

**CLARIFICATION OF THE IDENTITY OF *PICEA X ALBERTIANA*
AND A NEW NOTHOSPECIES FOR HYBRIDS OF *P. ENGELMANNII* AND *P. GLAUCA***

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ABSTRACT

The name *Picea x albertiana* has been in common use for hybrids of *P. engelmannii* and *P. glauca*. However, examination of the syntype specimens of that nothospecies (now lectotypified) and its original description reveals that usage to be a misapplication. The type and description of *P. x albertiana* are both consistent with hybrid origin of *P. glauca x P. mariana*. In light of this finding, we propose a new nothospecies, ***Picea x darwyniana* Björk & Goward, nothosp. nov.**, to account for hybrids of *P. engelmannii* and *P. glauca* within the area of geographical overlap of those two species. Notes on the distribution and ecology of *P. x albertiana* in southern inland British Columbia are provided.

Hybrids with presumed parentage of *Picea engelmannii* Engelm. and *P. glauca* (Moench) Voss have long been noted in ecological literature (e.g., Steen & Coupé 1997) and floras (Hitchcock et al. 1969; Taylor 1993; Douglas et al. 1998) within the region of sympatry between these two species. Others have stated that the presumed hybrid of those species is present even beyond the range of overlap (Strong & Hills 2006; Giblin et al. 2018). Our own observations confirm that morphological intermediates of *P. engelmannii* and *P. glauca* are abundant in portions of interior British Columbia. Similar to Burns and Honkala (1990), we have observed that *P. engelmannii* occurs most commonly at upper forested elevations, *P. glauca* mostly at valley elevations, and intermediates (presumed hybrids) at valley elevations and on slopes on intervening elevations. Neither of us has observed trees having intermediate morphology between *P. engelmannii* and *P. glauca* outside of the range of those two species' geographical overlap. Given the frequency with which morphological intermediates of *P. engelmannii* and *P. glauca* occur in their regions of sympatry, hybrid origin may be presumed.

Picea engelmannii x P. glauca hybrids or intermediates have been assigned to *P. x albertiana* in most recent literature including the recent edition of Flora of the Pacific Northwest (Giblin et al. 2018). However, our examination of the original material of *P. x albertiana* and a review of its original description reveal that this name properly applies to a hybrid between *P. glauca* and *P. mariana*. Thus, the use of *P. x albertiana* to account for intermediates between *Picea glauca* and *P. engelmannii* is in error, necessitating a new nothospecies for their hybrids.

***PICEA X DARWYNIANA* Björk & Goward, nothosp. nov. TYPE: CANADA. British Columbia.**

Clearwater Valley, 26 km N of town of Clearwater, Edgewood Blue, near W margin of Sky Pond, 716 m elev, 51.86856 N 120.02393 W, 15 Dec 2022 Björk 50152 (holotype: UBC, isotypes: CAN, NY).

Differs from *Picea engelmannii* in its less angular female cone scales the apices of which are less erose than in that species. Differs from *P. glauca* in its narrower, more erose female cone scales with moderately erose apical margins.



Figure 1. *Picea x darwyniana* — cones and a foliar branch of the tree from which the type was collected. Clearwater Valley, British Columbia. Photograph by C. Björk.



Figure 2. Approximate geographical ranges of *Picea engelmannii* (green), *P. glauca* (red), and *P. mariana* (orange); type localities of *P. x darwyniana* (star) and *P. x albertiana* (circle). Base map from Grosser 2022.

Trunk straight, unbranched, up to about 35 m tall. **Canopy** dark green to blue- or grey-green, outline narrowly pyramidal to oblong, branching not more dense near the trunk apex. **Bark** brownish grey, not fissuring, outer layers flaking. **Twigs** glabrous to sparsely puberulent, not or moderately glaucous. **Buds** gold-brown 3-6 mm, apex blunt; sterigmata ascending, ca 0.6 mm. **Leaves** 5-25 mm, stomatal rows usually 3 on all faces, in cross-section rounded quadrate, apex acicular. **Female cones** bronze or stramineous brown to reddish brown when aged, falling intact, not long retained on the tree, 30-65 cm long. **Scales** 11-15 x 6-11 mm, elliptic, rhombic-elliptic or obovate, when dry ascending or

apically recurved, even or moderately undulate, apex blunt to rounded, but not broadly rounded, moderately erose. **Bracts** oblong, ca. 6 x 2 mm. **Seeds** 2-3 mm, wing 5-8 mm.

