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### NOTES ON AMERICAN WILLOWS. V

#### THE SPECIES OF THE PLEONANDRAE GROUP<sup>1</sup>

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IN my conspectus of the Mexican species of *Salix* (Bot. Gaz. LXV. 1-41. 1918) I stated that I had "already made a rather extensive investigation of the forms belonging to the *Pleiandrae*<sup>2</sup> group (sect. *Nigrae*, *Triandrae*, *Pentandrae* subsect. *Lucidae* and *Bonplandianae*)"; I then dealt with all the forms of this group which are found from Mexico to South America. To-day I propose to give a key for the determination of all the American species and varieties of these sections, to discuss their geographical distribution, and to deal with those forms of which I have not yet spoken in my paper cited above. The *Pleonandrae* group is well defined in so far as the male plants always have more than 2 (from 3 to 15) stamens, while all the other American *Salix* (except of course some hybrids) have 2 stamens or only one in *S. sitchensis*, *S. Coulteri* and *S. Uva-Ursi*.

Besides the rich material of the herbarium of the Arnold Arboretum I have been able to study the collections of the Gray Herbarium and of the herbaria of the Missouri Botanic Garden, of the Field Museum, of the Geological Survey of Canada, and of the Leland Stanford University; and I have had at my disposal part of the collections of the herbaria at Kew, New York, Reno and Washington.<sup>3</sup> I wish to express my best thanks to

<sup>1</sup> The preceding parts of this series have appeared in Botanical Gazette: I. The species related to *Salix arctica* Pall. (Bot. Gaz. LXVI. 117-142. 1918.) — II. The species related to *Salix glauca*. (l. c. 318-353. 1918.) — III. A conspectus of American species and varieties of sections *Reticulatae*, *Herbaceae*, *Ovalifoliae* and *Glaucæ*. (l. c. LXVII. 27-64. 1919.) — IV. The species and varieties of section *Longifoliae*. (l. c. 309-346. 1919.) See also A conspectus of Mexican, West Indian, Central and South American species and varieties of *Salix*. (Bot. Gaz. LXV. 1-41. 1918.)

<sup>2</sup> The name *Pleiandrae* was used by ANDERSSON (1867, 1868) but he included in his group also sect. *Fragiles* of which the male plants are diandrous. I prefer to use the spelling *Pleonandrae* of VON SEEMEN (*Salic. Japon.* 15. 1903) who restricts his group to the species with more than 2 stamens.

<sup>3</sup> In the enumeration of specimens I am using the following abbreviations: A., Herbarium of the Arnold Arboretum. — C., Herbarium of the Field Museum, Chicago. — Cal., Herbarium of California Academy of Science. — Cor., Herbarium of Cornell University. — CU., Herbarium of University of Chicago. — E., Herbarium of the University of Oregon, Eugene. — G., Gray Herbarium. — Jeps., Herbarium of Professor W. L. Jepson, Berkeley, Cal. — K., Kew Herbarium. — L., Herbarium of the University of Wyoming, Laramie, Wyo. — M., Herbarium of the Missouri Botanic Garden. — N., Herbarium of the New York Botanic Gar-



the curators of all these herbaria. For some interesting material I am indebted to Professor G. P. Clinton, New Haven, Conn., Miss A. Eastwood, San Francisco, Professor J. K. Henry, Vancouver, B.C., Mr. I. M. Johnston, Upland, Cal., and last, but not least to Mr. J. C. Nelson, Salem, Ore. From the Herbarium of the University of Oregon, at Eugene, I have received the *Salix* material of the Howell Herbarium.

#### CLAVIS SPECIERUM VARIETATUMQUE

Folia adulta<sup>1</sup> semper utrinque concoloria, viridia, linearia, lineari-lanceolata vel lanceolata, utraque facie stomatibus plus minusve aequinumerosis (tantum in quadam forma incerta *S. nigrae* paucioribus vel fere nullis) instructa; petioli (vel basis laminae) apice eglandulosi vel subeglandulosi (i.e. glandulis distinctis flavescentibus saepe irregulariter lobulatis haud praeditis, sed saepe glandulae minimae punctiformes adsunt); ramuli fragilissimi . . . . Sect. I. NIGRAE. Ramuli annotini<sup>2</sup> biennesque plus minusve rufescentes vel purpurascentes; ovaria pedicellique semper glabri.

Fructus perfecte maturi<sup>3</sup> ovoidei vel ovoideo-oblongi, apice vix vel tantum breviter attenuati, pedicello brevi iis plerumque 4-5plo brevior glandulam circ. 2plo superante suffulti; folia linearia vel lineari-lanceolata; petioli laminae comparati satis longi; stipulae intus fere semper eglandulosae.

Flores feminei glandula tantum ventrali instructi.

Folia distincte linearia, tantum versus apicem attenuata.

1. *S. Humboldtiana*.

Folia plus minusve lineari-lanceolata, fere a basi ad apicem sensim attenuata . . . . . 1b. *S. Humboldtiana* var. *stipulacea*.

Flores feminei glandulis 2 (ventrali et dorsali) instructi.

1c. *S. Humboldtiana* var. *Martiana*.

Fructus perfecte maturi ovoideo-subrostrati, apice satis attenuati, pedicello satis variabili longitudine glandulam 2-5plo superante; folia lineari-lanceolata ad late lanceolata; petioli saepe laminae comparati breviores vel stipulae intus plus minusve glanduliferae.

Ramuli hornotini vel petioli (saltem superne) plus minusve distincte villosuli vel folia plus minusve lanceolata basi obtusa, subrotunda vel breviter acuta et petioli breves (id est quam latitudo laminae haud longiores); stipulae intus eglandulosae . . . . . 2. *S. nigra* et 2b. *S. nigra* var. *altissima*.

Ramuli petiolique citissime glabrescentes vel folia plus minusve linearia et basim versus attenuata et petioli graciles satis longi; stipulae intus glanduliferae . . . . . 2c. *S. nigra* var. *Lindheimerii*.

den. — NE., Herbarium of the New England Botanical Club. — O., Herbarium of the Geol. Surv. of Canada, Ottawa. — P., Herbarium of the Academy of Science, Philadelphia. — Pu., Herbarium of the University of Washington, Pullman, Wash. — Reno, Herbarium of the Nevada Agric. Exp. Station, Reno, Nev. — St., Herbarium of the Leland Stanford University. — W., U.S. National Herbarium, Washington, D.C. — If there is no indication of a herbarium, the specimens are in A., the herbarium of the Arnold Arboretum (and mostly also in the other herbaria). Other abbreviations are: m., male specimen. — f., female specimen in flower. — fr., fruiting specimen (im. fr. means with immature fruits). — st., sterile specimen.

<sup>1</sup> This refers to fully developed normal leaves towards the end of sterile branchlets or shoots. The first (lowermost) leaves of these branchlets and the leaves of the flower-bearing branchlets (peduncles) are often very different and mostly much smaller.

<sup>2</sup> "Annotini" is used here for the well-ripened branchlets of the previous season, while "hornotini" is used for the shoots of this year.

<sup>3</sup> Very often the capsules are not ripe, but have been collected unripe and have opened in drying. Hence they are frequently smaller or of a different shape. If not properly fertilized the ovaries do not develop into normal capsules, but remain much smaller and look differently.

Ramuli annotini biennesque plus minusve distincte flavescences vel flavo-cinerei; ovaria fructusque vel pedicelli tantum saepe plus minusve villosuli; fructus ovoideo- vel anguste ellipsoideo-conici, apice plus minusve attenuati, vulgo satis longe pedicellati . . . . . 3. *S. Gooddingii*.

Folia adulta subtus discoloria, plus minusve glaucescentia vel albescentia, vel viridia (concoloria) sed superne non stomatifera vel stomatibus sparsis instructa et non lineari-lanceolata et petioli apice vel ad basim laminae distincte glanduliferi.

