

## Key to Washington Willows (*Salix*)

© 2002-3002 George Wooten, Twisp, WA

(comments and advice from George Argus, Al Hanners and Bud Kovalchik are gratefully acknowledged)

### Introduction

This dichotomous key is designed to aid in the field and laboratory identification of approximately 31 species of native Washington state willows (genus *Salix*), using floral, vegetative, habit and habitat characteristics. The need for this key arises from numerous revisions in the nomenclature, taxonomy and known range of these taxa since publication of the regional flora by Cronquist in Hitchcock et al. (1969), as modified in Hitchcock and Cronquist (1973).

Synonyms are provided here for many recent revisions. Taxonomy was developed through reviews of Argus (2007), Argus (1999), Argus in Douglas et al (1991), Brayshaw (1976), Brunsfeld (1985), Cronquist in Hitchcock et al. (1969), Hitchcock and Cronquist (1973) and USDA (2001). The authority for most taxa is USDA (2001), except for the following: *S. glauca* var. *villosa*, follows Argus in Douglas et al. (1991) by dropping the subspecies designation; *S. piperi* is separated from *S. hookeriana sensu* Hitchcock and Cronquist (1973), however it is not treated here as an accepted taxon. *S. lutea* was separated from *S. prolixa* based on Argus in Hickman (1993) and Hultén (1968); *S. exigua*, *S. columbiana* and *S. interior* follow Argus (2007), except in not counting the latter as a species of WA.

Taxonomy and nomenclature continue to evolve. Recently, plants matching *S. piperi* (a willow of the lower Columbia and western Washington) in description have been found in subalpine interior passes of the northeast North Cascades (see comments in the Jepson Manual suggesting that further research is needed on the group containing *S. hookeriana*).

The taxa are enumerated for recognized Washington taxa, however descriptive notes and in some cases key leads are given for some taxa occurring just outside of Washington under the lead where they would have occurred. Intraspecific taxa and hybrids are noted where possible. The key also includes a number of widely introduced cultivars and hybrids, which may be difficult or impossible to reliably identify. For this reason, these taxa were keyed but not enumerated. The following European hybrids reported for Washington in USDA (2001) are found under alternate names here as follows: *Salix fragilis* L. hybrids are under *S. alba* or *S. babylonica* cultivars; *Salix x dieckiana* Suksdorf is found under *S. geyeriana* and *S. pedicellaris*.

The following taxa that have been tentatively listed for Washington (USDA 2001) are unconfirmed, and are not treated here as extant taxa:

*Salix eastwoodiae* Cockerell ex Heller – (see note under *S. commutata*) inexplicably omitted from mention by Cronquist in Hitchcock et al. (1969) and Hitchcock and Cronquist (1973), its range is now well documented in Idaho, Montana and Wyoming, but not, apparently, Washington.

*Salix interior* Rowlee – mapped in the southeast corner of the state by Argus (2007).

*Salix lutea*, s.l. – apparently occurring in adjacent states and reported for Ginkgo Petrified Forest State Park, near Vantage.

*Salix monochroma* Ball – apparently out of range to the south and east of Washington according to Cronquist in Hitchcock et al. (1969) and Hitchcock and Cronquist (1973); confusion has occurred with the *S. lutea* complex.

*Salix petrophila* (as a segregate from *S. arctica*) is included in this key even though it is uncertain for Washington and Oregon. Even though it does appear in USDA (2001), confirmed records

seem to be lacking from Washington. It is not easily separated from *S. arctica*, and the range descriptions for these two species given in Hitchcock et al. (1969) are confusing. It was included tentatively on these grounds, as well as for consideration of the known variability between widely scattered and often small populations of *S. arctica*.

*Salix vestita* Pursh – believed extirpated from its sole previously known location Washington in Chelan County, according to Washington Natural Heritage Program.

To be successful at willow identification, it may be necessary to sift through a large number of characteristics before a positive identification can be made. These characters cannot always be observed easily—leaves may be unopened, catkins (aments) may have already dropped (look in the stem branches), plants of the desired sex may be unavailable, and the blooming period may occur during spring snowmelt, making access difficult. Avoid sampling young plants that may have juvenile features; try to obtain both male and female plants using vegetative field characters.

Distinguishing characteristics for the willow family include shape, size and habitat of average plants; whether they are multiple-stemmed or not; whether plants are rhizomatous (colonial) or clumped (caespitose); characteristics of branchlets (twigs) of the season (branchlets) and previous season (branches), their color, pubescence, and whether glaucous (pruinose) or not; characteristics of both expanding as well as mature leaves, their pubescence or not, whether glaucous or not, their shape, length/width ratio (l:w); presence of teeth or not, and presence of glandular processes on the leaf margin or petioles; characteristics of the stipules, whether present or not, their size and shape, whether rudimentary, persistent or soon-deciduous (caducous); characteristics of male (staminate) and female (pistillate) aments (catkins), their length, and pubescence; whether or not the aments appear before (precocious), during (coetaneous), or after (serotinous) leaf expansion, and whether or not they are sessile, on leafy shoots, or terminal on branchlets of the previous season; the number of stamens per floret and filament pubescence; pubescence of the ovaries, their color, whether dark or not, and the length of the flower stipes; the pubescence, size and shape of the pistillate floral bracts (scales) and occurrence of any subtending tufts of hairs, and whether they are persistent or not; and length, shape and density of any hairs subtending the floral bracts.

## Dichotomous Key to Washington Willows (*Salix*)

In this synopsis, the accepted names of native and naturalized species in Washington are numbered and printed in bold text, while names of willows occurring outside of the state are merely italicized. Hybrids of European willows that could occur in the state are keyed, but not enumerated.

Taxa are grouped into morphologically similar categories. Habitat descriptions refer to those found in Washington.

