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REVISION OF AMERICAN WILLOWS. 1: CORDATAE.

BY

Carleton R. Ball

(Unpublished)

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(*) Undescribed willows section Cordatae. Bot. Gaz. 71. 1921.

(**) New or little known west Amer. willows. U. Calif. Pub. Bot. 17. 1934.

REVISION OF AMERICAN WILLOWS. 1: CORDATAE.

By

CARLETON R. BALL.

INTRODUCTION.

Much attention has been given to the taxonomy of American willows in recent years. It has been confined almost entirely, however, to the describing of new species and the shifting of names. Only one author has attempted to classify all the spe-

✓ Rowlee, W.W. North American Willows, 1. Longifoliae. Bull. Torr. Bot. Club 27:247-257, pl. 9, May, 1900.

cies of even a single section of the genus. In the present paper the writer keys, describes, discusses, and cites herbarium material of the 22 species in the section Cordatae.

It is a pleasure to acknowledge here the courteous assistance rendered by many botanists throughout the United States. Especially ~~7~~ thanks are given to Dr. C.F. Millspaugh and associates at the Field Museum, where the Bebb Herbarium is owned; to Dr. B.L. Robinson and Prof. M.L. Fernald, of the Gray Herbarium; Prof. Aven Nelson, of the Rocky Mountain Herbarium; Dr. L.H. Pammel of the Iowa State Herbarium; and to Dr. J.N. Rose and Mr. W.R. Maxon, of the National Herbarium, for the loan of material and for other kindly courtesies.

The letters in parenthesis used in the citation of specimens are initials of herbaria in which the cited material has been examined. The herbaria are as follows:

B = herb. C.R. Ball; C = herb. Canadian Geological Survey; F = herb. Field Museum; Fbb = herb. Bebbianum of the Field Museum; Fs = herb. U.S. Forest Service; I = herb. Iowa State College; N = U.S. National Herbarium; R = Rocky Mountain Herbarium; and U = herb. Utah Agricultural College.

HABITAT AND VALUE.

The section Cordatae as here discussed contains 22 species. With one exception, namely the section Arcticae, it is by far the largest section in the genus. It has probably a wider distribution in North America than any other section. Its representatives are found from the Atlantic to the Pacific and from Mexico to Alaska and Labrador. In altitude, it ranges from sea level to elevations of 12,000 feet and over in the Sierra Nevada.

The species of this section are characteristic of stream banks, ditch banks, wet meadows and low seepy ground. In such situations, they are frequently the dominant arborescent vegetation. This is especially true in the mountain valleys of the Great Basin Region, west of the Rockies. Here the dark green ribbon of Cordatae fringing streams and irrigation ditches contrasts strikingly with the usual silvery gray of the sandbar willows, of the section Longifoliae. On wet or marshy flats, they

may form dense jungles, often difficult to penetrate. Usually, however, they occur as more or less scattered clumps, dotted here and there at random on the open valley floor.

In general they are not species of high altitudes. Ranging from sea level on the Atlantic Coast, they occur commonly to elevations of 2000 meters (6000- 7000 feet) in the southern Rocky, Wahsatch and Sierra Nevada systems. Above that level they become gradually less common and mostly disappear at 2,500 meters (7500- 8000 feet). Only S. monticola ranges abundantly above that level.

ECONOMIC VALUE.

Digitized by  These willows have only a small economic value. In size, the species vary from about a decimeter (4 inches) or so in height (S. pseudo-cordata cordata) to trees 7 or 8 meters (25 to 27 feet) in height, (S. cordata, missouriensis, lutea, mackenziana, etc. In the states of the northern and central Great Plains area, cordata, missouriensis and lutea are used for ~~staples~~ and posts. In the Rocky Mountains and westward, several species furnish considerable browse for cattle and to some extent for sheep also. The larger species, lutea, mackenziana and pseudocordata, are of some value for poles and posts.

BIBLIOGRAPHY

Salix cordata subsp. angustata var. vitellina Anders., Monog. Sal.
189, 1867;-- Anders., in D. C. Prod. 163: 282, 1868.

Salix cordata var. lutea (Nutt) Bebb, Gard. & For. 8:473, 1895;--

Salix cordata var. watsoni Bebb, Willows of California 86, 1879 (Re-
printed in advance from Brewer and Watson, Bot. Calif. 2: 86, 1890);-- Jepson,
Fl. Calif. 341, 1909;-- Ball in Coult. & Nels. New Man. Rocky Mtn. Bot. 132, 1909

Salix flav Rydberg, Bull. Torr. Bot. Club 28: 273, May, 1901 (non
Schlecht., 1796).

Salix lutea Nuttall, No. Am. Sylva 1: 63, pl. 12, 1842;-- Rydb., Cat.
Fl. Mont. 110, 1900;-- Rydb., in Britt., Man. Fl. So. St. & Can. 315, 1901;--

Ball, in Coult. & Nels., New Man. Rocky Mtn. Bot. 132, 1909;-- Rydb., in Britt.

Fl. Mont. 110, 1900;-- Rydb., in Britt., Man. Fl. So. St. & Can. 315, 1901;--

also inseparable from S. cordata. Western Nebraska to Assiniboia).

Salix watsoni (Bebb) Rydberg, Bull. Torr. Bot. Club 33: 137, 1906;--
Rydb., Fl. Colo. 94, 1906.

DESCRIPTION

A caespitose shrub 3- 6 m. high; bark light gray; twigs yellow; leaf blades lanceolate to ovate lanceolate, subentire, stipulate, light green; glaucous beneath; aments subsessile, short; capsules 4- 5.5 mm. long, glabrous; pedicels 1- 2 mm. long (1.5- 3 mm. long in variety famelica Ball); styles about 0.4 mm. long.

A shrub or small tree, usually densely caespitose, 3- 6 m. tall; bark light gray, to almost white in very dry situations, branchlets mostly slender, viginate, under dry conditions shorter and more divaricate, yellow-gray, those of the season mostly bright yellow, or reddish brown on the sunny side, glabrous, usually shining; buds mid-sized, 4- 8 mm. long, lanceolate or ovate-lanceolate, mostly acute; ~~leaves~~ ^{leaves} orange-yellow, usually glabrous, occasionally puberulent or pubescent.

Leaves mid-sized to large, stipulate; stipules reiform to lunate and obtuse, or semicardate and acute, 5- 12 mm. long, entire to crenulate or serrulate, glabrous, colored as the blades; petioles slender, 8- 15 mm. long, yellow to brownish, glabrous or puberulent; blades lanceolate to ovate-lanceolate, or oblanceolate while expanding, the lower often obovate, rounded or rarely subcordate at the base, acute or cuspidate-acuminate at the apex of the broader ^{basal} leaf; acuminate to long-acuminate at the apex of narrower forms, subentire or shallowly glandular serrulate, or ~~co~~ ^{fin}rate-serrulate, 4- 8 cm. long, 1.5- 2.5 cm. wide, light green above, glaucous to very glaucous beneath, glabrous, or thinly puberulous when young, coriaceous and reticulate on both surfaces in age; sprout leaves 12- 20 cm. long, 2- 5 cm. wide, when shaded thin and only subglaucous, often sharply serrate, otherwise normal.

^e Aments slightly precocious or coetaneous with the leaves, subsessile; pistillate peduncle 3- 6 mm. long, pubescent, bearing 2- 3 small leaf-like bracts

pistillate aments rather small, 2- 4.5 cm. long, scarcely more than 1.4 cm. wide, capsules 4- 5 or 6 mm. long, lanceolate, acutish to rounded at base; ^{apex} pedicel slender, glabrous, 1- 2 or 2.5 mm. long; scales oblong, obtuse, to oblong-lanceolate and acutish, 1- 1.3 mm. long, tawny, drying brown, clothed thinly above and densely beneath with tangled white hairs; style 0.3- 0.5 mm. long, entire or occasionally notched or somewhat divided; stigmas notched or entire.

Staminate aments mostly precocious, sessile, subtended by one or two scale-like bracts, slender, 2- 3 or 4 cm. long, 1 cm. wide; stamens², filaments glabrous, usually free,

NOTES

The center of distribution for Salix lutea is the Wasatch mountain system. From this axis it spreads eastward into the Rocky Mts. as far as the Black Hills and down the rivers onto the plains of the Dakotas and the Canadian Provinces. Here it meets and perhaps passes the outpost positions of S. cordata. In the Wasatch it comes first in contact with S. mackenziana and together they occupy the States north and west of Utah.

This species is a typical and sometimes a dominant feature of the landscape in the Great Basin area. Along every cañon stream and bordering both streams and irrigation ditches in the valleys, its clustered stems form clumps, borders, and groves. Wherever cattle are grazed these clumps are kept well trimmed, at the base. Its altitudinal range lies between 900 and 2000 meters or thereabouts. Above that elevation it is replaced in part by Salix pseudomacrinata ^{cordata}

(Anderss.) ^{Ball*} At its usual levels it is accompanied by S. bebbiana Sarg., S. fendleriana And., and Populus angustifolia James, and in part of its range by S. mackenziana (Hook) Barr., S. exigua Nutt., and S. ~~var.~~ monochroma Ball.

From S. cordata it is distinguished by its yellow twigs, yellowish, acute or short-acuminate subentire leaves, and usually shorter aments and capsules. From S. mackenziana it is separated by its yellower twigs, more oblanceolate mature leaves, shorter pedicels and usually free filaments. S. lutea var. platyphylla is less readily distinguished from mackenziana as its pedicels are longer than those of lutea.

mostly var. watsoni - C.B.

5 *lutea*

SPECIMENS EXAMINED.

CALIFORNIA. Southern Calif., C. C. Parry 1, 1881 (Fb 3587, I); -- San Bernardino Mts.: Bear Valley, alt. 6,000 ft. S. B. Parish 1786, June, 1886 (Fb); between Bear Valley and Bluff Lake, alt. 7,000 ft., Parish 3187, June 22, 1894 (N); -- Inyo Co., foot hills west of Bishop, alt. 5,000 ft., A. A. Heller 8327, May 23, 1906 (as S. caudata) (N); White Mts., Wyman Creek, I. Tidestrom 9891, June 13, 1919 (B); -- Sierra Co., Sierra Valley, J. G. Lemmon (Fb 3694); -- Modoc Co., Pitt R., Alturas, elev. 4,400 ft., B. C. Goldsmith 2, April 23, 1910 (B, F, S).

NEVADA. Mineral Co., along river, Sweetwater, elev. 1,860 m., I. Tidestrom 10165, July 1, 1919 (B); -- Ormsby Co., Empire City, M. E. Jones 4077, May 20, 1882 (B, N); -- Washoe Co., Reno, road to Experiment Station, C. R. Ball 1726, July 1, 1911 (B, N); Franktown, elev. 5,000 ft., A. A. Heller 10392, June 28, 1909 (N); -- probably Washoe Co., Truckee Valley, alt. 4,500 ft., Sereno Watson 1096, July, 1867 (N, type of S. cordata watsoni = var. *platyphylla* Ball); -- no locality, Lieut. Wheeler, 1872 (N); -- Humboldt Co., 30 mi. west of Quinn R. crossing, which is 75 mi. north of Winnemucca, Griffiths and Morris 320, July 28, 1901; Elko Co., Star Canon, S. E. of Deeth, elev. 5,600 ft., A. A. Heller 10571, July 10, 1912 (N).

ARIZONA. Navajo Co., Moki Indian Reservation, W. Hough 6, Aug. 1-Sept. 5, 1897 (N); Myrtle Zuck, Aug. 22, 1897 (N). From appearances, these two specimens were taken from the same plant at the same time. Both were distributed as S. nigra wrightii.

