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CONTRIBUTIONS TOWARD A FLORA OF NEVADA

NO. 50

Salicaceae of Nevada

POPULUS by Elbert L. Little, Jr.

SALIX by W. Andrew Archer

July 12, 1965

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SALICACEAE OF NEVADA

POPULUS by Elbert L. Little, Jr. (*)

SALIX by W. Andrew Archer (**)

Contributions Toward a Flora of Nevada, No. 50

KEY TO GENERA

Flower-scales lacerate, deciduous; disk broad or cup-shaped; stamens 10-30 or more; buds with several imbricated scales. . . . 1. POPULUS

Flower-scales entire or merely toothed, persistent or tardily deciduous; disk reduced to 1 small gland, or sometimes 2 or more; stamens 2-7 or 8, rarely 1; buds with single scale. 2. SALIX

1. POPULUS L., 1754. "Cottonwood; Poplar"

Trees mostly with furrowed bark (smooth in aspens), deciduous, dioecious. Twigs terete or angled, with buds of several scales, mostly resinous, terminal bud present. Leaves alternate, mostly long-petioled, mostly ovate to ovate-lanceolate, crenate-serrate to dentate; stipules caducous. Flowers unisexual, in pendulous stalked catkins in early spring before the leaves; each flower in axil of a bract, usually obovate, lacinate to dentate, with cup-shaped often oblique disk; perianth none; staminate flowers with 4 to many stamens inserted on disk; pistillate flowers 2-4 carpellate, ovary sessile in disk, conic to ovoid, 1-celled

(*)Dendrologist, Forest Service, United States Department of Agriculture, Washington, D. C.

(**)Botanist, National Arboretum, United States Department of Agriculture, Washington, D. C.

with 2-4 placentas, style short, stigmas 2-4, often 2-lobed, ovules many. Capsule maturing before leaves are full grown, conic to ovoid, greenish to brown, separating into 2-4 recurved valves; seeds numerous, small, ovoid or obovoid, brown, surrounded at base with tufts of long white hairs. Derivation. - The classical Latin name. Type species. - P. alba L. About 40 species in temperate regions of northern hemisphere, including 10 species in the United States.

Four additional species have been cultivated in Nevada for shade and ornament: Populus alba L. (white poplar), of Europe and Asia; Populus deltoides Bartr. (eastern cottonwood), from E United States; Populus simonii Carr. (Simon poplar), of China; and Populus nigra L. var. italica Muench. (Lombardy poplar), a hybrid clone from Europe. Lombardy poplar, so widely planted in the Great Basin for shelter belts, shade, and ornament, was one of the first trees to be introduced into the State.

Populus Xacuminata Rydb. /P. angustifolia X sargentii/ (lanceleaf cottonwood), originally described as a species, is now regarded as a hybrid and excluded from Nevada, since one of the parent species is not native. A few sterile specimens from Nevada previously referred to P. Xacuminata Rydb. may be variants of P. angustifolia James or hybrids between that species and one of the broader leaved species.

KEY TO POPULUS SPECIES

1. Leaves with lanceolate, crenulate blade, short petiole

3. P. ANGUSTIFOLIA

References: Billings, W. D., Nevada Trees. Nev. Univ. Agr. Ext. Service Bull. 94, ed. 2, 125 p. illus. 1954; Sudworth, George B., Poplars, principal tree willows, and walnuts of the Rocky Mountain Region. U. S. Dept. Agr. Tech. Bull. 420, 112 p. illus. 1934.

1. Leaves with broader blade, long petiole, commonly more than half as long as blade
2. Blade usually somewhat longer than broad, petiole terete
2. *P. TRICHOCARPA*
2. Blade about as long as broad, petiole flattened
3. Blade suborbicular to ovate, finely crenate-serrate
1. *P. TREMULOIDES*
3. Blade deltoid to reniform, coarsely crenate or serrate
4 *P. FREMONTII*

1. *POPULUS TREMULOIDES* Michx., Fl. Bor.-Amer. 2: 243. 1803.
"Quaking Aspen"

P. aurea Tidestr., Am. Midl. Nat. 2: 35. f. 3-7. 1911.

P. tremuloides /var./ *aurea* (Tidestr.) Daniels, Mo. Univ. Studies, Sci. Ser. (Fl. Boulder, Colo.) 2 (2):98, 265. 1911.

Other common names - "golden aspen, trembling aspen, Rocky Mountain aspen".

Small to medium-sized tree usually 5-10 m. tall and less than 30 cm. in trunk diameter (rarely to 25 m. in height and 70 cm. in diameter) or shrubby at high elevations, with slender rounded or oblong crown of thin foliage. Bark whitish or yellowish, smooth and thin, or very large trunks becoming dark gray, thick and furrowed. Wood light brown with very thick whitish sapwood, soft and brittle, lightweight. Twigs glabrous, reddish brown, turning gray; buds conic, 5-10 mm. long, acute, shiny, glabrous not resinous. Leaves 6-14 cm. long, glabrous; petioled 3-7 cm. long, slender, flattened; blade suborbicular to ovate, 3-8 cm. long and broad, mostly acute at apex and rounded at base, finely crenate-serrate with glandular teeth, thin, shiny green above, dull green beneath, turning golden or orange in autumn before falling. Catkins 3-6 cm. long, pubescent, bracts with 3-5 lanceolate ciliate lobes; staminate flowers with oblique disk and 6-12 stamens; pistillate flowers with

slightly crenate disk, 2-carpellate pistil, conic ovary, and 2 stigmas, each with 2 dilated recurved basal lobes. Fruiting catkins 4-9 cm. long, capsule oblong-conic, 4-6 mm. long, light green, 2-valved; seeds about 1 mm. long, light brown, with white hairs. Flowering April-May; capsules maturing and shedding seeds May-June. Derivation. - Like Populus tremula L. (European aspen), from Latin trembling.

Common and widely distributed in high mountains on moist sites, in canyons, around streams and springs, and especially on north-facing slopes, often forming pure stands or groves from root sprouts, 1500-2900 m. elevation, throughout Nevada and probably in every county. Very widespread from Newfoundland W across Canada to NW Alaska, S in high mountains of W United States to northern Mexico, and S in NE United States to Missouri and Virginia.

Nevada (representative specimens)

CLARK CO.: Kyle Canyon, Charleston Mts., I. W. Clokey 8310 (NA, US, USFS).

ELKO CO.: near Blaine, A. A. Heller 11116 (US).

NYE CO.: Big Cr., Toiyabe Mts., Ivar Tidestrom 10852 (US, USFS).

WASHOE CO.: Jones Cr., 2 mi. N Galena Cr., Sierra Nevada Range, W. A. Archer 6489 (NA).

WHITE PINE CO.: Snake Cr., E slope Snake Range, P. Train 1182 (NA).

A variable species with the greatest range of all the North American trees, exhibiting minor differences in leaf shape and in shade of autumnal foliage.

Elsewhere the wood is cut for pulpwood, boxes and crates, excelsior, and matches. Domestic livestock and deer browse the foliage within reach, and the bark is eaten by beavers.

2. *POPULUS TRICHOCARPA* Torr. & Gray ex Hook., Icon. Pl. 9 (New Ser.):

878. 1852.

"Black Cottonwood"

P. hastata Dode, Soc. Hist. Nat. Autun Bull. 18: 222, pl. 12, f. 105. 1905; Extr. Mongr. Inéd. *Populus* 64, pl. 12, f. 105. 1905.

P. trichocarpa var. *hastata* (Dode) Henry in Elwes & Henry, Trees Great Brit. Ireland 7: 1837. 1913; nomen provisorium.

P. trichocarpa var. *ingrata* (Jeps.) Parish, Pl. World 20: 210. 1917. Other common name - "black balsam poplar".

Medium-sized to large tree 7-15 m. high, sometimes to 25 m. tall and 90 cm. in trunk diameter. Bark gray, smooth, becoming deeply furrowed with flat ridges. Wood grayish white to light brown, soft, lightweight. Twigs slightly angled, glabrous or puberulent, reddish brown, turning gray; buds narrowly ovoid, 1-2 cm. long, acuminate, puberulent or glabrous, reddish brown, shiny and resinous, fragrant. Leaves 9-16 cm. long, to 25 cm. on vigorous twigs; petiole 2-6 cm. long, slender, terete, puberulent or glabrous; blade narrowly to broadly ovate, 7-12 cm. long, 3-8 cm. broad, acuminate or acute at apex, rounded to cuneate or cordate at base, finely crenate-serrate with glandular teeth to nearly entire, glabrous, shiny dark green above, whitish and often with rusty specks beneath. Catkins 5-12 cm. long, pubescent, bracts with many filiform lobes, glabrous or slightly puberulent; staminate flowers crowded, with slightly oblique disk and 40-60 stamens; pistillate flowers with cup-shaped disk with irregularly crenate or nearly entire margin, 3-carpellate pistil, subglobose densely pubescent ovary, and 3 stigmas with dilated lobes. Fruiting catkins 8-20 cm. long, capsule subglobose, 6-8 mm. long, light brown, pubescent or sometimes glabrous, 3-valved; seeds about 2 mm. long, light brown, hairy. Flowering in early spring; capsules maturing and shedding seeds May-

June. Derivation. - Hairy-fruited, describing the seed capsules.

Frequent along streams in mountains of northern, central and W Nevada, W to streams flowing eastward from Sierra Nevada, at elevations of 1400-2300 m. Counties: Douglas, Elko, Humboldt. Lander, Lyon, Mineral, Nye, Ormsby, Washoe and White Pine. S Alaska, W Canada, W United States from central Montana to Washington S to S California and Nevada, and N Lower California, Mexico.

Nevada (representative specimens)

ELKO CO.: Jarbridge R. Canyon, Jarbridge Mts., Bassett Maguire & A. H. Holmgren 22323 (NA).

ESMERALDA CO.: Chiatovitch Cr., White Mts., Victor Duran 3062 (US).

NYE CO.: Kingston Canyon, Toiyabe Mts., Tidestrom 10958 (US, USFS).

WASHOE CO.: Galena Cr., 8 mi. W Reno Hot Springs, Archer 5444 (NA).

The tallest broadleaf tree of W United States. Livestock browse the foliage. Elsewhere the wood is used for boxes and crates, pulpwood, and excelsior.

Reports from N Nevada of Populus balsamifera L. (balsam poplar), a closely related species of wide distribution across Canada to Alaska and in N United States, may refer to P. trichocarpa. The former differs in having ovoid glabrous 2-valved capsules and leaves pale green or brownish beneath.

3. POPULUS ANGUSTIFOLIA James, Exped. Rocky Mts., 1: 497. 1823.

"Narrowleaf Cottonwood"

P. balsamifera var. angustifolia (James) S. Wats. in King, U. S. Explor. 40th Par. 5: 327. 1871.

Medium-sized tree 7-15 m. tall and to 40 cm. in trunk diameter, with narrow pyramidal crown and slender erect branches. Bark light yellow green, smooth, on large trunks becoming light gray brown and

fissured. Wood light brown with whitish sapwood, lightweight. Twigs terete, slender, glabrous, yellow green, turning gray; buds conic, 5-12 mm. long, acuminate, brown, glabrous, with several scales, resinous. Leaves 4-10 cm. long, to 15 cm. on vigorous shoots, glabrous or nearly so; petiole 1-2.5 cm. long, slender, terete, sometimes puberulent; blade lanceolate, 3-8 cm. long and 1-2.5 cm. broad, acuminate at apex, cuneate or rounded at base, glandular crenulate, yellow green above, paler beneath. Catkins 2-6 cm. long, glabrous; bracts obovate, with many filiform lobes; staminate flowers with slightly oblique cup-shaped disk and 12-20 stamens; pistillate flowers with slightly lobed cup-shaped disk, ovoid ovary, and 2 dilated irregularly lobed stigmas. Fruiting catkins 6-10 cm. long, capsule ovoid, 6 mm. long, 2-valved; seeds obovoid, 2 mm. long, light brown, hairy. Derivation. - Narrowleaf.

Frequent along streams in mountains at 1800-2300 m. elevation, E Nevada in Elko, White Pine, Lincoln and Clark Counties. S Saskatchewan and S Alberta, W United States from Montana to Washington, SE Oregon, E Nevada, Arizona and Trans-Pecos Texas, and N to Colorado, W Nebraska and Black Hills; also in northern Mexico (Chihuahua).

Nevada (representative specimens)

CLARK CO.: Kyle Canyon, Charleston Mts., Clokey 8307 (NA, US, USFS).

ELKO CO.: Lee Post Office, Heller 9444 (US).

WHITE PINE CO.: Indian Cr., 16 mi. N McGill, Train 974 (NA).