**Abbreviations:** m = meter; dm = decimeter; cm = centimeter; mm = millimeter; vs = versus; var. = variety; ssp. = subspecies; Mt = Mountain; ~ = approximately; × = hybrid taxon; X = multiplication; N, S, E, W, etc. = cardinal directions; n, e, s, w, etc. = azimuth; AB = Alberta; BC = British Columbia; NB = New Brunswick; NC = north-central; NA = North America; NF = Newfoundland; NT = Northwest Territories; MB = Manitoba; MX = Mexico; ON = Ontario; PQ = Quebec; YT = Yukon Territory; abbreviations for US states use postal abbreviations; numbers in parentheses represent extreme measurements; notes by George Argus are noted *GA*; notes by George Wooten are noted *GW*; notes from the Flora of North America are noted *FNA*.

**1a.** Single-stemmed trees > 10 m tall; stamens often 2 or more per floret; floral bracts pale, deciduous; capsules glabrous; leaves serrate to serrulate, lanceolate to acuminate; aments coetaneous on leafy flowering branchlets (see alternate lead for arborescent forms of *S. exigua*, *S. scouleriana*, and *S. bebbiana*).

**2a.** Stipules lacking or minute, possibly becoming foliaceous on later shoots; petioles eglandular; pistillate florets with 1 nectary; branchlets and young leaves glabrous and glaucous beneath; stamens 3-9 per floret; stipes 1-2 mm; native along stream banks in arid lowland habitats, SE BC south to TX, e to the Atlantic; peach-leaf willow.

**1. *S. amygdaloides* Anders.**

**2b.** Stipules present; petioles generally with 2 or more glandular processes; branchlets and young leaves pubescent; leaves lanceolate, acuminate to caudate.

**3a.** Native; stamens 3-9 per floret, with styles 0.4-0.8 mm, stipes 0.8-1.4 mm, and 2 or more glands; capsules 4-8 mm; this treatment follows that of Argus (2007) that maintains both of our varieties under *S. lasiandra* while relegating *S. lucida* to eastern NA (*S. lasiandra* Benth.), although USDA Plants (2001) includes these as varieties under *S. lucida* Muhl.; 2 vars.

***S. lasiandra* Benth.**

**a1.** Mature leaves glaucous beneath, stomata usually restricted to the lower surface; AK and YT, s to NM, primarily west of the Cascade crest in WA; (*S. lucida* Muhl. ssp. *lasiandra* (Benth.) E. Murray); Pacific willow.

**2. *S. lasiandra* Benth. var. *lasiandra***

**a2.** Leaves non-glaucous beneath, stomata abundant on both surfaces; BC, e to Sask, s to NM, east of the crest in WA; (*S. lucida* Benth. ssp. *caudata* (Nutt.) E. Murray); whiplash willow

**3. *S. lasiandra* Benth. var. *caudata* (Nutt.) Sudw.**

**3b.** Non-native; stamens 2 per floret, rarely 1 (except 4 in *S. ×ehrhartiana*); branchlets often brittle or pendant; pistillate aments sessile or subsessile with 1 gland (keyed here would be *S. matsudana* Koidz. var. *tortuosa* Rehd., commonly planted, but not naturalizing, with wavy, ascendant branches, subsessile aments 1-2 cm long, pistillate flowers with 2 glands, -sessile capsules, and leaves glabrous at maturity with eglandular petioles 2-8 mm long; mostly cultivars not readily keyable to the parents, most originating as hybrids of *S. fragilis* L., *S. alba* L., and *S. babylonica* L., which is supposedly not cold-hardy in WA;

**a.1.** Stamens usually 4 per floret; leaves oblong, slender-pointed, with ferruginous or rust-colored hairs; (*S. alba* L. × *pentandra* L.).

