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NEW COMBINATIONS IN *BROMUS SITCHENSIS* (POACEAE)

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ABSTRACT

New combinations are proposed to bring a complex of intergrading taxa into *Bromus sitchensis* Trin., a single, variable species: **B. sitchensis** Trin. var. **carinatus** (Hook. & Arn.) R.E. Brainerd & Otting, comb. nov., **B. sitchensis** Trin. var. **maritimus** (Piper) Otting & R.E. Brainerd, comb. nov., and **B. sitchensis** Trin. var. **polyanthus** (Scribn. ex Shear) R.E. Brainerd & Otting, comb. nov. A key to the varieties is provided.

Six native *Bromus* taxa in western North America are characterized by strongly keeled lemmas and glumes with 3–7(–9) veins. These taxa are among the members of *Bromus* sect. *Ceratochloa*. They have been recognized as species or have been combined with each other in various ways (Table 1). These taxa are distinguished mainly by the hairiness of the sheaths, ligules, leaf blades, glumes, or lemmas, the size of the culms, panicles, and spikelets, whether the panicle branches are erect, spreading, or reflexed, and the length of the lemma awns (Table 2). Theoretically most of these variants are perennial and one is annual or biennial, but the shorter-lived plants do not always die on schedule. Intermediate plants are common, and plants that key to one taxon may sometimes be found in the supposed range associated with another taxon. References disagree about how to identify these taxa (Hitchcock et al. 1969; Pavlick 2003; Pavlick & Anderton 2007; Welsh et al. 2003) and the identification keys provided tend to disagree with annotations on herbarium specimens (specimens at WTU annotated by Pavlick in 1991 and 1992 compared to Pavlick 2003 and Pavlick and Anderton 2007).

Intense study of the group (e.g., Pavlick 2003) has not produced a taxonomically satisfying resolution to this geographic and morphological pattern of variation. The problem seems intrinsic to the plants and probably results from their methods of reproduction. At least some plants in all the taxa have anthers about 0.2–1 mm long, remaining enclosed in the cleistogamous florets; and at least some plants in all taxa have anthers about 3–5(–6) mm long and exserted. The differences may be facultative and induced by the environment (Hitchcock et al. 1969). The mix of selfing and outcrossing creates a pattern of variation that does not fit simple species concepts. These grasses produce at least partially fertile hybrids when crossed and can be thought of as a single, successful, highly polymorphic taxon (Stebbins 1981; Welsh et al. 2003).

We find that at arm's length one can group the plants into five or six basic types and that each type has a characteristic habitat and range (Table 2). The more one delves into matters of lemma hairiness or awn length, the more difficult it becomes to separate the groups. Therefore, we conclude that there is value in recognizing all six of the variants taxonomically, although they are not fully distinct. In preparation for the *Bromus* treatment for the second edition of the Flora of the Pacific Northwest, we recognize all of them as varieties of the first published species name, *B. sitchensis* Trin. Two have already been named as such, *B. s.* var. *aleutensis* (Trin. ex Griseb.) Hultén and *B. s.* var. *mariginatus* (Nees ex Steud.) B. Boivin, of course implying *B. s.* var. *sitchensis*. Here we formally make the combinations necessary to include the remaining three taxa into *B. sitchensis*.

Bromus sitchensis Trin. var. **carinatus** (Hook. & Arn.) R.E. Brainerd & Otting, **comb. nov.** Basionym: *Bromus carinatus* Hook. & Arn., Bot. Beechey Voy. 403. 1841 [1840].

Bromus sitchensis Trin. var. **maritimus** (Piper) Otting and R.E. Brainerd, **comb. nov.** Basionym: *Bromus marginatus* subsp. *maritimus* Piper, Proc. Biol. Soc. Washington 18: 148. 1905. *Bromus maritimus* (Piper) A. Hitchc. in Jepson, Fl. Calif. 1: 177. 1912.

Bromus sitchensis Trin. var. **polyanthus** (Scribn. ex Shear) R.E. Brainerd & Otting, **comb. nov**. Basionym: *Bromus polyanthus* Scribn. ex Shear, Bull. Div. Agrostol., U.S.D.A. 23: 56. 1900.

Key to the varieties of *Bromus sitchensis*

1. Panicles dense, the pedicels or branches erect and mostly shorter than the spikelets; culms 20–70 cm tall; habitat coastal sands ..... var. **maritimus**
1. Panicles loose to compact, at least some of the pedicels and panicle branches longer than the spikelets, erect, ascending, spreading or reflexed; culms 30–180 cm tall; habitat various, including coastal sands; widespread.

