

Illustrated Key to Massachusetts Willows

This key is arranged by sections; however, as this is a simplified version for just Massachusetts common willows, it cannot serve a key to willow sections. Hybrids and those introduced species that are rarely found are not included, and therefore some sections are missing. Section names follow the *Flora of North America* (Argus 2010). Corresponding section names used by Skvortsov (1999) are shown after '=' sign.

Mode: text-only (printable)

1. All buds uniform (floriferous buds similar to vegetative ones), small (up to 3 mm long), conical (not compressed), positioned at acute angle to shoot, bud scale margins free, overlapping.

Sect. ***Humboldtianae***: *S. nigra* — black willow

Tree to 20 m tall, sometimes even taller; may be frequently recognized from the distance by its characteristic habit produced by long and narrow, sickle-shaped leaves. Bark rough, forming wide, thick, irregular plates. Branchlets highly brittle at base. Leaves lanceolate to sublinear, flat, 6-13 times as long as wide, 6–25 mm broad; in mature leaves pubescence usually inconspicuous or absent; leaf margins serrulate; lower (abaxial) leaf surface green (not glaucous); leaf texture very delicate, lateral veins entirely submersed in parenchyma, except for the very origins of lateral veins; upper surface with or without stomata; stipules present at least on vigorous shoots, broad, frequently rounded. Flowering late; catkins serotinous, on leafy stalks. Staminate flowers with two nectaries and numerous, usually 6, stamens. Pistillate catkins with one nectary; ovaries pyriform, glabrous, on short stipes and with short styles, floral bracts small, pale, short pubescent, at least partially deciduous after flowering.

— Buds not necessarily uniform, of different shape and structure, bud scale cap-like, always with connate margins.

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2. Stamens 4 to 10; young leaves glandular, producing pitch, like leaves in poplars.

Sect. ***Salicaster = Pentandrae*** [3]

Large or small trees or shrubs; floriferous buds similar to vegetative ones; petioles always with distinct glands, sometimes foliaceous. Leaves highly lustrous above, densely glandular dentate at margin. Flowering late; catkins serotinous, on leafy stalks, dense, rather stout; ovaries stipitate, styles short; staminate and pistillate flowers with two nectaries which can form cup-like structure (around stamens).

— Characters not as above. Stamens 2, usually free; in introduced *S. purpurea* connate in 1; young leaves not producing pitch.

4

3. Fruit ripening and seed dispersal from late fall into winter. Outermost primordial leaves (cataphylls) in bud nearly round, embracing the entire bud content, frequently persistent in spring on developing shoots. Bud scale glabrous and shiny, usually dying and hardening (though not blackening) at the start of winter, with just a narrow stripe of live tissue left at the very base. Leaves always completely glabrous.

pentandra-group: *S. serissima* — autumn willow

All references to *S. pentandra* from New England are to be attributed to introduced hybrids: *S. pentandra* x (*S. x fragilis*) or *S. pentandra* x *S. euxina* (= *S. x meyeriana*).

— Fruit ripening and seed dispersal in mid-summer (as in all other willows); buds different, cataphylls elongate. At least the youngest leaves usually with some reddish hairs.

lucida-group: *S. lucida* — shining willow

Shrub or small tree up to 6 m tall. Bud scales remain alive during the winter, their inner membranaceous layer (second prophyll) free, separated from outer layer, yet connected to base of developing shoot. It partially embraces and covers the developing cataphylls together with long silvery tufted trichomes that are spreading from the shoot origin and from medial parts of cataphylls.

4. Bracts in pistillate catkins deciduous after flowering (all or some fall off when capsules ripen), pale, rarely brown, never black. Outermost leaf primordia in floriferous buds at least as long as catkin primordium, either broad or narrow.

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— Bracts persistent, in most species not entirely pale; leaf primordia in floriferous buds much shorter than catkin primordium (except for *S. pedicellaris*).

6

5. Colonial shrubs producing root shoots; leaf blade very narrow, typically linear, with unusually distant dentation; petiole not glandular. Buds with elongate leaf primordia, sometimes with branched catkin primordia. Pistillate floral bracts deciduous in fruit; stigmas deciduous after flowering.

Sect. ***Longifoliae***: *S. interior* — sandbar willow

— Characters not as above. Trees not colonial by producing root shoots. Leaf blade not linear, petiole glandular. Buds with large and broad outer leaf primordia similar to those in pentandra-group but silky on outer surface.