***Salix ×ehrhartiana* Sm.**

- a.2.** Stamens 2 per floret; leaves acuminate.
- b.1.** First leaves and young branchlets ~silky beneath; branches pendant (weeping) or not; styles 0.2-0.4 mm; stipes 0.2 - 0.8 mm; bracts deciduous, 3.5-5 mm.
- c.1.** Branches pendant (weeping).
- d1.** Branchlets dull green or brown; stipules with long, slender tips; (*S. blanda* Anderss.; *S. babylonica* L. × *S. fragilis* L.) Wisconsin weeping willow.  
*S. ×pendulina* Wender.
- d1.** Branchlets bright yellow.
- e1.** Catkins 4-6 cm; leaves glaucous and remaining pubescent when mature. white willow.  
*S. alba* L. var. *tristis* Gaudin
- e2.** Some catkins longer; leaves glaucous, and almost glabrous when mature.  
*S. alba* L. var. *vitellina* L. (Stokes)
- c.2.** Branches not pendant.
- e1.** Flowers with 2 glands; branchlets brown or olive; questionably distinct from the alternate leads; (*Salix alba* L. ssp. *caerulea* (Sm.) Rech. f.) white willow.  
*S. alba* L. var. *calva* G.F.W. Mey.
- e2.** Flowers with one gland; branchlets variously colored, brown to yellow (*S. alba* L. × *fragilis* L.).  
*S. ×rubens* Schrank.
- b.2.** First leaves and young branchlets only slightly silky, wavy-pubescent or glabrous; branches spreading as well as pendulous; capsules short (1-2.5 mm); (*S. alba* L. × *S. babylonica* L.) (unconfirmed in WA-GA); weeping willow.  
*S. ×sepulcralis* Simonk.
- 1b.** Shrubs, generally < 10 m tall; stamens 1 or 2 per floret; other characters not combined as above, e.g., leaves entire or not lanceolate, bracts persistent or dark, capsules pubescent, or aments serotinous, sessile or not borne on leafy flowering branchlets.
- 5a.** Dwarf sub-shrubs generally < 1 dm, except up to 3 dm in *S. arctica*.
- 6a.** Bracts light-colored, glabrous; ovaries and stipes silky; distinguished from more northerly *S. reticulata* in having shorter leaves 5-25 mm long that are glabrous, not pubescent, beneath, and plane, not reticulate, above; pistillate aments have 2-10 (25) flowers, with bracts rounded, not retuse; alpine and subalpine meadows and openings from S BC to CA and NM; (*S. reticulata* L. ssp. *nivalis* (Hook.) Löve, Löve, & Kapoor; *S. nivalis* Hook. var. *saximontana* (Rydb.) C.K. Schneid.; *S. saximontana* Rydb.) dwarf snow willow.  
**4. *S. nivalis* Hook.**
- 6b.** Bracts dark-colored, pubescent (except in a rare form of *S. petrophila* from the Beartooth Mountains MT).
- 7a.** Plants caespitose or forming low mats; leaves narrowly elliptic, 10-15 (25) mm X 2.5-5; capsules and scales villous (except in a rare form from the Marble Mts in BC called var. *thompsonii* Brayshaw); subalpine and alpine meadows and talus from S BC to UT; Cascade willow.  
**5. *S. cascadiensis* Cockerell**
- 7b.** Plants not caespitose; leaves larger and broader, > 2 cm long and > 7 mm wide, glabrous to having long-straight hairs on the underside; branchlets glabrous to villous.
- 8a.** Plants < 1 dm tall, with smaller, acute-tipped leaves, 1.5-5 cm X 0.7-2 cm; possibly hybridizes with *S. glauca*; a glabrous-fruited form is known from the Beartooth Mountains MT; upper montane to alpine mesic slopes; of uncertain occurrence Washington, listed in Hitchcock et al. (1969) for the Rocky Mountains from BC, s to NM, but not listed in Douglas et al. (1991); the USDA (2001) inclusion of this taxon in Washington may have resulted from misidentifications of apparent differences in scattered and local populations of *S. arctica* that could not be reconciled by the compilers (*S. brownii* Bebb var. *petrophila* L. Kelso, *S. petrophila* Rydb.; *S. arctica* Pallas var. *petrophila* (Rydb.) L. Kelso; *S. arctica* Pallas var. *petraea* (Anderss.) Bebb) arctic willow.

*S. petrophila* Rydb.

**8b.** Plants > 1 dm tall, with larger leaves, up to 10 X 4.5 cm; upper montane to alpine mesic slopes; Cascades and Olympic Mountains of WA; apparent differences in scattered and local populations of *S. arctica* are difficult to reconcile; circumpolar, s to NF, MT, NM and CA; (*S. arctica* R. Br. ex Richards. (misapplied)) arctic willow.

**6. *S. arctica*** Pallas

**5b.** Shrubs > 1 dm (including arborescent forms of *S. exigua*, *S. scouleriana*, *S. bebbiana*, *S. sessilifolia*, and *S. hookeriana*).

**9a.** Colonial by root shoots; floral bracts pale, deciduous; plants of low- to mid-elevation habitats, often on larger Columbia River tributaries, except *S. melanopsis*, which extends upward along streams throughout the region from the lowlands into upper montane zones.

**10a.** Leaves linear, l:w 10-23X, silvery-pubescent; upper stem branches ascending, bark on younger branchlets sometimes with a pink to orange tinge; styles < 0.15 mm; reported to hybridize with *S. columbiana* and *S. melanopsis*; the treatment by Cronquist in Hitchcock et al. (1969) has been revised to exclude *S. melanopsis* and *S. interior* Rowlee (the latter is not considered in this key to occur in WA, however Argus (2007) maps it in the SE corner of the state; compared to *S. exigua* it is distinguished by having pedicellate, glabrous capsules 5-8 mm long and mature leaves that are less hairy to glabrescent and generally serrulate); floodplains in the steppe and montane zones from AK, e to NB, s to LA, CA, TX and MX; coyote willow.

**7. *S. exigua*** Nutt.

**10b.** Leaves elliptic, l:w 2.5-8.5X; stems gray or gray-green to purplish; styles 0.2-0.5 mm.

**11a.** Ovaries pubescent; leaf pubescence loosely appressed-villous to spreading; stigmas long, bifid and slender, margins sparsely toothed to entire; coastal WA or shorelines of the Columbia River.

**12a.** Leaves and branchlets copiously covered with loosely appressed-villous to spreading, somewhat bent, forward-pointing pubescence, becoming less pubescent to glabrous with age; l:w sometimes > 10X; shrub or small tree 2-6 m tall; riverbanks, sandy shorelines of the lower Columbia River; approaches and possibly hybridizes with *S. sessilifolia* or *S. melanopsis*; (*S. fluviatilis* Nutt.; *Salix exigua* Nutt. var. *columbiana* Dorn) Columbia River willow.

**8. *Salix columbiana*** (Dorn) Argus

**12b.** Leaves and branchlets densely soft and velvety-villous; l:w 3-10X; shrub or small tree 2-8 m, with trunks to 1 dm; riverbanks, shorelines and sandbars in the Columbia gorge south of the Cascades and lower river reaches in Northern Puget Sound; approaches and possibly hybridizes with *S. fluviatilis* and *S. melanopsis*; soft-leaved or sandbar willow.