4. *POPULUS FREMONTII* S. Wats., Proc. Am. Acad. 10: 350. 1875.

"Fremont Cottonwood"

Medium-sized to large tree 10-25 m. tall, with trunk 50 cm. to 1 m. or more in diameter, often leaning, and with very broad, spreading,

flat, open crown of large branches. Bark gray or brown, thick, rough and deeply furrowed. Wood light brown with whitish sapwood, soft, light-weight, brittle. Twigs terete, glabrous or nearly so, slightly pubescent, light green, turning to gray; buds ovoid, 1-2 cm. long, acute to acuminate, puberulent or glabrous, shiny, viscid, light green. Leaves 8-14 cm. long, hairy when young, becoming glabrous; petiole 4-7 cm. long, slender, flattened, yellowish; blade deltoid to reniform, usually broader than long, 4-9 cm. long, 5-10 cm. broad, acute to acuminate at apex, cuneate to truncate or subcordate at base, coarsely and irregularly crenate or serrate with glandular teeth, slightly coriaceous, shiny yellow green on both sides, turning yellow in autumn. Catkins 4-10 cm. long, glabrous, bracts with filiform lobes, pedicels 3-20 mm. long; staminate flowers with broad oblique disk and 50-80 stamens with dark red anthers; pistillate flowers with cup-shaped disk, 3-4 carpellate pistil, ovoid ovary, and 3-4 broad and flat irregularly lobed stigmas. Fruiting catkins 7-12 cm. long, capsule ovoid to subglobose, 5-12 mm. long, light brown, 3-4 valved; seeds ovoid, 2-3 mm. long, light brown, hairy. Flowering in March; capsules maturing and shedding seeds April-July. Derivation. - Named for its discoverer, General John Charles Frémont (1813-90), explorer, soldier and politician of western United States.

Along streams and springs, sometimes abundant in groves, creosotebush and sagebrush deserts and juniper woodland, at low and medium elevations from 500-1800 m., southern, central and W Nevada. Counties: Churchill, Clark, Douglas, Esmeralda, Lander, Lincoln, Lyon, Mineral and Washoe. S Utah, Nevada, and N to S California, S to Arizona, New Mexico, Trans-Pecos Texas, and northern Mexico.

Nevada (representative specimens)

CHURCHILL CO.: 4 mi. N Fulton, R. A. Allen 313 (NA).

CLARK CO.: Wilson's ranch, Charleston Mts., Clokey 8308 (NA).

LINCOLN CO.: Kiernan, Meadow Valley Wash, L. N. Goodding 634 (US).

WASHOE CO.: 4.3 mi. SE Spanish Spring, R. W. Saarni 185 (NA, USFS).

The type specimen was collected on "Deer Creek at 'Lassens' on the Upper Sacramento," California, in 1846 by Frémont's expedition of 1845-47. However, on his earlier expedition of 1843-44, Frémont recorded "sweet cottonwood" near Pyramid Lake, Nevada, Jan. 6, 1844 (Rpt. Explor. Exped. Rocky Mts., 215. 1845).

If varieties are recognized, the Nevada trees belong to the typical variety (var. fremontii) with leaves acute at apex, short pedicels, and broad capsules. In var. wislizenii S. Wats. (Rio Grande cottonwood), of E range in S Colorado, S Utah, New Mexico, Trans-Pecos Texas, and Chihuahua, the leaves are acuminate and the narrow capsules mostly shorter than the long pedicels. However, intermediates occur, and the variety is doubtfully distinct. A hybrid grove is reported by Billings from Smoke Cr. in N Washoe County.

This species is also in cultivation. Though not durable, the wood can be used for temporary fence posts as well as fuel.

2. SALIX L., 1754 "Willow" (*)

Dioecious shrubs (sometimes creeping in arctic and alpine regions) to tall trees. Buds more or less conical, obtuse to acute or subulate, glabrous or pubescent. Stipules minute to well-developed, deciduous or sometimes persistent. Leaves alternate deciduous, lanceolate to oblanceolate, ovate to obovate, elliptic, linear, to sometimes circular margins entire or toothed. Aments ascending or spreading, solitary or occasionally 2-3 together, appearing before (precocious), with (coetaneous), or after (serotinous) the leaves; pedunculate or sessile. Peduncle bracts scale-like or leaf-like. Flower-scales entire or sometimes erose or dentate, yellow and mostly deciduous, to brown or black and persistent. Stamens mostly 2, or 3-7, rarely 1; the filaments distinct or occasionally conglutinate for a third or more at base. Capsule 2-valved, ovoid to lanceolate, glabrous or pubescent, sessile or long-pedicelled. Style 1, occasionally more or less divided, almost obsolete or to 2-3 mm. long. Stigmas 2, entire or often divided, erect or spreading, 0.5-1.5 mm. long. Nectary usually one ventral gland, sometimes two, 1 ventral, 1 dorsal, or occasionally several and united into lobed saucer surrounding base of flower.

Some 300 species, of which about 100 are found in North America.

(*)This paper is based partially on an incomplete manuscript prepared some 25 years ago by Carleton R. Ball but the original treatment has been extensively rewritten and reorganized in accordance with recent publications and study of abundant material in the Ball Salix herbarium.

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SALIX KEY TO MATURE VEGETATIVE MATERIAL

1. Prostrate shrubs, branches repent or rooting, forming mats.
 2. Blades glabrous, more or less rugose above, glaucous and strongly reticulate beneath, tending to obovate, apex obtuse to round; petioles to 10 mm. 11. *S. RETICULATA*
 2. Blades pubescent to glabrate, not rugose, subglaucous and moderately reticulate beneath, tending to elliptic-oblong or -oblanceolate, apex acute to often plicately apiculate; petioles to 3 mm.
 12. *S. ARCTICA*
1. Erect shrubs or trees, branches not repent or rooting.
 3. Blades linear-lanceolate or -elliptic, petioles usually none or rarely to 4 mm. 5. *S. EXIGUA*
 3. Blades lanceolate, oblanceolate or elliptic, petioles distinct, 3-20 mm.
 4. Petioles with prominent, often irregularly lobed glands at apex.
 1. *S. LASIANTRA*
 4. Petioles without apical glands, or if present indistinct, viscid or few.
 5. Branches and twigs of present and last year pruinose.
 6. Stems cherry red or dark purplish, blades 1-2 times longer than wide. (Rare in Nevada, only 1 collection known, Elko Co.).
 15. *S. PLANIFOLIA*
 6. Stems chestnut, brown or black; blades more than 2 times longer than wide.
 7. Blades predominantly oblanceolate, glabrous or with fine, appressed silky hairs, often with intermixed red hairs.
 8. Blades 5-7 times longer than wide, often bronze-green above, margins entire or often shallowly and obscurely serrate (4-5 teeth per 1 cm.); buds to 2 mm. 13. *S. LEMMONII*
 8. Blades 4-5 times longer than wide, grayish or green above, margins entire with close-ranked glands or only a few scattered teeth; buds 3-5 mm.

9. Blades grayish above, margins with close-ranked yellow glands, dull gray tomentose; petioles yellow, sometimes red-stained.
10. *S. EASTWOODIAE*

9. Blades green above, margins without yellow glands, sometimes a few scattered teeth; pubescence of straight silvery hairs often intermixed with red or tawny hairs; petioles brownish.
19. *S. GEYERIANA*

7. Blades predominantly elliptic; thin silvery pubescent above, permanently silvery tomentose beneath, without red hairs.
14. *S. DRUMMONDIANA*

5. Branches and twigs not (or sometimes indistinctly) pruinose.

10. Blades essentially serrulate.

11. Blades green both sides.

12. Twigs chestnut; blades elliptic-ob lanceolate or -lanceolate.
7. *S. PSEUDOCORDATA*

12. Twigs yellow, gray or brownish; blades lanceolate .4. *S. NIGRA*

11. Blades glaucous beneath.

13. Blades yellow-green above, closely glandular-serrulate; buds 3-4 mm.; stipules ovate-lanceolate, closely glandular-serrulate or dissected. 3. *S. AMYGDALOIDES*

13. Blades dark green above, coarsely and shallowly serrate or crenate (teeth less than 10 per 1 cm.); buds 5-8 mm.; stipules reniform to circular, entire.

14. Twigs reddish-brown, often with tuft of tawny hairs at base; buds brown, pubescent; stipules reniform to ovate and obliquely acute; blades burnished green above, margins mostly serrulate. 2. *S. LAEVIGATA*

14. Branches grayish, without tuft tawny hairs at base; buds yellow, glabrous; stipules circular to broad ovate; blades dull green above, margins mostly crenulate. 6. *S. LUTEA*

10. Blades essentially entire.

15. Blades predominantly oblanceolate.

16. Blades 5 or more times longer than wide. . . 13. *S. LEMMONII*

16. Blades 5 or less times longer than wide.

17. Blades glabrate beneath with red hairs. 17. *S. SCOULERIANA*
17. Blades glabrous or pubescent beneath without red hairs.
18. Blades dense lanate beneath; apex rounded or obtuse; twigs pubescent. 16 *S. SITCHENSIS*
18. Blades glabrous to pubescent but not lanate beneath; apex acute; twigs glabrous.
19. Blades bronzed green above, glabrous; petioles glabrous. 8. *S. LASIOLEPIS*
19. Blades gray or green above, more or less pubescent; petioles pubescent.
20. Blades glaucous beneath, margins often with close-ranked glands all around; twigs reddish-brown or black; often pruinose. 10. *S. EASTWOODIAE*
20. Blades green beneath, marginal glands none or occasionally a few at base; twigs chestnut, not pruinose. 9. *S. WOLFII*
15. Blades predominantly elliptical.
21. Blades dull gray above, entire, margins with close-ranked yellow glands (often obscured by pubescence); petioles glabrous; twigs yellowish-brown, glabrous. . 10. *S. EASTWOODIAE*
21. Blades dull green above, entire or irregularly glandular crenate-dentate; petioles pubescent; twigs reddish brown, pubescent. 18. *S. BEBBIANA*

SALIX KEY TO STAMINATE MATERIAL

1. Prostrate shrubs, branches repent and rooting.
2. Aments 0.5-1 cm. long; filaments pubescent; nectary irregularly lobed and encircling base of filaments. 11. *S. RETICULATA*
2. Aments 1-3 cm. long; filaments glabrous; nectary 1 ventral gland. 12. *S. ARCTICA*
1. Erect shrubs or trees, branches not repent or rooting.
3. Stems of present and last year pruinose.
4. Filaments pubescent.

5. Aments 1 cm. or less long; flower-scale obovate, often revolute, tawny, often lavender-tipped, hairs shorter than the scale.

19. *S. GEYERIANA*

5. Aments more than 1 cm. long; flower-scale ovate, not revolute, brown to black, not lavender-tipped, hairs longer than scale.

6. Aments coetaneous, 1-3 cm. long; peduncle bracts, stipules and young leaves with close-ranked, yellow glands, pubescence grayish.

10. *S. EASTWOODIAE*

6. Aments precocious, 1-1.5 cm. long; peduncle bracts and young leaves entire, rarely serrate, without marginal glands, with tawny or red hairs, especially beneath. 13. *S. LEMMONII*

4. Filaments glabrous.

7. Twigs deep cherry red; flowers erect on rachis; anthers yellow, filaments free; peduncle bracts narrow elliptic, 5 mm. or less long. 15. *S. PLANIFOLIA*

7. Twigs dark brown to black; flowers often pendent in part or all of ament; anthers reddish or lavender, filaments sometimes conglutinate $1/3$; peduncle bracts lanceolate, 4-10 mm. long.

14. *S. DRUMMONDIANA*

3. Stems not (or only inconspicuously) pruinose.

8. Stamens 3 or more.

9. Peduncle bracts elliptic or lanceolate, margins distinctly glandular or serrulate.

10. Stipules and bracts of peduncle with close-ranked marginal glands; young leaves often bright red pubescent; stems reddish-brown.