UTAH. SOUTHERN AND CENTRAL. Kane Co., Three Lakes, north of Kanab, I. Tidestrom 2417, July 9, 1909 (B); -- (Cedar City, Iron Co.,) alt. 6,000 ft., M. E. Jones 5204p) May 10, 1894 (N); Marysville, Piute Co., Mt. Belknap, E. D. Ball 1764, June 22, 1912 (B, N); -- Vaca, Sevier Co., alt. 5,500 ft.,

1c. Salix lutea var. Watsoni ^{Bebb)} Jepson

Salix cordata var. *Watsoni* Bebb, Willows of California, 86. 1879 (Preprint with same pagination from Brewer and Watson, Bot. Calif. 2:86. 1880); Jepson, Fl. Calif., 341. 1909; Ball in Coulter and Nelson, New Man. Rocky Mtn. Bot., 132. 1909 (so far as it refers to the far western plant.)

Salix flava Rydberg, in Bull. Torr. Bot. Club 28:273. 1901 (only as to the citation of Watson's Nevada collection).

Salix lutea Nuttall (in part), of Ball in Abrams, Fl. Pac. States 1:494. 1923, and of other authors (by citation of Bebb's varietal name and far western distribution).

Salix lutea var. *Watsoni* (Bebb) Jepson, Man. Flow. Fl. Calif., 266. 1923 (not 1925).

Salix ormsbyensis von Seemen, in Bull. Torr. Bot. Club 30:635-36. 1903.

Salix Watsoni (Bebb) Rydberg, in Bull. Torr. Bot. Club 33:137. 1906.

This variety has not achieved general recognition, for several reasons. It was included by Rydberg, the type collection being cited, under his *S. flava*, a name which was immediately recognized as a homonym and discarded, and the species so named was a synonym of *S. lutea*. It then was raised to specific rank by Rydberg, and the action realized to be unwarranted. It was not separated from *S. lutea* by Ball in Abrams' Flora of the Pacific States in 1923, nor by Schneider (Jour. Arnold Arbor. 2:191, 1921) in 1921. And, finally, when Jepson combined it as a variety of *S. lutea* in the same year, it was done in a manual instead of a journal and hence not so widely recognized.

Bebb, more than 60 years ago, recognized the characters which separate his variety from typical *S. lutea*, even though he considered *S. lutea* to be conspecific with the Eastern *S. cordata*. He described *Watsoni* as: "Diffusely branched, the short and divaricate -- branches very smooth and polished; leaves smaller, oblong, short-acuminate, 1-2 inches long, serrulate or nearly entire;...." Although the type was a rather extreme representative, the peculiar short, polished, divaricate branchlets, often resembling pipe clay, and the small, shallowly-serrulate to entire leaves, still separate the variety from *S. lutea*. Jepson adds that the pedicels are $\frac{1}{2}$ - $\frac{3}{4}$ lines (1-3.5mm.) long. Those of *S. lutea* are only 1-2 mm. long.

Watson's collection from "near Carson City" (Nevada), being cited first by Bebb, who named his variety for its collector, must be regarded as the type. It was collected by Sereno Watson as No. 1097 at Unionville, Nevada, in 1868, as cited by Rydberg under his *S. flava*. The holotype presumably is in the Bebb Herbarium at the Field Museum and an isotype is in the U. S. National Herbarium.

The variety is restricted to the western part of the Great Basin and the southern Sierran plateau. Specimens examined are listed below, the additional herbariums cited being those of the Nevada University (NU), and its Agricultural Experiment Station (NES).

2 SALIX MACKENZIANA variety MACROGEMMA Ball.

Salix mackenziana variety macrogemma ^{Ball,} in Piper and Beattie, Fl. N. W. Coast, 116, Nov., 1915.

Branchlets densely pubescent-tomentose with gray hairs; buds elongated, 10-16 mm. long, lanceolate, acuminate, densely pilose-tomentose with long gray hairs; petioles and basal portion of midrib on upper surface pubescent, otherwise much as in the species.

The leaves in the type are ovate, shorter and broader than the normal, distinctly cordate at the base and abruptly acuminate at the apex.

The range is throughout the Willamette Valley of Oregon, and the Puget Sound section of Washington and adjacent British Columbia.

SPECIMENS EXAMINED.

OREGON. Willamette River Valley: Lane Co., Eugene, R. V. Bradshaw 1335, May 1 and Aug. 25, 1920 (B); 1436, May 1 and Aug. 20, 1920 (B); -- Benton Co., Corvallis, clump of trees 3-4 in. in diameter, C. R. Ball 1981, June 9, 1915 (B, N); -- Portland, L. F. Henderson (Feb 6233).

WASHINGTON. Cowlitz Co.: West's ranch, Lewis R., F. A. Walpole 34, July 29, 1898 (N); North fork of Lewis R., F. V. Coville 717, 718, July 16, 1898 (N); -- Tacoma, J. B. Flett 1880, May 3, June 14, 1901 (B, N); -- Seattle, Piper and Smith 559, March 27, April 11, May 9, and Sept. 12, 1889 (B, type, Feb 6892-6896, N); --

BRITISH COLUMBIA. vicinity of Victoria, Vancouver Id., John Macoun 76769, 76790 and 76793, May 4, May 2, and April 25, 1908 (B)..

4 SALIX PSEUDO-CORDATA (Andersson) Rydberg.

BIBLIOGRAPHY.

Salix novae-angliae subspecies pseudo-cordata Anderss.,
Monog. Sal. 161, 1867.

Salix novae-angliae var. pseudo-cordata Anderss., in
DC., Prod. 16²: 253, 1868; Bebb, in Coulter, Man. Bot. Rocky Mtn.
Reg. 336, 1885; Macoun, Cat. Can. Pl. 1: 452, 1886.

Salix pseudo-cordata (Anderss.) Rydb., Fl. Colo. (Colo.
Expt. Stat. Bull. 100:) 94, 1906. Salix pseudo-myrsinites

Salix pseudo-myrsinites Andersson, as interpreted by
Ball, in Coulter and Nelson, New Man. Rocky Mtn. Bot., 1909.

133,

DESCRIPTION.

Midsized shrub; branchlets stoutish, mostly divaricate, reddish-brown, glabrous, shining; leaves stipulate, lanceolate to somewhat oblanceolate, 3-8 cm. long, 1-3 cm. wide, acute, rounded at the base, coriaceous, glandular-serrulate, green and glabrous on both sides; aments appearing with the leaves; pistillate 2-4 cm. long; capsules 4-6 mm. long, glabrous; style about 0.5 mm. long; pedicel 1-1.5 mm. long usually pubescent; scales long, light brown, drying black, thinly pilose; staminate aments 1.5-2 cm. long, stamens 2, filaments glabrous, free.

Shrub with clustered stems 1-3 or 4 m. high; branchlets mostly divaricate or subvirgate, slender to medium stout, yellowish to reddish, the older reddish gray, those of the season often bright yellow, all glabrous (or occasionally pubescent); shining, and full of bud scars, bud scales large, ovate-lanceolate, acute, 4-9 mm. long, glabrous, yellow, mostly drying black.

Leaves medium sized, concolorous, stipulate; stipules ovate or semicordate, acute, 3-10 mm. long, glandular-serrulate; petioles stoutish to rather slender, 4-6 mm. long, or 8-10 mm. on sprout leaves, yellow or reddish-brown, sparsely pubescent, becoming glabrate or glabrous; blades lanceolate, oblong-lanceolate or somewhat oblanceolate, acute to short-acuminate at the apex, rounded to subcordate at the base, 1-3 cm. wide, 3-8 cm. long on the fruiting branches, commonly averaging 1 by 3-4, 1.2-1.5 by 4-5, and 1.8-2 by 6-7, and 2-3 by 8 cm., thick, coriaceous, margins cartilaginous, closely glandular-serrulate or crenulate-serrulate, dark yellowish green above, pale but pure green, sometimes somewhat leaden beneath, glabrous or somewhat thinly pubescent-tomentose, mostly thick and firm, coarsely to rather finely reticulate

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1 with broadish veins on both sides, especially beneath, the leaves of luxuriant sprouts thinner and much larger, 3-3.5 by 6 or 7, or 3-3.5 by 8-10 cm., rounded or subcordate at the base, acute or short-acuminate at the apex (somewhat resembling the foliage of S. ligulifolia ? Ball).

Aments appearing with the leaves, on woolly peduncles 3-12 mm. long and bearing 2-4 small leaves 5-15 mm. long; pistillate aments 2-4 cm. long, 1 cm. wide, fairly compact; capsules lanceolate, 4-6 (usually 5) mm. long, glabrous, somewhat rufescent; pedicels 1-1.5 mm. long, slender, usually pubescent, especially near the capsule, but becoming glabrous; styles medium to slender, 0.4-0.7 mm. long, entire; stigmas short, entire or notched; scales in both sexes 1-1.5 mm. long, oblong-elliptical or oblanceolate, obtuse or acutish, drying black, long-villous on the inside, nearly glabrous on the outer surface.

Staminate aments short-pedunculate, 1.5-2 cm. long, stamens 2, filaments glabrous, free; scales as in the pistillate ament.

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NOTES

Salix pseudo-cordata, as here interpreted, ranges from Saskatchewan and the mountains of Alberta and British Columbia south to the Uinta and Wahsatch systems of Utah and the Cascade Mts. of Oregon. In its variety cordata it is found still farther south, in the Rocky Mts. of New Mexico, the White Mts. of Arizona, and the Sierras of central California. The species is a plant of mountain streams at middle elevations. In the southern part of its range it occurs at altitudes of 6,500 to 10,000 feet. It is seldom if ever found in the broad open valleys, which there vary in elevation from 4,500 to 6,000 feet. Farther north it occurs at successively lower levels, as the height of the base level decreases.

Flowering specimens may be found from the middle or latter part of May until well along in June. Specimens were found in (second?) flower on August 8, 1913, at Bend, Oregon.

In character, it stands somewhat intermediate between laetifolia and myrtillifolia. From the former it is separated by having smaller and thicker leaves and shorter pedicels. From the latter species it may be distinguished by its thicker, longer, lighter green leaves, coarsely reticulate with stout veins.

Andersson's treatment of the forms here included in pseudo-cordata and those referred to myrtillifolia is fully discussed under the latter species. So also is the conclusion reached by Bebb and Fernald regarding the validity of the species.

mark-
Engelmann?

SPECIMENS EXAMINED.

SASKATCHEWAN. In a bog, Bare Hills, west of Eagle Creek, Macoun and Herriot (C 70260), July 31, 1906 (B); -- an ample rounded bush, about 8 ft. high, along McFarlane Creek, Macdonnell, Lat. 53°0, J. C. Blumer 5108, Aug. 29, 1913 (B).

ALBERTA. Jasper Park, boggy shore of Pyramid Lake, J. M. Macoun (C 95755) June 20, 1918, and (C 95773) July 9, 1918 (B); -- Banff: Rocky Mts., near Banff, W. M. Canby (?) 10, July 24, 1895 (Fb 117731); by the Spray R., J. Macoun 37 (C 18867), July 1, 1891 (Fb); beside the aspen drive, Edith M. Farr 535, May 31, 535a, Aug. 31, 1905 (B); vicinity of Banff, N. B. Sanson 44, 71 (?), 77, 102, 104, 105, 106, 118, 158, 191, 192, 193, 199, 205, 206, 208, 219, 225, 227, 258, 261, 308, 333, 344, 356, 416, 417, 2054, 2073, 2103, 2176, June to Aug., 1911; 503, 506, 510, 513, 516, 518, 528, 529, 2159, 2198, 2199, June 19-Aug. 19, 1912 (B, RMP); -- The Gap, Crow Nest Pass, Rocky Mts., J. Macoun 36, (C 94438) Aug. 14, 1897 (B).