**9. *S. sessilifolia*** Nutt.

**11b.** Ovaries glabrous; stigmas short and blunt; leaves glabrous or with wavy, tangled, or spreading pubescence; leaf margins typically glandular; bracts glabrous, broad and blunt; stems sometimes purplish; plants with crowns sometimes as wide as high, typically less than 3 m; range extending upward along gravelly streams from lowlands into the upper montane zone; three scarcely recognizable forms are described in Brunsfeld; our "var." *melanopsis* is distinguished from "var." *bolanderiana* (Rowlee) Schneid. in having non- or weakly-glaucous lower leaf surfaces, and less persistently pubescent leaves; it is distinguished from "var." *tenerima* (Hend.) Schneid. in having greater branchlet pubescence, broader leaves (0.4-1.5 mm, vs. < 0.4 mm), with glands rather than teeth, and the mature leaves remaining finely wavy- to tangled-tomentose, particularly above, rather than becoming glabrous; approaches and possibly hybridizes with *S. sessilifolia*, and *S. exigua*; S BC, e to AB, s to CA and NV; (*S. exigua* Nutt. ssp. *melanopsis* (Nutt.) Cronq.) dusky, or sandbar willow.

**10. *S. melanopsis*** Nutt.

**9b.** Non-colonial plants of a range of elevations (or if apparently colonial, e.g., *S. planifolia*, then plants occurring in subalpine wetlands); floral bracts generally more persistent, variously colored.

**13a.** Capsules pubescent; floral bracts variously colored.

**14a.** Mature branchlets of the season and previous season glabrous or sparsely pubescent at maturity, not glaucous (or rarely so in *S. planifolia*); leaves glabrous or nearly so at maturity; plants to 5 m.

**15a.** Mature leaves elliptic, thin, entire or minutely serrulate, parallel-veined, shining and glabrous above and glaucous beneath (young leaves sparsely hairy, soon becoming glabrous); generally 1.5-3.5 cm long; branchlet color reddish, brown or purplish; aments precocious, sessile; stamens glabrous; matted plants of subalpine wetlands generally < 2 (4) m tall. Plants in Washington can be distinguished from the more northern ssp. *pulchra* (Cham.) Argus (*Salix pulchra* Cham.) in having elliptic, not linear, stipules less than 2.8 mm long and persisting less than a year; Cronquist (1973) segregates "var." *pennata* as plants with larger leaves, 4.5-6.5 mm X 2-3 cm vs 2.5-3.5 (5) X 0.8-1.5 (2.3) cm, and filaments occasionally basally pubescent; stands of plants > 2 m tall, are "var." *planifolia* in Hitchcock and Cronquist (1969), however stands with this description have been observed in the Okanogan Range that appear to be intergradient with shorter var. *monica* depending on slight environmental differences; AK, e to NF, s to NH, NM and CA; (*S. phyllicifolia* L. ssp. *planifolia* (Pursh) Hiitonen; *S. phyllicifolia* L. var. *monica* (Bebb) Jepson) tea-leaved, parallel-veined, or plane-leaved willow.

**11. *S. planifolia* Pursh**

**15b.** Leaves leathery, crenate to serrate (rarely entire), elliptic-lanceolate to oblong, up to 8 X 2.5 cm; glabrous at maturity, not glaucous beneath, with a stout, yellow midrib; juvenile leaves silky with white and rust-colored hairs; aments coetaneous on leafy branchlets; branchlets red-brown or yellow-brown; staminate aments 2-3 cm long by up to 1.5 cm wide, pistillate aments to 5 cm long by 2 cm wide; stamens 2 per floret, basally pubescent; bracts 3-5 mm long, yellow to pale brown, sparsely pubescent beneath, glabrous and merely ciliate near the apex; style to 1 mm; filaments pubescent; capsules to 12 mm, hoary with curly white hairs on stipes 2 mm long; erect, non-colonial plants 1-5 m tall; occurring in sloughs, marshes and fens of moderate elevation, limited in Washington the NE corner near the Canadian border, where occurring in calcareous waters on Kettle and Sullivan Lake Districts of the National Forest; NE WA, n to S YT and e to PQ; McCalla's willow.

**12. *S. maccalliana* Rowlee**

**14b.** Mature branchlets of the season and previous season generally pubescent, sometimes glaucous; mature leaves generally pubescent, or if becoming glabrate, then mature plants > 2 m tall.

**16a.** Mature branchlets of the season and previous season usually glaucous at maturity; mature plants often > 2 m tall.

**17a.** Leaf margins revolute, the sides parallel, the lower surface obscured (and thus not evidently glaucous) by dense, silver-velvety pubescence; pistillate aments precocious, densely-flowered, sessile, without subtending leaves, or occasionally borne on short flowering shoots less than 1 cm long, with or without only a few small, narrow, inconspicuous leaves; bracts dark brown or black; multi-stemmed, rounded plants, 2-5 m tall; occurring in subalpine peatlands and wet habitats at high elevation in northern Washington, east of the Cascade crest; YT, e to MB, s to NM and CA; Drummond's willow.

**13. *S. drummondiana* Baratt ex Hook.**

**17b.** Leaf margins plane, glaucous and less pubescent beneath; early leaves small, obovate, becoming elliptic-lanceolate, 3-5 cm long, occasionally deciduous by late season; pistillate aments generally coetaneous, loosely flowered, on leafy flowering shoots 0.5-20 cm long.

**18a.** Mature leaves persistently white-pubescent above and beneath with thin to moderate pubescence, branchlets of the season moderately to densely white-pubescent; bracts narrow (l:w > 2X), pale, short-pubescent; multi-stemmed plants, 1-5 m tall, with straight stems arising from a tight basal cluster; "var." *meleina* Henry would be

differentiable in having branchlets slightly or not glaucous and leaves more quickly glabrate than in our var. *geyeriana*; suspected hybrids with *S. pedicellaris* near Bingen, WA are called *Salix* × *dieckiana* Suksdorf; of low- to mid-elevations in fine-textured soils from S BC, s to CA, e to MT and CO; (*S. geyeriana* var. *meleina* Henry) Geyer's willow.