1. *S. LASIANDRA*

10. Stipules and bracts of peduncle serrulate; young leaves not red pubescent; stems yellow, gray or dark brown. 4. *S. NIGRA*

9. Peduncle bracts oblanceolate, margins entire or indistinctly serrate.

11. Twigs reddish-brown, pubescent at nodes; peduncles and youngest stems usually yellowish; peduncle bracts at first tawny appressed pubescent beneath, soon glabrous; miniature shoot frequent from axial bud of top peduncle bract. 2. *S. LAEVIGATA*

11. Twigs gray, entirely glabrous; peduncles and youngest stems usually blackish; peduncle bracts puberulent above, crinkly white pubescent in petiole groove; miniature shoots rare.
3. *S. AMYGDALOIDES*
8. Stamens 1 or 2.
12. Stamens usually 1 (or sometimes 1 to 2 mixed in same ament).
16. *S. SITCHENSIS*
12. Stamens always 2.
13. Aments 1 to several on single peduncle; peduncle to 3 cm. long; peduncle bracts narrow linear; nectary glands 2 or more, ventral and dorsal. 5. *S. EXIGUA*
13. Aments only 1 on peduncle; peduncle usually none or to 5 mm.; peduncle bracts elliptic, lanceolate or oblanceolate; nectary gland 1 ventral.
14. Flower-scale yellowish or pale brown. . . . 18. *S. BEBBIANA*
14. Flower-scale dark brown or black.
15. Peduncle bracts oblanceolate, not over 5 mm. long.
17. *S. SCOULERIANA*
15. Peduncle bracts elliptic or lanceolate, usually more than 5 mm. long.
16. Filament base pilose.
17. Peduncle bracts stipulate, bracts and stipules with close-ranked, yellow marginal glands (sometimes deliquescent).
10. *S. EASTWOODIAE*
17. Peduncle bracts not stipulate, and not gland-margined.
13. *S. LEMMONII*
16. Filaments glabrous
18. Twigs yellowish; peduncle bracts entire or with a few marginal glands. q 6. *S. LUTEA*
18. Twigs chestnut, brown or black; peduncle bracts entire or serrate, without marginal glands.
19. Aments precocious; peduncle bracts lanceolate, revolute, glabrous inside, dense pubescent outside; filaments conglutinated 1/3; twigs brown to blackish, more or less pubescent.
8. *S. LASIOLEPIS*

19. Aments coetaneous; peduncle bracts elliptic, glabrous or pubescent both sides, not revolute; filaments free (usually); twigs chestnut, glabrous.
20. Peduncle more or less distinct, often to 4 mm.; peduncle bracts pubescent, entire; flower-scale obovate, with straight hairs. 9. S. WOLFII
20. Peduncle usually none, rare to 5 mm.; peduncle bracts glabrous, glandular-serrate; flower-scale ovate, with crinkly hairs. 7. S. PSEUDOCORDATA

SALIX KEY TO PISTILLATE MATERIAL

1. Prostrate shrubs, branches repent and rooting.
2. Aments 0.5-1 cm. long, few- to many-flowered, lax; extended rachis (not a peduncle) as long as flowering portion; peduncle bracts none; buds 1 mm., ovoid; twigs chestnut; nectary an irregularly lobed cup surrounding pedicel. 11. S. RETICULATA
2. Aments 1-3 cm. long, dense-flowered; peduncle 0.4-2 cm.; peduncle bracts 3 to 5, leaf-like in size and shape; buds 1.5-2 mm., lanceolate; twigs brown to reddish; nectary 1 ventral gland, flat, strap-shaped. 12. S. ARCTICA
1. Erect shrubs or trees, branches not repent nor rooting.
3. Branches of present and last year pruinose.
4. Peduncle 0.5-1 cm.; flower-scale revolute, obovate, tawny or pale brown; scale hairs shorter than scale. 19. S. GEYERIANA
4. Peduncle usually none or not over 0.5 cm.; flower-scale not revolute, usually ovate, dark brown or black; scale hairs as long or longer than scale.
- ✓ 5. Peduncle bracts glabrate to glabrous both sides, with distinct stipules, both with prominent close-ranked marginal glands. 10. S. EASTWOODIAE
5. Peduncle bracts pubescent beneath, not stipulate, marginal glands none.
6. Aments mostly coetaneous; peduncle bracts elliptic, to 2 cm. long, often with red hairs beneath; capsule not rostrate; pedicel distinct, 1-2 mm.; flower-scale yellow below, brown or black above. 13. S. LEMMONII

6. Aments precocious; peduncle bracts scale-like, usually 0.5 (rarely 1) cm. long; pubescence white or tawny; capsule rostrate; pedicel usually none; flower-scale entirely black or brown.
7. Twigs cherry red or dark purplish; scale hairs tawny; flowers erect on rachis. 15. *S. PLANIFOLIA*
7. Twigs brown or black; scale hairs white; flowers often pendent on rachis in part or all of ament; scale hairs white.
14. *S. DRUMMONDIANA*
3. Branches not (or only inconspicuously) pruinose.
8. Flower-scale yellow, pale brownish or greenish, not persistent under capsule.
9. Aments 1 to several on single peduncle; peduncle bracts pubescent. 5. *S. EXIGUA*
9. Aments only 1 on peduncle; peduncle bracts glabrous.
10. Ovary and capsule glabrous.
11. Peduncle bracts elliptic-lanceolate, entire, with close-ranked yellow, marginal glands; young unfolding leaves often dense red-pubescent. 1. *S. LASIANDRA*
11. Peduncle bracts linear or oblanceolate, margin serrulate or without close-ranked glands; young leaves not red pubescent.
12. Peduncle bracts linear, serrulate, green both sides; absciss layer at right angle to peduncle; peduncle not over 6 mm. long. 4. *S. NIGRA*
12. Peduncle bracts oblanceolate, entire (or essentially so), glaucous beneath; absciss layer at oblique angle to peduncle; peduncle to 3 cm. long.
13. Capsule 4-5 mm.; flower-scale oblong or obovate; peduncle yellowish or brownish, hirsute; miniature shoot often arising from axis of first peduncle bract; nectary gland pulvinate, twice wider than high; twigs reddish-brown, pubescent at nodes. 2. *S. LAEVIGATA*
13. Capsule 5-8 mm.; flower-scale lanceolate or ovate; peduncle usually blackish, glabrous; miniature shoot rarely produced; nectary gland quadrate; twigs gray, entirely glabrous.
3. *S. AMYGDALOIDES*
10. Ovary more or less pubescent; capsule mostly glabrate or with only a few hairs at apex. 4. *S. NIGRA*

8. Flower-scale dark brown or black (tawny in 18. S. bebbiana) and persistent under capsule.
14. Peduncle bracts scale-like, 5-10 mm. long, glabrous above, pubescent beneath.
15. Peduncle to 1.5 cm.; capsule 5-9 mm., pubescent; stigmas 0.5-1 mm.; twigs more or less pubescent. . . . 17. S. SCOULERIANA
15. Peduncle none; capsule 3-5 mm., glabrous; stigmas 0.5 mm. or less; twigs glabrous. 8. S. LASIOLEPIS
14. Peduncle bracts mostly larger, to 4 cm. long, either glabrous or pubescent both sides.
16. Flower-scale tawny or pale brown; capsule 7-10 mm.; style to 0.2 mm. or none; stigmas 0.5-1 mm. 18. S. BEBBIANA
16. Flower-scale dark brown or black; capsule 7 mm. or less; style more than 0.5 mm. long; stigmas 0.5 mm. or less.
17. Peduncle bracts dense lanate beneath; twigs more or less gray tomentose. 16. S. SITCHENSIS
17. Peduncle bracts more or less glabrous both sides (at least not lanate); twigs glabrous or sometimes thinly villose.
18. Twigs yellow to gray; stipules coriaceous and subpersistent; capsule pedicel 1.5-3 mm. 6. S. LUTEA
18. Twigs chestnut, brown or black; stipules thin and more or less deciduous; capsule pedicel none or to 2 mm.
19. Peduncle usually distinct to 10 mm.; capsule pedicel 1 mm. or less.
20. Twigs chestnut; young leaves and stipules not gland-margined; peduncle bracts entire; aments 1-2.5 cm. long; capsule not rostrate; pedicel none or to 0.5 mm.; flower-scale obovate. 9. S. WOLFII
20. Twigs brown or black; young leaves and stipules prominently gland-margined; aments 2-6 cm.; peduncle bracts gland-margined; capsule rostrate; pedicel 1 mm.; flower-scale ovate. 10. S. EASTWOODIAE
19. Peduncle usually none, rarely to 5 mm.; capsule pedicel 1-2 mm.

21. Capsule and pedicel pubescent; peduncle bracts entire;
flower-scale hairs straight; style 1-2 mm.; twigs brown to
black; stipules glaucous beneath.13. S. LEMMONII
21. Capsule and pedicel glabrous; peduncle bracts serrulate;
flower-scale hairs crinkly; style 0.7 mm.; twigs chestnut;
stipules green both sides.7. S. PSEUDOCORDATA

1. SALIX LASIANDRA Benth. Pl. Hartweg. 334. 1857.

S. speciosa Nuttall, N. Am. Sylva 1: 58. 1843, not Host, 1828, nor Hook. & Arn., 1832.

S. pentandra caudata Nuttall, loc. cit. 1: 61. 1843.

S. fendleriana Anders., Öfv. Svensk. Vet.-Akad. Förh. 15: 115. 1858.

S. lancifolia Anders., Svensk. Vet.-Akad. Handl. 6: 34. 1867.

S. lucida macrophylla Anders., loc. cit. 6: 32. 1867.

S. arguta lasiandra (Benth.) Anders., loc. cit. 6: 33. 1867.

S. lasiandra var. lancifolia (Anders.) Bebb, Willows Calif. (preprint Brewer & Wats. Bot. Calif. 2:) 84. 1879.

S. lasiandra var. fendleriana (Anders.) Bebb, loc. cit. 2: 84. 1880.

S. lasiandra var. caudata (Nutt.) Sudworth, Bul. Torr. Bot. Club 20: 43. 1893.

S. lasiandra var. lyallii Sargent, Gard. & For. 8: 463. 1895.

S. lyallii (Sarg.) Heller, Bul. Torr. Bot. Club 25: 580. 1898.

S. caudata (Nutt.) Heller, Muhlenbergia 2: 186. 1906.

S. lasiandra var. abramsii Ball, Bot. Gaz. 72: 224. 1921.

S. caudata var. parvifolia Ball, loc. cit. 72: 225. 1921.

S. caudata var. bryantiana Ball & Bracelin, Jour. Wash. Acad. Sci. 28: 445. 1938.

S. lasiandra var. macrophylla (Anders.) Little, Am. Midl. Nat. 33: 496. 1945.

Shrub to large tree, 5-15 m., bark rough, furrowed; new twigs yellow, becoming reddish-brown, shining, at first more or less pubescent but usually soon glabrous, sometimes persisting on 1-yr. growth; buds to 10 mm., lanceolate, obtuse, golden yellow to pale brown, paler than twigs, usually thinly hirsute and shining, occasionally dense white pubescent; stipules broad ovate, circular to reniform, to 12 mm. long,

colored as the blades, glandular-serrulate, often glandular on inner surface, sometimes pubescent; petioles 5-15 mm. long, apical glands prominent and often irregularly lobed, pubescent at first, becoming glabrous or at least glabrate, except for groove above; blades narrow to broad lanceolate, 6-20x1.5-3.5 cm., apex acuminate to long-acuminate, base acutish to rounded, closely glandular-serrulate, green and shining above, usually paler and more or less glaucous beneath when expanded or mature, depending upon climatic conditions; pubescence of young unrolling leaves often dense with rufous hairs, usually fading to white or soon deciduous, older and mature leaves sometimes puberulent at base and with a few persisting red hairs, especially along the midrib on both sides, midrib and usually primary nerves pale yellowish-white; aments coetaneous, stout, cylindrical or tapered to apex, male flowering from base upward, 1.5-5 cm., female 2-10.5 cm., male peduncle 0.3-1.5 cm. (rarely none), female 0.5-3 cm., bearing 3 to 5(7), elliptic-lanceolate bracts, stipulate, 0.7-4.5x0.2-1.5 cm., glabrous except for petiole and midrib, apex acute, margins of bracts and stipules conspicuously studded with closely-ranked, cream-colored glands (as are also young vegetative leaves); ament deciduous by abscission of rachis at oblique angle from first to second bract of peduncle, bracts frequently turn yellow and fall off; stamens 3 to 8 (usually 5 to 7), hairy at base; flower-scale pale greenish-yellow, narrow to broad lanceolate, acute to obtuse, usually irregularly glandular-toothed, pubescent outside at base, glabrous above, dense crinkly silky pubescent inside, deciduous; ovaries and capsules glabrous, capsule 5-7 mm. long, ovate-lanceolate, pale

reddish-brown, pedicel 1-2 mm., slender, glabrous; style 0.4-0.5 mm., stigmas equal to style, divided; nectary, male 2 glands, the ventral keg-shaped, the dorsal slender, cylindrical, indistinctly united at base and encircling filaments, female 1 ventral, shield-like or quadrate, as long as pedicel.