Petioli distincte glanduliferi, satis breves vel crassi; ramuli annotini biennesque plus minusve nitiduli; amenta mascula plus minusve breviter cylindrica, satis crassa et stricta, apice vulgo attenuata, filamentis strictis; fructus satis breviter et crasse pedicellati vel folia subtus viridescencia; ramuli ut videtur semper plus minusve valde fragiles . . . Sect. III. PENTANDRAE, subsect. LUCIDAE.

Folia matura subtus distincte albescentia vel glaucescentia.

Fructus 7-12 (vulgo circ. 10) mm. longi pedicello circ. 5plo brevior excluso; folia elliptico-lanceolata, apice acuta, vix ultra 9: 2.8 cm. (surculorum excepta) magna, superne estomatifera . . . . . 5. *S. serissima*.

Fructus 6-7.5 (rarius ad 9) mm. longi pedicello 3-5plo brevior excluso; folia apice plus minusve acuminata caudatave, ad 16: 4 vel 19: 2.5 cm. (eis surculorum exceptis) magna, superne estomatifera vel stomatibus paucis instructa . . . . . 6. *S. lasiandra*.

Folia matura subtus plus minusve concoloria, viridescencia (interdum pallide viridia, sed non glaucescentia).

Stomata in pagina superiore foliorum iis paginae inferioris fere aequinumerosa; folia plus minusve lanceolata et plus minusve sensim caudato-acuminata, vulgo 4-5plo longiora quam lata . . . 6b. *S. lasiandra*, var. *caudata*.

Stomata in pagina superiore foliorum nulla vel sparsa (rarissime ut videtur satis numerosa); folia late ovata, elliptica vel elliptico-lanceolata et semper plus minusve subito in acumen longum caudatum attenuata vel haud ultra 3½plo longiora quam lata (in. f. *angustifolia* 5-6plo longiora quam lata iis *S. lasiandrae* var. *caudatae* saepe similia sed vulgo distinctius glanduloso-serrata vel basim versus magis angustata).

Folia plus minusve late ovato- vel elliptico-lanceolata, satis subito caudato-acuminata.

Ramuli novelli foliaque novella glabra vel citissime glabrescentia.

17. *S. lucida*.

Ramuli hornotini et interdum partim annotini pubescentia sordide grisea vel rufescente praediti; folia initio satis pilosa, etiam adulta saltem in venis subtus (rufescenti-)pilosa . . . 7b. *S. lucida* var. *intonsa*.

Folia plus minusve anguste lanceolata, satis sensim acuminata.

7c. *S. lucida* f. *angustifolia*.

Petioli eglandulosi vel glandulis indistinctis parvis praediti, vel stomata in pagina superiore foliorum nulla et folia satis indistincte glanduloso-denticulata.

Ramuli annotini biennesque plus minusve flavescences, non distincte rubescentes vel purpurascences, fragiles; folia superne vulgo stomatifera vel petioli satis tenues et longi, quam lamina vix ultra 6plo breviores.

Sect. II. TRIANDRAE.

Folia plus minusve lanceolata, sensim acuminata, superne stomatibus numerosis instructa; ramuli distincte flavescences.

4b. *S. amygdaloides* var. *Wrightii*.

Folia plus minusve ovato- vel elliptico-lanceolata, satis subito acuminata; ramuli vulgo magis olivacei vel flavo-brunnei vel cinereo-fusci.

Ramuli satis flavescences, initio ut folia novella plus minusve pilosuli.

4a. *S. amygdaloides* f. *pilosiuscula*.

Ramuli magis brunnescentes vel cinereo-fusci, ab initio ut folia glaberrimi.

4. *S. amygdaloides*.

*falcata* Pursh, Fl. Am. Sept. II. 614 (1814). — Hooker, Fl. Bor.-Am. II. 149 (1839). — Forbes, Salict. Woburn. 279, t. 148 (1829). — *S. Houstoniana* Pursh, Fl. Am. Sept. II, 614 (1814), ex parte. — Forbes, Salict. Woburn.



*Ramuli* annotini distincte rubescentes vel purpurascetes vel tomentelli, tenaces (tantum in *S. Harbisonii* fragiles); folia superne nunquam stomatifera (vel in *S. Harbisonii* secundum costam stomatibus plus minusve sparsis praedita) . . . . . Sect. IV. BONPLANDIANAE.

IDAHO. Bear Lake County: Montpelier, creek bank, May 15, 1910, *J. F. Macbride* (No. 17, m. tantum; M.). Ada County: Boise, along the river, alt. 900 m., May 26, 1911, *J. A. Clark* (No. 21, fr. juv.; C., M., St.; forma tantum parce pilosa). Washington County: Weiser, alt. 660 m., July 5, 1899, *M. E. Jones* (No. 6545, fr.; M.). Nez Perces County: about Lewiston, alt. 240 m., June 9, 1896, *A. A. & E. G. Heller* (No. 3201, m., f.; A., St.; forma parcissime pilosa).

WASHINGTON. Whitman County: Almota, May 27, 1893, *C. V. Piper* (No. 1776, m.; C.); near Pullman, Aug. 31, 1918, *J. S. Jack* (No. 1244, st.; A.; "15 ft. high, several stems 2-3 in. diam.").

OREGON. Lake County: Alkali, May, 1882, *Th. J. Howell* (m., f.; E. M.).

There is also a puberulous form from northwestern Texas, collected by E. J. Palmer, at Canyon, along streams, Randall County, July 12, 1917 (No. 12517, st.; A.) and near Amarillo, along streams, Potter County, July 13, 1917 (No. 12538, fr.; A.); this in my opinion belongs to the typical *S. amygdaloides* while, as stated above, the f. *pilosiuscula* s. str. is a form of the western *S. amygdaloides* which can probably be regarded as a distinct variety.

In the south we find the following well-marked variety:

4b. *S. amygdaloides* var. *Wrightii* Schneider in Bot. Gaz. LXV. 14 (1918). For further synonymy and literature see Schneider, l. c.; to the quotations may be added the following given under *S. amygdaloides* pro parte minima: Sargent in 1884, 1896 and 1905; Britton & Brown in 1896 and 1913; Small in 1903 and 1913; Hough in 1908. — *S. amygdaloides* Coulter in Contrib. U.S. Nat. Herb. II. 419 (1892), non Andersson. — *S. Wrightii* Rydberg, Fl. Colo. 93 (1906); Fl. Rocky Mts. 191 (1917), pro parte. — Britton and Shafer, N. Am. Trees, 185, fig. 142 (1908), pro parte maxima. — I am not yet well enough acquainted with this variety to decide the question whether it is possible to keep it as a distinct species. Judging by the following material<sup>1</sup> I prefer to regard it at present as only a variety, the geographical distribution of which needs further investigation, especially in southern Colorado to where its range seems to extend. Wright's Willow seems to have also a puberulous form, but sometimes young specimens of *S. Gooddingii* are mistaken for it. Both have the same yellowish branchlets, and the very young leaves of var. *Wrightii* do not always show the glaucescent lower surface. Where the two Willows meet there may occur hybrids as it is frequently the case between *S. amygdaloides* and *S. nigra*.

WESTERN TEXAS. El Paso County: El Paso, abundant along the Rio Grande, April 1851, *G. Thurber* (No. 195, m., f.; G., N.; "large tree"); vicinity of El Paso, 1911, *E. Stearns* (No. 151, fr. im.; A.); Belen, June 19, 1893, *E. A. Mearns* (Nos. 1510, fr.; St.; 1511, fr.; A., N.). Ward County: Barstow, bank of canal, April 14, 1902, *S. M. Tracy & F. S. Earle* (Nos. 52, m., 67 f.; A.). Potter County: Amarillo Creek, along the stream, May 29, 1902, *J. Reverchon* (No. 2926, fr.; A.). Oldham County: Magenta, "S.W. Shore of lake" (1625) and Railroad gravel pit, August 26, 1910, *C. R. Ball* (Nos. 1625, 1626, 1627, st.; G., M., O.; "1 ft. diam."; Ball also collected seedlings, No. 1622, "in small sandy flat back of section house.")