**14. *S. geyeriana*** Anderss.

**18b.** Mature leaves becoming green and glabrous above, remaining thinly pubescent beneath with reddish-tinged hairs; branchlets of the season glabrous or sparsely reddish-pubescent; bracts broader (l:w < 2X), dark, long-pubescent; plants 3-5 m tall, with crooked stems arising from a loose basal cluster; occurring at mid- to upper-elevations, in coarser soils than *S. geyeriana*, reported by several authors for WA, but primarily occurring e of WA in ID, s to NV and CA, however Argus (2007) shows a single WA location in the Puget Trough; Lemmon's willow.

**15. *S. lemmonii*** Bebb

**16b.** Branchlets not glaucous.

**19a.** Branchlets tomentose; leaves generally glaucous (mealy-white) and densely pubescent beneath, hairs sometimes rufous; mature plants generally < 1.5 m tall, except occasionally to 4 m in *S. glauca* (short-statured specimens of *S. bebbiana* and *S. scouleriana* can be difficult to separate); (*S. vestita* Pursh, beyond our range to the north and east and believed extirpated from Washington, would key here, distinguished in having elliptic-obovate to oval, mostly leathery, entire leaves with more silky, straight-haired pubescence beneath, and serotinous aments).

**20a.** Leaf margins revolute; leaves narrow, < 1 cm wide, l:w 4-8, with parallel sides, densely felt-like beneath, and often obscuring the glaucous surface; bracts pale to brown, woolly-villous; freely branched low shrubs to 1.5 m tall; occurring in river floodplains, bogs, fens, swamps and meadows in the steppe and montane zones; AK, e to NF, s to NJ, SD, CO and ID; rare in northeastern Washington, where it is found in Calcium-rich shrub-fens; hoary willow.

**16. *S. candida*** Flueggé ex Willd.

**20b.** Leaf margins flat; leaves less densely pubescent.

**21a.** Mature aments short, 1.5-2 cm, on leafy branchlets 3-5 mm long; stipes < 0.5 mm; petioles short, (1) 2-3 (5) mm, yellowish; leaves broadly elliptic to obovate; bracts yellow to greenish to light brown, sometimes red-tipped; a dwarf form, "var." *sansonii* Ball, was found by Argus to be within the normal range of the species; hybrids are reported with *S. glauca* (RM); erect shrubs to 1 (2) m tall; of the foothills to high montane habitats, generally where salty or alkaline; N BC, e to PQ, s to NM, UT and OR; short-fruit willow.

**17. *S. brachycarpa*** var. *brachycarpa* Nutt.

**21b.** Mature aments 2-5 cm, on leafy branchlets 5-20 mm long; stipes 0.4-1.6 (2.8) mm; petioles longer, 3-10 (14) mm, often reddish; leaves oblanceolate; bracts light- to dark-brown or black; our var. *villosa* is distinguished from var. *acutifolia* of N BC in having the lower leaf surfaces glabrescent or sparsely pubescent rather than with long, straight, silky hairs, and with stipules < 4 (8) mm, caducous rather than persistent, and with pistillate aments 16-55 (65) mm rather than 35-80 mm; apparently hybridizes with *S. arctica*, and reportedly, *S. brachycarpa*; erect, branching shrubs to 2 (4) m tall; of subalpine habitats, circumboreal, S in America to PQ, NC WA near the international border, and NM in the Rocky Mts; (*S. glauca* L. ssp. *glauca* var. *villosa* (D. Don ex Hook.) Anderss.) gray-leaved or shaggy-leaved willow.

**18. *S. glauca*** L. var. *villosa* (Hook.) Anderss.

**19b.** Leaves not glaucous beneath, or less densely pubescent; lower leaf surfaces visibly green beneath, even when pubescent; mature plants usually > 5 m tall (*S. petiolaris* Sm., unconfirmed for Washington USDA (2001), would fall under this or the alternate lead;

Douglas et al. (1991) report it for N BC; it can be distinguished from *S. geyeriana* by having one-year-old branchlets that are *sometimes* pruinose vs. *barely* pruinose, and in having branches dark brown, rather than drying yellow with dark blotches, and in having at some leaves serrate, with leaf l:w > 5X; and in having capsules 5-9 mm vs. 4-5 mm long, with stipes 1.5-4 mm vs. 1.2-2.8 mm; *S. petiolaris* is usually less than 3 m tall and has leaves that are glaucous beneath.)

**22a.** Plants generally < 3 m tall; leaves villous throughout with silky hairs; branchlets generally with dense pubescence.

**23a.** Leaves oblanceolate or obovate with entire, revolute (sometimes minutely glandular) margins, silky beneath with short, appressed hairs diverging from either side of the main vein, and causing the leaf to flash on either side when rolled back and forth between the fingers; shoots of the season velvety; bracts light- to dark-brown or blackish, darker distally; stamen 1 per floret (unique in our native species); erect plants 2-4 (6) m tall; of low to moderately high elevations of more humid west slopes in WA, from S AK, s to CA, and e to ID and OR; Sitka willow.

**19. *S. sitchensis* Sanson ex Bong.**

**23b.** Leaves villous with ascendant hairs above and beneath, margins glandular; branchlets sparsely to densely pubescent; hybrids are reported with *S. barclayi*, *S. boothii*, *S. wolfii*, *S. eastwoodiae* and *S. barrattiana*; most newer treatments including USDA (2001) do not recognize "var." *puberula* Bebb, which has pubescent capsules instead of glabrous ones as in the commoner "var." *commutata*; (a number of other species just beyond our range would also key here: out of range to the east is *S. wolfii* Bebb with entire, not toothed, leaves, more appressed pubescence, smaller aments on short flowering branchlets, and capsules typically pubescent, or glabrous in one variety; *S. eastwoodiae* Cockerell to the south and east of our range, and reportedly intergradient, has shorter pistillate aments 1.5-4 cm, reportedly more loosely appressed pubescence, fewer or no leaf glands, and strictly pubescent capsules; and *S. barrattiana* Nutt., out of our range to the north and east, is distinguished in having entire leaves and sessile pistillate aments); blocky shrubs to 3 m tall; occurring in wet subalpine forests and meadows, AK and YT, s to N CA and N UT; variable or undergreen willow.

