also with small hairs | with fringe of small hairs, sometimes also lacerate |
| Pedicel scabers                 | sparser, longer                           | denser, shorter                                     |
| Spikelets (= glumes)            | 3.2–5.8 mm                                | (4)4.5–6(7) mm                                      |
| Glume keel scabers              | sparser, longer                           | denser, shorter                                     |
| Lemma, length                   | 2.9–4.2 mm                                | (3.5)4–5(6) mm                                      |
| Anthers                         | (1)1.6–2.5 mm                             | 2–3.5 mm  |
| Lemma awn bend                  | 66–100% of lemma length                   | 50–66% of lemma length                              |

TABLE 3. Traits distinguishing *Calamagrostis tacomensis* from *C. utsutsuensis*. The length of the spikelets is the length of the glumes because the glumes exceed the floret. Measurements for *C. utsutsuensis* come from the authors' research; those of *C. tacomensis* come from Marr et al. 2007 modified by the authors' observations.

| Trait                          | <i>C. utsutsuensis</i>                    | <i>C. tacomensis</i>  |
|--------------------------------|---|---|
| Culms                          | 41–95 cm                                  | (20)30–55 cm  |
| Nodes                          | 2–3                                       | (1)2(5)   |
| Ligules                        | 3–6.3 mm                                  | (3)3.5–5.5(6) mm  |
| Leaf blade length              | (3.7)7–43 cm                              | (6)7–14(30) cm  |
| Leaf blade width               | 1–4.5 mm                                  | (1.5)2–3(4) mm  |
| Inflorescence, length          | 5–18 cm                                   | (5)7–10(18) cm  |
| Inflorescence, width           | 0.7–2.8(5) cm                             | (0.5)1–2(3) cm  |
| Inflorescence branches, length | (0.7)1.5–6 cm                             | (2)2.3–4 cm   |
| Inflorescence branches         | spikelet-bearing to the base or nearly so | spikelet-bearing mostly on the distal 2/3                                   |
| Spikelets (= glumes)           | 3.2–5.8 mm                                | (4)6–6.5(7) mm  |
| Callus hairs                   | 1.2–3 mm                                  | (1.2)2(2.5) mm  |
| Lemma length                   | 2.9–4.2 mm                                | 4–6(6.5) mm   |
| Lemmas shorter than glumes     | 0.5–1.5 mm                                | (0.5)1.5–2(3) mm  |
| Lemma awn, length              | 2.9–6.6 mm                                | (5.5)7–8.5(10) mm   |
| Lemma awn exertion             | 0.5–2.3 mm                                | (2)3–5.5(7) mm  |
| Anther length                  | (1)1.6–2.5 mm                             | 2–3(3.5) mm   |
| Elevation range                | 1700–2760 m                               | (475)957–1850 m   |
| Habitat                        | moist                                     | dry   |
| Distribution                   | Steens Mountain, southeastern Oregon      | Cascade Range, Olympic Mountains of western Washington, and northern Oregon |

Specimens of *Calamagrostis tacomensis* and *C. utsuensis* from CIC, OSC, WS, and WTU were examined (see Appendix; herbarium acronyms from Thiers continually updated). In Tables 1–3, traits for *Calamagrostis koelerioides* and *C. purpurascens*, are taken from Marr et al. (2007). Those of *C. tacomensis* were taken from Marr et al. (2007) modified by observations of specimens (Appendix). Those of *C. utsuensis* are observations of the authors.

APPENDIX: SPECIMENS EXAMINED  
Herbarium codes from Thiers, B. [continuously updated]