Picea x darwyniana is named in honour of Darwyn Coxson — ecologist, lichenologist, founding faculty member of the University of Northern British Columbia, and highly accomplished researcher and conservationist.

Picea x darwyniana is one of the most common and widespread conifers in British Columbia, occurring as a co-dominant in the forest canopy layer in a wide variety of upland habitats, though mostly at valley elevations and on mid-slopes. We have observed only few individuals within wetlands or at subalpine elevations. Its range includes the valleys and plateaus of the Fraser River Drainage east of the Coast Ranges, and south into the upper Columbia Drainage to near the international border. Reported occurrences of *P. x albertiana* auct. non S.Br. in other regions, e.g., adjacent portions of the northwestern U.S. (Giblin et al. 2018) and the Yukon (Cody 1996) must be re-examined. The Clearwater Valley of British Columbia was chosen as the type locality owing to its position well within the area of sympatry of *P. engelmannii* and *P. glauca* and because both putative parents are abundant here.

Identity of *Picea x albertiana*

Picea x albertiana S. Br., *Torreya* 7: 126. 1907. **LECTOTYPE (here designated): Canada. Alberta.** Bankhead, *S. Brown* 796 (NY 1237 – scan!; other original material: PH 30571 – scan!, GH397241 – scan!). *Picea alba* var. *albertiana* (S. Br.) Beissn., *Handb. Nadelholzk.* ed. 2, 273. 1909. *Picea canadensis* var. *albertiana* (S. Br.) Rehder, *Mitt. Deutsch. Dendrol. Ges.* 213. 1915. *Picea glauca* var. *albertiana* (S. Br.) Sarg., *Bot. Gaz.* 67: 208. 1919. *Picea glauca* subsp. *albertiana* (S. Br.) P.A. Schmidt, *Haussknechtia* 4: 38. 1988.

Brown's original description of *Picea albertiana* included the following comments.

A slender tree, attaining a height of over 15 m. Twigs and sterigmata smooth and shining or occasionally slightly glandular but never glaucous, yellowish brown when young becoming darker with age; sterigmata strongly reflexed and standing out frequently more than 1 mm from the twigs; leaves pale-blue or blue-green, surrounding the stem and crowded toward the upper side, at the ends of the branches, 1.5 cm to 2.5 cm long, 4 sided, with 3, 4, or sometimes 5 rows of stomata on each side, incurved, acute or acuminate with a rigid tip; cones ovate, bright-crimson when young, at maturity 2.5 cm. to 3.5 cm. long and nearly as broad when expanded, early deciduous; scales stiff and rigid, broadly rounded at the apex, entire, broader than long, cinnamon-brown with a chestnut edging and shading to darker chestnut toward the base; bract 2 mm or less long, 1 mm broad, with a sharply angular, more or less acute erose tip. Type *no.* 796, *S. Brown*, Bankhead, Alberta.

This description is discordant with hybrids of *Picea engelmannii* x *P. glauca* and does not describe an intermediate set of character states between those species. The cone scales of *Picea engelmannii* have erose margins steeply converging toward the angular apex, while hybrids with *P. engelmannii* parentage are not broadly rounded or entire, but instead are somewhat angular and moderately erose. In comparing to other spruces, Brown did not mention *P. engelmannii*, only *P. glauca* (as *P. canadensis*) and *P. mariana*, though he did not state that his new species was of hybrid origin of those or any other species. He claimed that *P. albertiana* is “The common spruce of the lower altitudes through the Canadian Rockies in Alberta and British Columbia” and added “In a landscape in the Canadian Rocky Mountains in Alberta or British Columbia, probably the most striking feature is the slender spruces, which at the lower altitudes in the wet grounds and river bottoms are frequently found growing to the exclusion of all other trees. The species has been referred by authors to both

Picea canadensis (Mill.) B.S.P. and *P. mariana* (Mill.) B.S.P., to both of which it bears a certain resemblance...” It is possible that by “Canadian Rockies,” Brown meant all the mountain ranges of the interior, where putative hybrids of *P. engelmannii* x *P. glauca* are common over a large area. Among Canadians, however, the term “Rocky Mountains” usually is reserved for the ranges along the Alberta-BC border, east of the Rocky Mountain Trench, where at the latitude of the type locality of *P. x albertiana*, hybrids of *P. glauca* x *P. mariana* might be expected to be common owing to the cold, continental climate there, which favours both parental species.