**20. the pubescent-capsuled form of *S. commutata* Bebb**

**22b.** Plants generally > 3 m tall, occasionally trees; leaves sparsely pubescent on both sides, branchlets with looser pubescence, becoming glabrous by the second year.

**24a.** Mature leaves ovate, entire, generally broadest at or below the middle, ~glaucous beneath; capsules attenuate-beaked; bracts tawny; shrubs or rounded short trees to 10 m; in fine soils of lower elevation wetlands, from Siberia to Canada, s to DE, NM and CA, but not west of the Cascades; Bebb's, gray, or beaked willow.

**21. *S. bebbiana* Sarg.**

**24b.** Mature leaves generally spoon-shaped, broadest about the distal third; leaf pubescence variable, from sparse to dense, occasionally reddish-pubescent beneath, sometimes appearing glaucous due to a mealy texture; capsules not attenuate-beaked; bracts dark-brown to black; plants of diverse habitats from low- to high-elevations, and notable among our WA willows for facultative growth in upland habitats; plants of the East Cascades are generally of short-stature, with multiple stems 3-10 m tall, but in temperate, coastal forests, trees can reach 30 m tall, with trunk diameters > 1 m; AK and YT to MB, s to SD, NM, AZ and CA; Scouler's willow.

**22. *S. scouleriana* Barratt ex Hook.**

**13b.** Capsules glabrous (occasionally pubescent in *S. commutata* or distally villous in *S. hookeriana*); floral bracts brown to black and persistent (pale in *S. pedicellaris*, minute in *S. prolixa*).



**25a.** Leaves glaucous beneath at maturity.

**26a.** Leaf margins revolute; leaves entire or occasionally shallowly toothed, narrowly- or elliptic-oblong, 3-11 cm long X 5-25 (30) mm wide, thick and firm, branchlets yellow-olive to reddish; shrub or small tree, 1-6 m tall, along streams and arroyos in arid lands from S BC to CA, east of the Cascades; arroyo willow.

**23. *S. lasiolepis*** Benth.

**26b.** Leaf margins plane, frequently wider or without teeth.

**27a.** Pistillate aments sessile, leafless, lateral on the previous year's branchlets, precocious; leaves saliently toothed, red-tinged when expanding, becoming glabrous beneath at maturity; styles 0.5-1.0 mm; branchlets of the season spreading-pubescent; stipules well-developed, > 2 mm; rounded plants to 5 (6) m tall; plants of open sagebrush bottomlands in eastern WA and calcareous sites in NE WA; AK, e to PQ, s to ID and SD; (misapplied: *Salix monticola* auct. non Bebb); false mountain willow; serviceberry willow.

**24. *S. pseudomonticola*** Ball

**27b.** Pistillate aments frequently stalked or leafy; plants of higher elevations or riverine habitats, or west of the Cascades.

**28a.** Mature leaves glaucous above and beneath as well as glabrous beneath, margins entire; bracts pale or partly anthocyanic; style 0.1-0.3 mm or obsolete; stipes 2-3.2 mm; branchlets glabrous, dark; reportedly hybridizes with *S. athabascensis*; suspected hybrids with *S. geyeriana* near Bingen, WA are called *Salix xdieckiana* Suksdorf; plants are slender, sparingly-branched bog shrubs, 4-12 dm tall; S YT and NT, e to NF, s to OR and NJ, W of the Cascades in WA; bog willow.

**25. *S. pedicellaris*** Pursh

**28b.** Mature leaves not glaucous above, toothed (sometimes obscurely or not at all in *S. farriae*, *S. piperi*, or *S. lutea*); bracts dark; occurring on either side of the Cascades.

**29a.** Rounded shrubs < 1.5 m tall, occurring in high-elevation peatlands in WA; unfolding leaves glabrous beneath, sparsely pubescent above, with some hairs ferruginous; margins entire or inconspicuously toothed, broadly lanceolate to more narrow, 1.5-4 cm long X 0.5-2 cm wide; branchlets initially appressed-pubescent, becoming glabrous; style 0.4-0.7 mm; stipes 0.2-1.5 mm; pistils often reddish-tinged; pubescence of the ament axis and bract is dense, with most hairs exerted > ½ the length of the capsule; AK and YT, s to MB, ID, MT and in WA close to the international border from the Cascades eastward; Farr's willow.

**26. *S. farriae*** Ball

**29b.** Mature plants generally > 1.5 m tall, or with entire leaves, or occurring at lower elevations, or not occurring in peatlands; branchlet pubescence villous (*S. hookeriana* and *S. piperi*), spreading (*S. barclayi* and *S. proluxa*) or lacking (*S. proluxa* and *S. lutea*).

**30a.** Leaves pubescent beneath at maturity; margins toothed; branchlets villous-tomentose; stipules small; pistils reddish; stout, branching shrubs or small trees to 6 m; occurring in salt marshes, sand dunes and inland within the coastal-fog zone, S BC to Mendocino Co, CA; hybridizes with *S. piperi*, which it includes in most modern treatments (see); Hooker's willow, dune willow.