BRITISH COLUMBIA. Valley of Fraser R., J. Macoun 22, May 28, 1875 (Fb); -- Kamanskis, thickets in the foothills, J. Macoun 14, June 22, 1888 (Fb);

WASHINGTON. Kittitas Co., head of Cook Creek, Wenatchee Mts., F. V. Coville 1175, Sept. 3, 1901 (N); Wenatchee Mts., Coville 1176, Sept. 4, 1901 (N); -- Cascade Mts., alt. 4,000 ft., Frank Tweedy, July, 1882 (Fb); -- Pullman, C. V. Piper 1773 (in part), 1893 (B,); Piper 3598, May 13, 1898 (N).

OREGON. In swamp of East Eagle, Willows Mts., alt. 4,000 ft., W. C. Cusick 3164, June 6, Aug. 17, 1907 (B, N); -- Harney Co., on Calamity Creek, 15 miles from Drewsey, Griffiths and Morris 824, Aug. 20, 1901 (B); -- Crook Co., on Little Deschutes R., about 1 mile north of Pengra, Coville and Applegate 537, Aug. 14, 1897 (N); on Deschutes R., one half

mile above Bend, C. R. Ball 1801, 1802, 1803, 1804, Aug. 8, 1915 (B, N); --
N. E. of Prineville, Cabin Sta., Oshoco Nat. Forest, elev. 3,620 ft., D.
C. Ingram 337, 338, May 7, 1916 (B, Fs); ~~DO~~ Sherman Co., Grass Valley, D.
R. Ball 2013, June 30, 1915 (B).

MONTANA. Little Rocky Mts., V. Harvard 2 (Fb); -- Glacier Natl. Park,
vicinity of Glacier Park Station, alt. 1,440-1,530 m., P. C. Standley 14958,
14970, July 5 (B, N); 17645, Aug. 15 (N); along ^{near} Ape~~ek~~ Creek, P. C. Stand-
ley 15293, July 9, 1919 (B, N); vicinity of Mary Chalets, foot of St. Mary
Lake, alt. 1,350 m., P. C. Standley 17365, Aug. 8, 1919 (N); Columbia
Falls, R. S. Williams 971, June 5, 1893 (N); -- Valley of Nevada Creek,
W. M. Canby 1, July 12, 1883 (Fb); -- Helena Nat. For., G. H. Lamb 1,
1911 (B, Fs); -- Deer Lodge Valley, alt. about 5,000 ft., J. W. Blankin-
ship 790, May 27, 1906 (B, N); Deer Lodge, ~~Pamper~~ and Dodgeon 17, Aug.
14, 1905 (B, N); -- Bozeman, edge of town near Fair Grounds, C. R. Ball
1306, Sept. 3, 1908 (B, N); -- Madison Co., ten miles east of Monida, A.
Nelson 5446, June 18, 1899 (B, N); -- Beaverhead Co., Lima, C. L. Shear 3422,
June 29, 1895 (N).

IDAHO. Custer (or Lemlai) Co., Challis Nat. Forest, alt. 1,830 m.,
I. Tidestrom 1948, Sept. 18, 1908 (B); -- Custer Co., Salmon R. Mts., near
Bonanza, alt. 7,500 ft., ^{Mack} ~~W~~ride & Payson 3439, July 25, 1916 (N); -- Blaine
Co., (?) Sawtooth Nat. Forest, Big Smoky Ranger-Station, Woods & Tidestrom
2605, July 30, 1909 (B); -- Blaine Co., Warm Creek, 4 miles south of Ketchum,
L. F. Henderson 3396, July 23, 1895 (N); near Bailey, C. H. Woods 243, Aug.
1910 (B, Fs); Arco, along Lost R., E. Palmer 175, June 18, 1893 (N); -- Fre-
mont Co., Spencer, along Little Dry Creek, H. J. Rust 536, June 15, 1916 (N); --
Teton Co., Teton Basin, near Victor, E. D. Merrill 365, Aug. 22, 1900 (B, N); --
Power Co., Bannock River, at bridge near

Aug 6,

1915 (B, N); -- Bannock Co., Johnson Ranger Station, Timber Creek, elev. 1900-2000 m., W. W. Eggleston 9952, Sept. 2-11, 1913 (N).

WYOMING. Yellowstone Nat'l. Park: Electric Park, 8,500 ft. alt., E. C. S. 111, July 26, 1902 (N, S. wolfii on same sheet); E. A. Mearns 4517, Sept. 24, 1902 (N); Mammoth Hot Springs, F. Tweedy 483, June, 1881 (N).

UTAH. Logan Canon, alt. about 7,000 ft., Logan, C. R. Ball 1862, Aug. 18, 1914 (B, N); -- Weber R., Peterson, alt. 6,500 ft., Pammel and Blackwood 3901, July 22, 1902 (B, I); -- Uinta Mtns., H. D. Langille 110, 1902 (B, N); -- Utah Co., alt. 1,500 m., Thistle Jct., I. Tidestrom 2058, May 11, 1909 (N); -- Sanpete Co., Aspen zone, alt. 2,400 m., Ephraim Canon, I. Tidestrom 298, Aug. 21, 1907 (B); -- Piute Co., Mt. Belknap, Marysville, E. D. Ball 1765, June 22, 1912 (B, N).

NEVADA. White Pine Co., Berry Creek, Shell Creek Range near Ely, I. Tidestrom 11081, Aug. 23, 1919 (B); -- ^{Lander} ~~Ely~~ Co., Toiyabe Range, Kingston Canon, elev. 2,040 m., I. Tidestrom 10836, Aug. 6, 1919 (B); Big Creek, elev. 2,400 m., I. Tidestrom 10865, Aug. 7, 1919 (B); -- Washoe Co., Reno, Riverside Park, elev. 4,500 ft., A. A. Heller 9700a, May 26, 1909 (B, I).

The NV
Spec. is
57, Ely
Washoe
see my paper

CALIFORNIA. Shasta Co., Poison Valley, headwaters of Hat Creek, 2,200 m. elev., W. W. Eggleston 7469, Aug. 2-5, 1911 (N).

Ball Sect. Cord. - Revision

4a SALIX PSEUDOCORDATA variety CORDATA (Anderss.) ~~Ball~~ n. comb.

BIBLIOGRAPHY.

Salix novae-angliae subspecies 1. pseudomyrsinites variety α . cordata Anderss. Monog. Sal. 161, 1867.

Salix novae-angliae variety $\times$ pseudomyrsinites forma 1, cordata Anderss., in DC. Prod. 16²: 252, 1868.

DESCRIPTION.

Low erect or ascending leafy shrub 3-10 (or more?) dm.

Digitized by Hunt Institute for Botanical Documentation
Stems darkened and striate; bark smooth or slightly scaly, mostly crooked and divaricate, full of bud scars, dark brown, somewhat shining, glabrous or the younger pubescent-tomentose;

Leaves small, short-petiolate, sparingly stipulate; stipules wanting, or minute, glandular; petioles stout, usually pubescent, 2-6 mm. long; blades narrowly to broadly elliptic-lanceolate or oblanceolate, ^{to obovate,} mostly obtuse, rounded to subcordate at the base, 2-4 or 5 cm. long, 1-2 cm. wide, firm, finely and shallowly serrulate or crenulate-serrulate, green, to yellowish green on both sides, but paler beneath, often darkening somewhat in drying, often thinly tomentose above, especially at the basal end and along the midrib.

Aments 1-2 cm. long; peduncles 2-8 mm. long, bearing 2-5 small leaves 8-15 mm. long; capsule 4-5 mm. long; pedicel about 0.5 mm. long, mostly pubescent; other characters as in the species.

NOTES.

The habitat given by Andersson is "in Rocky mountains: Drummond (Hb. Hook.) et Bourgeau." The number of Drummond's specimen is not given nor is any annotation by which it may be recognized. The description, though brief, is clear and indicates a plant with small, very broad, mostly obtuse leaves, half as wide as long, sharply serrulate and more or less reticulate. The specimens here included answer this description quite fully.

The type of Andersson's subspecies pseudomyrsinites is Douglas' plant from the "Grand rapids of the Saskatchewan", which is referable to S. myrtillofolia ^{Andersson} ~~variety lingulata~~. The mountain forms here described seem more closely related to the plant here recognized as a separate species, pseudocordata, and therefore ~~is~~ ^{are} transferred to the latter. a

For a discussion of the nomenclatorial problems, the reader is referred to the treatment of S. myrtillofolia.

This variety is found at middle to high elevations from the mountains of Alberta southward to the Sierra Nevada of central California, and the higher peaks of the Wasatch in Utah, the Rockies in New Mexico, and the White Mts. of Arizona. Two specimens from the Athabasca plains also are placed here. The Sierra Nevada specimens of Jepson are very small and apparently the entire plant was but a few inches high. The leaves are narrower than in most of the specimens from high altitudes.

SPECIMENS EXAMINED.

Athabasca Plains, J. Macoun 11 and 13, Sept. 17 and 14, 1872 (FBb), ~~1872 (FBb)~~ (BRITISH COLUMBIA. Kicking Horse Pass, J. Macoun 35, June 21, 1887 (FBb).

ALBERTA. Banff: low ground along Cave Avenue, 2 ft. high, (alt. 4500 ft., W. C. McCalla 2243, May 31, June 27, 1899 (N));-- by the Spray River, J. Macoun 37, July 1, 1891 (FBb, C, 18867);-- Cave and Basin, J. Macoun 39, July 7, 1891 (FBb).

WASHINGTON. Wet places, Mt. Adams (Paddo), W. N. Suksdorf 28, July 31, 1883 (FBb).

IDAHO. Shoshone Co., divide between St. Joe and Clearwater Rivers, wet mountain meadows, alt. 1600 m., J. B. Leiberg 1245, July 11, 1895 (N).

MONTANA. Bald Mt., S. W. Mont., alt. 7-8000 ft., S. Watson 372 a, July 21, 1880 (FBb, a fragment and drawing by Bebb).

WYOMING. Big Horn Mts., head of Big Goose Creek, F. Tweedy 62, July 15-24, 1893 (FBb).

COLORADO. Routt Co., alt. 6700 ft., R. B. Weaver 144, July 16, 1914 (B).

UTAH. Sanpete Co., Six-mile canyon near Ephraim, spruce zone, alt. 2700 m., I. Tidestrom 1491, July 11, 1908 (B);-- Iron Co., Louder Ranger Sta., Brian Head Dist., Sevier Forest, alt. 3000-3200 m., W. W. Eggleston 8435, July 16, 1912 (B).

CALIFORNIA. Siskiyou Co., Medicine Lake, alt. 6500 ft., dwarf, scarcely 1 ft. high, Milo S. Baker, Aug. 8, 1893 (Greene);-- head of Lost Creek, Sawtooth Range, alt. 10,100 ft., W. L. Jepson 4992, July 9, 1912 (B);-- Whitney Creek, near Mt. Whitney, alt. 10,500 ft., W. L. Jepson 5051, July 20, 1912 (B);-- Kern Nat'l. For., alt. 11,000 ft., scattering in wet meadows and on stream banks, W. J. Rushing 14-13, July 7,

1913 (E,F8).

ARIZONA. White Mts.: Thompson's Ranch, Black River, L. N.
Goodding 575, July 13, 1910 (N); In crevices, head of Little Colorado
R., L. N. Goodding 1153, July 10, 1912 (N).

NEW MEXICO. Pecos Baldy, near Sante Fe, alt. 11000 ft. Ver-
non Bailey / 661, July 29, 1903 (N); alt. 11,600 ft. ^{Bailey} 660, Aug. 14, 1903
(N).

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sect. Cordatae - revision

? S. PSEUDOCORDATA VAR. EQUALIS (Anderss.) Ball, n. comb.
1

BIBLIOGRAPHY.