The type specimens of *Picea x albertiana* show characteristics consistent with Brown’s description. The cones are short (2.5-3.5 cm) and broad in shape, while the scales are entire and broadly rounded at the apex, the sterigmata are recurved (not reflexed as in Brown’s description, but that term is often misused and it is highly unlikely that he meant reflexed as that would direct the leaves toward the twig bases), and the twigs are glabrous. *Picea engelmannii* x *P. glauca* hybrids would be expected to exhibit characteristics intermediate between the parent species (i.e., cone scales erose and more narrowly tapering to the apex, cones longer), but the types of *P. x albertiana* instead are intermediate between *P. glauca* and *P. mariana*.

The application by some authors of the name *Picea x albertiana* to refer to the *P. engelmannii* x *P. glauca* hybrids that are common in interior ranges west of the Rocky Mountains proper may have relied in part on Brown’s description of the range and abundance of his species. Taylor (1959) was the first of many authors (Table 1) to apply the name *P. x albertiana* to hybrids of *P. engelmannii* and *P. glauca*. His comments are as follows.

Judging from the data at hand, Brown (1907) chose a most remarkable specimen on which to base his var. *albertiana*, for he described it as having sterigmata that are strongly “reflexed” (they actually point distally!) and stand out more than 1 mm from the twig (but see Table 1), with the ovuliferous cones nearly as broad as long (see Fig. 4). McKinnon (1940) wrote: “I have made extensive trips through the Canadian Rockies and have been unable to find any white spruce which answers the description of the variety ‘*albertiana*.’”

Taylor gave no indication that he studied the type material of *Picea x albertiana*, nor did he annotate any of the types we have examined. To judge from his statement above, he appears not to have questioned the applicability of the name *P. x albertiana* for intermediates between *P. engelmannii* and *P. glauca*. Thus, it seems reasonable to assume that both Taylor (1959) and McKinnon (1940) were attempting to match Brown’s description to their concept of a *P. engelmannii* x *P. glauca* hybrid, without considering the possibility that Brown’s intention was to name a taxon intermediate between *P. glauca* and *P. mariana*.

Picea engelmannii, *P. glauca*, and *P. mariana* are all known from the general vicinity of Bankhead, Alberta, though *P. engelmannii* and *P. mariana* are present there near the eastern and southern margins of their geographical ranges, respectively (Burns and Honkala 1990). While the types of *P. x albertiana* might not unequivocally be linked to a hybrid origin of *P. glauca* x *P. mariana* based on morphology alone, they are clearly not representative of intermediates between *P. engelmannii* and *P. glauca*, notwithstanding their long association with hybrids of those two species. Removal of this misapplied name necessitates a new name for hybrids of *P. engelmannii* x *P. glauca*.

<i>P. glauca</i> x <i>P. mariana</i>	<i>P. glauca</i> x <i>P. engelmannii</i>	Non-hybrid variety or subspecies of <i>P. glauca</i>
S. Brown 1907 (implied)	Taylor 1959	Raup 1947
Present publication	Daubenmire 1974	Porsild 1951
	Burns & Honkala 1990	Peattie 1950
	Taylor 1993 (implied)	Hultén 1968
	Strong & Hills 2006	Scoggan 1978
	Giblin et al. 2018	Porsild 1980
		Packer 1983
		Cody 1996

Table 1. Prior applications of the name *Picea x albertiana* or recombinations based on that name.