At elevations from sea level to 2750 m., from California to New Mexico and northward to Alberta and British Columbia, sparingly in Alaska and Yukon Territory.

In Nevada; Douglas, Elko, Esmeralda, Humboldt, Mineral, Nye, Ormsby, Storey and Washoe Cos.

2. *SALIX LAEVIGATA* Bebb, Am. Nat. 202. 1874.

S. laevigata var. *angustifolia* Bebb, Willows Calif. (preprint Brewer & Wats., Bot. Calif. 2:) 84. 1879

S. laevigata var. *congesta* Bebb, *loc. cit.* 2: 84. 1880.

S. congesta (Bebb) Howell, Fl. N. W. Amer. 1: 617. 1902.

S. laevigata forma *araquipa* Jepson, Fl. Calif. 339. 1909.

S. laevigata var. *araquipa* (Jeps.) Ball, Bot. Gaz. 72: 234. 1921.

Shrub to tree, 2-15 m. high, to 3 dm. diam., with rather rounded crowns, bark brown, roughly furrowed with narrow ridges; twigs reddish-brown to dull brown (often grayish during exfoliation), seasonal sometimes yellowish, not shining, usually glabrous except at nodes but sometimes seasonal and 1-yr. dense pubescent, especially at apex, and rarely the hairiness may be renewed to lesser degree after exfoliation; a conspicuous basal tuft of tawny hairs usually is seen at juncture seasonal twigs with older stem; buds 5-7 mm., ovoid, stout, beaked,

reddish-brown, brighter than stem, shining, hirsute; stipules subpersistent, to 6 mm., circular or reniform, apex rounded, rarely obliquely acute, essentially entire, glands on margin and inner face, glaucous and glabrous outside, pubescent inside; petioles stout, 4-14 mm., usually yellow, sometimes red- or brown-tinged; pubescent at least in groove, sometimes with small apical glands; mature blades thick, firm, narrow to broad lanceolate, 7-19x1.5-4 cm., apex acute to acuminate, usually cuspidate, base rounded to obtuse, margin coarsely and shallowly glandular-serrulate (10 or less teeth per 1 cm.), somewhat revolute, above dark green, often dark bronze-greenish or reddish, highly burnished, contrasting with pale yellowish vein network, beneath densely glaucous, usually glabrous, sometimes pubescent at base and along midrib above; midrib and lateral veins prominent beneath; aments subprecocious to coetaneous, flexuous, 3-8(11) cm. long, male 1 cm., female 1.5 cm. wide, rachis more or less hirsute with short, straight hairs; peduncles 0.2-3 cm., usually yellow, hirsute; peduncle bracts 3 to 6, 1-6x0.5-2 cm., oblanceolate or obovate, apex rounded, apiculate, entire, at first dense pubescent beneath with long, appressed tawny hairs, quickly glabrous except for brief persistence at margin and particularly at apex, glaucous beneath; peduncle stipules frequent, to 2 mm., circular, gland-margined; at base of rachis an absciss layer sometimes occurs at oblique angle from first to second bract of peduncle, also (in both sexes) seen frequently in axil of top bract is a small hirsute bud which often produces a miniature vegetative shoot even before maturity of ament; flower-scale oblong, 2-3 mm. long, truncate or blunt, usually irregularly erose or dentate at apex, nerved, pale yellow, crinkly pilose both sides or glabrous outside; stamens 3 to

7, free, crinkly pilose on lower half; ovary and capsule lance-ovate, 4-5(6) mm. long, brown, glabrous; pedicels 1.5-2.5 mm., occasionally slightly hirsute; styles 0.1-0.2 mm. long, equaling the notched stigmas; male nectary, ventral gland pulvinate, twice wider than high, truncate, fleshy, encircling base of filaments as a sheath or cup to form 1 to 3 nipple- or rod-like lobes in dorsal position, tawny to dark brown, female 1 ventral, as in male, clasping $3/4$ of pedicel, brown.

S. laevigata occurs in Arizona, California, Nevada, Utah and N Baja California at altitudes from sea level to 1800 m.

In Nevada: Lincoln and Washoe Cos.

3. SALIX AMYGDALOIDES Andersson, Ofv. Sven. Vet.-Akad. Förh. 15: 114. 1855.

S. wrightii Anders., loc. cit. 15: 115. 1858.

S. nigra ssp. amygdaloides Anders., Sven. Vet.-Akad. Handl. 6: 21. 1867.

S. nigra var. amygdaloides Anders. in DC. Prodr. 16(2): 201. 1868.

S. amygdaloides var. wrightii (Anders.) Schn., Bot. Gaz. 65: 14. 1918.

S. amygdaloides forma pilosiuscula Schneider, J. Arn. Arb. 1: 11. 1919.

Erect shrub or tree, 3-12 m., yellowish-green in color effect, bark furrowed, brown to dark brown; twigs gray, the youngest yellow (drying blackish-brown or brown), glabrous except when very young; buds 2-4 mm., ovoid, acute, yellow, glabrous, shining; stipules on young shoots of flowering twigs none or minute and semi-ovate to reniform, glandular, quickly fugacious, on older growth none or reniform, glandular-serrate, apex round or occasionally obliquely acute, glands on inner face, outer face glaucous, rarely persistent and to 1 cm.; petioles

slender, twisted, 5-20 mm., yellow, often a few small glands at apex and occasionally pilose in groove; blades narrow to broad lanceolate, 5-12 (15) x 1-3 cm., apex long acuminate, caudate, often falcate, base acute to obtuse, margin finely glandular-serrulate, yellowish-green above, glaucous or glaucescent beneath, glabrous but occasionally puberulent on upper surface at base of midrib, very small vein islets distinct beneath; anthers coetaneous, slender, flexuous, lax-flowered, male yellow, 2-6 cm. long, female 3-8(10) cm.; peduncles blackish-brown (when dry), glabrous, 0.5-3(4) cm., bearing 3 to 5 bracts, 1-3 x 0.6-1.3 cm., oblanceolate to obovate, apex acute or obtuse, apiculate, margin entire or less often inconspicuously and shallowly serrate, usually crinkly white pubescent in petiole groove and sometimes puberulent on upper surface, especially along midrib, lower surface glaucescent to glaucous; absciss layer formed at base of rachis at oblique angle from first to second bract (sometimes evident before cleavage, especially in male, by yellow color and hairiness of rachis contrasting with blackish and glabrous peduncle), often not formed (especially in female), or bracts may wither and fall and the peduncle become deciduous by abscission at juncture with main stem; flower-scales lanceolate or ovate, apex mostly obtuse or round, sometimes truncate or acute, crisp-villose both sides, except for glabrous apex outside, pale brown or tawny, deciduous; stamens 3 to 7, filaments free, pilose on lower half; capsules lanceolate to ovate, 5-8 mm. long, glabrous; pedicels 1-2 mm., usually glabrous; style and stigmas 0.2-0.5 mm.; male nectary 2 (or more) lobed, the ventral pulvinate, tongue-shaped or truncate conical, fleshy, tawny or dark brown, 0.4 mm., the dorsal strap-shaped or rod-like, longer than the ventral, sometimes lobed, tawny, the

lateral lobes when present, rod-like and smaller, (frequently occurring in pairs in all four positions), joined at base to form distinct cup; female one ventral, quadrate, fleshy, dark brown, about 0.5 mm., with ear-like extensions clasping $3/4$ of pedicel base.

Widely distributed in southermost portions of Canada, from North Dakota to Texas and all States west, except California, and in most of the eastern States above Lat. 38° .

In Nevada: Churchill Co.

4. *SALIX NIGRA* Marshall, Arbust. Am. 139. 1785.

S. nigra var. *vallicola* Dudley in Abrams, Fl. Los Angeles 100. 1904.

S. vallicola (Dudl.) Britton, N. Am. Trees. 184. 1908.

S. gooddingii Ball, Bot. Gaz. 40: 376. 1905; 72: 227. 1921.

S. gooddingii var. *vallicola* (Dudl.) Ball, J. Wash. Acad. Sci. 40: 324. 1950. ined.

S. gooddingii var. *variabilis* Ball, *loc. cit.* 40: 324. 1950

Shrub to large tree, 2-18 (sometimes to 24) m., bark grayish to yellowish brown, rough, scaly and furrowed; twigs straight, slender, seasonal usually bright yellow, older yellowish-gray, gray or brownish, usually pubescent when young, older becoming glabrous, striated; buds 2-4 mm., pointed, yellow, gray, brownish to reddish, often contrasting with stem color, usually glabrous, sometimes hirsute, usually not shining; stipules to 8 mm., lanceolate or ovate to reniform, more or less excentrically acute toward petiole, glandular-dentate margins, and frequently with glands on inner surface, usually quickly deciduous but on shoots often conspicuous and persistent (although apparently not in Great Basin

region); petioles 0.3-1.5 cm., yellow to brown or reddish, often purple-tinged, pubescent but becoming glabrous excepting frequently the groove, with small pale, viscid glands at apex; blades narrowly to broadly lanceolate, 5-15x0.5-1.5 cm., often falcate, apex short- to (usually) long-acuminate, infrequently merely acute, base acute, obtuse or sometimes rounded, margins finely glandular-serrulate, deep green to yellowish-green both sides, pubescent but becoming glabrous or glabrate, midrib often pubescent and prominent beneath, yellowish, red-tinged or reddish; aments coetaneous, slender, cylindrical, somewhat flexuous, lax, 3-8 cm. long, rachis dense pubescent to sometimes glabrate, terminating usually glabrous peduncles, 0.5-6(8) cm. long, bearing 3 to 7, stipulate bracts, linear- or narrow-lanceolate, 1-5x0.3-1 cm. (male usually smaller than female), acute, apiculate, usually glandular serrulate, glabrous except at base, a miniature shoot often produced from axial bud of apical bract; flower-scale yellow or yellowish, narrow to broad oblanceolate or obovate, obtuse, rounded to truncate, nerved, entire or irregularly toothed, crisp-villose, especially inside, deciduous; stamens 4 to 7, filaments free, pilose lower half (or more); ovary and capsule brown, red or greenish, usually glabrous but infrequently more or less pubescent (S. gooddingii), ovate-conical, (3)4-7.5 mm., attenuate; pedicel (0.5)1-2 mm., commonly glabrous but sometimes more or less hirsute; style none to 0.3 mm., entire; stigmas 0.3-0.5 mm., divided; male nectary a more or less distinct saucer or cup surrounding the filaments, variously lobed but in general the ventral lobe larger, shield- or strap-shaped, the dorsal 1 to 3, rod-like, lateral protusions small and nipple-like, female 1 ventral, quadrate or rectangular with wing-like extensions clasping $\frac{3}{4}$ of

pedicel base.

S. nigra is widely distributed in the United States and occurs also in S Canada and N Mexico.

In Nevada: Churchill, Clark and Nye Cos.

S. gooddingii cannot be maintained as a taxon separate from S. nigra because an examination of specimens from widely separated localities reveals that none of the supposedly differentiating characters holds true.

In the Great Basin region, some plants retain the bright yellow color in older twigs, but in the same region the stem color of most specimens varies from light or dark gray, to blackish or reddish (including the Dudley and Ball types, Abrams 3256, Goodding 689, 719. US) and on this basis are indistinguishable from typical nigra. (Cfr. also Schneider's keys, J. Arn. Arb. 3: 91, 92, 98, 110. 1921.)

Standard references indicate that the stipules of S. nigra bear no glands on the inner surface but examination of a large series of specimens (from Connecticut, Indiana, Iowa, Kentucky, Maine, West Virginia and elsewhere) reveals that glands are present, especially in young stipules.

The occurrence of pubescent ovaries is merely an expression of variation within the taxon. Examples of pubescent pedicels and ovaries in S. nigra are seen in scattered examples from Alabama, Arkansas, Illinois, Indiana, Iowa, Kansas, Massachusetts, Oklahoma, Texas and elsewhere. Schneider, Bot. Gaz. 67: 47. 1919, states that "the glabrousness or pubescence of the ovaries, . . . cannot always be taken for a decisive taxonomic character."

5. *SALIX EXIGUA* Nuttall, N. Am. Sylva 1: 75. 1843.