Salix novae-angliae, subsp. pseudomyrsinites, variety aequalis Andersson, Monog. Sal. 161, 1867.

Salix novae-angliae variety pseudo-myrsinites forma aequalis Anderss., in DC., Prod. 16²: 753, 1868.

DESCRIPTION.

Mostly a low shrub, 0.7-2 or 3 meters high, or sometimes taller; branchlets brown or yellowish-brown; leaves small to medium, petioles 3-6 mm. long, yellowish, pubescent or glabrate; stipules wanting or small, ovate, acute; blades oblanceolate or elliptic-lanceolate, acute to short-acuminate, 2.5-5 or 6 cm. long, 6-15 or 20 mm. wide, entire or remotely and minutely serrulate, firm, deep green on both sides, discoloring in drying, glabrous or very thinly overspread with tangled gray hairs, veins scarcely evident.

Aments short, 1.5-2.5 cm. long, on short pubescent peduncles 5-10 mm. long, and bearing 1-3 small leaves nearly equalling the ament; rachis densely villous; capsule slender, 4-5 mm. long, glabrous, often reddish; pedicel 1.5-2 mm. long; style 0.5-0.7 mm. long; stigmas entire or bifid; scales oblong-lanceolate, thinly villous or nearly naked at the apex outside.

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NOTES.

This variety is intermediate in size and character between pseudocordata and S. wolffii Bebb. From the former it is separated by the smaller entire and scarcely reticulate, mostly oblanceolate leaves, and shorter but longer-peduncled aments. From wolffii it is distinguished by larger glabrous or glabrate leaves, longer-pedicelled capsules and rather shorter styles.

Variety aequalis is a shrub of wet meadows and stream banks at middle elevations from the Uinta Mts. of Utah north to the Yellowstone Park and the Big Horn Mts. in Wyoming and the Selkirks in Alberta, and westward to the Cascade Mts. in Oregon. It is seen to occupy the central part of the territory covered by the species, pseudocordata, and its variety cordata. Flowering occurs during late May and ^{through} ~~A~~ June.

regina

pseudosordata aequalis
SPECIMENS EXAMINED.

ALBERTA. By the Bow River, Banff, J. Macoun 36, June 26, 1891 (Fbb).

Paulina Mts.

OREGON. Crook Co., in crater at shore of West Lake, alt. 2100 m., J. B. Leiberger 579, July 29, 1894 (Fbb, N);-- low shrub, 0.5-1 m., wet meadows, Diamond Lake, alt. 2500 m., Douglas Co., J. B. Leiberger 4295, July 16, 1899 (N);-- a dwarf shrub of wet soil, highest Stein's Mts., W. C. Cusick 2009 (in part, as S. barclayi), July 5, 1898 (N).

IDAHO. Arco, E. Palmer 175, June 18, 1893 (Fbb).

WYOMING. Yellowstone Nat. Park: East De Lacy's Creek, alt. 7500 ft., Rydberg and Bessey 3916 (as S. chlorophylla), Aug. 10, 1897 (N); Golden Gate, in dense clumps on creek banks, 3-5 ft. high, A. and E. Nelson 5549, June 28, 1899 (cited by Rydberg under his S. padifolia) (N); 3-6 ft. high, in clumps on creek bottoms, Obsidian Creek, A. and E. Nelson 6070, July 23, 1899 (N); no locality, E. A. Mearns 1832, July 13, 1902 (N); bank of Glen Creek, Swan Lake Valley, F. H. Knowlton, July 6, 1888 (Fbb);-- above Big Horn, Sheridan Co., alt. 7500 ft., Pammel and Stanton 222, June 25, 1897 (B, I);-- Boulder Creek, west side of Wind River Mts., A. Nelson 1122, Aug. 26, 1894 (N);-- Little Sandy River near ~~of~~ Leckie, Merrill and Wilcox 592, June 23, 1901 (B, N);-- along the creek, Kennerer, Uinta Co., A. Nelson 7175, 7178, June 13, 1900 (B).

UTAH. Logan cañon, alt. about 7000 ft., near Logan, C. R. Fall 1861, Aug. 18, 1914 (B, N);-- Wintah Mts.: In springy places, alkali soil, alt. 7000 ft., Black's Fork, Pammel and others 814, Aug. 4, 1901 (B, I); Dryer (Dyer) Mines, L. N. Goodding 1227, July 2, 1902 (B, N).

NEVADA. Pole Creek, Burnt Timber Mts., alt. 7500 ft., Nelson and Macbride 2065, July 15, 1912 (N).

5. Salix farrae Ball

Salix farrae Ball, in P. C. Standley, Flora of Glacier National Park, Montana. Contr. U. S. Nat. Herb. 22:321, 1921.

The first collections of this trim little species apparently were made by Miss Edith M. Farr at Field, B. C., on June 8, 1904, and June 7 and July 15, 1905. John Macoun was a close second with his specimens from ~~Laggen, Alberta, on June 26, 1904, and again at~~ Emerald Lake, B. C., on Aug. 27, 1904. Of these specimens, only Miss Farr's second collection was complete enough to permit a description of the species and it accordingly became the type. It was a real pleasure to dedicate the species to this able and observant collector. Her paper 1/ on the

1/
Farr, Edith M. Contributions to a Catalogue of the Flora of the Canadian Rocky Mountains and the Selkirk Range. Contr. Bot. Lab. Univ. Penn. 3:1-88, 1 map. 1907.

flora of the Rocky and Selkirk Mtns. of Canada was published long before this species was recognized and it is there mentioned under S. cordata and S. glaucops (p. 30). Only with the abundant collections of H. B. Sanson from Banff and vicinity, made available in 1919 and thereafter, was it possible to determine the range of expression in this species and prepare a description.

The treatment given in the Flora of Glacier National Park necessarily was brief and a projected monograph of the section Cordatae was prevented by other duties. It seems desirable, therefore, to present the following more complete description.

Caespitose shrub 3 dm. to 1.5 m. high; branches ascending; branchlets ascending or somewhat divergent, glabrous, reddish brown and shining, or drying a dull reddish brown, more or less striated; those of the season pale yellow or reddish-yellow, glabrous or occasionally somewhat puberulent; bud-scales colored as the seasonal twigs, glabrous or puberulent, 2-4 or 6 mm. long, mostly obtuse.

Leaves small to mid-sized, glabrous throughout; stipules wanting or occasionally 0.5-1.5 or rarely 3 (Sanson 2028) mm. long and semicordate; petioles glabrous or slightly puberulent, yellow or yellowish-brown, twisted; blades elliptical-oblongate to elliptic-oval, or broadly lanceolate (the young lower ones often obovate and obtuse), usually widest just above the middle, acute to usually rounded or sometimes truncate at the base, acute or those on sterile twigs often abruptly short acuminate and sometimes plicate at the apex, entire or rarely the upper minutely glandular-serrulate, 1-1.8 cm. wide, 3-5.5 cm. long, or the largest 2.5-6 cm. on sterile twigs, common sizes being 1.4 x 3; 1.3 x 3.5; 1.4-1.7 x 4; 1.7-2.0 x 5, and 1.8 x 6 cm., or the sterile 2.4 x 6 cm., green and rather dull above, subglaucous to usually strongly glaucous beneath, the veins above subimpressed when the leaves are young but somewhat elevated in age, those on the lower surface slender and raised to form a fine but not close reticulation.

Aments coetaneous, short-pedunculate; pistillate peduncles 5-10 or rarely 15 mm. long, yellow during anthesis, becoming brown, glabrous or very thingly pilose pubescent, bearing 2-3 or rarely 4 small leaves usually 1-1.5 or 2 cm. long; pistillate aments 1-2 cm. long in anthesis, becoming 2-4 cm. long and about 1 cm. wide in fruit; the rachis glabrate to thinly pilose; scales oblong or oblanceolate, 0.7-1 mm. long, obtuse, the lower portion yellowish, the apical portion dark brown, sometimes completely fuscous in drying, thinly pilose beneath or becoming glabrous throughout; capsule lanceolate, often acute at base, 4-6 mm. long, glabrous, yellowish, sometimes becoming brown in age; pedicel yellow, glabrous, 1-1.5 mm. long, or on basal capsules sometimes 1.5-2 mm.; gland short, filiform-capitate; style 0.4-0.8 mm. long; stigmas usually very short, entire or sometimes one or both somewhat bifid.

The staminate aments are scarcely known. Although many of the collections bearing only leaves probably are from staminate plants, they were made too late to obtain aments. Cusick's No. 3586^a from the Innaha Mts. of Northeastern Oregon, collected on August 18, bears one staminate ament with full grown leaves. This doubtless represents a second or autumnal flowering and may not be fully representative of vernal flowers. However, the following description is given. It is to be hoped that collectors will be enabled to obtain staminate flowers and later to get mature foliage from the same plants.

Staminate ament (a single autumnal example) short-pedunculate, 1.5 cm. long, yellow; peduncle 5 mm. long, bearing 2 small leaves 4 x 10 mm. long; stamens 2; filaments glabrous, free; anthers oval or subspherical, yellow.

One striking feature of most of the pistillate specimens examined is the frosted condition of the aments. In many cases, the ovaries have not been fertilized, although this could result from absence of male plants. ^{condition} In a large percentage of the cases, however, the ament is distorted and all or part of the capsules are blackened. Often the rachis and pedicels show injury. This prevalent condition seems to indicate a lack of adaptation to the present environment. Reproduction by seeds must be greatly reduced and this may be a factor in the apparently limited range of the species.

Salix farrae is a plant of wet places, chiefly swamps and marshes. It has been found from the Yellowstone National Park of northwestern Wyoming, the Imnaha Mountains of northeastern Oregon, and the Glacier National Park of northwestern Montana, northward along the Rocky Mountain ranges as far as Lake Louise in the Rocky Mountains Park of Alberta, and Wapta and Emerald Lakes in the Yoho Park of British Columbia. This carries it north nearly to latitude $51^{\circ}30'$. Very probably its known range will be extended as more collecting is done in the northern mountains. It occurs at relatively high altitudes varying from 7000 or 8000 feet in the southern portion of its range to 5000 or 6000 feet in Glacier Park and 4000 to 5000 in the Canadian Mountains. Its zonal distribution is upper Transition and Canadian. The following specimens have been studied.

(- 5 -) 18

S. farrae

WYOMING. Yellowstone National Park, Obsidian Creek: In small clumps 2-3 ft. high, A. and E. Nelson 6094 (B); on a boggy slope, 3-4 feet high, A. and E. Nelson, 6104 (N), both July 24, 1899.

MONTANA. Glacier National Park; Along Apekanny Creek, 2-3 ft. high, in open mossy bog, P. C. Standley 16930, Aug. 2, 1919 (B,N); Vicinity of Cracker Lake, alt. 1740 to 1920 m., common, on rock slides above lake, Standley 15755(N), moist place at foot of cliff, 3 feet high, 15813(B,N), July 15, 1919; Vicinity of Grinnell Glacier, alt. 1650-1950 m., 2-4 feet high, common on rocks near brook, Standley 16753(B,N), July 31, 1919; Vicinity of Grinnell Lake, alt. 1500-1650 m., in marsh, 3 feet high, Standley 16109, 16110, July 21, 1919(B,N); Along Swiftcurrent Creek, below Lake McDermott, alt. about 1350 m., 1-2 feet high, abundant in open marsh, Standley 16058, July 20, 1919(B,N).

OREGON. Wallowa Co., shrub 3-5 feet high, on the Imnaha R., alt. 7,000 ft., W. C. Cusick, 3386, 3386a, Aug. 18, 1909(B as S. monticola Bebb; N, on sheet 622467 as a mixture with Cusick 3383, S. melanopsis); Wet higher Wallowa Mts., near the lake, a low shrub, W. C. Cusick 2302 (as S. commutata demodata) Aug. 2, 1899 (N, four small immature twigs, 3 pistillate and 1 staminate, probably all belonging to farrae, and, if so, one pistillate twig representing forma microserrulata Ball).

