

5. PSEUDOTSUGA Carrière, *Traité Gén. Conif.*, ed. 2, 1: 256. 1867.

黄杉属 *huang shan shu*

Trees evergreen; trunk straight; branches irregularly vertical; branchlets with slightly raised, circular leaf scars; short branchlets absent; winter buds ovoid or fusiform, not resinous. Leaves spirally arranged, ± linear, flattened, longitudinally grooved adaxially, stomatal lines abaxial, in 2 white bands, separated by an elevated midvein, vascular bundle 1, resin canals 2, sublateral, marginal, base ± twisted. Pollen cones axillary, solitary, cylindrical; pollen not saccate, globose. Seed cones developing from axillary buds near ends of 2nd-year branchlets, solitary, pedunculate, pendulous, purplish red or green, maturing in 1st year. Seed scales variously shaped, convex, woody, margin rounded toward apex, persistent. Bracts well developed, exerted or included, 3-lobed, straight or reflexed, with a cusp longer than lateral lobes. Seeds borne in a shallow, membranous cup covering 1 side of seed, adnate to wing; wing obliquely ovate, short, covering only a small portion of seed scale. Cotyledons 5–8(–12). Germination epigeal. $2n = 24$ (26 in *P. menziesii*).

Six species: China, Japan, W North America; five species (three endemic, two introduced) in China.

1a. Leaf apex acute, acuminate, or obtuse; bracts appressed or reflexed.

2a. Seed cones ca. 8×3.5 –4 cm; seed scales about as long as or longer than wide 5. *P. menziesii*

2b. Seed cones 9–13(–18) \times 4–6 cm; seed scales distinctly wider than long 4. *P. macrocarpa*

1b. Leaf apex emarginate; bracts reflexed.

3a. Leaves 2.8–5.5 cm \times 1.3–1.8(–2) mm; seed scales at middle of cones suborbicular or rhombic-orbicular; cusp of bracts 6–12 mm; wing of seeds as long as seed scale 1. *P. forrestii*

3b. Leaves 0.7–2.5(–3) cm \times 2–3.2 mm; seed scales at middle of cones flabellate, reniform, semiorbicular, or compressed orbicular-rhombic; cusp of bracts 2–5 mm; wing of seeds 1/2–4/5 as long as seed scale.

4a. Leaves usually (1.3–)2–2.5(–3) cm \times ca. 2 mm; seed scales at middle of cones semiorbicular, flabellate, or reniform 2. *P. sinensis*

4b. Leaves usually 0.7–1.5(–2) cm \times 2–3.2 mm; seed scales at middle of cones broadly compressed orbicular-rhombic 3. *P. brevifolia*

1. *Pseudotsuga forrestii* Craib, *Notes Roy. Bot. Gard. Edinburgh* 11: 189. 1919.

澜沧黄杉 *lan cang huang shan*

Pseudotsuga sinensis Dode var. *forrestii* (Craib) Silba.

Trees to 40 m tall; trunk to 80 cm d.b.h.; bark dark brown-gray, rough, deeply fissured longitudinally; branchlets initially pale yellow or greenish yellow, becoming reddish brown when dry, light brown or brownish gray in 2nd or 3rd year, glabrous or pubescent. Leaves pectinately arranged, subsessile, linear, 2.8–5.5 cm \times 1.3–1.8(–2) mm, base cuneate, apex emarginate. Seed cones ovoid, 5–8 \times 4–5.5 cm. Seed scales at middle of cones suborbicular or rhombic-orbicular, (2.5–)2.7–3.5 \times 3–3.6 (–4) cm, glabrous abaxially, base cuneate-orbicular. Bracts obviously longer than seed scales, reflexed, cusp lanceolate, 6–12 mm, lateral lobes narrowly triangular, ca. 3 mm. Seeds light brown, irregularly dark spotted, triangular-ovoid, slightly depressed, glabrous adaxially; wing obliquely ovate. Seed maturity Oct.

• Mountains; 2400–3300 m. Yunnan.

A vulnerable species. The timber is used for construction, bridge building, vehicles, and furniture. The species is also grown for afforestation.

2. *Pseudotsuga sinensis* Dode, *Bull. Soc. Dendrol. France* 23–24: 58. 1912.

黄杉 *huang shan*

Trees to 50 m tall; trunk to 1 m d.b.h.; bark gray or dark gray, irregularly and thickly scaly; branchlets initially pale yellow or yellowish gray, aging gray, usually glabrous or slightly pubescent on main branchlets and densely pubescent on lateral branchlets. Leaves pectinately arranged, linear, (1.3–)2–2.5(–3) cm \times ca. 2 mm, stomatal bands abaxial, whitish or gray-green, base broadly cuneate, apex emarginate. Seed cones pale purple, glaucous, maturing purplish brown, ovoid to ellipsoid- or conical-ovoid, 3.5–8 \times 2–4.5 cm. Seed scales at middle of cones semiorbicular, flabellate, or reniform, 2.5–3 \times 3.2–4.5 (–5) cm, rusty brown pubescent abaxially, base broadly cuneate or almost truncate, concave at sides. Bracts reflexed, cusp narrowly triangular, ca. 3 mm, apex obtuse. Seeds irregularly brown spotted abaxially, triangular-ovoid, slightly depressed, densely rusty brown pubescent adaxially; wing obliquely ovate or semitrullate. Pollination Apr, seed maturity Oct–Nov.

• Hills, mountains, evergreen broad-leaved forests; 600–2800 (–3300) m. S Anhui, N Fujian, N Guizhou, W Hubei, NW Hunan, NE Jiangxi, S Shaanxi, SE Sichuan, Taiwan, C and NE Yunnan, Zhejiang.