<sup>1</sup> Since this was written I have seen also the material in Herb. W. which probably contains the richest collection of *Salix* specimens from Texas and New Mexico. It is a matter of personal opinion whether to regard *S. Wrightii* as a species or as a variety of *S. amygdaloides*. I prefer, however, to keep it as a variety.



SECT. I. *NIGRAE* Loudon. — Sect. *Australes* Andersson in Öfv. Svensk. Vetensk. Akad. Förh. xv. 114 (1858), ex parte. — Sect. *Austro-americanae* sive sect. *Humboldtianae* Andersson in Svensk. Vetensk. Akad. Handl. vi. 15 (Mon. Salic.) (1867), ex parte. — For further information see Schneider in Bot. Gaz. LXV. 5 (1918). It may be mentioned that in a certain form of *S. nigra* which will be discussed later the upper epidermis of the leaves contains relatively few or no stomata at all.

1. *S. Humboldtiana* Willdenow. — See Schneider, l. c. 6. — As I have stated, this species in its typical form is confined to South America.

1b. *S. Humboldtiana* var. *stipulacea* (Martens & Galeotti) Schneider. — See Schneider, l. c. 7 (1918). — This variety represents the type in Central America and Mexico but does not reach the southern border of the United States.

1c. *S. Humboldtiana* var. *Martiana* (Leybold) Andersson. — See Schneider, l. c. 8 (1918). — A badly understood form which seems to be confined to certain parts of Brazil and Colombia.

2. *S. nigra* Marshall, Arbust. Am. 139 (1785). — Muhlenberg in Neue Schrift. Ges. Nat. Fr. Berlin, iv. 237, t. 6, fig. 5 (1803). — Michaux f., Hist. Arb. Am. iii. 324, t. 5, fig. 1 (1813); N. Am. Sylva, iii. 78, t. 125, fig. 1 (1819). — Pursh, Fl. Am. Sept. iii. 614 (1814). — Hooker, Fl. Bor.-Am. ii. 148 (1839). — Barratt, Salic. Am. no. 20 (1840). — Carey in Gray, Man. 429 (1848). — Andersson in Svensk. Vetensk. Akad. Handl. vi. 19, t. 2, fig. 15 (Monog. Salic.) (1867), ex parte; in De Candolle, Prodr. xvi.<sup>2</sup> 200 (1868), ex parte. — Newhall, Trees N.E. Am. 72, fig. 36 (1890). — Bebb apud Watson & Coulter, Gray Man. ed. 6, 480 (1890), excl. var. *Wardii*. — Sargent, Silva N. Am. ix. 103, t. 462 (1896), excl. syn. ex parte; Man. Trees N. Am. 168, fig. 140 (1905), pro parte max. — Glatfelter in Trans. Acad. Sci. St. Louis, vi. 427, t. 1, figs. 5-7, 10 (1894). — Britton & Brown, Ill. Fl. i. 494, fig. 1173 (1896). — Sudworth in Bull. U.S. Dept. Agric. Div. For. xiv. 118 (Nomencl. Arb. Fl.) (1897), ex parte. — Ball in Proc. Iowa Acad. Sci. vii. 143 (1900); in Elys. Mar. iii. 19 (1910). — Mohr in Contrib. U.S. Nat. Herb. vi. 465 (Pl. Life Ala.) (1901). — Small, Fl. S.E. States, 341 (1903), ex parte. — Schneider, Ill. Handb. Laubh. i. 32, figs. 11a-b, 12a (1904). — Hough, Handb. Trees, 78, figs. 91-92 (1907), pro parte max. — Robinson & Fernald, Gray's Man. 320, fig. 640 (1908). — Britton & Shafer, N. Am. Trees, 183, fig. 184 (1908), ex parte et excl. syn. — Small, Shrubs Florida, 9 (1913). — Rydberg, Fl. Rocky Mts. 191 (1917). — *S. pentandra* Walter, Fl. Car. 243 (1788). — *S. flavo-virens* Hornemann, Cat. Hort. Hafn. Suppl. ii. 11, ex Willdenow, Berl. Baumz. ed. 2, 426 (1811), pro syn. *S. nigrae*. — *S. ligustrina* Michaux f., Hist. Arb. Am. iii. 326, t. 5, fig. 2 (1813); N. Am. Sylva, iii. 80, t. 125, fig. 2 (1819). — *S. falcata* Pursh, Fl. Am. Sept. ii. 614 (1814). — Hooker, Fl. Bor.-Am. ii. 149 (1839). — Forbes, Salict. Woburn. 279, t. 148 (1829). — *S. Houstoniana* Pursh, Fl. Am. Sept. ii. 614 (1814), ex parte. — Forbes, Salict. Woburn.



21, t. 11 (1829). — ? *S. ambigua* Pursh, Fl. Am. Sept. 617 (1814). — ? *S. Purshiana* Sprengel, Syst. v. 608, in indice (1828). — *S. nigra* var. *falcata* Torrey, Fl. N.Y. II. 209 (1843). — Carey in Gray, Man. 429 (1848). — Andersson in Ofv. Svensk. Vetensk. Akad. Förh. xv. 114 (1858). — Newhall, Trees N.E. Am. 74, fig. 37 (1890). — Sargent, Silva N. Am. ix. 104, t. 463 (1896). — *S. nigra* a. *angustifolia* a. *falcata* et  $\beta$ . *longifolia* Andersson in Svensk. Vetensk. Akad. Handl. vi. 20 (1868). — *S. nigra* b. *latifolia* a. *brevijulis* et  $\beta$ . *longijulis gracilescens* Andersson, l. c. 21 (1868). — *S. nigra* [subspec.] *S. furcipila* Gandoger, Fl. Europ. XXI. 167 (1890). — *S. nigra* [subspec.] *S. leptodes* Gandoger, l. c. — *S. nigra* [subspec.] *S. ventricosa* Gandoger, l. c.

A very well-known eastern species the range of which seems to extend along the Atlantic coast from southern New Brunswick to northern North Carolina, and westward through northwestern South Carolina and northern Georgia (from where I have not yet seen typical material) to central and eastern Alabama (probably also to northern Missouri), southern Arkansas (where var. *altissima* is the prevailing form) and from northern Louisiana to northeastern Texas (where it seems to spread in the central parts as far south as Val Verde County on the Rio Grande, although most of the material from Texas belongs to var. *Lindheimerii*). The southern borderline of the range of *S. nigra* reaches its most western point at about 100° W. L., and from there runs northward through central Oklahoma and the eastern parts of Kansas, Nebraska, and South Dakota.<sup>1</sup> For the northern limit of its range may be taken a line running from about the 95th degree W. L. along the north shores of Lake Superior through southern Ontario and Quebec to southern New Brunswick. *S. nigra* does not occur in the southwest or west where it is represented by *S. Gooddingii*. In the south the typical form apparently passes by many intermediates into var. *Lindheimerii* and var. *altissima*. Of peculiar interest are the forms of the southeast from Virginia to northern Florida because they show a smaller number of stomata on the upper surface of the leaves. While in the typical form as well as in var. *altissima* and var. *Lindheimerii* the number of the stomata is scarcely less on the upper than on the lower leaf-surface, these southeastern forms sometimes only have a few stomata along the midrib and even these seem to be occasionally wanting. I have not yet been able to detect other characters to separate these forms from typical *nigra* but for two reasons I think it best to enumerate them below. Firstly, they certainly need a further study, and secondly I wish to draw the special attention of all collectors to them, because the distribution of *S. nigra* in the southeast is very insufficiently known, and material of it from that