(- 6 -) 19

S. farose

ALBERTA. Margins of streams, Oldman River, W. Dawson C, 24334
(as S. cordata), Aug. 7, 1883 (C). Rocky Mountains Park.-- Elbow River,
J. Macoun 41, June 23, 1897 (B, C, 94441, as S. lutea);-- Banff and vicinity:
Lake back of Mt. Assiniboine (20 mi. S.W. of Banff), N.B. Sanson 611, 613,

616, Aug. 26, 1921 (B, RM); Swampy ground to Calumet Camp, Banff, N. B.

Sanson 603, July 29, 1924 (B, RM); *Museum grounds, back of cages,*
N.B. Sanson 95, 132, 134, 180, June 9, 10, 19, 21, 1911 (B, RM); By the Spray

River, N. B. Sanson 108, June 9, 1911 (B, RM, pedicels up to 2 mm. long);

Damp places, Cave Avenue, Macoun C, 24337, June 26, 1891 (C, as S. cordata

var.); River Avenue, N. B. Sanson 336, Aug. 2, 1911, and 2032, Aug. 12,

1911 (B, RM); Cascade Mtn. (about 5 miles north of Banff), 2028, and 2207

(Cascade Camp), Aug. 26, 1916 (B, RM), and 2027 (amphitheatre), Sept. 2,

1916 (B, RM); Side of 40-mile Creek, Sanson 2048, June 13, 1900 (B, C, 25358

as S. cordata, RM); Without specific locality, N. B. Sanson 228, June 29,

1911 (B, RM), 241, 315, 317, 318, and 322, all July, 1911 (B, RM), 338, 359,

386 (smaller, obovate leaves), 390, 415, 440, 2034, all August, 1911 (B,

RM); Castlemount Ranger Station, In swamp about 3 miles east, alt. 4300

ft., Malte and Watson 508, 511 (ovate-obovate leaves), 513, June 21, Sept.

4, 1925 (B, C, 116774, 116777, 116779); Lake Louise, alt. 5700 ft.; Upper

end of Lake L, Malte and Watson 1081, July 9, 1925 (B, C, 116813); 2-4 ft.

high, Near chateau at Lake Louise, J. G. Jack 2927, as S. barclayi, Sept.

18, 1922 (A).

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(-7-) 19a S. farrae

BRITISH COLUMBIA (All in Yoho Park). Emerald Lake, J. Macoun 0,68901, as S. cordata var. (B,O), Aug. 21, 1904. Field, along the Kicking Horse River, on the flats which are often overflowed in July, when snows melt, Edith M. Farr 558 (B, type), June 7, July 15, 1905; Edith M. Farr. June 8, 1904 (B, as a mixture with S. glauca glabrescens). North side of Wapta Lake, J. Macoun 0,68900 (B,O, as S. cordata var.), Aug. 2, 1904. Burgess Pass trail, alt. 6,500 ft., shrub/ 3 ft. high, Titus Ulke, July 28, 1922 (U).

5a S. farrae forma microserrulata new form

This form differs from the species in having the margins of the leaves shallowly but not always regularly serrulate, or sometimes crenulate-serrulate. The blades themselves tend to be a little narrower than in the species.

On many shoots of typical farrae the apical leaf or leaves may be somewhat serrulate. This is true also of the ^{apical} leaves of some other species with normally entire margins, as S. planifolia Pursh. Occasionally, however, a specimen has all or nearly all of its leaves with the margins finely and regularly serrulate. Such specimens do not seem to differ in other respects from typical farrae, though this is not wholly certain. Most such specimens are without fruit or have only unfertilized capsules. It seems desirable to designate these as a form of the species rather than a variety until more and better material enables a surer diagnosis. The following specimens are placed here.

ALBERTA. Rocky Mountains Park:-- Banff and Vicinity: Springy thickets, Sundance Canyon, near Banff, alt. 4500 ft., M. O. Malte and W. R. Watson 898, July 4, 1925 (B, type; C, 1168 C6); Swamp, Canyon Road, N. B. Sanson lx, Aug. 21, 1911 (B, RM); Without specific locality, - N. B. Sanson 327, July 27, 1911, 328 (capsules to 7 mm. long), July 28, 1911, 340, Aug. 3, 1911, 395, Aug. 16, 1911, and 2040, Aug. 10, 1911 (all B, RM).

7 SALIX CORDATA Muhl

BIBLIOGRAPHY

Salix acutidens Rydb., in Britt. Man. Fl. No. St. & Can. 315, 1901.
Salix cordata Muhl., Gesell. Naturf. Fr. Berlin, Neue Schrift, 4:
 236, pl. 6, fig. 3., 1803; - Hook. Fl. Bor.-Amer. 2: ¹⁴⁹1838, - Torrey, Fl. St.
 N. Y. 2: 211, 1843; - Anderss. Sal. Bor.-Amer. 19, 1858 (repr. in adv. from
 Proc. Amer. Sci. & Arts 4: 1858); - Anderss. Monog. Sal. 157, fig. 91, 1867; -
 Anderss. in D.C. Prod. 162: 251, 1868; - Macoun Cat. Can. Fl. 1: 446, 1886; -
 Britt. & Brown, Illus. Fl. 1: 503, fig. 1198, 1896; - Rydb., in Britt. Man. Fl.
 No. St. & Can. 314, 1901; - Griggs, Proc. Ohio Acad. Sci. 6: 307, pl. 13, 1905; -
 Robin. & Fern. Gray, New Man. 323, fig. 650, 1908; - Ball, in Coult. & Nels. New
 Man. Rocky Mt. Bot. 132, 1900; - Ball in Tidestrom, Elys. Marianum 3: 29, 1910; -
 Rydb., in Britt. & Br. Illus. Fl., Ed. 2, 1: 596, fig. 1463, 1913.

Salix cordata L. C. Richard in Michx., Fl. Bor.-Am. 2: 225, 1803.

Salix cordata var. rigida (Muhl.) Carey in Gray, Man. Bot. 427, 1848; -

Anderss. Monog. Sol. 158, 1867; - Anderss. in D.C. Prod. 162: ²⁵¹1868.

Salix rigida Muhlenberg, Gesell. Naturforsch. Fr. Berlin, Neue Schrift.
 4: 237, pl. 6, fig. 4, 1803; - Willd. Sp. pl., Ed. 4, 667, 1805; - Pursh, Fl. Am. Sept.
 2: 615, 1814; - Hook., Fl. Bor.-Am. 2: 149, 1838; -
 Torr., Fl. St. N.Y. 2: 212, 1843x-

2

DESCRIPTION

Tall shrub; leaves large, stipulate, lanceolate or oblong-lanceolate, serrate, 7-15 cm. long, dark green above, pale to subglauous beneath; aments slender, short-pedicelled, appearing with the leaves; scales tawny or brown, pubescent; capsules glabrous, greenish, 4.5-6 or 6.5 mm. long; pedicels 1.5-2 mm. long; style 0.5 mm. long.

A sparingly to densely caespitose shrub, 3-6 m. high; bark reddish-gray; twigs medium stout, ~~vinate~~ to divaricate, reddish brown to nearly black in humid areas, more yellowish in drier sections, glabrous or thinly or densely puberulent; buds large, 6-10 mm. long, broadly lanceolate, glabrous or thinly or densely puberulent or pubescent.

Leaves large, stipulate; stipules mostly large, semi-cordate to sub~~lyrate~~^{lyrate}, acute or obtuse, serrulate, 0.5- 1.5^{or} 2 cm. long; color and pubescence as in the blades; petioles stoutish, 1-3 cm. long, color and pubescence as in the twigs; blades narrowly to broadly lanceolate, oblong-lanceolate, or slightly oblanceolate, rounded to subcordate to cordate at the narrow to broad base, acuminate or short-acuminate at the apex, 7-15 cm. long, 1.5- 5 cm. wide; common sizes being 8 by 1.5- 2, 10 by 2.5- 3, 12 by 3-3.5, 13 by 4, or on sprouts 15 by 5.5 and 16 by 7 cm., sharply and closely serrate on the margins, dark green above, paler and usually subglauous to glauous beneath, mostly glabrous, sometimes puberulent on the petiole and lower midrib on both surfaces, and occasionally puberulent on the lower surface, especially the veins, becoming thick, rigid, and more or less reticulate on both sides in age.

Aments appearing with the leaves or slightly precocious, subsessile or short peduncled; pistillate, peduncle 0.5- 1.5 cm. long, bearing 3 or 4 small leaves, aments 3-5 cm. long, slender, becoming 3-6 or 7 cm. long and somewhat lax in fruit; scales oblong-lanceolate to oblanceolate, acute or obtuse 1 to 1.5 mm. long, tawny to brown, thinly to densely pilose with rather long shining hairs on both sides; capsule lanceolate from an ovate base, occasionally

A subovoid, 4.5-6 or 6.5 cm. long, glabrous, greenish; pedicel slender, 1-1.5 or 1.8 mm. long, glabrous; style 0.4-0.6 mm. long, slender, glabrous, usually entire; stigmas entire or divided, half as long as the style.

Staminate peduncle 4-8 mm. long, bearing 1-3 very small leaves; anther slender, 2.5-4 cm. long, about 1 cm. wide; stamens 2, filaments glabrous, free, or occasionally united at the base; scales as in the pistillate anthers.

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NOTES

Salix cordata is found along the margins of lakes and rivers and in wet alluvial soils but not usually in marshy places. Flowers appear from early April to the first half of May and fruit may be found until the middle of June.

The species ranges from New Brunswick and New England to Maryland, extends sparingly southward in the Appalachian system, being rare south of the Ohio and Potomac Rivers, thence westward to Missouri, Kansas, and sparingly across the Great Plains, and northward into Canada to about lat. 55 degrees N. in Manitoba. From New England and Pennsylvania to the Missouri River it is one of the most abundant species of willow. With S. sericea Marsh., it often marks the course of small streams across the landscape by a sinuous ribbon of green.

S. cordata is separated from missouriensis by its smaller dimensions in every way, especially smaller capsules, shorter pedicels, shorter and less flaccid aments, and less glaucous and less pubescent foliage; from S. desmophylla by longer and laxer aments, larger capsules and larger, broader, more oblanceolate, and much more serrate leaves; from S. lutea by dark branchlets and darker, longer and more acutely serrate leaves, and longer aments with usually shorter-pedicelled capsules; and from S. mackenziana by darker, less oblanceolate leaves and especially by shorter pedicels.

Of S. cordata it may be observed that the leaves become narrower, the capsules longer, and the pedicels longer as we pass westward. The New Brunswick specimens tend to have short, ovoid, short-pedicelled capsules.

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SPECIMENS EXAMINED

Owing to the wide acquaintance with this species, and the absence of close relatives throughout most of its range, it does not seem necessary to cite any specimens. A great mass of herbarium material, totalling hundreds of specimens, has been examined.

7a *SALIX CORDATA ANGUSTATA* (Pursh) Andersson

BIBLIOGRAPHY

Salix angustata Pursh, Fl. Am. Sept. 2:613, 1814;- Carey, in Gray,
Man. Bot. 427, 1848 ✕

Salix cordata Muhl (in part), Robinson & Fern, ^{Gray,} New Man., 323, 1908;-
Rydb. in Britt. & Br. Illus. Fl., Ed. 2, 1:596, 1913.

Salix cordata angustata (Pursh) Andersson, Monog. Sal. 159, 1867;-
Anderss. in D. C. Prod. 16²₇₇:252, 1868;-MacCunn, Cat. Can. Fl. 2: 447, 1886;-
Bebb in Gray, Man. 494, 1890;-Britt. & Br., Illus. Fl. 1: 503, 1896;-Rydb.,
- In Britt., Man. 314, 1901;- Ball (in part), in Coult. & Nels., New Man. Rocky
Mtn. Bot. 132, 1909.