A vulnerable species. The timber is used for construction, bridge building, furniture, and wood fiber.

- 1a. Leaves with whitish stomatal bands
abaxially 2a. var. *sinensis*
1b. Leaves with gray-green stomatal bands
abaxially 2b. var. *wilsoniana*

2a. *Pseudotsuga sinensis* var. *sinensis*

黄杉(原变种) huang shan (yuan bian zhong)

Pseudotsuga gausсенii Flous; *P. shaanxiensis* S. Z. Qu & K. Y. Wang; *P. sinensis* var. *gaussenii* (Flous) Silba; *P. xichangensis* C. T. Kuan & L. J. Zhou.

Leaves with whitish stomatal bands abaxially.

- Hills, mountains; 600–2800(–3300) m. S Anhui, N Fujian, N Guizhou, W Hubei, NW Hunan, NE Jiangxi, S Shaanxi, SE Sichuan, C and NE Yunnan, Zhejiang.

2b. *Pseudotsuga sinensis* var. *wilsoniana* (Hayata) L. K. Fu & Nan Li, *Novon* 7: 263. 1997.

台湾黄杉 tai wan huang shan

Pseudotsuga wilsoniana Hayata, *Icon. Pl. Formos.* 5: 204. 1915; *P. salvadori* Flous.

Leaves with gray-green stomatal bands abaxially.

- Mountains, mainly in evergreen broad-leaved forests; 800–1500 m. Taiwan.

This variety is isolated geographically from var. *sinensis* but is not markedly distinct morphologically.

3. *Pseudotsuga brevifolia* W. C. Cheng & L. K. Fu in W. C. Cheng & al., *Acta Phytotax. Sin.* 13(4): 83. 1975.

短叶黄杉 duan ye huang shan

Pseudotsuga sinensis Dode var. *brevifolia* (W. C. Cheng & L. K. Fu) Farjon & Silba.

Bark brown, scaly, longitudinally fissured. Branchlets reddish brown, initially densely pubescent, turning light brown or gray and glabrous or subglabrous in 2nd or 3rd year. Leaves spirally or irregularly pectinately arranged, linear, 0.7–1.5(–2) cm × 2–3.2 mm, apex emarginate. Seed cones ovoid-ellipsoid or ovoid, 3.7–6.5 × ca. 3.4 cm. Seed scales at middle of cones compressed orbicular-rhombic, 2.2–2.5 × ca. 3.3 cm, hard and woody, densely pubescent abaxially, base cuneate, not concave at sides. Bracts reflexed, cusp narrowly triangular, ca. 3 mm, lateral lobes triangular, margin erose. Seeds irregularly brown spotted, obliquely triangular-ovoid, ca. 2 cm including wing; wing reddish brown, lustrous, ca. 1 cm, pubescent on middle part adaxially.

- Scattered on S-facing slopes and mountain tops, on calcareous and rocky soils; ca. 1300 m. SW Guangxi, Guizhou.

A vulnerable species.

4. *Pseudotsuga macrocarpa* (Vasey) Mayr, *Wald. Nordamer.* 278. 1889.

大果黄杉 da guo huang shan

Abies macrocarpa Vasey, *Gard. Monthly & Hort.* 18: 21. 1876.

Trees to 25 m tall; trunk to 1.3 m d.b.h.; bark reddish brown, aging dark blackish gray, scaly, longitudinally fissured; branchlets pendulous, reddish brown or pale brown, aging gray-brown, slender, flexible, slightly pubescent; winter buds reddish brown, ovoid-conical or fusiform-conical, acute. Leaves 2.5–4 cm × ca. 2 mm, stomatal bands 2, abaxial, grayish white, base strongly twisted, apex acute. Seed cones greenish yellow when immature, ripening to dull brown, ovoid-cylindric, 9–13(–18) × 4–6 cm. Seed scales at middle of cones broadly cuneate-flabellate, thick, transversely convex, 2–2.5 × 3–3.5 cm, often resinous, puberulent when young, soon glabrous, faintly striate abaxially. Bracts exerted, not reflexed, lingulate, cusp longer than lateral lobes. Seeds brown, ovoid-conical, 1–1.2 cm × ca. 6 mm; wing pale brown, obovate, 1–1.4 cm.

Cultivated. Jiangxi (Lu Shan) [native to W United States].

5. *Pseudotsuga menziesii* (Mirbel) Franco, *Bol. Soc. Brot.*, ser. 2, 24: 74. 1950.

花旗松 hua qi song

Abies menziesii Mirbel, *Mém. Mus. Hist. Nat.* 13: 70. 1825; *Abies taxifolia* Lambert (1803), not Salisbury (1796); *Pinus douglasii* Sabine ex D. Don; *Pseudotsuga douglasii* (Sabine ex D. Don) Carrière; *P. taxifolia* (Lambert) Britton.

Trees to 100 m tall; trunk to 4 m d.b.h. in native range; bark dark gray-brown or blackish green, smooth, with resin blisters, aging rough and scaly with deep longitudinal fissures; branchlets initially light yellow, becoming red-brown when dry, slightly pubescent. Leaves dark green adaxially, linear, 1.5–3 cm × 1–2 mm, stomatal bands 2, abaxial, white, apex obtuse or acuminate. Seed cones brown, glossy, ellipsoid-ovoid, ca. 8 × 3.5–4 cm. Seed scales ± rhombic, 2–2.5 × 2–2.5 cm, as long as or longer than wide. Bracts exerted, longer than seed scales, cusp straight or reflexed, 6–10 mm, tapering at apex, lateral lobes wide and short, denticulate at margin.

Cultivated. Beijing Shi, Jiangxi (Lu Shan) [native to W Canada, Mexico, W United States].