Hybridizing capability of *Picea glauca* and *P. mariana*

With the establishment of *Picea x darwyniana*, it seems appropriate to provide a few notes on the status of *Picea x albertiana* sensu stricto. As a rule, most earlier authors have tended to emphasize the rarity of this taxon. A morphometric study by Parker and McLachlan (1978) concluded that hybrids between *P. glauca* and *P. mariana* are absent at sites in Minnesota and Ontario where they had previously been reported. In British Columbia, Douglas et al. (1998) and Eckenwalder (2009) stated that hybrids of *P. glauca* and *P. mariana* are rare, though without providing supporting data or published studies. Burns & Honkala (1990) likewise stated that hybrids of *P. glauca* and *P. mariana* are rare along the southern edge of the species' range — such hybrids are more common northward, including in northern British Columbia.

These rarity assessments notwithstanding, many *Picea* species are well known to hybridize readily, even in cases where the parent species are not closely related (Hamilton and Aitken 2013; Sullivan et al. 2017). We are aware of many occurrences of hybrids between *P. mariana* and *P. glauca* growing in or around wetlands within or near stands of both species, as for example in the Robson Valley, approximately 70-100 km east of Prince George. There *P. mariana* is restricted to bogs and muskeg, *P. glauca* in surrounding upland forest, and bands of morphological intermediates occur in the ecotones between upland forest and bogs, fens, and muskeg. Elsewhere, as in Wells Gray Provincial Park (just south of the range of *P. mariana*), we have observed morphological intermediates occupying hummocks in fens and around bogs. These trees of intermediate morphology have shorter cones than are normally found on *P. glauca*, lack of the characteristic dense, “bulbous” canopy crown of *P. mariana*, and are generally intermediate in canopy outline, twig pubescence, and pungency of the leaf apices. *Picea mariana* in the southernmost portion of its western range grows mostly in bogs, muskeg, and other cold sites corresponding to peaty wetlands, whereas *P. glauca* usually grows in upland sites or riparian forest. The morphological intermediates we have observed are therefore also intermediate in ecological preferences.

Names of unclear applicability

1. *Picea glauca* var. *densata* L.H. Bailey, Cult. Conif. N. Amer. 108. 1933. *Picea albertiana* var. *densata* (Bailey) Strong & Hills

This name refers to a population in the Black Hills of South Dakota and Wyoming (Strong & Hills 2006).

2. *Picea albertiana* subsp. *ogilviei* Strong & Hills, *Canad. J. Bot.* 84: 1139. 2006.

This name is based on a variant of presumed hybridization of *P. engelmannii* and *P. glauca*. However, as it is now clear that *P. x albertiana* does not refer to hybrids involving *P. engelmannii*, it is not possible to know where to place this subspecific taxon in synonymy, and its delimitations are ambiguous. In any case, the terminal epithet has not been used at species rank, hence cannot be used as a name for the hybrids of *P. engelmannii* x *P. glauca*.

3. *Picea glauca* var. *porsildii* Raup, *Sargentia* 6: 102. 1947. *Picea albertiana* var. *porsildii* (Raup) Strong & Hills

This name refers to a widespread boreal spruce having smooth bark with frequent presence of resin blisters.

4. *Picea columbiana* Lemmon, *Gard. & Forest* 10: 183. 1897. No collections cited; no original material found.

Lemmon explicitly stated his intention to name the northwest form of *Picea engelmannii* as distinct from the typical form, which he identified as larger overall, wider in canopy outline, and with fissured bark. He did not compare against *P. glauca* or mention hybrids or intermediates. Lemmon collected and traveled primarily in California and is not known to have explored any region where hybrids or intermediates of *P. engelmannii* and *P. glauca* would likely occur. Hence, *P. columbiana* is unlikely to be an earlier homonym for *P. x darwyniana*, and there is no way to lectotypify *P. columbiana* to represent the *P. engelmannii* x *P. glauca* nothospecies.

5. Horticultural plants referred to as “Alberta spruce,” sometimes named *P. x albertiana* (usually emended with a cultivar name).

Application of the name *Picea x albertiana* appears to be based on the (mis)assumption that the vernacular name “Alberta spruce” links the cultivars to the scientific name. We see no reason to identify these cultivars as *P. x albertiana*. The horticultural forms have also gone by the name *P. glauca* forma *conica* Rehd., *J. Arnold Arb.* 1: 192. 1920. **TYPE:** *Rehder 5411* (holotype: A 22322 - scan!). That epithet (“conica”), however, has not been used at species rank and cannot provide a nothospecies name for *P. engelmannii* x *P. glauca* hybrids.

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