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NOTES,

This variety differs from the species chiefly in the comparative width of the leaves, which are only 1.5- 2.5 cm. wide, while still 8-12 cm. long, tapering toward both ^{ends} sides, somewhat rounded at the base, acuminate at the apex. The styles are said to be somewhat longer than in the species, but the writer is unable to see that this is the case.

The variety *angustata* as here interpreted, is distinguished by narrower leaves, and by no correlated character. It is rare in the eastern range of the species, common in the longitude of Ohio and the dominant form west of the Mississippi River. In the general longitude of Ohio a leaf-width of 1.5- 2 cm. indicates the same degree of leaf attenuation as does a width of about 1 cm. farther west.

BIBLIOGRAPHY

- Salix cordata Muhl. (in part) Rydb. in Britt. & Br. Illus. Fl., Ed. 2, 1: 596, 1913.
- Salix cordata var. missouriensis (Bebb) Mackenzie and Bush, Man. Fl. Jackson Co., Mo. 69, 1902.
- Salix cordata rigida vestita Anderss. in D.C. Prod. 16²: 252, 1868.
- Salix cordata var. vestita (Anderss). Sargent, For. Trees No. Am., Tenth Census U. S. 9: 170, 1884.
- Salix missouriensis Bebb, Gard. & For. 8: 373, 1895;- Sargent, Silva No. Am. 9: 137, pl. 480, 1896;- Britt. & Br. Illus. Fl. 1: 503, fig. 1200, 1896;- Glatfelter, Relation of Salix missouriensis Bebb, to S. cordata Muhl., Trans. Acad. Sci. St. Louis 7: 137-144, pls 1-3, 1896;- Glatfelter, Salix cordata X Sericea, Bot. Gaz. 22: 392-400, 1896;- Ball, Proc. Ia. Acad. Sci. 7: 152, 1900;- Rydb. in Britt. Man Bot. 314, 1901;- Robin. & Fern. in Gray, New Man. 323, fig. 651, 1908X-
- Salix rigida var. vestita Anderss. Monog. Sal. 159, 1867;-

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DESCRIPTION

Shrub or small tree with usually pubescent buds and branches; large, lanceolate, serrate leaves, 10-16 cm. long, 2-5 cm. wide, and large glabrous ~~or puberulent~~ greenish capsules, 6-7 mm. long, on pedicels 2-3 mm. long, and tipped with styles 0.5-0.8 mm. long.

A more or less clustered shrub or small tree 3-9 m. in height, and 5-17.5 cm. in diameter (Bebb says 30 to 40 or even 50 ft. in height, trunk 10 or 12, rarely 18 in. in diameter); bark grayish, branchlets brown to dark brown, occasionally yellowish, usually pubescent with white hairs, or puberulent, becoming glabrate in age, occasionally glabrous, buds large, 8-12 mm., long, usually densely long-pilose-pubescent, with grayish white hairs, becoming glabrate.

Leaves large, stipulate; stipules large, foliaceous, mostly cordate-ovate, sometimes reniform or semi-cordate, 8-20 mm. long, serrate, mostly acute, sometimes acuminate, green above, pale to densely glaucous beneath, usually pubescent, becoming glabrate in age; petioles stoutish, brown, 1-2 cm. long, usually densely pubescent; blades large, broadly to narrowly lanceolate, or slightly oblanceolate (as in *S. cordata*), 10 to 15 or 17 cm. long, 1.5- 5 cm.

wide, common sizes being 2.5 by 10, 3 by 12, 4 by 8, and 5 by 16 cm. respectively, rigid in maturity, acute to acuminate at the apex, rounded to subcordate at base, evenly serrate on the margins, deep green above, glaucous to densely white beneath, usually thinly pubescent on both surfaces when young, becoming glabrate in age, the pubescence usually persisting on the prominent white midrib above, and along the greenish-yellow shining midrib and the basal parts of the primary veins beneath, often coarsely reticulate on both surfaces in age.

Aments precocious, or coetaneous with the leaves, subsessile in flower, short-peduncled in fruit, rachis densely pubescent;

Pistillate ament 2.5-5 cm. long in flower, lengthening to 3.5-9 cm. long and becoming rather lax in fruit, 1.7-2 cm. wide; peduncle about 0.5 cm. long on flower, becoming 1-2 cm. long in fruit, ^{as} becoming 2-4 small leaves; scales lanceolate or oblanceolate, acute or obtuse, yellowish brown to dark brown, 1.2-1.5 mm. long, clothed on ^{the} outer surface with long pilose white or gray hairs, pedicels slender 1-1.8 mm. long in flower, 2-3 mm. long in fruit, glabrous; capsules larger than in S. cordata, about 4 mm. long in flower, 6-7 mm. long in fruit, lanceolate from an ovate ~~base~~, rounded or slightly cordate ~~at~~ base, deep rich green, glabrous or sometimes puberulent when young; style slender, 0.5-0.7 mm. long; stigmas short, usually divided.

Staminate aments not well known to the writer, slender, nearly or quite sessile, naked at base or ^{with 2 or 3 very small leaves} 2-4 cm. long, 1-1.4 mm. wide; scales as in the pistillate; stamens 2, filaments glabrous, free.

NOTES

Salix missouriensis apparently is confined to the central Mississippi Valley, in the broad sense of the term. It is most abundant along the Mississippi and Missouri Rivers, for some 100 or 200 miles above St. Louis. It occurs, however, on tributary streams as far northwest as central Nebraska.

In Missouri, it flowers from about April 10 onward for three weeks and ^{as} ripe fruit in due course thereafter.

This willow was first described as a quasi-variety of S. rigida, by Andersson. It was founded on a specimen collected by the Duke of Neuwied, at Ft. Osage, on the Missouri River, near the Site of Kansas City, and seen by Andersson in the ~~herbarium~~ herbarium Vindobonae. Bebb raised the form to specific rank in 1895, as S. missouriensis, Andersson's name being ~~in 1895~~ preoccupied.

Both Andersson and Bebb recorded the ~~stout~~, tomentose branchlets and precocious, subsessile aments and the somewhat pubescent foliage. Bebb emphasized also the size of the mature leaves (which Andersson had not seen), the downy petioles and large stipules, and the large, somewhat lax aments.

Bebb speaks of the lower leaf surface, however, as "paler but not glaucous". Concerning the pedicel he says, "pedicel (relatively) short, three times the length of the glaund~~ous~~ and not exceeding the scale". An examination of more abundant material than that seen by Mr. Bebb, but some of it from the same locality, shows that the intensely white color of the lower surface of the blades is one of the constant characters of the species. Furthermore, the elongation of the pedicel beyond the end of the scale, and to a greater extent than in cordata, is also characteristic. The aments themselves are longer, as are also the peduncles.

Some foliage specimens, unaccompanied by fruit, could scarcely be distinguished from luxuriant cordata. However, the several characters by which it differs from that species, and its geographical position on the edge of the range of cordata have seemed sufficient cause for maintaining it as a separate species.

The most extensive series of specimens referable to this species is that collected in the vicinity of St. Louis, Mo., by N. M. Glatfelter, in 1895 and 1896. Dr. Glatfelter was a practicing physician and enthusiastic amateur botanist. In those years he became thoroughly imbued with the idea that most willows were of hybrid nature. Under the impulse of this idea he collected some 30 or 40 ~~sets~~^{specimens} of this species which he labelled and distributed as hybrids.

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Thirty-two of these are in the National Herbarium. Four different hybrid combinations are indicated, with their reciprocals in most cases. The combinations, with the number of specimens assigned by him to each, are as follows: "cordata X sericea, 13; cordata X sericea X var. vestita, 3; "cordata X var. vestita", 10; and var. vestita X sericea", 6. All this material is referred to S. missouriensis Bebb by the writer.

Dr. Glatfelter discussed his collections and conclusions at some length in two of the papers cited above. One of the chief difficulties in the way of accepting the conclusions is that, so far as known, S. sericea does not occur in the vicinity of St. Louis. Furthermore, cordata as here interpreted is not common in that district. Hybrids ~~can scarcely~~ ^{the other} occur in abundance with one supposed parent absent ~~in one case~~ and rare ~~in a second case~~. One of the specimens said by Dr. Glatfelter to show especially the influence of sericea on the capsules is a case of second or late flowering where apparently the capsules are seedless because of absence of pollen ~~at~~ the time the stigmas were receptive. Very possibly some of the specimens represent hybrids between cordata and missouriensis, but of this the writer is unable to convince himself from a study of the material.

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SPECIMENS EXAMINED.

ILLINOIS. Jo. Daviess Co., Warren, L. M. Umbach, July 9, 1896 (N);
Pepoon and Moffatt, July 1, 1896 (N); H. S. Pepoon, April 26, 1897 (N); --
St. Clair Co., Cahokia, H. Eggert, April 16, 1887 (I, N).

MISSOURI. Lewis Co., Lagrange, John Davis 1056, Sept. 14, 1911 (N); --
Marion Co., Hannibal, John Davis 1041, Sept. 16, 1911 (N); -- Pike Co.,
Clarksville, John Davis 1230, Oct. 1, 1911 (N); -- St. Louis and vicinity,
N. M. Glatfelter (32 sheets labeled as hybrids of various sorts between
cordata, sericea and variety vestita), (N 283206-283209, 283211-283220,
283222, 283224-283230, 283232-283234, 283236-283240, 283244-283445), 1895-
7846, Oct. 7, 1916 (N); --
1896 (N); -- Shannon Co., Monteer, B. F. Bush 5325, Oct. 23, 1908 (N); --
Wright Co., Mansfield, E. J. Palmer 6247, July 10, 1914 (N); -- Taney Co.,
Swan, W. W. Eggleston 12248, Oct. 7, 1915 (N); -- Newton Co., Joplin,
E. J. Palmer 2043, May 20, 1909 (N); -- Jackson Co., Courtney, B. F. Bush
448 and 464, April 11, 1896; 470, 475 and 480, April 19, 1896; 480a, Oct. 14,
1896; 6551, 6552, April 15, 1912 (all N); 7718, 7719, Mar. 24, 1916; --
Kansas City, common in low ground, K. K. Mackenzie, March 29, June 14, 1896 (I); --
~~Joplin, E. J. Palmer 2043, May 20, 1909 (N);~~
IOWA. Hamburg, Pammel and Clark 37, July 4, 1914 (I); -- Sioux City, L.
H. Pammel, June 21, 1896 (B, I); H. B. Clark 8, Aug. 14, 1914 (B, I).

KANSAS. Manhattan, Riley Co., W. A. Kellerman (N, 220886, 220889);
J. B. Norton 512, April 10, 1895, 512a, Oct. 12, 1895 (N); -- Wyandotte Co.,
Quindaro, K. K. Mackenzie, April 12, June 21, 1896 (I).

NEBRASKA. Hooker Co., on Middle Loup River near Hallen, P. A. Rydberg,
July 19, 1893 (N).