<sup>1</sup> According to the map given by Hough *S. nigra* inhabits almost the whole state of Kansas, the eastern half of Nebraska and South Dakota, the southeastern corner of North Dakota and nearly the whole of Minnesota except the northwestern corner. I have not yet seen material from the Dakotas and Minnesota but according to Lunell's enumeration (Am. Midl. Nat. iv. 197 [1916]) *S. nigra* is wanting in North Dakota, and according to Petersen (Fl. Nebr. ed. 2, 69 [1912]) it occurs in Nebraska only in the eastern part of the state. It is absent from northern central and western Kansas (see Hitchcock in The Industrialist, xxiv. 323 [Fl. Kansas] [1899.])



region in herbaria is very scanty. From the range given in Britton and Brown's Flora or in Small's Flora it would appear that *S. nigra* was distributed along the whole eastern coast including Florida. In his Florida Shrubs 9 (1913), Small distinguishes two species from northern Florida with "leaf-blades green beneath." One he calls *S. nigra*, and the other *S. marginata* "Weimer" [Wimmer]. The first apparently represents the form I refer to above, while *S. marginata* seems to me identical with the plant I describe as *S. Harbisonii*. As to the name *marginata* see later under *S. longipes venulosa*. Harper, in his Geogr. and Veget. of northern Florida (in Sixth Ann. Rep. Florida Geol. Surv. 401 [1914]) says under *S. nigra* "Banks of streams, etc., mostly westward." He probably too includes forms of *S. Harbisonii* which, as I shall explain later, often looks intermediate between *S. nigra* and forms of *S. longipes*. I have been able to examine the following specimens of what I believe is a form closely related to typical *S. nigra* from Virginia to northern Florida.

VIRGINIA. Alexandria County: Arlington, May 10, 1891, *F. Blanchard* (fr.; M.; stomata in pagina foliorum superiore pauciora). Dinwiddie County: Petersburg, banks of the Appomatox River, August 22, 1908, *A. Rehder* (st.; A.). Gloucester County, without exact locality, common, September 14, 1912, *C. S. Sargent* (st.; A.; very similar to the preceding). Smyth County: about falls of Holston River, June 8, 1892, *J. K. Small* (fr.; A., M.; stomata in pag. superiore foliorum partim non visa).

SOUTH CAROLINA. Oconee County: Clemson College, April 23, 1906, *H. D. House* (No. 1910, m., f.; N.; forma satis typica stomatibus paucioribus). Abbeville County: Calhoun Falls, along Savannah River, May 20, 1918, *T. G. Harbison* (No. 6, fr.; A.; stomata in foliis superne non visa). Darlington County: Darlington, in low swampy ground, April 24, 1918, *T. G. Harbison* (Nos. 19, fr., st., 21, fr., 23, fr.; A.; "large shrub"; stomata non visa vel tantum pauca secundum costam).

GEORGIA. Rabun County: Pine Mountain, along rocky stream in mountain, April 16, 1918, *T. G. Harbison* (Nos. 1, 2, m.; A.; "small tree"; flowers very young, twigs rather brownish); Clayton, on bank of small stream, April 11, 1918, *T. G. Harbison* (Nos. 1, 2, m., f.; A.; "small tree with brittle-jointed twigs"; same as preceding). Gwinnett County: Yellow River, May 22, 1897, *H. Eggert* (fr.; M.; stomata superne sparsa). De Kalb County: on and about Stone Mountain, May 1-18, 1895, *J. K. Small* (m., f.; A., N.; stomata superne nulla vel sparsa). Richmond County: near Augusta, October 7, 1914, *C. S. Sargent* (st.; A.; stomata superne non visa); on bank of river, April 6, 1918, *T. G. Harbison* (No. 6, m.; A.; "large tree; bark rough and scaly; twigs brittle-jointed"). Randolph County: Cuthbert, in low ground along a small stream, March 29, 1918, *T. G. Harbison* (Nos. 4, f., 5, m.; A.; "a tree 60 ft. tall and a foot in diameter; bark furrowed and scaly in thick plates; twigs brittle-jointed"; stomata superne tantum ad costam sparsa).

FLORIDA. Gadsden County: River Junction, in low ground, March 24, 1918, *T. G. Harbison* (No. 18, fr. im.; A.; "shrub 8 ft. tall; twigs brittle-jointed"; this form may be referable to *S. Harbisonii*); March 24, 1918, *T. G. Harbison* (No. 2, m.; A.; "a tree nearly a ft. in diameter and about 50 ft. tall; bark deeply furrowed and scaly"; stomata superne numerosa!). Duval County: Jacksonville, in low inundated swamp, March 19, 1918, *T. G. Harbison* (No. 2, fr.; A.; "large shrub or low straggling tree"; according to the rather long pedicels of the fruits this form may belong to *S. Harbisonii*).

The var. *falcata* cannot in my opinion even be distinguished as a good form (see Blake's statements in *Rhodora*, xv. 163 [1903]), and so far as I can



see it is hardly possible to separate any other forms but the two following. As to *S. ambigua* Pursh I can only say that it deserves its name until we find a type specimen.

2b. *S. nigra* var. *altissima* Sargent in *Trees & Shrubs*, II. 216 (1913). — ? *Salix* spec. Robin, *Voy. Louisiana*, III. 521 (1807). — ? *S. denudata* Rafinesque, *Florul. Ludovic.* 116 (1817). — As the varietal name indicates this willow becomes the tallest American *Salix* growing up to the height of 40 m. The type was collected near Fulton on the Red River, Hempstead County, Arkansas, May 20, 1909, by the well-known collector B. F. Bush (No. 5654, fr.; A.). Except in its size it differs from the type only in the more pubescent young shoots, leaves and especially the petioles which are almost barbate-tomentose above and on the average are comparatively longer, and in the shape of its leaves which as a whole are more acute at the base thus resembling var. *Lindheimerii*. Besides this var. *altissima* flowers a little later than the type where both grow together. I have seen specimens from Arkansas (Hempstead County), Louisiana (Caddo, Winn, Richland, Rapides, West Feliciana, New Orleans, St. Landry, Jefferson, Lafayette and Calcasieu Parishes), and from eastern Texas (Harrison, San Augustine, Polk, Walker, Harris, Houston, and Jefferson Counties) but some of the Texan forms need further study and may partly be referable to var. *Lindheimerii*. Sargent suggested that *S. marginata* Wimmer might be identical with var. *altissima*, but Wimmer's form belongs to *S. longipes venulosa*. *S. denudata* Rafinesque mentioned in the synonymy is an obscure species very badly described, but it seems to be referable to var. *altissima*.

2c. *S. nigra* var. *Lindheimerii* Schneider in *Bot. Gaz.* LXV. 9 (1918). — I have (l. c.) already dealt with this interesting variety which in some respects seems to form a connecting link between *S. nigra* and its southern representative, *S. Humboldtiana* (var. *stipulacea*), and I have enumerated the specimens examined from Mexico. In the United States it is found in the eastern part of central Texas and in southeastern Texas where I have seen it from the following counties: Grayson, Dallas, Tarrant, McLennan, Bell, Gillespie, Kendall, Comal, Bexar, Wilson, Calvado, Harris, Polk, Brazoria, Wharton, Matagorda, Victoria, Atascosa, Refugio; a specimen from Caddo County, Louisiana, is rather intermediate between var. *altissima* and var. *Lindheimerii*, and a sterile one from western Texas, Jeff Davis County (near Fort Davis, D. M. Andrews, No. 77; A.) belongs probably to those forms from Texas which I am unable to distinguish from typical *S. nigra*.<sup>1</sup> The var. *Lindheimerii* may also occur somewhere in southern Oklahoma along the Red River, and it seems to me to be connected by intermediates in the north with typical *S. nigra*, and more to the east with var. *altissima*, while in Mexico it comes very near *S. Humboldtiana* as I have previously stated.