S. nevadensis S. Wats., Am. Nat. 7: 302. 1873.

S. longifolia var. *exigua* (Nutt.) Bebb, Willows Calif. (preprint Brewer & Watson, Bot. Calif. 2:) 85. 1879.

S. fluviatilis var. *exigua* (Nutt.) Sargent, Silva N. Am. 9: 124. 1896.

S. exigua var. *virens* Rowlee, Bul. Torr. Bot. Club 27: 255. 1900.

S. stenophylla Rydb., loc. cit. 28: 271. 1901.

S. luteosericea Rydb. in Britt. Man. 316. 1901.

S. exigua var. *stenophylla* (Rydb.) Schn., Bot. Gaz. 65: 25. 1918.

S. exigua var. *nevadensis* (S. Wats.) Schn., loc. cit. 67: 331. 1919.

S. exigua var. *luteosericea* (Rydb.) Schn., loc. cit. 67: 334. 1919.

Shrub to small tree, 1-7 m.; young twigs yellow (color often obscured

ed by pubescence), older gray, pale to dark brown, sometimes reddish or blackish, at first often silvery pubescent, becoming glabrous and more or less lustrous; buds ovate, stout, obtuse, to 4 mm., keeled, brown, gray pubescent; stipules minute to rarely 5 mm., ovate to lanceolate, pubescent, sparsely glandular-toothed, quickly evanescent; petioles none or sometimes to 4 mm.; blades mostly linear-lanceolate or linear-elliptical to less often oblong-elliptical (in Nevada), often falcate, 2-10x0.2-1.5 cm., sharply acute both ends, apex aristate, margin entire or remotely and more or less irregularly spinulose-denticulate, opaque, grayish-green, young often silvery-white, older more or less dense, gray, appressed pubescent both sides, or glabrate to sometimes glabrous; aments coetaneous to serotinous, 1-4 cm. long, 1 to several on single peduncle; peduncle 0.5-3 cm., bracts 3 to 7, leaf-like, narrow linear or narrow linear-oblongate, acute, spinulose, 1-6x0.3-0.7 cm., entire or often

coarsely or irregularly spinulose-denticulate, gray pubescent both sides, stipules minute, ovate, glandular, quickly evanescent, (peduncle and bracts often much smaller in male); miniature shoot often produced from axial bud of apical bract; flower-scale ovate to lanceolate, sometimes obovate, acute to obtuse, occasionally erose, pale yellow, more or less pubescent with straight or crinkly silky hairs, deciduous; stamens 2, filaments free, pubescent on lower $1/2$ to $2/3$; ovaries densely to thinly sericeous or glabrous, capsules lanceolate, 4-6 mm. long, more or less glabrate to glabrous in age; pedicels none or to 1 mm. long, pubescent; styles none, stigmas 0.4-0.6 mm., divided; nectary glands (male) 2, the ventral usually shield- or jug-shaped, less frequently strap- or rod-like, sometimes irregularly lobed, ca. 1 mm. long, the dorsal usually smaller and rod-like, (female) 1 or 2, the ventral rectangular, quadrangular, broad ovate or bottle-shaped, sometimes irregularly lobed, the dorsal usually like that of male, rarely squarish or ovate or lobed. In both sexes the ventral and dorsal lobes are united at base to form a more or less distinct cup-like sheath. In the female the presence or absence of the dorsal gland varies from ament to ament or even in different parts of the same ament.

Occuring commonly in western portion of the United States and in S Canada, in a wide range of climates and elevations.

In Nevada it has been collected in every county except Esmeralda.

Although recognizing S. exigua as an exceedingly plastic and variable entity, C. R. Ball and C. Schneider endeavored to maintain a number of varieties as taxonomic units, even though both authors were aware that

they were dealing merely with extremes of variation. Schneider (Bot. Gaz. 65: 25) remarks that "In my opinion this species may be divided into several varieties which of course seem to be connected by intermediate forms"; also (Bot. Gaz. 67: 333) ". . . var. stenophylla is connected with the typical by numerous intermediates", (p. 334) "can hardly point out a good character by which to recognize this form [var. luteosericea]." Ball (Flora Texas 3: 385. 1961) states: "Separation of these varieties nevadensis and stenophylla from each other, and of both from S. exigua, always must be a somewhat arbitrary matter".

6. *SALIX LUTEA* Nuttall, N. Am. Sylva 1: 63. 1843.

S. cordata var. *watsoni* Bebb, Willows Calif. (preprint Brewer & Watson, Bot. Calif. 2:) 86. 1879.

S. cordata var. *lutea* Bebb, Gard. & For. 8: 473. 1895.

S. flava Rydb., Bul. Torr. Bot. Club 28: 273. 1901.

S. ormsbyensis v. Seem., *loc. cit.* 30: 635. 1903.

S. watsoni Rydb., *loc. cit.* 33: 137. 1906.

S. lutea var. *famelica* Ball, Bot. Gaz. 71: 426. 1921.

S. lutea var. *platyphylla* Ball, *loc. cit.* 71: 430. 1921.

S. lutea var. *watsonii* (Bebb) Jepson, Man. Fl. Pl. Calif. 266. 1923.

Shrub to small tree, 1-6 m. high, bark light gray; young twigs yellow, often drying brown to dark brown, 1-2 year yellowish, yellowish-gray, pale brownish or grayish, more or less shining and polished, glabrous or sometimes pubescent when young; buds yellowish, 5-7 mm. long, ovoid or lanceolate, keeled, acute, glabrous to rarely slightly pubescent, shining; stipules often coriaceous and subpersistent, to 8 mm., mostly circular or broad ovate, sometimes reniform, broad lanceolate or elliptical, apex rounded to rarely acute, entire to crenate or coarsely dentate, usually glandular on margin and inner face, especially at first, glaucous on outer face, glabrous, rarely slightly pubescent on inner face; petioles to 1.5 cm. long, yellow to reddish, slightly pubescent, especially in groove, to glabrous; blades coriaceous, 3-10x1-2.5 cm., lanceolate to broadly lanceolate, (when young often obovate, oblanceolate or at least broader above middle), apex mostly acute to sometimes acuminate, base rounded to obtuse, margin coarsely and shallowly crenulate-serrate (10 or less teeth per 1 cm.), rarely entire, marginal glands usually visible

only on young leaves, dull dark green above, glaucous beneath, glabrous; veins somewhat reticulate both sides in age; aments precocious, 2-4.5 cm., slightly curved, rachis white woolly; peduncle usually none or to 0.5 cm. (female rarely to 1 cm.), peduncle bracts 3 to 5, 0.6-2.5x0.3-0.8 cm., elliptic to oval, obtuse both ends, entire or obscurely crenulate, sometimes with a few whitish glands especially at first, glaucous beneath, soon glabrous, sometimes deciduous; flower-scale broad ovate or oblong, round or obtuse apex, brown or black, entire, more or less glabrate both sides, crinkly hairs mostly marginal and longer than scale; stamens 2, filaments glabrous, free or sometimes apparently $1/3$ united but actually only conglutinated and easily separated when wet; capsules lanceolate, 4-6 mm., glabrous, pedicel 1.5-3 mm., glabrous; style 0.5-1 mm., entire, stigma very short, notched or divided; nectary both sexes, 1 ventral gland, rod-like and cylindrical, sometimes flattened and oblong.

At elevations up to 2100 m., from the Rocky Mountain region westward, Nebraska, North and South Dakota and northward to Canada.

In Nevada: Elko, Humboldt, Lander, Lyon, Mineral, Nye, Ormsby, Washoe and White Pine Cos.

Examination of a large series of specimens (Ball Herbarium, NA) indicates that the varietal distinctions of famelica, platyphylla and watsonii are arbitrary and based on selected material. The var. famelica

is particularly dubious in that most of the specimens so-named by Ball, including the type (Ball 1304, US) do not correspond to the original description. In fact Ball, himself, seemed uncertain of its status. The var. platyphylla is not even a leaf form, and here again the type (Ball 1336, 3 sheets, US) does not agree with the original description. The conception of the var. watsonii apparently has been conditioned largely by the "grayish-white (pipe-clay)" color of the stems. Actually all gradations of color from yellow to the extreme whitish-gray occur throughout the range of the species. The paler shade is not confined to the Great Basin region as stated in various texts. Quite possibly this condition is due to sun-bleaching.

7. SALIX PSEUDOCORDATA (Anders.) Rydb., Colo. Agr. Exp. Sta. Bul. 100: 94. 1906.

S. novae-angliae ssp. pseudo-cordata Anders., Svensk. Vet.-Akad. Handl. 6: 161. 1867.

S. novae-angliae var. pseudo-cordata Anders. in DC. Prodr. 16(2): 253. 1868.

S. pseudomyrsinites Anders., as interpreted by Ball in Coulter & Nelson, New Man. Rocky Mt. Bot. 133. 1909.

Shrub, 1-5 m. high; bark brownish; youngest twigs often yellow, older chestnut, usually glabrous but occasionally retaining traces of juvenile pubescence, shining; buds ovate-lanceolate, acute or subacuminate, 3-7 mm. long, yellowish to chestnut, glabrous or thinly hirsute; stipules ovate or broad lanceolate, usually acute, to 7 mm. long, glandular on margin and inner surface, dentate or entire, glabrous or slightly pubescent; petioles 0.5-1 cm., yellow, usually pubescent, especially in

groove; blades coriaceous, 3-8x1-2.5 cm., elliptic-ob lanceolate, to elliptic-lanceolate, or oblanceolate to lanceolate, apex acute to short acuminate, base obtuse to subcordate, margin cartilaginous, finely or coarsely glandular-serrulate to subentire, green both sides or paler beneath, pubescent when unfolding but usually soon glabrous both sides, sometimes retaining scant traces especially along midrib; veins usually prominent both sides; aments coetaneous, male 1.5-3, female 1.5-4 cm. long, sessile or rarely on peduncle to 2-3 mm., basal bracts 2 to 4, elliptic to lanceolate, 0.8-1.5x0.3-0.7 cm., glandular-serrulate, deciduous; flower-scale broad ovate or broad lanceolate, mostly obtuse, dark brown or black, long crispy hairs inside, almost glabrous outside, persistent; stamens 2, filaments free, rarely slightly united at base, glabrous; capsule lanceolate, rostrate, 4-6 mm., glabrous, reddish; pedicel 1-2 mm., usually glabrous; style to 0.7 mm., stigmas 0.2 mm., entire to notched; nectary both sexes 1 ventral, strap- or flask-shaped.

At elevations of 2000-3000 m. in the Rockies of New Mexico, White Mts. of Arizona, Wasatch ranges of Utah and the Sierras of California, northward to Saskatchewan, Alberta and British Columbia.

In Nevada: Douglas, Elko, Humboldt, Lander, Mineral, Nye and White Pine Cos.

The juvenile sexual stages of this species have been confused in herbaria with those of S. eastwoodiae. They are distinguished by the following:

	<u>S. pseudocordata</u>	<u>S. eastwoodiae</u>
<u>Peduncle</u>	none or to 0.3 cm.	0.3 - 3 cm.
<u>Peduncle bracts</u>	gland-margined, serrulate	gland-margined, entire

<u>Filaments</u>	glabrous	often slightly pubescent
<u>Ovary</u>	glabrous	pubescent
<u>New leaves</u>	often brilliant red hairs	hairs not red

8. *SALIX LASIOLEPIS* Benth., Pl. Hartweg. 335. 1857.

S. bigelovii Torrey, Pac. R. R. Rep. 4: 139. 1857.

S. lasiolepis var. bigelovii (Torr.) Bebb, Willows Calif. (preprint Brewer & Wats., Bot. Calif. 2:) 86. 1879.

S. sandbergii Rydb., Bul. Torrey Bot. Club 39: 304. 1912.

S. boiseana A. Nels., Bot. Gaz. 54: 406. 1912.

S. lasiolepis var. sandbergii (Rydb.) Ball, J. Wash. Acad. Sci. 28: 448. 1938.

S. lasiolepis var. bracelinae Ball, loc. cit. 40: 331. 1950.

Shrub to tree, 2-12 m., bark grayish, shallowly furrowed; twigs usually light or dark brown or blackish, occasionally bright yellow when young, pubescent to puberulent, becoming glabrate or entirely glabrous in age, shining; buds stout, ovate, obtuse, light brown to sometimes blackish, 4-6 mm., pubescent to glabrous and shining; stipules on flowering twigs usually minute, glutinous and evanescent early in season, later ones broadly ovate to sublunate, to 6(10) mm., obtuse to rounded or acute, coriaceous, entire, pubescent, becoming glabrous, glaucous outer surface, glandular inner surface; petioles 0.2-1.7 cm., yellowish when young, later brownish or blackish, pubescent at first, becoming glabrous; blades coriaceous in age, 3.8-12x0.7-4 cm., mostly narrow to broad oblanceolate, to sometimes oblong or elliptic, apex acute, short acuminate or obtuse, base obtuse to acute or cuneate, margin revolute, entire

or irregularly denticulate, often repand, dark green or bronzed and usually shining above, paler and often glaucescent or glaucous beneath, thin to dense pubescent both surfaces when young, usually glabrous in age, especially above; midrib and veins yellow, conspicuous both sides, reticulate beneath; aments precocious, 2-4 cm. long, suberect, compactly cylindrical, rachis dense pubescent, sessile or female in fruit on densely pubescent peduncle to 1 cm., bracts basal, 3 to 6, scale-like, lanceolate, 5-10 mm., often involuted, dense shining tawny pubescent outside, brown and glabrous inside, deciduous; flower-scale obovate or subcircular to broad ovate, 1-1.2 mm., apex rounded, dark brown or black, sometimes paler below, dense white silky both sides, hairs straight and longer than scale; stamens 2, filaments glabrous, basally adherent (conglutinated) 1/3; capsule 3-5 mm., greenish, lanceolate, glabrous, pedicel 1-2.5(3) mm., glabrous; style 0.4-0.8 mm., entire or somewhat bifid, stigmas short, usually notched; nectary both sexes, 1 ventral gland, ca. 1 mm., light brownish, strap-shaped, broader at base, sometimes slightly capitate and curved toward flower axis.