Sect. ***Salix***

Trees, sometimes large. Floriferous buds similar to vegetative ones. Petioles with a pair of glands near blade base. Catkin stalks leafy. Bracts pale, deciduous in pistillate catkins. Nectaries 2 in staminate flowers and mostly 1 in pistillate. Stamens 2 (but very rarely up to 4 or even 8). Capsules glabrous, stipitate, styles short. In North America includes introduced *S. alba*, *S. euxina* and *S. x fragilis* (*S. alba* x *S. euxina*).

6. Large trees with weeping branches. Floriferous buds 4-7 mm long, floral bracts pale, capsules sessile to subsessile.

Sect. ***Subalbae*** — introduced weeping clones of *S. babylonica* and its hybrids

— Characters not as above: shrubs or small trees, not weeping/pendulous (except for cultivated *S. caprea* 'Pendula').

7

7. Catkins very densely flowered; ovaries sessile to short-stipitate, tomentose or woolly. Leaves narrowly elliptic to oblanceolate, with dense white tangled hairs (woolly or tomentose) beneath, rugose (wrinkled) on the upper side.

Sect. ***Candidae***: *S. candida* — hoary willow

— Leaf pubescence not as above, never woolly.

8

8. Low shrubs with slender shoots up to 1.5 (1.7) mm in diameter. Leaves on short (2-8 mm) petioles, relatively small, broad, usually entire, with veins not prominent beneath, somewhat glaucous (with bluish tint), at least mature leaves glabrous; stipules absent or sometimes rudimentary. Catkins late (serotinous), on leafy branchlets. Floral bracts in staminate catkins pale, with rose tint. Ovaries long stipitate, glabrous, often glaucous, frequently reddish; styles and stigmas short. Floriferous buds ovate to lanceolate, faintly pointed, not at all or slightly compressed, up to 8 (rarely 10) mm long; unfolding leaves (primordia) longer than catkin (not as broad as in section *Salix* or *S. serissima*).

Sect. ***Myrtilloides***: *S. pedicellaris* — bog willow

— Characters not as above; either ovaries/capsules hairy, or stipules well developed and leaves densely denticulate, or else leaves with pronounced pubescence.

9

9. Ovaries and capsules on distinct stipes, acute at apex, glabrous. Stipules usually present (at least on vigorous shoots), well developed, frequently equilateral or subequilateral. Mature leaves almost invariably glabrous or glabrate, green or glaucous beneath; commonly cordate at base but sometimes cuneate; venation distinct, yet not

forming reticulum. Inner membrane of bud scale completely free ("loose"), falling off as translucent "additional cap" when shoot starts to grow.

Sect. ***Cordatae = Hastatae in part***: *S. eriocephala* — heartleaf willow

A largely wetland shrub (0.2-6.0 m tall), not necessarily alluvial (water may be running or stagnate), occurring on gravelly or rocky river and stream banks, in mixed mesophytic woods on alluvium, at pond margins, in marshy fields and wet thickets; also at roadsides, especially if there is a ditch along a road. *S. eriocephala* is one of the most common and easily recognized willows in New England. In spring, immature leaves pinkish or yellowish, translucent; in summer, large leaves on upper (distal) parts of vigorous shoots form characteristic regular "ladder-like" pattern.

— Characters not as above. Ovaries and capsules hairy; stipules, if present, of different shape, or else leaves with different type of dentation, shape, or venation.

10

10. Leaves narrow, lanceolate or oblong, serrulate or serrate; glabrous or silky sericeous beneath, veins of third order never prominent, i.e., never forming reticulate pattern. Floriferous buds not very large.

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— Leaves different: if narrow, then with maximal width above middle, crenate or entire at margin; pubescence, if present, different; veins of third order prominent, reticulate pattern pronounced beneath (except for *S. discolor*, but in this species leaves crenate, floriferous buds very large, strikingly different from vegetative).

12

11. Branchlets brittle at base. Pistillate catkins very dense, with very short stipes, ovary ovate, abruptly tapering to short/indistinct style. Leaf blades beneath densely short-silky, with age becoming glabrate, very rarely completely glabrous; hairs white (rarely some rusty hairs present); leaves on average broader than in *S. petiolaris* (up to 2.5 cm broad, length/width ratio mostly 4-6).