<sup>1</sup> *S. nigra* Coulter in *Contrib. U.S. Nat. Herb.* II. 419 (1892), probably belongs partly to var. *Lindheimerii*, and his var. *Wrightii* seems also to represent a form of *S. nigra* and not the true *S. Wrightii*. A sterile specimen collected by C. R. Ball on the Bear Creek, 14 mi. northwest of Junction, Kimble County, August 25, 1909 (No. 1537; O.) has very short petioles, and looks much like typical *S. nigra*.



3. *S. Gooddingii* Ball in Bot. Gaz. XL. 376, t. 12, figs. 1-2 (1905). — *S. nigra* var. *venulosa* Bebb apud Coville in Contrib. U.S. Nat. Herb. IV. 199 (Bot. Death Valley Exped.) (1893). — *S. nigra* Greene, Man. Bot. San Francisco Bay, 299 (1894), non Marshall. — Eastwood, Handb. Trees Cal. 35 (1905), pro parte max. — Sudworth, For. Trees Pacif. Slope, 213, figs. 85-86 (1908), pro parte. — Jepson in Mem. Univ. Cal. II. 175, t. 56, figs. 1-3 (Silva Cal.) (1910), incl. var. *vallicola*. — Wootton in Bull. N. Mex. Agr. Coll. LXXXVII. 43, fig. (1913). — For further synonymy and literature see Schneider in Bot. Gaz. LXV. 12 (1918). — This species is widely spread in California from Tehama and Butte Counties in the north to the very south and to northern Lower California. Toward the east it is found in southeastern Nevada, Lincoln and Clarke Counties (where the type was collected), Arizona (except probably in the northern and northeastern part of the state), southwestern New Mexico (probably not north of Socorro County and not east of the Rio Grande), and northwestern Texas (El Paso and Jeff Davis Counties). There is a specimen in Herb. N., collected by Frémont, "on road day we left Canyon Arkansas River Aug. 28," 1845 (No. 402<sup>a</sup>, st.) which would mean Colorado if the locality is correctly given. I have seen no other specimen of our species from that state. The eastern and north-eastern limits of its range need further observation. It is clearly distinct from the eastern *S. nigra* for which it has been taken by most authors. There seem to be two forms which may be distinguished by the glabrousness or by the more or less copious pubescence of the young and the one-year-old branchlets; the more pubescent one would have to be taken for the type.

SECT. II. TRIANDRAE Dumortier. — Sect. *Australes* Andersson in Öfv. Svensk. Vetensk. Akad. Förh. XV. 114 (1858), ex parte. — Sect. *Fragiles* Andersson, l. c. 115, ex parte, non Koch, nec Fries. — For further information see Schneider in Bot. Gaz. LXV. 13 (1918).

4. *S. amygdaloides* Andersson in Öfv. Svensk. Vetensk. Akad. Förh. XV. 114 (1858); in Proc. Am. Acad. Sci. IV. 53 (Salic. Bor.-Am. 8) (1858); in Walpers, Ann. Bot. V. 744 (1858). — Bebb in Rothrock, Wheeler's Rep. VI. Bot. 240 (1878); in Coulter, Man. Rocky Mts. Bot. 334 (1885); apud Watson & Coulter, Gray Man. ed. 6, 481 (1890). — Macoun, Cat. Can. Pl. II. 444 (1883). — Sargent, Rep. For. N. Am. 10 Cens. U.S. IX. 166 (1884), pro parte max.; Silva N. Am. IX. 111, t. 467 (1896), pro parte max.; Man. Trees N. Am. 170, fig. 142 (1905), pro parte max. — Glatfelter in Trans. Acad. Sci. St. Louis, VI. 428, t. 1, figs. 1, 3, 4, 8, 9 (1894). — Bush in State Hort. Rep. Mo. 1895, p. 360 (List Trees Mo.). — Williams in Bull. S. Dak. Agric. Coll. Exp. Sta. XLIII. 105 (1895). — Britton & Brown, Ill. Fl. I. 495, fig. 1175 (1896), pro parte max.; ed. 2, I. 593, fig. 1452 (1913), pro parte max. — Sudworth in Bull. U.S. Dept. Agric. Div. For. XIV. 120 (Nomencl. Arb. Fl.) (1897), pro parte max.; For. Trees Pacif. Slope, 216, fig. 87 (1908). — Ball in Proc. Iowa Acad. Sci. VII. 144 (1900); in Coulter & Nel-



son, *New Man. Rocky Mts. Bot.* 129 (1909); in *Bot. Gaz.* LX. 397 (1915). — Rydberg in Britton, *Man.* 313 (1901); ed. 2, 313 (1905); in *Mem. N.Y. Bot. Gard.* I. 109 (*Cat. Fl. Mont.*) (1901); *Fl. Colo.* 93 (1906); *Fl. Rocky Mts.* 191 (1917). — Howell, *Fl. N.W. Am.* I. 617 (1902). — Small, *Fl. S.E. States*, 341 (1903). — Eastwood, *Handb. Trees Cal.* 37 (1905). — Piper in *Contrib. U.S. Nat. Herb.* XI. 212 (*Fl. Wash.*) (1906). — Hough, *Handb. Trees*, 75, fig. 86 (1907), pro parte max. — Jones, *Willow Fam.* 26 (1908). — Robinson & Fernald, *Gray's Man.* 321, fig. 642 (1908). — Britton & Shafer, *N. Am. Trees*, 188, fig. 146 (1908). — Daniels in *Univ. Mo. Stud. Sci. Ser.* II. 247 (*Fl. Boulder Colo.* 99) (1911). — Schaffner in *Ohio Biol. Surv.* I. 199 (*Cat. Ohio Pl.*) (1914). — J. L. Henry, *Fl. S. Brit. Col.* 73 (1915). — *Salix* [second species] Torrey in Nicollet, *Rep. Upper Miss. Riv. App. B.* 237 (*Cat. Pl. Geyer*, 160) (1843). — *S. nigra* \*\**S. amygdaloides* Andersson in *Svensk. Vetensk. Akad. Handl.* VI. 21 (*Monog. Salic.*) (1867). — *S. nigra*  $\beta$ . *amygdaloides* Andersson in *De Candolle Prodr.* XVI.<sup>2</sup> 201 (1868). — Porter & Coulter in *U.S. Geol. Surv. Misc. Publ. No. 4.* 128 (*Syn. Fl. Colo.*) (1874). — *S. Wrightii* Rydberg, *Fl. Rocky Mts.* 191 (1917), ex parte, non Andersson. The type of this well-known species came from South Dakota where it was collected on the banks of the Missouri at Fort Pierre during the voyage of Prince Maximilian Wied-Neuwied. I have not yet been able to examine the type, but so far as I can judge by the material from South Dakota at my disposal the form of this state is identical with that of Missouri described by Glatfelter. Its range extends from Quebec (about 73° W. L.) to central New York (Onondaga and Tompkins Counties) apparently along the southern shores of Lake Erie (absent from Pennsylvania) through northern Ohio (where it has been observed according to Schaffner as far south as Franklin County) and northern Indiana (where I have seen it from Jasper and Wells Counties) to Illinois Missouri (where it is apparently absent from the southern part of the state), Kansas to northwestern Oklahoma and the northwestern corner of Texas, but the forms of Oklahoma and Texas approach the western ones which may not represent typical *S. amygdaloides*. Further to the west it is found in Colorado (except probably in the southwestern corner), Utah (here wanting apparently in the south) and Nevada (where, judging by the material before me, it does not seem to occur in the southern and central parts of the state). From Nevada the western borderline runs northward through central Oregon (Lake and Wasco Counties), southeastern Washington (West Klickitat to Whitman County) to southeastern British Columbia (eastern Kootenay according to J. L. Henry). From here the northern limit of its range seems to follow about the 50th parallel to the Winnipeg region, from where it turns a little to the south through southern Ontario and northern Quebec to Montreal. On the map given by Hough it is shown farther north in Alberta and to central Saskatchewan and central Manitoba, but I have seen no material from as far north. In the southeast Hough includes the whole course of the Ohio in the range of *S. amygdaloides* but it is not mentioned by Porter from Pennsylvania, and I have seen no specimens from the lower Ohio where it is



said to be "abundant" by Sargent (Man. 171). This is probably a mistake, as indicated above.