Along watercourses from N Mexico to Arizona, New Mexico, Texas Utah and Idaho, and to California, Oregon and Washington.

In Nevada: Clark, Humboldt, Lander, Mineral, Nye, Ormsby, Storey and Washoe Cos.

The attempt to base the variety bracelinae principally on narrow leaves is unrealistic. The dimensions (6-10x0.8-1.5 cm.) given in the original description apparently are idealized and do not hold when a sufficient number of leaves are examined on different specimens. The leaves of some California collections cited by Ball as var. bracelinae

are 2.8 cm. wide! Ball, himself, (Flora Texas 3: 190. 1961) states that leaves of all these forms may be linear-oblongate if environmental conditions are unfavorable. In many sheets considered as var. typica by Ball, narrow to broad leaves can be found on the same branch, or even some where the lower half of a branch has narrow leaves while those of the upper half are broad, or reversely with broad leaves below and narrow ones above. Also in southern California where leaves are retained over winter, the old may be narrow while the new ones are broad. The capsules of var. bracelinae are supposed to average 1 mm. shorter than the typical but this is not borne out by the examination of 30 sheets of the latter.

In variety sandbergii the upper surface of the leaves is said to be "dull green (not shining)" but this is not true. The old leaves are not uniformly pubescent beneath; a careful examination indicates that the vesture varies from dense to slight or none, just as in many so-called typica sheets.

9. SALIX WOLFII Bebb in Wheeler, Rep. U. S. Geog. Surv. Bot.: 241. 1878.

S. wolfii var. idahoensis Ball, Bot. Gaz. 40: 378. 1905.

S. idahoensis (Ball) Rydb., Fl. Rocky Mts. 197. 1917.

A many-stemmed shrub 0.5-2 m. high; young twigs bright lemon yellow and silky villose, the older chestnut to dark brown, glabrous, shining; buds ovate, to 5 mm., blunt, dark brown or chestnut, shining, at first pubescent, then glabrous; stipules 1-5 mm., ovate or lanceolate, entire with a few marginal glands, greenish, pubescent; petioles stout, yellowish, villose; blades oblanceolate to sometimes elliptical, 2-7x0.8-2 cm., apex acute to sometimes obtuse, base mostly rounded or to cuneate,

margin entire, sometimes a few marginal glands at base or apex, dull green both sides, appressed silky hairs both sides, sometimes becoming glabrate, veins impressed above, prominent beneath, dark and reticulate both sides; aments coetaneous, male 0.5-2.5 cm., female 1-3.5 cm., globose or oblong, peduncles usually about 4 mm., peduncle bracts 2 to 5, elliptical, obtuse, 6-15 mm. long, entire, pubescent to glabrate, deciduous; flower-scales mostly obovate, rarely ovate, dark brown to blackish, rounded apex, straight silky hairs longer than scale, persistent; stamens 2, filaments free, glabrous; capsules lanceolate, 3.5-5(6) mm., thinly to densely appressed, gray pubescent, or glabrous except for base and pedicel (when present), pedicels none or to 0.5 mm. (rarely more), pubescent; style 0.5-1 mm., entire; stigmas ca. $1/3$ as long as style, entire to notched; nectary both sexes, 1 ventral, ca. 0.7 mm., strap-shaped, sometimes broader at base, truncate, pale brown, semi-fleshy.

Occurring from Colorado, Utah and Nevada, northward to Idaho, Oregon, Wyoming and Montana, at elevations of 1800 to 3600 m.

Typical S. wolfii is described as having glabrous ovaries and capsules, however a close examination of specimens shows that all are pubescent at the very base, as is the pedicel when present, and further that many bear a few hairs along the sides. Conversely in the var. idahoensis many ovaries display bald patches, usually toward the base. Schneider (J. Arn. Arb. 1:232) states that "After all the var. idahoensis hardly represents more than a vigorous variety of S. wolfii. On the other hand in S. wolfii the ovaries are not always entirely glabrous ...

.... ."

The dorsal nectary gland reported by Schneider for the male flowers of S. wolfii, occurs in the type specimen, but it was not found in any of the other specimens examined for the present study.

10. SALIX EASTWOODIAE Cockerell ex Heller, Cat. N. Am. Pl. ed. 3. 89. 1910.

S. californica Bebb, Willows Calif. (preprint Brewer & Wats., Bot. Calif. 2:) 89. 1879, not Lesquereux, 1878.

S. eastwoodiae forma callicoma Schn., J. Arn. Arb. 1: 164. 1920.

S. orestera Schn., loc. cit. 1: 164. 1920.

Shrub 0.2-4 m., seasonal twigs often yellowish, older reddish-brown or blackish, at first pubescent, becoming glabrous and shining, occasionally faintly pruinose; buds ovate, obtuse, stout, to 5 mm., color and vesture as in twigs; stipules ovate to sometimes lanceolate, obtuse to acute, to 5 mm., pubescent, marginal glands close-ranked, pale yellow, entire to sometimes toothed, fugacious; petioles yellowish, usually red- or brown-stained, 2-9(10) mm., pubescence as in blades; blades oblanceolate to elliptic, or lanceolate, 4-7x0.8-1.8 cm., apex mostly acute, sometimes cuspidate, base rounded to obtuse, rarely acute, margin entire or occasionally shallowly serrulate, marginal glands yellow, close-ranked and prominent but often obscured by pubescence, or deliquescent and disappearing with age, dull grayish both sides, but frequently paler or glaucescent beneath, both sides dense grayish appressed tomentose when young, more or less glabrate in age, midrib yellow to brown and prominent, veins more or less reticulate beneath; aments coetaneous, cylindrical, dense-flowered, male 1-3 cm., female 2-6 cm.; peduncle usually none or to 5 mm. (rarely to 1 cm. in female); peduncle bracts

3 to 5, mostly elliptic, or ovate to lanceolate, 0.8-4x0.3-1 cm., at first with straight, appressed silky hairs both sides, becoming glabrous in age, stipulate, both bracts and stipules typically with prominent, close-ranked marginal glands which often deliquesce and disappear; flower-scale light to dark brown or black, ovate, obtuse, 1-1.5 mm., pubescent both sides with straight silvery hairs longer than scale; stamens 2, filaments free, hairy below; capsules lance-rostrate, 5-7 mm., silvery or gray tomentose; pedicel 0.5-1 mm., pubescent; style ca. 1 mm., entire, stigmas ca. 0.3 mm., cleft or entire; nectary both sexes 1 ventral, flat, bottle-shaped or oblong, usually truncate, sometimes capitate, brownish.

S. eastwoodiae occurs primarily in the Sierra Nevada and Cascade mountains from California and Nevada to Washington, Oregon and Wyoming, at elevations of 1800 to 3600 m. or more.

In Nevada: Elko, Lander, Ormsby and Washoe Cos.

11. SALIX RETICULATA L., Sp. Pl. 2: 1018. 1753.

S. reticulata var. subrotunda Seringe, Essai Mon. Saules Suisse 29. 1815.

S. nivalis Hooker, Fl. Bor.-Am. 2: 152. 1839.

S. reticulata var. nana Anders., Ofv. Svensk. Vet.-Akad. Förh. 15: 133. 1858.

S. orbicularis Anders. in DC. Prod. 16(2): 301. 1868.

S. reticulata var. nivalis (Hook.) Anders., loc. cit. 16(2): 301. 1868.

S. saximontana Rydb., Bul. N. Y. Bot. Gard. 1: 261. 1899.

S. aemulans v. Seem., Bot. Jahrb. 29: Beibl. 65: 28. 1900.

S. nivalis var. saximontana (Rydb.) Schn., Bot. Gaz. 67: 47. 1919.

S. reticulata ssp. orbicularis (Anders.) Floderus, Arkiv. Bot. 20: 5. 1926.

S. reticulata var. orbicularis (Anders.) Komar., Fl. Pen. Kamtschat. 1: 331. 1927.

S. reticulata var. gigantifolia Ball, Proc. Nat. Acad. Sci. 21:185. 1935.

S. reticulata var. nivalis (Hook.) Kelso, Biol. Leaflet. 34: 11. 1946.

S. reticulata var. saximontana (Rydb.) Kelso, loc. cit. 34: 11. 1946.

Dwarf shrub, prostrate, creeping from buried stems, rooting, forming mats; leafy twigs erect to 10 cm., chestnut, slightly pubescent at first, soon glabrous, shining; buds 1 mm., ovoid, obtuse to rounded, slightly hirsute or glabrous, chestnut, shining, sometimes pruinose, old bud-scale often encircling new shoot; stipule reduced to minute, dark gland, fugacious or none; petiole to 2.5(3) (in Nevada 0.2-1) cm., channeled above, greenish to yellow, often purple-tinged, pubescent to glabrous; blades coriaceous and more or less rugose when mature, especially at lower elevations, dead leaves sometimes persisting from previous year, 0.5-5.5x1-5 (in Nevada 0.8-2.2x0.5-1.2) cm., mostly obovate, to oval or circular, apex rounded to blunt, rarely retuse or acute, base obtuse to roundish, often plicate, margin revolute, entire or with occasional marginal glands, rarely shallowly glandular-serrulate or -crenulate, (in Nevada only 2 dark glands at base), dull green, rarely shining above, paler to glaucous beneath, young leaves just emerging from bud, densely pubescent, especially beneath, with long silvery hairs, soon glabrous except for a few scattered hairs; veins deeply impressed above, prominent and reticulate beneath; aments coetaneous to serotinous, 0.5-5 (Nevada

0.5-1) cm. long, arising opposite last leaf, few- to many-flowered; extended rachis (not peduncle) about as long as flowering portion of ament, yellowish-green or yellowish, often reddish or purplish-tinged, pubescent to glabrous; flower-scale mostly broad ovate, to obovate and circular, apex obtuse to rounded or truncate, or sometimes retuse or toothed, base rounded to cuneate, greenish-yellow to straw color or brownish, often lavender-tinged or tipped, 3-nerved, glabrous outside except for margins, pubescent inside, persistent in fruit; stamens 2, filaments free, pubescent, yellowish to sometimes lavender-tinged at base; ovary greenish to sometimes purplish, capsule 3-5 mm., ovoid, silvery short-pubescent, yellow, reddish-brown to purplish; pedicel none or to 0.1 mm.; style none or to 0.5 mm., blackish, stigmas short, bifid, divergent, dark brown to black; nectary in both sexes an irregularly lobed, brownish cup, encircling base of sexual organs, typically with 2 ventral, horn-like lobes, 1 mm. high and 1 dorsal, usually lighter in color, smaller or even rudimentary and nipple-like.

Widely distributed in arctic and alpine regions of Europe and Asia, common in Alaska and Canada. In the United States it occurs at elevations of 2900 m. and above, from New Mexico, Colorado, Utah, Nevada and California to Oregon and Washington.

In Nevada: Elko Co.

Raup (Sargentia 4: 94. 1943) states: "The species is exceeding well-marked, and even though specimens could be found to represent various of the growth forms that have been described, I am inclined to agree with Polunin in disregarding them as of little taxonomic significance." Polunin (Nat. Mus. Canada Bul. 92. 1940) indicates that: "it

nevertheless shows in these characters a considerable range of variation . . . , with the result that numerous varieties and forms have been erected around it."

The small-leaved plants (so-called S. nivalis and the var. saximontana) of higher altitudes in the United States and Canada are not distinguishable from those of alpine regions of Europe.

Authors in general consider the support of the ament to be a peduncle but actually it is merely an extension of the rachis. This basal portion agrees in coloration and vesture with the upper portion which bears the flowers. There are no bracts as commonly seen in other taxa. In many *Salix* species the basal portion of the rachis bears no flowers and usually there is a difference in vesture and coloration between the rachis and the supporting peduncle. (See description under S. amygdaloides).