**27. *S. hookeriana*** Barratt ex Hook.

**30b.** Leaves generally glabrous beneath at maturity (expanding leaves silky or pubescent but soon glabrate).

**31a.** Branchlets of the season villous-puberulent at first, soon glabrate; unfolding leaves silky, becoming glabrous above and beneath when mature; leaves oblanceolate, margins generally entire, occasionally crenate-serrulate; stipules large and leafy, scars conspicuous, narrowly elliptic to linear; staminate aments stout, ~1.5 cm thick; styles 0.7-1.8 mm; stout, branching shrubs or small trees to 6 m; occurring in lowlands W of the Cascades from S BC, s to Mendocino Co, CA and

up the Columbia River to Bingen; plants apparently matching this description also occurs anomalously in inland mountains, high passes and avalanche chutes in the Cascades (see note in Jepson-GA); hybridizes with *S. hookeriana*, with which it is synonymized in most modern treatments including USDA (2001), but possibly worthy of retention until resolution of subalpine plants matching these characters; Piper's willow.

*S. piperi* Bebb

**31b.** Branchlet pubescence lacking or not silky; leaf margins various; stipules small and inconspicuous on normal growth, up to 1 cm long on vigorous shoots.

**32a.** Young branchlets pubescent with spreading hairs; plants of subalpine or high montane forests of the central Cascades; styles long, (0.5) 0.7-1.5 (2) mm; stipes short, 0.3-1.5 mm; aments to 1.5 cm wide, on long, leafy flowering branchlets 8-25 mm long; unfolding leaves green, pubescent on both sides with white hairs, generally becoming glabrous or sparsely pubescent beneath, but remaining pubescent above, sometimes broadly obovate, l:w 2-3X; stipules elliptic; pistils greenish; reportedly hybridizes with *S. commutata*, *S. barrattiana*, *S. farriae* and *S. boothii*; blocky shrubs to 2.5 m tall; AK, e to NT, e to AB, s to ID and WA; Barclay's willow.

**28. *S. barclayi*** Anderss.

**32b.** Young branchlets glabrous or soon glabrate, occasionally with spreading hairs; plants of lower elevations; styles short, 0.2-0.7 mm; stipes longer, up to 4.2 mm; aments < 1.5 cm wide; unfolding leaves more elongate, l:w usually > 2.5X, often reddish; mature leaves glabrous above; stipules ovate to rounded.

**33a.** Young branchlets reddish brown, pubescent with spreading hairs in some forms; largest medial leaves with margins generally toothed to minutely serrulate or entire; leaf l:w generally > 3X; floral bracts brown, persistent, generally glabrous but sparsely hairy on the adaxial surface and on the catkin rachis; stipes elongate, mostly 2-4 mm; plants west of the Cascades with spreading-pubescent branchlets are called *S. rigida* var. *macrogemma* (Ball in Piper & Beattie) Cronq.; multiple-stemmed shrubs or small trees, 2-4 m tall; generally along waterways in the foothills and lowlands, extending up into the lower intermontane valleys; occurring from NT south to the Great Lakes and CA; (*S. mackenziana* (Hook.) Baratt ex Anderss.; *S. eriocephala* Michx. ssp. *prolixa* (Anderss.) Argus; *S. rigida* Muhl. var. *mackenziana* (Hook.) Cronq.; it has been confused and synonymized with *S. lutea*); Mackenzie's willow.

**29. *S. prolixa*** Anderss.

**33b.** Young branchlets yellowish to gray; largest medial leaves with entire margins or undulate or indistinctly crenulate or serrulate; leaf l:w not infrequently < 3X; floral bracts tawny or brown, persistent or caducous, generally glabrous but with copious curly hairs on the adaxial surface and on the catkin rachis; stipes shorter, 0.5-2 (3) mm; multiple-stemmed rounded shrubs, 3-6 m tall; absent in Washington according to Argus (2007), but occurring in adjacent states, and reported by some authors; occurring in low elevation riparian parts of the sagebrush steppe and lower forests, from AB and MB, s to NB, WA, CO and CA; (*S. rigida* Muhl. var. *watsonii* (Bebb) Cronq.; *S. lutea* Nutt. var. *watsonii* (Bebb) Jepson; *S. lutea* Nutt.; *S. cordata* Muhl. var. *lutea* (Nutt.) Bebb; *S. eriocephala* Michx. var. *watsonii* (Bebb) Dorn; it has been confused with *S. ligulifolia* Ball; and *Salix monochroma* Ball) yellow willow.

*S. lutea* Nutt.

**25b.** Leaves not glaucous beneath at maturity; leaf margins ~toothed.

**34a.** Mature leaves pubescent beneath (in *S. tweedyi* sometimes pubescent only along the midrib).

**35a.** Mature leaves more densely pubescent above, sparsely pubescent or glabrous beneath; branchlet pubescence generally stiff and spreading (hirsute); lowermost stems smooth at the base; style elongate, 1.5-3 mm; aments stout, staminate ones to 4 (30) cm, pistillate to 9 cm; some keys list pistillate aments as being sessile and axillary or terminal and leafy on the previous year's branchlets, however North Cascades specimens typically also exhibit leafy axillary aments; tall, sometimes crooked shrubs to 6 m tall; occurring along streams and wet subalpine forests and meadows, S BC, MT, ID, WY and WA east of the Cascades in mountains along the international border; Tweedy's willow.

**30. *S. tweedyi*** (Bebb ex Rose) Ball

**35b.** Leaves villous with ascendant hairs above and beneath; style shorter, 0.5-1.6 mm; pistillate aments on leafy shoots; this is the commoner, glabrous-capsuled form of the species, sometimes called "var." *commutata*.

(see lead 23b, no. 20, for description) the glabrous-capsuled form of *S. commutata* Bebb

**34b.** Mature leaves glabrous beneath or if with scant pubescence along the midrib, then branchlets lacking spreading pubescence.