I am not sure whether the western forms really represent typical *S. amygdaloides*,<sup>1</sup> but there is certainly a form with puberulous or subtomentose young parts that deserves a special mention. Ball (1909) says that "a form with very narrow leaves, scarcely 1 cm. wide, is found on the high plains east of the Rocky Mountains." I am not yet sure to which form he refers, and I wish to state that the western forms need a much closer study than I have been able to devote to them. It may be that the following form ought to be regarded only as a form of a western variety, and that even within the range of typical *amygdaloides* another corresponding form may occur. I only wish to call attention to this western form in proposing the name *S. amygdaloides* f. *pilosiuscula*, forma nov.: a typo ut videtur tantum recedit ramulis foliisque novellis pilosiusculis (? rarius ramulis petiolis foliisque ad costam breviter subtomentosis; confer no. 902 Gooddingii); ramulis annotinis biennesque satis (ut fere in omnibus aliis speciminibus occidentalibus) flavescentibus, foliis superne stomatibus vulgo numerosioribus instructis, stipulis plus minusve acutis, amentis saepissime densioribus, fructibus magis approximatis. — I refer to f. *pilosiuscula* the following specimens:

NEVADA. Washoe County: Wadsworth, alt. 1265 m., May 7, 1909, *A. A. Heller* (No. 10403, m., paratype; A., M.); sloughs between Pyramid and Winnemucca Lakes, alt. 1200 m., June 2, 1913, *P. B. Kennedy* (No. 1997, m., fr., im., G., Reno; foliis normalibus valde juvenilibus; forma in herbariis sub nomine inedito *S. washoensis* W. W. R. distributa). Churchill County: Carson Sink Region, alt. 1265 m., July 15, 1908, *P. B. Kennedy* (No. 1776, fr. type; A., M., Reno).

UTAH. Davis County: Farmington, June 11, 1908, *J. Clemens* (fr. juv.; G.). Salt Lake County: Salt Lake City, alt. 1300 m., May 12, 1880, *M. E. Jones* (No. 1711, m.; A.); May 22, 1887, *M. E. Jones* (m., f.; A.); City Creek Cañon, Wasatch Mts., 1500 m., April 20, 1900, *S. G. Stokes* (m., f.; St.). Beaver County: Milford, along a bottom, June 4, 1902, *L. N. Goodding* (No. 1019, m., f.; A., M.). Washington County: Santa Clara Creek, May 20, 1902, *L. N. Goodding* (No. 902, fr. im.; M.; specimen a cl. Ball pro *S. laevigata* determinatum, sed ab hac species satis diversum et magis ad f. *pilosiusculam* accedens; forma satis incerta ramulis novellis et partim annotinis petiolis costaque foliorum superne tomentellis, amentis laxis fructibus in pedicello sparse pilosis, foliis normalibus nondum satis evolutis).

COLORADO. Montrose County: Naturita, ditch bank, alt. 1620 m., May 26, 1914, *E. Payson* (No. 354, m., 355, f.; M.) ? Clear Creek County: Clear Creek Valley, May 27, 1916, *A. Eastwood* (Nos. 5390, f., 5391, m.; A.). Larimer County: without exact locality, foothills, alt. 1800 m., May 26, 1897, *C. S. Crandall* (No. 12, m., fr. juv.; M.; amentis fructiferis sublaxioribus); Fort Collins, alt. 1500 m., May 15, 1896, *C. F. Baker* (m.; M.). Weld County: Greely, June 24, 1896, *L. H. Pammel* (No. 205, fr.; M.; parcissime pilosa); Evans, 1909, *E. L. Johnson* (No. 541, m., f.; M.). Morgan County: Fort Morgan, June 23, 1896, *L. H. Pammel* (No. 206, st.; M.). Las Animas County: bank of Purgatoire River near Trinidad, 2000 m., May 13, 1892, *C. S. Crandall* (No. 9, m., f.; C.).

<sup>1</sup> Professor J. S. Jack collected a very vigorous form at Holland near Pullman, Wash., Aug. 31, 1918 (No. 1241, st.; A.), that looks much like vigorous forms collected by Glatfelter near St. Louis, Mo., but in the western form the stipules are decidedly acute, not rounded as in the type. The young shoots and leaves are puberulous.



IDAHO. Bear Lake County: Montpelier, creek bank, May 15, 1910, *J. F. Macbride* (No. 17, m. tantum; M.). Ada County: Boise, along the river, alt. 900 m., May 26, 1911, *J. A. Clark* (No. 21, fr. juv.; C., M., St.; forma tantum parce pilosa). Washington County: Weiser, alt. 660 m., July 5, 1899, *M. E. Jones* (No. 6545, fr.; M.). Nez Perces County: about Lewiston, alt. 240 m., June 9, 1896, *A. A. & E. G. Heller* (No. 3201, m., f.; A., St.; forma parcissime pilosa).

WASHINGTON. Whitman County: Almota, May 27, 1893, *C. V. Piper* (No. 1776, m.; C.); near Pullman, Aug. 31, 1918, *J. S. Jack* (No. 1244, st.; A.; "15 ft. high, several stems 2-3 in. diam.").

OREGON. Lake County: Alkali, May, 1882, *Th. J. Howell* (m., f.; E. M.).

There is also a puberulous form from northwestern Texas, collected by *E. J. Palmer*, at Canyon, along streams, Randall County, July 12, 1917 (No. 12517, st.; A.) and near Amarillo, along streams, Potter County, July 13, 1917 (No. 12538, fr.; A.); this in my opinion belongs to the typical *S. amygdaloides* while, as stated above, the f. *pilosiuscula* s. str. is a form of the western *S. amygdaloides* which can probably be regarded as a distinct variety.

In the south we find the following well-marked variety:

4b. *S. amygdaloides* var. *Wrightii* Schneider in Bot. Gaz. LXV. 14 (1918). For further synonymy and literature see Schneider, l. c.; to the quotations may be added the following given under *S. amygdaloides* pro parte minima: Sargent in 1884, 1896 and 1905; Britton & Brown in 1896 and 1913; Small in 1903 and 1913; Hough in 1908. — *S. amygdaloides* Coulter in Contrib. U.S. Nat. Herb. II. 419 (1892), non Andersson. — *S. Wrightii* Rydberg, Fl. Colo. 93 (1906); Fl. Rocky Mts. 191 (1917), pro parte. — Britton and Shafer, N. Am. Trees, 185, fig. 142 (1908), pro parte maxima. — I am not yet well enough acquainted with this variety to decide the question whether it is possible to keep it as a distinct species. Judging by the following material<sup>1</sup> I prefer to regard it at present as only a variety, the geographical distribution of which needs further investigation, especially in southern Colorado to where its range seems to extend. Wright's Willow seems to have also a puberulous form, but sometimes young specimens of *S. Gooddingii* are mistaken for it. Both have the same yellowish branchlets, and the very young leaves of var. *Wrightii* do not always show the glaucescent lower surface. Where the two Willows meet there may occur hybrids as it is frequently the case between *S. amygdaloides* and *S. nigra*.