12. SALIX ARCTICA Pall., Fl. Ross. I, 2: 86. 1788.

S. arctica R. Br., in Bot. Ross Voy. Appl. 143. 1819.

S. anglorum Cham., Linnaea 6: 541. 1831.

S. petrophila Rydb., Bul. N. Y. Bot. Gard. 1: 268. 1899.

S. caespitosa Kenn., Muhlenbergia 7: 135. 1912.

S. anglorum var. antiplasta Sch., Bot. Gaz. 66: 134. 1918.

S. anglorum var. caespitosa (Kenn.) Schn., Bot. Gaz. 66: 136. 1919.

S. anglorum var. antiplasta fma. caespitosa (Kenn.) Ball, Am. Midland Nat. 43: 239. 1950.

Shrub, prostrate, creeping, more or less subterranean branches, rooting, forming mats 30-60 cm. diam.; foliage twigs ascending or running, up to 20 cm. long, slender, youngest yellow, becoming brownish to

reddish, thinly pubescent at first, quickly glabrous, dull or shining, sometimes faintly pruinose; buds lanceolate, 1.5-2 mm., obtuse, color and vesture as in twigs; stipules none or rare and minute; petioles none to 12 (in Nevada to 4) mm. long, channeled, yellow, more or less pubescent at first, quickly glabrous; blades firm, elliptic, ovate to obovate, 1.2-2.2x0.5-1.2 cm., apex acute to plicate-acute or obtuse, base acute, obtuse or rounded; margin slightly revolute, entire, rarely a few marginal glands at base; deep green above, paler to glaucous beneath, pubescent both sides at first, becoming glabrous; veins subimpressed above, prominent and more or less reticulate beneath; aments coetaneous, 1-3 cm., dense-flowered, peduncle 0.4-2 cm., yellowish, pubescent, peduncle bracts 3 to 5, leaf-like in shape and size; flower-scale broad ovate to obovate, entire, rounded or sometimes obtuse, rarely acute, 3-nerved, both sides with silky, straight hairs as long or longer than scale, brownish to black, persistent; stamens 2, filaments free, glabrous; ovary purplish, capsule ovate to ovate-lanceolate, 3-6 mm., pubescent, yellow to reddish, pedicel usually none or to 1 mm.; style 1-1.5 mm., usually entire, dark brown; stigmas 0.4-0.6, divided, dark brown; nectary in male usually 1 ventral gland, 1 mm., flat, strap- or flask-shaped, or oblong, truncate, brown, sometimes 1 dorsal but smaller or rudimentary and nipple-like; female 1 ventral, like the male.

Widespread in arctic regions of Asia, Europe and North America.

In the Rocky, Cascade and Wasatch mountains it occurs at altitudes between 2400 to 3600 m.

In Nevada: Elko and Washoe Cos.

13. *SALIX LEMMONII* Bebb, Willows Calif. (preprint Brewer & Wats., Bot. Calif. 2:) 1879.

S. austinae Bebb, loc. cit. 2: 88. 1879.

S. lemmonii var. *austinae* (Bebb) Schn., J. Arn. Arb. 2: 79. 1920.

Shrub 1-5 m.; young twigs yellowish, older brownish or black, at first sparsely pubescent but glabrous in age, shining, more or less pruinose; buds ovoid, stout, to 2 mm., blunt, colored as in twigs, usually pruinose, sometimes slightly hairy; stipules when present, to 7 mm., lanceolate, acuminate, glandular-serrulate, glaucous outside; petioles slender, 4-10 mm., yellow, often brown-stained, usually glabrous, except for sulcus; blades firm, mostly narrow oblanceolate, 2.8-8.5x0.4-1.5 cm., apex acute to acuminate, base acute to obtuse, margin entire or often shallowly and obscurely serrate (4-5 teeth per 1 cm.), dark green, often bronzed, shining above, glaucous beneath, young unfolding leaves often dense, appressed, brilliant red pubescent, becoming glabrous or glabrate with remnant red hairs, especially beneath, midrib brownish yellow both sides, tertiary veins dark and more or less reticulate beneath; aments precocious to coetaneous, dense-flowered, male 1-1.5 cm., female 1-3 cm. long by 1-1.5 cm. wide, rachis villose, peduncle none or to 0.5 cm., bracts 2 to 5, elliptic, 0.5-2x0.3-0.7 cm., entire, occasionally serrate, glabrous above, beneath at first with long tawny or red hairs, finally also glabrous, deciduous; flower-scale broad ovate, 2 mm., yellow at base, black or dark brown above, apex rounded or obtuse, silky, straight hairs both sides as long or longer than scale, persistent; stamens 2, filaments free, pubescent below; capsule lanceolate, long-rostrate, 5-9 mm., pubescence of appressed silvery hairs, sometimes glabrous at base,

pale reddish-brown or straw color; pedicel 1-2 mm., usually pubescent, reddish-brown; style 0.6-1.5 mm., slender, entire, brownish, stigmas 0.5 mm., slender, divided, brownish; nectary both sexes, 1 ventral gland, 0.5 mm., sub-fleshy, rectangular or rod-shaped, to wider at base and flask-shaped, truncate, pale brownish.

Along streams from California, New Mexico and Idaho to Oregon at elevations from 1060 to 3050 m.

In Nevada: Douglas, Elko, Humboldt, Ormsby and Washoe Cos.

14. *SALIX DRUMMONDIANA* Barratt in Hook. Fl. Bor.-Am. 2: 144. 1838.

S. pellita Anders., Svensk. Vet.-Akad. Handl. 6: 137. 1867.

S. bella Piper, Bul. Torrey Bot. Club 27: 399. 1900.

S. subcoerules Piper, loc. cit. 27: 400. 1900.

S. covillei Eastwood, Zoe 5: 80. 1900.

S. pachnophora Rydb., Bul. Torrey Bot. Club 31: 403. 1904.

S. drummondiana var. bella (Piper) Ball, Am. Midl. Nat. 45: 743. 1951.

S. drummondiana var. subcoerulea (Piper) Ball, loc. cit. 45: 744. 1951.

Erect shrub 1-4 m., young twigs light or yellowish-brown, older dark brown to blackish, at first puberulent, soon glabrous, usually conspicuously glaucous; buds 3-7 mm., lanceolate, obtuse or acute, pubescent when young but soon glabrous, pruinose as stems or becoming shining; stipules 2-3 mm. long, usually narrow lanceolate, acute, vesture as in leaves, entire with marginal glands, soon deciduous; petioles 0.3-1 cm., brownish, pubescent at least in sulcus; blades 3-7.5x0.8-1.8 cm. (in Nevada), mostly elliptic but often oblanceolate, apex acute, acuminate

to sometimes obtuse, base acute or occasionally obtuse; margin revolute, entire, rarely slightly crenulate, sometimes with inconspicuous marginal glands; dark green above, glaucous beneath but concealed by hairs, above thin silvery pubescent, beneath permanently dense silvery tomentose; veins above impressed and more or less reticulate, beneath midrib yellowish to brownish, prominent, as are laterals obscured by vestiture; aments precocious, cylindrical, dense-flowered, male 1.5-3 cm., female 2-6 mm.; peduncles none or to 5 mm., (female rarely to 8 mm.), peduncle bracts 2 to 3, scale-like, lanceolate, 0.4-1 cm. long, usually obscured by dense pubescence of rachis, glabrous inside, usually quickly deciduous, or persisting and to 2 cm. long; flower-scale ovate, oblong or obovate, acute to obtuse, straight silky hairs both sides as long or longer than scale, entire, black or dark brown, persisting; stamens 2, young anthers reddish to lavender, filaments free (sometimes adhering $1/3$ but not fused), glabrous; capsule ovate-lanceolate, 4-5 mm., dense silvery, appressed pubescent, pedicel none or to 1 mm., style 0.5-1 mm., entire, brownish, stigmas 0.5, entire, (often the flowers of either sex are pendent on the rachis in the entire ament or at least in lower half); nectary both sexes 1 ventral, fleshy, rod-like or flat and ribbon-shaped, sometimes wider at base, 1 mm., pale yellow.

Along streams and moist meadows from foothills at 900 m. to mountains at 3000 m., in the Rocky Mountains from New Mexico to Canada and across northern United States to the Atlantic.

In Nevada: Elko and Nye Cos. Infrequent, there being only 4 collections known.

15. *SALIX PLANIFOLIA* Pursh, Fl. Am. Sept. 2: 611. 1814.

S. chlorophylla Anders., Svensk. Vet.-Akad. Handl. 6: 138. 1867.
(in part).

S. monica Bebb, Willows Calif. (preprint Brewer & Wats. Bot. Calif. 2:) 90. 1879.

S. nelsonii Ball, Bot. Gaz. 40: 379. 1905.

S. planifolia var. *monica* (Bebb) Schn., J. Arn. Arb. 1: 78. 1919.

S. phylicifolia var. *monica* (Bebb) Jeps., Man. Fl. Pl. Calif. 265. 1923.

S. chlorophylla var. *monica* (Bebb) Flod., Ark. Bot. 29A(18): 33. 1939.

S. chlorophylla var. *nelsonii* (Ball) Ball in Fraser & Russell, Plants Saskatchewan 23. 1944.

S. phylicifolia ssp. *planifolia* (Pursh) Hiitonen, Mem. Soc. Faun. Fl. Fennica 25: 82. 1950.

Shrub, 0.3 m. (in Nevada); twigs cherry red (in Nevada) to dark purplish, very slightly puberulent at first, soon glabrous, glaucous, usually shining; buds lanceolate, obtuse to acute, 3-4 mm., concolor with stem, pubescent to glabrous; stipules none or ovate, dot-like, or to narrow lanceolate and 4 mm. long, hairy and gland-margined, soon drying and deciduous; petioles 2-8(10) mm., yellow or reddish-stained, winged, glabrous; blades leathery or coriaceous, 2-6x0.8-2.5 (Nevada 2.5-3.5x1-1.5) cm., mostly elliptic to elliptic obovate, apex acute to sometimes obtuse, base acute to obtuse, or sometimes rounded, margin revolute, entire, dark green and subshining above, glaucous beneath; young unfolding leaves with dense pubescence of mixed silvery and rufous hairs, usually glabrous by maturity; veins impressed above, prominent beneath, brownish and reticulate both sides; aments precocious, stout, globose or cylindrical, dense-flowered, male 1.5-3(4), female to 6 cm. in fruit;

peduncles none or rarely to 2 mm., with 2 to 4 scale-like bracts, narrow elliptic, to 5 mm., dense pubescence of long tawny hairs outside, glabrous inside, soon deciduous; flower-scale ovate, acute to obtuse, black or dark brown, with dense, straight tawny hairs both sides, longer than scale, persistent; stamens 2, filaments free, glabrous; capsule lanceolate, 4-6 mm., usually reddish, with dense silvery, appressed pubescence, pedicels usually none or to 0.5 mm.; style 1-2 mm., usually entire, pubescent at base, brownish; stigmas 0.5-0.7 mm., usually entire, brownish; nectary of both sexes, 1 ventral gland, rod-like (sometimes thin, papery), 0.5-1 mm., brownish.

Widely distributed in a variety of habitats, at elevations from 1800 to 4000 m., from Canada to California, New Mexico, Colorado and across northern States to New England.

In Nevada: Elko Co., the single collection (Train 4640) came from shores of Robinson Lake, where the plant formed dense thickets.

The Nevada specimen was considered to be the var. monica by Ball but extensive comparison of material from the entire range indicates that no reasonable separation from the typical planifolia is possible. In many Canadian collections of S. planifolia the leaf measurements fall within the supposed limits for the var. monica. In fact there are a number of sheets in the Ball Herbarium (NA) with uniformly small leaves on lower half of stems, and large ones on the upper. A composite from four sheets shows the lower ones to be 1.7-4.5x0.5-1.8 cm. (= var. monica), while the upper ones are 3.8-6.2x1.5-2.2 cm. (= planifolia typica). Even Schneider, in making the new combination, S. planifolia var. monica, stated that S. monica is nothing but the dwarfed high alpine form of S. planifolia.

16. *SALIX SITCHENSIS* Sanson in Bong. Mém. Acad. St. Pertersb. VI, 2:162. 1831.