    2. Some lower panicle branches 10–20 cm, spreading to reflexed, with 1–2(–3) spikelets borne at the tip; ligules 3–8 mm; leaf sheaths glabrous to sparsely pilose; lemmas usually glabrous (sometimes short-hairy) ..... var. **sitchensis**
    2. Lower panicle branches usually < 10 cm, erect, ascending, spreading or reflexed, with 1–5 spikelets variously arranged, borne at the tip or sometimes to near the base; ligules 1–5(–6) mm; leaf sheaths and lemmas variously hairy or glabrous.

        3. Panicle branches erect to ascending, generally with 1–2(–3) spikelets borne at the tip; ligules (1–)3.5–5 mm; leaf veins relatively narrow, mostly < 1/3 as broad as the area between them; spikelets with 3–6 florets; culms often > 3 mm thick at mid-length ..... var. **aleutensis**
        3. Panicle branches erect, ascending, spreading or reflexed, with 1–5 spikelets borne variously, often not limited to the tip; ligules 1–3(–6) mm; leaf veins relatively wide, mostly at least ½ as broad as the area between them; spikelets with 4–11 florets; culms often < 3(–4) mm thick at mid-length.

            4. Uppermost leaf sheath margins glabrous; lemmas glabrous, sometimes scabrous ..... var. **polyanthus**
            4. Uppermost leaf sheath margins usually hairy; lemmas hairy, scabrous, or glabrous.

                5. Most awns 8–17 mm; panicle branches mostly spreading to reflexed .. var. **carinatus**
                5. Most awns 4–7 mm; panicle branches mostly erect to ascending ..... var. **marginatus**

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Table 1. Selected nomenclatural history of plants of the *Bromus sitchensis* complex.

	in *Bromus carinatus*	in *Bromus sitchensis*
Bromus aleutensis Trin. ex Griseb.		*B. s.* var. *aleutensis* (Trin. ex Griseb.) Hultén
B. carinatus Hook. & Arn.	*B. c.* var. *carinatus*	*B. s.* var. *carinatus* hoc. loc.
B. marginatus (Nees ex Steud.)	*B. c.* var. *marginatus* (Nees) Barkworth & Anderton	*B. s.* var. *marginatus* (Nees ex Steud.) B. Boivin
B. maritimus (Piper) A. Hitchc.	*B. c.* var. *maritimus* (Piper) C.L. Hitchc.	*B. s.* var. *maritimus* hoc. loc.
B. polyanthus Scrib. ex Shear	Synonymized with *B. carinatus* (Cronquist et al. 1977)	*B. s.* var. *polyanthus* hoc. loc.
B. sitchensis Trin.		*B. s.* var. *sitchensis*

Table 2. Comparison of the six taxa in the *Bromus sitchensis* complex. Data from Pavlick and Anderton (2007).

Trait	var. *aleutensis*	var. *carinatus*	var. *marginatus*	var. *maritimus*	var. *polyanthus*	var. *sitchensis*
Range	Mainly Pacific coast Aleutians to NW WA; inland in B.C. and WA	Widespread, more common west of Cascade / Sierra axis	mostly in and east of the Cascade / Sierra axis	Coastal	Mainly central Rocky Mts, but extending to BC, CA, NM, and west Texas	Aleutian Islands to southern CA, coastal or coast mountains
Habitat	disturbed soil, lake shores	meadows, savannah	grasslands	cliffs, bluffs	grasslands	forest edge
Duration	perennial	annual or biennial	perennial	perennial	perennial	perennial
Height	40-130 cm	50-100 cm	45-120(180) cm	20–80 cm	60-120 cm	120-180 cm
Culm thickness	3-7 mm	usually < 3mm	to 3 mm	to 3 mm	to 3 mm	3-5 mm
Sheath surface	hairy	glabrous or retrorsely hairy	usually sparsely retrorsely hairy	usually smooth or scabrous	usually smooth or scabrous	glabrous or sparsely pilose
Sheath throat	pilose	usually pilose	always pilose	not pilose	glabrous	glabrous or sparsely pilose
Leaf width	6-15 mm	3-6(9) mm	1-12 mm	6-8 mm	2-9 mm	(2)5-20 mm
Inflorescence	erect	lax	erect	erect to sl. lax	erect	lax, nodding
Inflorescence	open to somewhat contracted	open	open to somewhat contracted	dense	open to somewhat contracted	open
Panicle branches	lowest stiffly ascending	ascending or spreading (reflexed)	erect or ascending	erect	erect, ascending, or spreading	spreading to drooping
Long branch L	to 10 cm	usually < 10 cm	< 10 cm	<10 cm	< 10 cm	> 10 cm
Pedicels	some > spikelets	some > spikelets	some > spikelets	< spikelets	some > spikelets	some > spikelets
Lemma awn L	(3)5-10 mm	8-17 mm	4-7 mm	(2)4-7 mm	4-7 mm	5-10 mm
2n =	56	28, 56	42	56	56	42, 56