**Calamagrostis utsuensis:**

**Oregon: Harney Co.:** E side of Steens Mountains, a hundred mi SE of Burns, along the S tributary to Alford Creek, T34S R34E S5, 2 Jul 1959, *Cronquist 8618* (WS, WTU); Steens Mts. Region, 11.5 mi E and 10 mi due S of Frenchglen, L. Blitzen I, 23 Jul 1954, *Hansen 868* (OSC); Steen Mts. Region, 11.5 mi E and 10 mi due S of Frenchglen, L. Blitzen I, 25 Jul 1954, *Hansen 893* (OSC); in the S fork of Willow Creek Cirque on Steens, T33.5S R34E S18 N ½, 8800 ft, 16 Aug 1990, *Mansfield 90-543* (CIC); meadow in upper Little Blitzen cirque, T33S R33E S14, SE ¼, 8960 ft, 28 Jul 1992, *Mansfield 92-118* (CIC); above willow benches of S Fork Willow Creek cirque. Steens Mountain, T33S R34E S18 SW ¼, 31 Jul 1992, *Mansfield 92-215* (CIC); on E wall of Kiger gorge in SW part of E Kiger Rim RNA, Steens Mountain, T32S R34E S19 NE ¼, 5 Aug 1992, *Mansfield 92-469a* (CIC); below middle bench of S Fork Willow Creek cirque, Steens Mountain, T33S R34E S18 SW ¼, 31 Jul 1992, *Mansfield 92-233* (CIC); seep 600 ft below NW end of E Kiger Rim RNA on E wall of Kiger gorge, 5 Aug 1992, *Mansfield 92-449* (CIC, OSC); in the middle of Little Blitzen cirque, T33S R33E Sec 14 NE ¼, 8600 ft, 20 Aug 1992, *Mansfield 92-845* (CIC); Steens Mountain, Little Blitzen River, 14.7 air mi SE of Frenchglen, UTM zone 11, 360223 east, 4726614 north, 19 Jul 2017, *Otting 3408* (OSC, UBC, UC, UTC, WS); Steens Mountain, Big Alford Cirque, 21 air mi SE of Frenchglen, 42.6410°, 118.5750°, 7 Aug 2014, *Otting 3968* (OSC, CAS); Steens Mountain, Lower Little Blitzen River Canyon, 14 air mi SE of Frenchglen, 42.6794°, 118.7072°, 8 Aug 2014, *Otting 3976* (MO, NY, OSC, US, UTC, WS); Steens Mountain, Lower Little Blitzen River Canyon, 14 air mi SE of Frenchglen, 42.6839°, 118.6879°, 8 Aug 2014, *Otting 3983* (V); Steens Mountain, Wildhorse Lake Cirque, 21 air mi SE of Frenchglen, along unnamed stream N of lake, 42.6357°, 118.5832°, 22 Sep 2014, *Otting 4039* (OSC, UTC); Steens Mountain, Wildhorse Lake Cirque, 21 air mi SE of Frenchglen, 42.6254°, 118.5894°, 22 Sep 2014, *Otting 4045* (OSC, US); Steens Mountain, Wildhorse Lake Cirque, along unnamed tributary of Wildhorse Creek, 21 air mi SE of Frenchglen, 42.6246°, 118.5870°, 22 Sep 2014, *Otting 4049* (MO, NY); in tributary to Little Blitzen Creek in gorge at lower, W end of RNA, Steens Mountain, T33S R33E S10 SW ¼, 10 Aug 1992, *Spencer & Holte 92-482* (CIC); by creek flowing into Little Blitzen River at lower, W end of Little Blitzen RNA, Steens Mountain, T33S R33E S15 NE ¼, 10 Aug 1992, *Spencer & Holte 92-505* (CIC); lower end of Little Blitzen RNA in L. Blitzen Gorge, T33S R33E Sec 15 NW ¼, 7000 ft, 10 Aug 1992, *Spencer & Holte 92-534* (CIC); along Little Blitzen River in lower Little Blitzen RNA. Steens Mountain, T33S R33E S15 NE ¼, 10 Aug 1992, *Spencer & Holte 92-507* (CIC); near seeps below Little Wildhorse Lake, Steens Mtn., T33S R33E Sec 34 SE ¼, 8300 ft, 11 Aug 1992, *Spencer & Holte 92-563* (CIC); alpine head of Little Blitzen River, T33S R33E S12 SE ¼ of NW ¼, Steens Mountain, 21 Sep 1991, *Zika 11409* (WS).

**Calamagrostis tacomensis:**

**WASHINGTON: Clallam Co.:** Mount Angeles, Olympic Mountains, 5000 ft, 18 Jul 1931, *Thompson 7528* (WTU). **Jefferson Co.:** Marmot Lake, Olympic Mountains, 23 Aug 1935, *Dickinson 103* (WTU); above Lake Constance, Olympic Mountains, 11 Aug 1931, *Thompson 7869* (WTU). **King Co.:** Cedar River Watershed. Marmot Peak. To end of 280 Road, T21N R9E S11 NW, 3 Aug 2002, *Antieau, Dedy, & Solitto 37662* (WTU); Guye Peak, Cascade Mts, 7 Aug 1933, *Thompson 9686* (WTU); 800 Road, Lost Creek drainage, Cedar River Watershed, W slope of Cascade Range, 47°24.2'N, 121°45.7'W, 26 Jul 2010, *Zika & Antieau 25216* (WTU). **Kittitas Co.:** North Fork of the Teanaway River, end of road, below Esmareldi Peaks, T22N R15E, 21 Jul 1963, *Maas 1209* (WTU); at head of Beverly Creek, Wenatchee Mountains, 2 Sep 1933, *Thompson 10044* (WTU); Mount Tacoma, 23 Aug 1901, *Flett 1959* (WTU); Mount Tacoma, 25 Aug 1901, *Flett 2076* (WTU); Mount Rainier National Park, Chinook Pass, 17 Aug 1935, *Eyerdam s.n.* (WTU); Mount Tacoma, 23 Aug 1901, *Flett 1959* (WTU); Mount Tacoma, 25 Aug 1901, *Flett 2076* (WTU); Mount Olympus, Aug 1907, *Flett 3075* (WTU); Mount Rainier National Park, Ipsut Pass circa 1 mi N of Mowich Lake, 46°57.039'N, 121°52.09'W, UTM Zone 10, 8 Aug 2006, *Harrison 06-9* (WTU); Paradise Park, Mount Rainier, 26 Jul 1931, *Thompson 7635* (WTU); above Owyhigh Lakes, Mount Rainier National Park, 27 Aug 1931, *Thompson 8097* (WTU); above Goat Pass, Mount Rainier, 26 Jul 1934, *Thompson 11079* (3 sheets, WTU); Mount Wow, Mount Rainier National Park, 15 Aug 1935, *Thompson 12503* (WTU); Mount Wow near Mount Rainier, 15 Aug 1935, *Thompson 12583* (WTU); Tipsoo Lake, Mount Rainier, 12 Sep 1932, *Warren 1547* (WTU). **Skamania Co.:** Camp 19, 4 Aug 1899, *Flett 1390* (WTU); Columbia National Forest, along Wind River, 1600 ft, 20 May 1926, *Ingram 2022* (OSC); Columbia National Forest, along Wind River, 1600 ft, 29 Jul 1926, *Ingram 2022a* (OSC); Chinook Pass, Cascade Mountains, 1 Aug 1940, *Thompson 15149* (WTU); Pumice Plain N of crater breach, Mount Saint Helens, 4 Aug 1994, *Titus s.n.* (WTU).

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