S. coulteri Anders., Öfv. Svensk. Vet.-Akad. Förh. 15: 119. 1858.

S. sitchensis var. *congesta* Anders. in DC. Prodr. 16(2); 233. 1868.

S. sitchensis var. *denudata* Anders., loc. cit. 16(2): 233. 1868.

S. sitchensis var. *angustifolia* Bebb. Willows Calif. (preprint Brewer & Wats. Bot. Calif. 2:) 87. 1879.

S. sitchensis forma *coulteri* (Anders.) Jeps., Fl. Calif. 1: 342. 1909.

S. jepsonii Schn., J. Arn. Arb. 1: 89. 1919.

S. sitchensis var. *coulteri* Jeps., Man. Fl. Pl. Calif. 265. 1923.

Shrub to small tree, 1-6 m., smooth gray bark; twigs deep chestnut to dark purplish, young more or less dense grayish tomentose, usually persisting to second year; buds stout, 2-6 mm., ovoid to lanceolate, blunt, concolor with stem, hirsute to glabrous; stipules ovate or lanceolate, with marginal glands, to 5 mm. on flowering stems or on older growth to 13 mm., and more or less persistent; petiole 0.5-1.5 cm., yellowish-brown or purplish, pubescent; blades thick and firm to coriaceous, oblanceolate, elliptic or obovate, 2-10(16)x0.6-4.5(6) cm., apex obtuse to acute, base cuneate to obtuse, margin revolute, entire or occasionally crenulate, marginal glands more or less evenly spaced, often obscured by pubescence or inrolled margin, dark green above, gray or white and apparently glaucous beneath but obscured by vestiture, upper surface moderately puberulent, lower surface densely lanate to velutinous, felt-like with satiny sheen; veins impressed above, prominent beneath, yellowish-brown both sides; aments coetaneous to sporadically serotinous, dense-flowered, cylindrical, male 1-5(6) cm., female 2-12(14) cm.;

peduncles usually none or rarely to 1.5 cm., peduncle bracts 2 to 7, oblanceolate to elliptic or lanceolate, exceptionally to 3 cm. long, marginal glands and vestiture as in vegetative leaves, deciduous; flower-scale obovate, spatulate, oblong or ovate, obtuse to rounded, 1.5-2 mm., tawny straight hairs both sides as long as scale, tawny when young, often lavender-tipped, older with upper half dark brown, persistent; stamens usually 1, or at times 1 to 2 mixed in same ament, young anthers lavender-tipped, filaments free, glabrous or slightly hirsute; capsules ovoid-conic, 4-6 mm., dense, short, silvery pubescent, straw color, pedicel none or to 1 mm., pubescent; style 0.5-1.3 mm., usually entire, stigmas 0.2-0.3 mm., usually entire, purplish; nectary both sexes 1 ventral gland, ca. 1 mm., thin, scale- or rod-like, or wider at base and bottle-shaped, slightly fleshy, concave dorsally, pale brownish.

Ranging from Alaska, British Columbia and Alberta, southward to Washington, Oregon, California, Idaho and W Nevada, at elevations from sea level to 2800 m.

In Nevada only two collections, Churchill and Washoe Cos.

17. *SALIX SCOULERIANA* Barratt in Hook. Fl. Bor.-Am. 2: 145. 1839.

S. flavescens Nutt., N. Am. Sylva 1: 65. 1843.

S. stagnalis Nutt., loc. cit. 1: 66. 1843.

S. brachystachys Benth., Pl. Hartw. 336. 1857.

S. capreoides Anders., Öfv. Svensk. Vet.-Akad. Förh. 15: 120. 1858.

S. brachystachys var. *scouleriana* Anders. in DC. Prodr. 16(2): 224. 1868.

S. flavescens var. *scouleriana* (Anders.) Bebb, Bot. Gaz. 7: 129. 1882.

S. flavescens var. capreoides (Anders.) Bebb, Gard. & For. 8: 373. 1895.

S. nuttallii Sarg., loc. cit. 8: 463. 1895.

S. nuttallii var. capreoides (Anders.) Sarg., loc. cit. 8: 463. 1895.

S. scouleriana var. brachystachys (Benth.) M. E. Jones, Willow Fam. 15. 1908.

S. scouleriana var. flavescens (Nutt.) Henry, Fl. So. B. C. 98. 1915.

S. scouleriana var. poikilia Schn., J. Arn. Arb. 2: 12. 1920.

S. scouleriana forma poikilia Schn., loc. cit. 3: 76. 1922.

S. scouleriana var. coetanea Ball, J. Wash. Acad. Sci. 24: 73. 1934.

S. scouleriana var. thompsonii Ball, loc. cit. 24: 75. 1934.

Shrub to tree, 1-15 m., dark dull gray, fissured; twigs when young yellowish or yellowish-brown, becoming reddish-brown or black, densely hirsute when young, often persisting to usually lesser degree on older twigs; buds lanceolate, 3-7 mm., obtuse to acute, color and vesture as in twigs; stipules to 6 mm., (on shoots to 2 cm.), lanceolate, irregularly toothed or crenulate, with marginal glands, hirsute both sides to glabrous, glaucous outside, deciduous; petioles 0.5-1 cm., yellow, pubescent; blades thick, firm, oblanceolate (spatulate), obovate to elliptic, 3-11.5x1-4.5 cm., first leaves commonly and characteristically arranged fan-like on short twigs, apex rounded, obtuse to sharply acute, base mostly cuneate, sometimes obtuse or rounded; margin revolute, entire with inconspicuous marginal glands to coarsely glandular-crenulate or -dentate, dark bronzed-green above, glaucous beneath, young unfolding leaves usually densely pubescent with mixed silvery and red hairs, above

soon glabrate or glabrous, beneath more or less glabrate and normally the red or rusty hairs persistent; veins pale greenish-yellow both sides, midrib and laterals prominent beneath; aments precocious, occasionally coetaneous or even sporadically serotinous, dense-flowered, male 1-4 cm., female 2-7 cm.; peduncle usually none but occasionally to 0.5 cm. in male and to 1.5 cm. in female; peduncle bracts 3 to 7, commonly scale-like, oblanceolate, 4-5 mm. long, with dense, long silky white or golden hairs outside, glabrous and brown inside; flower-scale elliptic to ovate, 2-3 mm., obtuse to rounded, rarely acute, dark brown to black, pubescent both sides, straight silky hairs usually longer than scale, persistent; stamens 2, filaments free, slightly pilose to glabrous; capsule slender lanceolate, long-beaked, 5-9 mm., often purplish-tinged, dense and permanent pubescence of appressed silvery hairs; pedicel 1.5-2 mm., pubescent, often purplish; style 0.2-0.5 mm., pubescent, stigmas slender, 0.5-1 mm., erect to spreading, entire to bifid; nectary both sexes 1 ventral gland, flattened, oblong, 0.5-1 mm., 2 to 3 times higher than wide, or quadrate, truncate, fleshy, yellowish to dark brown.

Occurring over a wide range from New Mexico to California and northward to Alaska and Canada, at elevations from sea level to 3000 m.

In Nevada: Douglas, Elko, Ormsby and Washoe Cos.

18. *SALIX BEBBIANA* Sargent, Gard. & For. 8: 463. 1895.

S. rostrata Richards., App. Frankl. Jour. 753. 1823, not Thuiller, 1799.

S. perrostrata Rydb., Bul. N. Y. Bot. Gard. 2: 163. 1901.

S. rostrata var. *perrostrata* (Rydb.) Fern., Rhodora 16: 177. 1914.

S. bebbiana var. perrostrata (Rydb.) Schn., J. Arn. Arb. 2: 71. 1920.

Much-branched shrub or sometimes tree, 0.6-8 m., bark gray or brown, furrowed; young twigs greenish or greenish-yellow, becoming reddish-brown or brownish, sometimes shining, pubescence thin or dense and often persisting on older stems, occasionally with traces of glaucosity; buds lanceolate, flat, blunt, yellowish or red-tinged, to 5 mm., pubescent; stipules on flowering twigs minute, ovate, glandular-dentate, pubescent, on older stems to 10 mm., usually broad ovate, sometimes reniform or asymmetrically lanceolate, acute, irregularly glandular-dentate, pubescent, glaucous outside, soon deciduous; petioles 2-10 mm., yellowish, red-tinged or brownish, usually dense pubescent; blades membranous, elliptic to oblanceolate, 1.5-8x0.5-3 cm., apex mostly abruptly acute to obtuse, or sometimes acute to short acuminate, base usually obtuse or rounded, sometimes acute; margin sub-revolute, mostly entire with scattered marginal glands but frequently irregularly glandular crenate-dentate, dull dark green above, paler and more or less glaucous beneath; pubescence varying from thin to dense both sides, more or less persistent; veins impressed above, prominent and often strongly reticulate beneath; aments precocious to coetaneous, male dense-flowered, yellow, 1-2.5(3) cm., female lax-flowered, 2-5(6) cm.; male peduncle none to 0.5 cm., female 0.3 to rarely 1.5 cm.; peduncle bracts 3 to 7, male scale-like, 2-12 mm., elliptic, pubescent outside, glabrous inside, female elliptic, 0.5-3 cm., entire, becoming more or less glabrate, stipulate, glaucous beneath, finally deciduous; flower-scale mostly linear-oblong or -lanceolate, occasionally ovate, obtuse to acute, 1-3 mm., sparsely to densely pilose, hairs shorter than scale, yellowish or pale

brown, sometimes red- or purplish-tipped, persistent; stamens 2, filaments free, more or less pilose at base (or occasionally glabrous in same ament); capsules 7-10 mm., narrow lanceolate, long-beaked, tightly coiled old capsules give a characteristic whorled appearance to ament, short silvery pubescent; pedicels 2-4(5) mm., pubescent; style short, commonly 0.2 mm., sometimes none, pale greenish to brownish, stigmas 0.5-1 mm., usually 4-parted, dark brown; nectary gland 1 ventral both sexes, pale brown, male ca. 0.6 mm., usually rod-like, fleshy, female usually flattened, quadrate, 0.4-0.5 mm.

Ranging from Canada and Alaska, to most of northern and western United States (except California), at elevations from sea level to 2800 m.

In Nevada: Elko, Lander and White Pine Cos.

19. SALIX GEYERIANA Anders., Öfv. Svensk. Vet.-Akad. Förh. 15: 122. 1858.

S. macrocarpa Nuttall, N. Am. Sylva 1: 67. 1842, not Trautvetter, 1832.

S. macrocarpa var. argentea Bebb, Bot. Gaz. 10: 223. 1885.

S. geyeriana var. argentea (Bebb) Schn., J. Arn. Arb. 2: 74. 1920.

Shrub to small tree 1-5 m., bark brown to grayish black, shallowly striate; young twigs brownish, becoming chestnut or blackish, usually dense pubescent at first, becoming glabrous, or sometimes persistent on 1-yr. stems, shining, pruinose; buds lanceolate to ovate, acute to sharp-pointed, stout, 3-4 mm., pubescent, pale brown, pruinose; stipules rare, minute, glandular, hairy and often obscured by stem pubescence, quickly deciduous; petioles 2-7 mm., brownish, pubescent; blades mostly narrow oblanceolate, 2.5-7x0.6-1.5 cm., apex acute to short acuminate, base

acute to obtuse; margin revolute, entire or rarely a few scattered teeth, dark green above, glaucous beneath, more or less pubescent both sides with fine, appressed silvery hairs (often difficult to see except by reflected light), frequently with intermixed rusty hairs, especially beneath; veins almost plane both sides; aments coetaneous, numerous, subglobose, male usually 1 cm. or less, occasionally to 1.5 cm., female 1-2 cm., peduncle in male none or rarely to 0.4 cm., female 0.5-1 cm.; peduncle bracts 2 to 5, linear-lanceolate or elliptic-oblong, acute to obtuse, 0.5-1 cm., entire, long tawny appressed hairs beneath, above glabrous; female (0.5) 1-2(3) cm., otherwise as in male; flower-scale obovate, oblong to ovate, margin often revolute, 1.2-2x0.8-1 mm., tawny to pale brown (or greenish), male often pale lavender to purplish-black-tipped, apex rounded to obtuse, usually dense pubescent outside and thin inside, or sometimes glabrate both sides, hairs shorter than scale; stamens 2, filaments free, dense hairy at base; capsule rostrate from conic base, 4-7 mm., dense appressed short pubescent; pedicel 1-2.5 mm., stout, pubescent; style mostly none or to 0.2 mm., stigmas 0.2, divided, brown; nectary both sexes 1 ventral gland, tongue-shaped, 0.8 mm., pale olive or pale brown, sometimes red-tipped.

Meadows and streambanks in the Cascades, Rocky Mountains and Sierra Nevada from Colorado, Arizona and California northward to S British Columbia.

In Nevada: Douglas, Elko, Esmeralda, Humboldt, Lyon, Mineral and Washoe Cos.

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