WESTERN TEXAS. El Paso County: El Paso, abundant along the Rio Grande, April 1851, *G. Thurber* (No. 195, m., f.; G., N.; "large tree"); vicinity of El Paso, 1911, *E. Stearns* (No. 151, fr. im.; A.); Belen, June 19, 1893, *E. A. Mearns* (Nos. 1510, fr.; St.; 1511, fr.; A., N.). Ward County: Barstow, bank of canal, April 14, 1902, *S. M. Tracy & F. S. Earle* (Nos. 52, m., 67 f.; A.). Potter County: Amarillo Creek, along the stream, May 29, 1902, *J. Reverchon* (No. 2926, fr.; A.). Oldham County: Magenta, "S.W. Shore of lake" (1625) and Railroad gravel pit, August 26, 1910, *C. R. Ball* (Nos. 1625, 1626, 1627, st.; G., M., O.; "1 ft. diam."; Ball also collected seedlings, No. 1622, "in small sandy flat back of section house."

<sup>1</sup> Since this was written I have seen also the material in Herb. W. which probably contains the richest collection of *Salix* specimens from Texas and New Mexico. It is a matter of personal opinion whether to regard *S. Wrightii* as a species or as a variety of *S. amygdaloides*. I prefer, however, to keep it as a variety.



NEW MEXICO. Dona Ana County: Las Cruces, Experiment Station, June 13, 1911, *C. R. Ball* (No. 1739, fr.; G., M., O.; "large tree"); Valley of the Rio Grande, near La Mesilla, June 19, 1858, *S. Hayes* (fr.; C.); at Mesilla, April, 1897, *T. D. A. Cockerell* (m., f.; N.); same locality, alt. 1150 m., June 21, 1897, *E. V. Wooton* (No. 44, fr.; G., M.; in *St. forma foliis subtus concoloribus porro observanda*); in the Mesilla Valley, alt. circ. 1150 m., April 19, 1907, *E. V. Wooton & P. Standley* (No. 3242, m.; C., M.). Sierra County: Tierra Blanca, 1904, *I. N. Beals* (fr.; A.). Otero County: Sacramento Mts., Fresnal Canyon, below High Rolls, alt. 1800 m., August 26, 1916, *A. Rehder* (No. 445, st.; A.).

SECT. III. PENTANDRAE Dumortier, subsect. LUCIDAE, subsect. nov. — Sect. *Fragiles* Andersson in Öfv. Svensk. Vetensk. Akad. Förh. xv. 115 (1858), ex parte. — Sect. *Lucidae* sive sect. *Pentandrae* Andersson in Svensk. Vetensk. Akad. Handl. vi. 30 (Mon. Salic.) (1867), ex parte. — Sect. *Pentandrae* Ball in Coulter & Nelson, N. Man. Rocky Mts. Bot. 130 (1909), non Dumortier.

At present I think it best to keep the American forms which are most closely related to *S. pentandra* L. in a special subsection, although *S. serissima* may perhaps be more correctly referred to the true *Pentandrae*.

5. *S. serissima* Fernald in Rhodora, vi. 6 (Dec. 28, 1903); Robinson & Fernald, Gray's Man. 322, fig. 645 (1908). — Britton & Brown, Ill. Fl. ed. 2, i. 594, fig. 1455 (1913). — Rydberg in Britton, Man. Fl. N. St. Can. ed. 2, 1061 (1905); Fl. Rocky Mts. 191 (1917). — ? *S. (pentandra) lucida ovatifolia densiflora* Andersson in Öfv. Svensk. Vetensk. Akad. Förh. xv. 115 (1858); in Proc. Am. Acad. iv. 54 (Salic. Bor.-Am. 8) (1858). — ? *S. (pentandra) lucida pilosa* Andersson in Öfv. Svensk. Vetensk. Akad. Förh. xv. 115 (1858), pro parte. — ? *S. (pentandra) lucida* var. *angustifolia* f. *pilosa* Andersson in Proc. Am. Acad. iv. 54 (1858), pro parte. — ? *S. lucida angustifolia rigida* Andersson in Svensk. Vetensk. Akad. Handl. vi. 32 (Monog. Salic.) (1867), pro parte. — ? *S. arguta erythrocoma* Andersson l. c. 33. — ? *S. erythrocoma* Barratt ex Andersson l. c., pro synonym. — Rydberg, Fl. Rocky Mts. 191 (1917), an tantum ex parte ? — *S. arguta* \**S. pallescens* Andersson in Svensk. Vetensk. Akad. Handl., vi. 32 (1867), prob. incl. f. *hirtisquama* Andersson, l. c. 34, sed. excl. f. *alpigena* Andersson, l. c. 33. — *S. arguta* δ, *pallescens* Andersson in De Candolle, Prodr. xvi.<sup>2</sup> 206 (1868). — *S. lucida ovalifolia* Andersson, l. c. 205 (1868). — *S. lucida serissima* Bailey apud Arthur in Bull. Geol. Nat. Hist. Surv. Minn. iii. 19 (1887). — For further synonymy and literature see Fernald in Rhodora vi. 7 (1903). — This interesting and well-marked species has always been confused with *S. lucida* or *S. amygdaloides*, until its characteristic features were recognized by Bailey and later with more preciseness by Fernald. Unfortunately Fernald did not pay attention to the forms described by Andersson and enumerated above in the synonymy. Andersson had to deal with little and insufficient material, therefore, he was, apparently, not able to get a clear understanding of the different forms he referred to *S. lucida* and *S. arguta*. Without having seen all the material upon which Andersson based his descriptions it is impossible to elucidate his varieties and forms, but there can



hardly be any doubt that his *S. pallescens*<sup>1</sup> with the exception of f. *alpigena* and his *S. lucida pallescens* are the same as *S. serissima*. The type was collected by Bourgeau on the Saskatchewan and of f. *hirtisquama* by the same collector "ad lac. Winnipeg." Andersson describes the leaves as "subtus pallide glaucescentibus" and the fruits as "distinctius pedicellatis," and there is no other willow to which the name could be applied in the region from which the type came.

*S. arguta erythrocoma* Andersson or *S. erythrocoma* Barratt which is regarded by Rydberg (Fl. Rocky Mts. 191 [1917]) as a good species represents a mixture of forms from Lake Winnipeg (belonging, so far as I can judge by the specimen in Herb. G., to *S. serissima*) and from the Columbia (collected probably at the mouth of this river in April-May 1825 by Dr. Scouler). I have seen a specimen of the last named under No. 62 in Herb. N. consisting of male and female flowers. I cannot distinguish it from typical *S. lasiandra*. There is another specimen under No. 61 of Dr. Scouler from the Columbia in Herb. N. also labeled *S. erythrocoma* Barratt. It consists of very young female flowers of *S. lasiandra*, and also of a branch with male aments of which the flowers do not seem to be normal. It is too poor to be properly identified.

According to Fernald who gave an excellent account of this species it ranges "from the Housatonic Valley, Massachusetts, to the north shore of Lake Superior, south to Morris County, New Jersey, western New York, northern Ohio, Michigan, Wisconsin, and Minnesota." I have seen it also from northeastern Indiana (Steuben and La Grange Counties). In the northeast its range extends to Newfoundland (Valley of Exploit River) and Anticosti Island, whence its northern limit seems to run to the eastern shores of James Bay and to reach its northernmost point in Keewatin, on the Severn River (J. M. Macoun, No. 2028, O.), while from further west I have seen specimens from near Edmonton, Alberta. From here the western borderline runs south to Banff and Crow's Nest Lake in Alberta and then turns to the east to Sidney in Manitoba and to north-eastern Minnesota (St. Louis County).