Sect. ***Griseae***: *S. sericea* — silky willow

— Branchlets flexible at base. Pistillate catkins loosely flowered, stipes long (1.5-4 mm); ovary pyriform, gradually tapering to distinct style. Leaf blades 5-9 times as long as wide, more or less glabrous or silky sericeous when young, with white and usually at least some rusty (ferruginous) hairs.

Sect. ***Geyerianae***: *S. petiolaris* — meadow willow

12. Floriferous buds not essentially different from vegetative ones: elongate, lanceolate, flattened, ribbed laterally, attenuate into slightly recurved beak. Flowering subprecocious (nearly simultaneous with leaf development). Capsules narrowly lanceolate or sublinear, stipitate; stipes considerably elongating after flowering. Leaves elliptic, rarely oblanceolate, usually conspicuously pubescent beneath; veins of third order prominent, forming distinct reticulate pattern on blade surface beneath and impressed above (leaves rugose above). Shrubs or small trees with short trunks. Wood usually with short, scattered ridges (striae). Bark on old branches and trunks with characteristic "woven" pattern.

Sect. ***Fulvae = Vetric subsect. Substriatae***: *S. bebbiana* — Bebb's willow

Section *Vetric* subsect. *Substriatae*, according to Skvortsov, includes at least 5 species, all but one from the Old World. *S. bebbiana* is that species with a unique range. This circumboreal willow occurs across North America and nearly all of Eurasia.

— Floriferous buds large, drastically different from vegetative ones; groups of floriferous and vegetative buds alternating (following in turn) along shoots. Flowering precocious (before leaves emerge). Pistillate catkins dense, stipes never elongate after flowering to such extent as in *S. bebbiana*. Leaf shape different from that in *S. bebbiana*, venation less prominent; bark different.

Sect. ***Cinerella = Vetric (in part)*** [13]

13. Leaf veins of third order not prominent beneath, reticulate pattern absent; upper leaf surface shiny, without impressed veins. Floriferous buds very large, with beak parallel to shoot, blackening in winter. Catkins very

large and initially very dense, then becoming slightly more lax. Styles and stigmas longer than in other species of the section.

S. discolor — pussy willow

The species has a very broad range across North America, occurring at marshy margins of ponds, in alluvial woods, fens, frequently on peaty substrates. A tall shrub (2-8 m), which may grow as a tree only as rare exception. Peeled wood smooth or striate. Stipules on mature leaves typically foliaceous. Leaves vary from narrowly elliptic to oblanceolate or obovate, 2.3 to 4.5 times as long as broad; blade base convex or cuneate, margin flat, crenate, irregularly toothed, sinuate, or entire; lower (abaxial) surface glaucous, glabrous, pilose, sparsely pubescent or long-silky; hairs (if present) white and/or rusty (ferruginous). May hybridize with *S. humilis* in areas where they grow in proximity (ecology of these two species is different: *S. discolor* occurs in wetlands, *S. humilis* in comparatively dry sandy upland forests). Hybrids have been named *S. x conifera* and characterized by tomentose leaves (like those in *S. humilis*) and large long catkins and long styles (like those in *S. discolor*). These hybrids are fertile; however, "large [hybrid] swarms have not been observed" (Argus 2010).

— Leaves conspicuously reticulate beneath (veins of third order distinct). Floriferous buds of different shape, not blackening in winter. Catkins smaller, styles and stigmas short.

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14. Native shrubs of mostly sandy substrates, medium-sized to low, with numerous successive floriferous buds in upper (distal) parts of shoots uninterrupted by vegetative buds. Floriferous buds differ from vegetative ones, though not as drastically as in preceding species; staminate and pistillate catkins frequently arching, unless very few flowered.

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— Introduced and/or cultivated trees and shrubs. Combination of characters not as above. Floriferous buds extremely large, drastically different from vegetative ones; groups of floriferous and vegetative buds alternating (following in turn) along shoots.

16

15. Low shrub (to 1 m) with bluish foliage of open sandy habitats, such as treeless frost pockets in pine woodlands or sandplain grasslands; sometimes at roadsides. Branched near ground, producing thin, nearly parallel twigs (a habit similar to that of *Cytisus*). Buds small and broad. Leaves elongate, with revolute margins; leaf shape only insignificantly changing along shoots; stipules usually absent or rudimentary, sometimes developed on vigorous plants (narrow, subequilateral). Catkins, especially staminate ones, few flowered.