SOUTH DAKOTA. Clay Co., Vermillion R., Vermillion, W. H. Over 5023,
May 1, June 9, 1913 (N); Brule Co., Chamberlain, W. H. Over 2826, May 6, 1914 (N)

First draft, ribbon

9 SALIX MYRTILLIFOLIA ANDERSSON.

BIBLIOGRAPHY.

omit (*part*) Salix myrsinites subsp. curtiflora Anderss. Oefvers
Kon. Vet. Akad. Förh. 15: 130, 1858; Sal. Bor. Am. 25, 1858. 1858;

Salix myrtillifolia Anderss. Oefvers, Kon. Vetensk.
kaps. Akad. Förh. 15: 132, 1858; Sal. Bor. Am. 28, 1858; Ma- 4: 74
coun Cat. Can. Pl. 2: 358, 1890; Bebb, Bot. Gaz. 15: 54, 1890; 1858;
Rydberg in Britt. Man. Fl. No. St. and Can. 315, 1901; Coville
(Willows of Alaska), Proc. Washn. Acad. Sci. 3: 325, fig. 22,
1901; ~~Robinson~~ and Fernald, *Rhodora* 16: 170, 1914.

part (*omit*) Salix novae-angliae subsp. myrtillifolia Andersson, *Svensk.
Kon. Vetensk. Akad. Handl.* 3: 5.
(Monog. Sal.) 162, 1867;

Salix novae-angliae var. myrtillifolia Anderss. in D.
C. Prod. 16: 253, 1868; Macoun, Cat. Can. Pl. 1: 452, 1886. (3) (part)

omit (*part*) Salix myrtillifolia curtiflora (Anderss.) Bebb, (ex-
clusive of specimens cited) in Rose, Contr. U.S. Nat. Herb. 3:
573, 1896.

omit (*part*) Salix myrsinites novae-Angliae subsp. 1. pseudo-
myrsinites, var. cordata Andersson (5: 161)
S. novae-angliae var. pseudomyrsinites forme cord-
ata And. in D. Prod. 16(2): 253, 1868.

Low, much-branched, leafy shrub, 2-10 dm. tall; blades
broadly oblanceolate or elliptical, 2-5 cm. long, acute or obtus-
ish, finely crenulate-serrulate, green, glabrous and reticulate on
both surfaces; aments pedunculate, appearing with the leaves; pis-
tillate 1-4 cm. long; capsule 4-5.5 mm. long, glabrous; pedicel
0.5-1.5 mm. long, glabrous; style 0.4 mm. long; scales pale brown,
nearly glabrous outside; staminate aments 1-2 $\frac{1}{2}$ mm. long, filaments
glabrous, free.

myrtillifolia typical ⁵⁷⁴ Florida Alaska rough dry

Low or depressed shrub, 2-5 or more dm. high, the branches ascending ^{to} nearly erect, leafy, fuscous or brown, the 1-year and 2-year branchlets and budscales rather densely pubescent, the 1-year sometimes somewhat pruinose, seasonal shoots brown to yellowish, pubescent; budscales obtuse, colored and clothed as the branchlets, sometimes densely pruinose; blades ovate, with broadly rounded or truncate to subcordate base, to oval and oval-obovate with rounded base, ^{the width} usually half, or more than half ^{the} ^{length} as wide as long, (2-4 or 5 cm. long by 1-3 cm. wide), common sizes being 1 x 2, 1.5 x 2.5-3, 2-2.4 x 4-4.5, 2.5-2.8 x 5, and 3 x 6 cm., ^{the} primary and the widely spreading secondary veins rather prominently raised, especially beneath, apex rounded or abruptly acute, margins finely and evenly crenate-serrulate, yellowish-green, often drying dark brown; petioles short, 4-8 mm. long, yellowish to fuscous, pubescent to glabrous; stipules small, subrotund to elliptical-lanceolate, or lacking.

Aments small, 1-1.5 cm. long in flower, the pistillate 1.5-2.5 cm. long in fruit.

Pistillate peduncles 5-10 mm. long, pubescent, bearing 2-3 small leaf-like bracts; aments ascending, 1.5-3 cm. long in fruit, subdensely flowered; capsules lanceolate to broadly lanceolate 4.5-6 or 6.5 mm. long, glabrous, brown; pedicel 1-1.5 mm. long; style about 0.5 mm. long; stigmas short, entire (?); scales lanceolate-oblong, acute, brown to fuscous, thinly pilose, especially within, with crisp twisted hairs.

mytillofolia

DESCRIPTION

Low shrub, 2-6 or 10 dm. in height, spreading (more or less trailing in the northern part of its range); stems medium to slender, much branched; branchlets mostly slender, strict to spreading, grayish, usually glabrous, full of bud scars, those of the season yellowish to lemon yellow, usually puberulent to thinly villous-tomentose; buds rather slender, 2-4 mm. long, puberulent to tomentose, yellowish but usually drying darker: leaves small, stipulate; stipules small or sometimes wanting, ovate, acute or obtusish, crenate, 1-3 mm. long, glabrous or pubescent; petioles slender, 2-4 mm. long, yellowish, glabrous, or pubescent where the branchlets are pubescent; blades small, broadly oblanceolate to obovate and obtusish or elliptical, or the apical narrowly ovate and acute at apex, narrowed to rounded at the base, 8-18 mm. wide, 2-4.5 cm. long, on fruiting branches commonly averaging 1.1 by 2.5, 1.3 by 3, and 1.6 by 3.5 cm., thin to mediumly thick, finely and evenly crenulate-serrulate on the margins, finely reticulate with slender, elevated veins on both surfaces, especially beneath, usually pale green above, and a dull leaden green beneath, often drying so black as to obscure the natural color entirely, smooth on both sides or occasionally puberulent on the proximal portion of the midrib *above*,

Aments pedunculate, appearing with the leaves, leafy-bracted at base, rachis villous: pistillate aments 1-4 cm. long, about 1 cm. wide, loose or semi-compact, on slender, villous peduncles 5-12 mm. long and bearing 2-4 small, elliptical leaves; capsules small, lanceolate, 4-5.5 or 6 mm. long, glabrous,

styles 0.5-0.8 or 1 mm. long.

mytillofolia

greenish to reddish, on slender glabrous pedicels .5-1.5 mm. long; tipped with a slender, glabrous style .3-.5 mm. long, and short, suberect, entire or notched stigmas ; scales small, pale brown, oblanceolate to lanceolate, equalling or shorter than the pedicel, thinly villous on the inside, nearly glabrous on the outside; gland short: staminate aments 1.2-2 mm. long, on peduncles 2-4 mm. long and bearing 2-3 small leaves; stamens 2; filaments glabrous, free, 4-5 mm. long; scales dark, elliptical-lanceolate, acute, villous on the inside, nearly glabrous on the outside.

~~Flowers from about May 25 to June 15 and fruits from June 15 to July 15 in different parts of its range.~~

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NOTES.

Salix myrtillifolia is distributed from central Alberta east to Labrador and north to Keewatin, Mackenzie, and central Alaska. It is a plant of swamps and bogs rather than of river banks, although not wanting on the latter. Flowers may be found from about May 20 to the end of June and fruit until well into July.

Salix myrtillifolia was published by Andersson, as a species, in 1858. The type locality is given thus-"Hab. 'Rocky Mountains, east side, in low situations', (Herb. Hook.)". The name of the collector is not given but probably it was Douglas, possibly Bourgeau. Three and two pages earlier, respectively, in the same publication, he describes S. pseudo-myrsinites and S. curtiflora as binominals but arranged as subspecies under the European S. myrsinites. The type locality of the former was given-"Hab. 'on the grand rapid of Saskatchewan' et in 'Rocky Mountains'", and for S. curtiflora thus- "Hab. 'Fort Franklin, Mackenzie river, Richardson".

Salix myrtillifolia was placed in the section Glaciales while myrsinites with the two subspecies ^{as} ~~were~~ placed in a different section, Frigidae. Apparently the two series of specimens were examined independently, with no recognition of their similarity at that time. As a matter of fact, there is almost no difference in the original descriptions of myrtillifolia and curtiflora except the longer pedicel credited to the latter. The subspecies pseudo-myrsinites, however, differed, as described, in having larger and more oblanceolate or lingulate leaves and longer aments. So far as the original descriptions and cited specimens

myrtillifolia

are concerned, the three may be forms regarded as belonging to one species.

In his Monographia Salicum, 1867, Andersson arranged all three as subspecies of a single species for which he proposed and published the name Salix novae-angliae. The subspecies were placed in the following order, S. novae-angliae, 1. S. pseudo-myrsinites; 2. S. pseudo-cordata; and 3. S. myrtillifolia. The treatment in De Candolle's Prodromus, 1868, is exactly similar except that the 3 subspecies are reduced to the rank of varieties, and the 3 varieties ^{of subspecies pseudo-myrsinites} noted below, are reduced to the rank of forms.

Under subspecies 1., S. pseudo-myrsinites Andersson disposed 3 varieties- a. cordata, b. lingulata, and c. aequalis. Under cordata he records "Hab. in Rocky mountains: Drummond (Hb. Hook.) et Bourgeau". The description includes oval-lanceolate, sharply serrulate, reticulate leaves, half as broad as long, with rounded or subcordate base and briefly produced apex. The writer has not seen authentic specimens of the collections cited, but Rocky Mt. material answering this description seems to him more closely related to pseudo-cordata than to myrtillifolia. In this paper it is arranged as S. pseudo-cordata variety cordata.

For variety lingulata Andersson says "Hab. 'On the grand rapid of Saskatchewan' (Hb. Hook.)" and describes it as having ob-ovate-oblong or lingulate leaves, less prominently nerved, with narrow base and briefly produced apex. From this description and the differences noted between this variety and the variety cordata, from a study of the fragments and drawings of Douglas' specimen in the Bebb Herbarium, noted as "common on the portage of the Grand rapid near Lake Winnipeg", and from the characters of other speci-

6 *myrtillifolia* 52
mens from the same section, it becomes evident that this plant is very closely related to S. myrtillifolia. It is here presented as a variety of that species. The Douglas specimen was ^{the} cited first under S. myrsinites subspecies 1. S. pseudo-myrsinites and therefore is the type of the subspecies. Since it is regarded as conspecific with myrtillifolia, the other two very different varieties are transferred to the next subspecies, pseudo-cordata, to which they are obviously more closely related.

The third variety, aequalis, is described as having entire or most minutely serrulate leaves with scarcely evident reticulations. The statement, "Hab. in 'campement forêt brûlé Rocky mountains 15 Aug. 1858' (Bourgeau)", places this as a plant of the Rockies rather than the plains. No authentic specimens of the original collection have been seen. A plant of the Rockies which answers this description is discussed herein as S. pseudo-cordata aequalis, being transferred thereto because of its evident relationship with that species rather than with myrtillifolia.

It is seen from the foregoing that Andersson, in revising and recombining his three previously published forms, introduced some new and apparently different material into the one subspecies, pseudo-myrsinites. An equal or greater change was made in another. Salix myrsinites subspecies S. curtiflora, of 1858, was founded on Richardson's specimens from Fort Franklin, Mackenzie River. From the drawings and fragments in the Bebb Herbarium, this is clearly referable to S. myrtillifolia. In 1867, he published his subspecies S. pseudo-cordata, citing subspecies curtiflora as a synonym. However, the description is greatly changed and three additional collections are cited. Two of these are listed before Richardson's collection, the type of curtiflo-

ra. One is by Bourgeau from the Saskatchewan River near Ft. Pitt, and one by Burke from Jasper's House, while a third, collected by Drummond in the Rocky mountains, completes the quartette.

As redescribed, the leaves are oval-oblong, scarcely narrower below the middle and rounded at the base, $1\frac{1}{2}$ in. long by $\frac{1}{4}$ in. wide, sharply crenate and distinctly ~~veiny~~ reticulate. The dimensions and other characters of the plant mostly are not those of myrtillifolia. They are, however, characteristic of an otherwise nameless plant common in the mountains of our northwest states and found in Alberta and Saskatchewan. This is the plant mistakenly called S. pseudo-myrsinites by the writer in Nelson and Coulter's New Manual of Rocky Mountain Botany. As noted above, the type of pseudo-myrsinites is not this plant but myrtillifolia variety lingulata. In his "Flora of Colorado", Rydberg has raised Andersson's subspecies pseudo-cordata to specific rank and that name has been adopted here for the mountain plant under discussion.