**36a.** Stipules 5-12 mm, apex sharply acute; leaf apices abruptly short-acuminate; juvenile leaves white-hairy; branchlets glabrous or appressed-pubescent; multi-stemmed, rounded shrubs 3-6 m tall; stream sides and meadows in the subalpine zone, SC BC, e to AB, s to CA and CO; (misapplied: *Salix myrtilifolia* Anders.; *S. pseudocordata* auct non (Anders.) Rydb.); Booth's willow.

**31. *S. boothii*** Dorn

**36b.** Stipules caducous, 1-5 mm long, ovate, with serrulate margins and blunt apex; juvenile leaves glabrous rather than white-hairy; leaf apices broadly acute to rounded; branchlets minutely puberulent with short, curved, stiff hairs; aments coetaneous, to 3 cm long; our var. *myrtilifolia* is distinguished from var. *cordata* (Anders.) Dorn of N BC and northward in being a decumbent shrub < 1 m, with leaves glabrous, not pubescent, and with stipules inconspicuous and caducous, not prominent and persistent (0.2-2 mm vs. 1-5 mm), and with shorter styles (0.3-0.5 mm vs. 0.5-0.9 mm); reportedly hybridizes with *S. barrattiana* and possibly *S. boothii*; muskegs, fens and lakeshores at mid to high elevations; occurring from AK, s to WA, e to ON; unconfirmed in Washington, but occurring just north of Okanogan County; plants with this description were observed in shallow tarns along the international border near Cathedral Peak in the Okanogan Range of the North Cascades, occurring near taller but otherwise morphologically similar *S. tweedyi*, which occupies the more highly oxygenated inlets and outlets of the same tarns - *GW*; blueberry willow.

*S. myrtilifolia* Anders.

## References

- Argus, George W. 2007. *Salix* (Salicaceae) distribution maps and a synopsis of their classification in North America, North of Mexico. *Harvard Papers in Botany*, 12(2):335-368.
- Argus, George W. 2004. A Guide to the identification of *Salix* (willows) in Alaska, the Yukon Territory and adjacent regions. July 2004 workshop on willow identification. George W. Argus, 310 Haskins Rd, Merrickville R3, Ontario, Canada K0G 1N0 (<http://aknhp.uaa.alaska.edu/willow/pdfs/guidesalixak-yt11may05.pdf>).
- Argus, George W. 1999. Classification of *Salix* in the New World. *Botanical Electronic News*, No. 227, July 5, 1999.
- Argus, George W. 1993. In: Hickman, James C., ed., *The Jepson Manual - Higher Plants of California*. University of California Press, Berkeley, Calif.
- Argus, George W. 1991. In: Douglas, George W., G.B. Straley, Del Meidinger, eds., *The Vascular Plants of British Columbia, Part 3*. BC Ministry of Forests, Forest Science Research Branch, Victoria, BC.
- Brayshaw, T.C. 1976. *Catkin Bearing Plants of British Columbia*. BC Provincial Museum Occasional Paper No. 18.
- Brunsfeld, S.J., F.D. Johnson, illus. J. Janish, D. Mattson. 1985. *Field Guide to the Willows of East-Central Idaho*. Bulletin No. 39., Forest, Wildlife and Range Experiment Station, College of Forestry, Wildlife and Range Sciences, Univ. of Idaho, Moscow.
- Clay-Poole, Scott. (undated). Leaf key of the genus *Salix* of Washington State (online file).
- Cronquist, C. Leo. 1969. In: Hitchcock, C. Leo, A. Cronquist, M. Ownbey, J.W. Thompson, illus. J.R. Janish, *Vascular Plants of the Pacific Northwest*. Univ. of Wash. Press, Seattle, WA Vols. 1-5.
- Cronquist, C. Leo. 1973. In: Hitchcock, C. Leo, A. Cronquist, *Flora of the Pacific Northwest, an Illustrated Manual*. Univ. of Wash. Press, Seattle, WA.
- Gleason, Henry A. 1952. *Illustrated Flora of the Northeastern United States and Adjacent Canada*. Vol. 2, the Choripetalous Dicotyledoneae. Hafner Press, a division of Macmillan Publ., Inc., NY.
- Hanners, Al. 1989. Key to Northwest lowland willows in flower, leaf and in bud. Presented at a workshop by the Washington Native Plant Society in the San Juan Islands, 1990.
- Heinze, Donald H. 1992. *Montana Willows (a Third Approximation)* Riparian Technical Bulletin No. 2. USDI-BLM Montana State Office, Billings, Montana.
- Hulten, Eric. 1968. *Flora of Alaska and Neighboring Territories, A Manual of the Vascular Plants*. Stanford Univ. Press, Stanford, CA.
- Kovalchik, B.L. 2001. Classification and management of aquatic, riparian and wetland sites on the National Forests of Eastern Washington, Part 1: the series descriptions, Appendix F-3. Comparisons for important willows in eastern Washington, USDA Forest Service, Region 6 and Pacific Northwest Research Station, in publishing, February 14, 2001.
- Kovalchik, B.L., W.E. Hopkins, S.J. Brunsfeld. 1988. Major indicator shrubs and herbs in riparian zones on National Forests of Central Oregon. USDA-FS, PNW Region publication R6-ECOL-TP-005-88.
- Rehder, Alfred. 1977 (13th). *Manual of Cultivated Trees and Shrubs Hardy in North America Exclusive of the Subtropical and Warmer Temperate Regions*. Macmillan Publ., NY.
- Sargent, Charles S. 1933. *Manual of the Trees of North America (exclusive of Mexico)*. Houghton Mifflin, Boston and NY.
- USDA, NRCS. 2001. The PLANTS Database, Version 3.1 (<http://plants.usda.gov>). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.
- Zika, Peter. 1988. A checklist and key to Willamette Valley willows. Kirk Park, Fern Ridge Reservoir, Emerald Chapter NPSO field trip, 10 Sept 1988. Workshop handout, USDA-FS, 1991.