S. occidentalis (S. humilis var. tristis) — dwarf upland willow

— Taller, medium-sized shrub (1 to 3 m) tolerating some shade. Foliage green without bluish tint. Branching pattern unremarkable. Buds usually elongate. Leaf shape changes gradually but drastically along shoots: lower (proximal) leaves broad elliptic, broadest near blade middle; upper (distal) ones narrow (relatively to their length), broadest near apex; stipules usually present, typically equilateral, more rarely subequilateral; catkins flowered more profusely than in previous species.

S. humilis — upland willow

Produces hybrids with non-native invasive willows (*S. atrocinerea* and probably *S. cinerea*).

16. Pubescence on leaf underside of rumpled hairs, conspicuously denser on veins than in-between, typically with some rusty (ferruginous) hairs—hence the common name 'rusty willow.' According to Skvortsov (1999), leaves frequently absolutely glabrous, but such specimens are rare, if at all present, in eastern MA. Upper leaf surface bright green, shiny; leaf shape variable, with some leaves broadest at about blade middle, others above middle. Single-trunk trees to 10-15 m tall (if not damaged) or tall shrubs. Bark on branches and limbs smooth, without cracks (except for senescent specimens), fluted, looking similar to that in *Carpinus caroliniana*; sometimes pitted. Peeled wood with long dense ridges (striae). Floriferous buds "clog-shaped" (with distinct,

recurved beaks), glabrous, in autumn and winter usually red. Branchlets and young branches slenderer than in gray willow, glabrous, frequently with reddish coloration.

S. atrocinerea (S. cinerea ssp. oleifolia) — rusty willow

Native to Atlantic Europe and northern Africa. Together with *S. cinerea* (the two willows have been sometimes considered subspecies of a single species), it has been deemed invasive in Massachusetts.

— Leaf pubescence on veins of second and third order not more dense than between veins, uniform across leaf surface; rusty hairs absent; upper leaf surface not bright green, grayish or somewhat bluish (not yellowish). Branchlets and young branches more stout than in previous species.

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17. A large (to 5 m) spreading shrub that never grows as a tree. Similar to *S. atrocinerea* in having smooth, light gray, fluted bark, wood with long dense ridges (striae), and clog-shaped floriferous buds. Mature leaves dull green to ash gray above; leaves broadest near apex, gradually attenuating to base. Branches and buds gray, coated with dense persistent pubescence.

S. cinerea — gray or ash willow

Native to West Siberia and most of Europe except the Atlantic coast.

— Plant typically grows as a tree. Peeled wood with long dense ridges (striae), yet bark not at all or only indistinctly fluted. Floriferous buds in plants introduced to North America not clog-shaped, with indistinct beak parallel to branchlet, similar to floriferous buds in *S. discolor*, but not blackening in winter, with a free inner bud scale membrane. Leaves broad (20-50 mm, 1.25-3.5 times as long as broad), medial and upper (distal) leaves on shoots mostly broadest at about blade middle. All leaves pubescent beneath, at least along midribs (rarely completely glabrous); hairs white or grayish, deviating off leaf blade surface, pubescence on veins of second and third order, if any, not more dense than between veins.

S. aegyptiaca (S. medemii) — Egyptian willow

A willow originating from West Asia and widely cultivated. (Plants from Egypt, after which the species was named, represent cultivated material.) Due to tree habit and broad hairy leaves, *S. aegyptiaca* resembles the European goat willow *S. caprea*; however, unlike *S. caprea*, it is easily propagated from cuttings and thus has been favored for cultivation (Skvortsov 1999: 178). According to Rehder (1954), it has been in cultivation in the United States since 1888 (under the name *S. medemii*). As its naturalization is not yet positively demonstrated, for the time being we prefer to treat any findings as waifs. All examined herbarium samples that we could confidently identify as *S. aegyptiaca* as well as living plants found in Berkshire County might represent planted willows. Plants found in natural settings, deviating from *S. atrocinerea* or *S. cinerea* by somewhat bluish foliage, more densely pubescent leaves, and buds without recurved beak may belong to this species. Alternatively, these plants may constitute hybrids whose parents not necessarily include *S. aegyptiaca*.

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