8
myrtillifolia

Flora Alaska
rewritten

The opinions of salicologists regarding the identity of the components of Andersson's complex species may be of interest at this time. Bebb examined all available material in the herbaria of Torrey and of Gray and expressed his conclusions (Bot. Gaz. 15: 54) as follows:-

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"After a careful examination of the collections of Richardson, Douglas and others, upon which Andersson founded his *S. Novae-Angliae*, I am satisfied that (with the exception of Drummond's Rocky Mt. specimens) all belong to one species, for which *S. myrtillifolia* is the oldest (and best) name. It is useless and confusing to attempt to distinguish as varieties the different forms due to varying conditions of locality and exposure. Andersson himself, in the case of Richardson's collections, where aments and leaves of the same plant are under separate tickets, has referred the aments to one of his varieties and the leaves to another. The species is one of the plain from Lake Winnipeg north to the Arctic circle. Drummond's specimens, mentioned above, are more robust every way, with thick, white-woolly staminate aments, fertile immature, leaves wanting, and cannot be safely determined, though most likely belonging to *S. monticola* Bebb."

myrtillifolia

Fernald has recently given expression to much the same opinion (*Rhodora* 16: 171, 1914). After reviewing the manner in which Andersson shifted the names of the plants under discussion he says:-

"All this, of course, is very perplexing, but it is evident that in his mature judgment Andersson considered all three shrubs as belonging to one North American species. The material which seems to belong in these three categories is certainly too difficult of separation, and after prolonged study the writer is satisfied to accept the conclusion of Andersson, and later of Bebb, that they are all one species. Furthermore, there can be no question that Bebb's further conclusion is correct, that for the species "*S. myrtillifolia* is the oldest (and best) name"; for *S. myrtillifolia* was published as a true species in 1858, six years before the publication of *S. novae-angliae*, while the name *S. pseudo-myrsinites*, though of binomial form, was published and intended by Andersson not as the name of a fully ranking species but of a subspecies, and later of a variety."

However, Fernald just previously had stated that

"many of the foliage-specimens referred to *S. pseudo-myrsinitis* and all of the material so-called from west of the Rocky Mountain system seem to be different."

Salix pseudo-cordata as here interpreted is doubtless the different form of the Rocky Mountains and westward.

SPECIMENS EXAMINED

MANITOBA. Hayes R., 25 mi. above York Factory, Hudson Bay, Preble and Cary 58, Aug. 30, 1900 (N.).

SASKATCHEWAN. In the muskeg north of Prince Albert, Macoun (O 13672 in part), July 1, 1896 (O).

ALBERTA. Elbow River, John Macoun 34 (O 94437), July 15 1897 (B, O). Banff: 2 ft. high, low ground along Cave Avenue, W. C. McCalla 2243, May 31, June 27, 1899 (N); The Loop, N. B. Sanson 9, July 11, 1911 (B); Sanson 82, June 9, 1911 (B), Sanson 2183, July 7, 1911 (B). Jasper Park: by a spring, Cavell Creek, alt. 4,500 ft., J. M. Macoun (O 95394), Aug. 14, 1917 (B, O); along Athabaska River, near Jasper, J. M. Macoun (O 95385), Aug. 24, 1918 (O); West end of bridge, Athabaska River, J. M. Macoun (O 95767), June 15, 1918 (B, O); Mt. Cavell Sta., near Yellowhead Pass, J. G. Jack 2736, Sept. 5, 1922 (B); Athabaska Plains (Railway Survey), John Macoun 11 (O 24633), Sept. 17, 1872 (O, as S. nova-angliae).

YUKON. White Horse, John Macoun (O 91478), Aug. 30, 1902 (O). Dawson, Cemetery Hill, Alice Eastwood 438, June 29, 1914 (O 97535, in part).

57
Canadian middle
9a SALIX MYRTILLIFOLIA variety lingulata (Anders.) Ball. n. comb.

BIBLIOGRAPHY.

Salix myrsinites subsp. pseudo-myrsinites Anderss.
Oefvers. Kon. Vet. Akad. Förh. 15: 129, 1858; Sal. Bor. Am. 25,
1858.

Salix novae-angliae subspecies pseudo-myrsinites varie-
ty lingulata Anderss. Monog. Sal. 164, 1867.

Salix novae-angliae variety pseudo-myrsinites Andersson,
Macoun, in part, Cat. Can. Pl. 1: 452, 1886; but not as interpret-
ed by Bebb, in Coulter, Man. Bot. Rocky Mtn. Region 336, 1885, this
probably being some form of pseudo-cordata.

Salix novae-angliae variety pseudo-myrsinites forma lin-
gulata Andersson in DC. Prod. 162: 253, 1868.

DESCRIPTION.

Branchlets longer, more virgate; leaves larger, 4-6 cm.
long, 12-24 mm. wide; aments 2-3.5 cm. long.

NOTES.

The nomenclatorial history of this plant has already
been presented under the species. It seems to be merely a more
luxuriant expression of the species, varying in the direction of
S. pseudo-cordata. The leaves, though large, are still thin, and
mostly oblanceolate and narrowed at the base. The Hudson Bay spe-
cimens have broader and thicker leaves with wider bases and are

13 68
more nearly like pseudo-cordata. On all the specimens cited the leaves have blackened in drying.

SPECIMENS EXAMINED.

p.
KEEWATIN. (Manitoba). Hayes River, 25 miles above York Factory, Hudson Bay, E. A. and A. E. Preble 58, 59, Aug. 30, 1900 (N).

SASKATCHEWAN. Common on the portage of the grand rapid of the Saskatchewan, near Lake Winnipeg, Douglas (Drawings and fragments from the specimen in the Gray Herbarium) (FBB 7618 in part); no locality, Bourgeau, 1859 (N, as "S. cordata subhastata And.")

Digitized by Herbarium Institute for Botanical Documentation
p p
MACKENZIE. Great Slave Lake: Fort Resolution, E. A. Preble 199, 200, June 21, 1903 (N); Fort Providence, Preble and Cary 45, July 5, 1903 (N).
p

~~As this variety has never before been reported from Alaska, nor for any~~
~~territory west of Hudson Bay,~~ it is desirable to give here the original descrip-

tion by Fernald as it was derived from the Newfoundland type of the variety.
(Fernald & St. John 10, 822. July 17, 1914. Type in Gray Herb; cotype in USNH.)
"Caespitose shrub with subterranean prostrate trunk up to 1 cm in dia-

meter; branches assurgent, 1-3 dm. high, with brown bark; the branchlets
puberulent; leaves oblong or obovate-oblong, obtusish, closely crenate, 1-3.5
cm. long, 0.4-1.6 cm. wide, glabrous on both surfaces, flat, the upper surface
face green, shining, and reticulate-veined, the lower glaucous-whitened, quickly
blackening in drying, petioles 1-2 mm. long; stipules none; fruiting aments
1.5-2.5 cm. long, 0.6-1 cm. thick, subtended by 1-3 small leaves; peduncle
and rachis white-villous; scales black, oblong, obtuse, villous or glabrate,
1-1.5 mm. long; capsules conic-ovoid, glabrous, reddish-yellow, 4-6 mm. long,
subsessile; style 0.5-1 mm. long; stigmas entire, divergent; nectary minute."

In publishing the description of this variety, Fernald discusses it and
its relationship to *S. myrtillofolia* as follows:

"Throughout its range, from southern Labrador, northern Newfoundland,
and the Gaspé Peninsula to the northern Rocky Mountains, *S. myrtillofolia*
is fairly constant in having the foliage green on both surfaces or merely
a little paler beneath and in having the more or less pedicelled capsules
slenderly conic-subulate and subtended by brownish or fuscous scales. On
mossy knolls of the limestone tableland of Table Mountain on Port a Port Bay
in western Newfoundland, a low shrub closely agreeing with *S. myrtillofolia*
in foliage, aments, etc., departs from the general tendencies of the species
in having the foliage conspicuously whitened beneath, the scales of the ament
black, and the capsules sessile or subsessile and of a conic-ovoid outline.
These characters would, at first sight, seem to constitute a good species,
but in the series of specimens of *S. myrtillofolia* from across the continent
one or another of these exceptional characters occasionally appears in oth-
erwise good *S. myrtillofolia* and it is, therefore, most satisfactory to
treat the Table Mountain shrub as a very extreme variety of a widely dis-
tributed species". *Rhodora* 16:171-172. 1914. Desc. on p. 172.

herb
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"Along the gravelly half-inundated margin of the River Ste. Anne des Monts occurs an unusually attractive little shrub, its slender smooth branches rarely more than 22 cm 2 or 3 feet high and its short oblong or suborbicular dentate leaves suggesting to the casual observer the foliage of the common *Amelanchier spicata* (Lam.) C. Koch (*A. rotundifolia* Roem.) of the region, rather than that of any of our willows. Prolonged study fails to show any American willow to which it is nearly related, but in foliage as well as in sessile aments the shrub very strongly suggests the little known Siberian *Salix pyrolaeifolia* Ledeb. as shown in Ledebour's beautiful plate. From that unique species the shrub of the Ste. Anne River differs in several important characters enumerated below, and it seems sufficiently distinct to merit the name

"*Salix obtusata* n. sp. Frutex parvus, ramis gracilibus castaneis glaberrimis; foliis oblongis vel terminalibus suborbiculatis 2-5 cm. longis 1-3 cm. latis dentato-serratis apice rotundatis basi rotundatis vel subcordatis junioribus arachnoideis tenuissimis pellucidis purpureo-olivaceis demum coriaceis glabris supra viridibus subtus pallidioribus; petiolis gracilibus 5-12 mm. longis; stipulis cordatis persistentibus majoribus 5 mm. longis obscure glanduloso-dentatis; amentis sessilibus, femineis 5-20 mm. longis; squamis oblongo-ovatis obtusissimis laevibus villosis; capsulis glabris coriaceo-subulatis rufescentibus vel flavescentibus 2-3 mm. longis breviter pedicellatis, pedicello nectarium valde superante; stylo parvo, stigmatibus minimis bifidis.

"Low slender shrub (0.5-1 m. high); branchlets slender, glossy brown, glabrous; leaves oblong to suborbicular, 2-5 cm. long, 1-3 cm. broad, closely dentate-serrate, rounded 1/2 or subcordate at base, rounded at apex, glabrous, or the youngest archaetomentose, at first thin and purple-tinged, later coriaceous, bright green above, slightly glaucous beneath; petiole slender, 5-12 mm. long; stipules cordate, persistent, the largest about 5 mm. long, obscurely glandular, (p. 224) dentate; aments sessile upon the old wood, the pistillate short-cylindric, 0.5-2 cm. long; scales oblong-obovate, obtuse, brownish, loosely villous; capsule glabrous, conic-subulate, reddish or yellowish 2-3 mm. long; pedicel 0.5 mm. long, much exceeding the very short nectary; style very short, the stigmas bifid. staminate aments not seen.

"QUEBEC, inundated gravelly bars and beaches, River Ste. Anne des Monts, fruit July 15, 1906, mature foliage August 16, 1906, Fernald & Collins nos. 203, 203a." (Only these specimens in Gray Herbarium, Dec. 30, 1922. CRE).

Closely allied and strongly simulating the Siberian *S. pyrolaeifolia* Ledeb., but differing in its more shallowly toothed leaves, shorter sessile aments, and very short style. The type specimens were collected from characteristic low shrubs associated with a number of other willows — *S. cordata*, *S. pellita*, *S. glaucophyllis* (sic &c. — at the frequently inundated margins of a group of alluvial islands near the head of the Grand Rapids of the River Ste. Anne des Monts.

Fernald, M. L. (Some New Willows of Eastern America) *Rhodora* 9:223-224, December, 1907.