6. *S. lasiandra* Benthams, Pl. Hartweg. 335 (1857). — Torrey in Pacific R.R. Rep. iv. Bot. 138 (1857). — Sargent, Rep. For. N. Am. 10 census U.S. ix. 167 (1884), excl. var.; Silva N. Am. ix. 115, t. 469 (1896), excl. var.; Man. Trees 173, fig. 145 (1905). — Bebb in Bot. Gaz. xvi. 103 (1891). — Greene, Man. Bot. San Francisco Bay, 299 (1894). — Sudworth in Bull. U.S. Dept. Agric. Div. For. xiv. 120 (Nomencl. Arb. Fl.) (1897), pro parte max. — Ball in Trans. Acad. Sci. St. Louis, ix. 71 (1899), pro parte; in Coulter and Nelson, New Man. Rocky Mts. Bot. 130 (1909). — Howell,

<sup>1</sup> This name cannot be used according to the Philadelphia Code because there is an earlier *S. pallescens* Schleicher (Cat. Pl. Helv. ed. 3. 26. 1815) which had probably been published first in ed. 2 (1807). The International Rules would permit the use of the name because Schleicher's name is a nomen nudum and represents nothing but a form of *S. nigricans* Smith, but as it is doubtful whether Andersson's binomial can be regarded as a correct publication of a species or only of a subspecies I abstain at present from using this name.



Fl. N.W. Am. 617 (1902). — Schneider, Ill. Handb. Laubh. i. 29, figs. 11c-d. 15a, (1904), excl. var. *caudata*. — Eastwood, Handb. Trees Cal. 38 (1905). — Piper in Contrib. U.S. Nat. Herb. xi. 212 (Fl. Wash.) (1906). — Jones, Willow Fam. 27 (1908), pro parte et excl. var. — Jepson, Fl. Cal. 338 (1909); in Mem. Univ. Cal. ii. 175, t. 56, figs. 1-3 (Silva Cal.) (1910). — Wooton in Bull. N. Mex. Coll. Agric. LXXXVII. 41, fig. p. 42 (1913). — Henry, Fl. S. Brit. Col. 96 (1915), excl. var. *caudata*. — Wooton & Standley in Contrib. U.S. Nat. Herb. xix. 160 (Fl. N. Mex.) (1915). — *S. lucida* Hooker, Fl. Bor.-Am. ii. 148 (1839), pro parte, non Muhlenberg. — *S. speciosa* Nuttall, N. Am. Sylva, i. 58, t. 17 (1843), and reprint 1852, probabiler pro parte, non Host, nec Hooker et Arnott. — *S. (pentandra) lucida angustifolia lasiandra* Andersson in Öfv. Svensk. Vetensk. Akad. Förh. xv. 115 (1858). — *S. Fendleriana* Andersson, l. c. (1858), pro parte, s. str. — Wooton & Standley in Contrib. U.S. Nat. Herb. xix. 160 (1915), pro parte. — *S. lucida* \**macrophylla* Andersson in Svensk. Vetensk. Akad. Handl. vi. 32 (Monog. Salic.) (1867); in De Candolle, Prodr. xvi.<sup>2</sup> 205 (1868). — *S. arguta lasiandra* Andersson in l. c. 33 (1867); l. c. 205 (1868). — *S. arguta erythromoma* Andersson, l. c. 33 (1867), pro parte; l. c. 205 (1868), pro parte. — *S. lasiandra* var. *typica* Bebb in Watson, Fl. Cal. ii. 84 (1879). — Macoun, Cat. Can. Pl. i. 449 (1883); ii. 358 (1890). — *S. lasiandra* var. *Lyallii* Sargent in Gard. & For. viii. 463 (1895); Silva N. Am. ix. 115, t. 470 (1896). — Sudworth in Bull. U.S. Dept. Agric. Div. For. xiv. 120 (Nomencl. Arb. Fl.) (1897); For. Trees Pac. Slope 219, figs. 89-90 (1908). — Ball in Piper & Beattie, Fl. N.W. Coast, 114 (1915). — *S. Lyallii* Heller in Bull. Torr. Bot. Club, xxv. 580 (1898), ut videtur pro parte tantum. — Britton & Shafer, N. Am. Trees, 191, fig. 149 (1908). — Rydberg, Fl. Rocky Mts. 191 (1917), ex parte.

The history of this species of which its first describer Nuttall said that "no Willow of the American continent presents so remarkable and splendid an appearance" has been already discussed at a considerable length by Ball (1899). He explained the reason why the typical form has been so often misunderstood, and so many varieties have been described which in fact represent nothing but the type. According to Ball (1899) Andersson's *S. Fendleriana* is a synonym of *S. lasiandra caudata*, and the name has to be applied to this variety if we take it for a species. But in this respect I differ from Ball for the following reasons. Andersson based his *S. Fendleriana* on Fendler's No. 816 which came from New Mexico and was collected "probably about Santa Fe" (fide Wooton and Standley), and Andersson besides mentions Geyer's No. 287 from the Rocky Mountains. Only the last specimen belongs to var. *caudata* while No. 816, in my opinion, represents the typical *S. lasiandra* or at least a form of it which is different from var. *caudata*. Therefore, the name *S. Fendleriana* cannot be used for that species if we regard var. *caudata* as specifically distinct.

To the typical *S. lasiandra* also belongs Andersson's *S. lucida macrophylla* of which I have seen a photograph and fragments of the type in Herb. K. and a co-type in Herb. G. It was collected by Dr. Lyall in May



1859 at Sumas Prairie "Lower Frazer River 49. N. Lat." according to the label in Herb. K. The printed labels of both herbaria bear the inscription: "*Salix lucida tenuior* (*S. pentandra americana* Andr.)" Andersson probably later changed the name *tenuior* to *macrophylla*. Lyall's specimens show a large dorsal gland in the male flowers, and a similar gland may be observed in the flowers of other male specimens from British Columbia which otherwise are apparently not distinguishable from typical *S. lasiandra*. Further observation of more copious material must prove if this character is of any taxonomic importance; in this case we could distinguish this northern glabrous form as a special variety using the name *macrophylla*. Sargent founded his var. *Lyallii* upon Lyall's specimens in changing the older name *macrophylla*, and Heller raised var. *Lyallii* to specific rank, a fact already rightly deplored by Ball (1899). In 1915, however, Ball applied the name var. *Lyallii* to a form of *S. lasiandra* common within the area of Piper and Beattie's Flora of the Northwest Coast. I am not aware of the reason for which Ball has been induced to do this, but in my opinion, even if it should be possible to distinguish the northern glabrous form from the typical *S. lasiandra* of California the name var. *Lyallii* cannot be used.

In 1867 Andersson created two new species: *S. arguta* and *S. lancifolia*. To *S. arguta* he referred his *S. Fendleriana* of 1858 as a synonym but only "p. p." Nevertheless he cited both specimens upon which he previously based this species, and added to them in the first place a specimen collected by Bourgeau "ad fl. Saskatchewan, prope Carlton-house." This specimen (I have not yet seen the type in Herb. K.) probably belongs to *S. lucida* and is identical with one of Bourgeau's specimens from the "Saskatchewan, 1859," preserved in Herb. G. Therefore the typical *S. arguta* of Andersson consists of 3 different things, namely *S. lucida* (Bourgeau), *S. lasiandra* (Fendler's No. 816, as explained before), and *S. lasiandra caudata* ("Burke et Geyer No. 287"). Andersson himself said of *S. arguta* (1867): "Valde dubius sum, utrum a *S. lucida* distincta an cum ea conjugenda sit," and he was not sure whether it might be "quasi hybrida a *S. lucida* et *S. cordata*" (1868). In spite of all his doubts he adds (1867) the var. *lasiandra* which is nothing but the typical *S. lasiandra*, and var. *erythrocoma*. Under the name *S. erythrocoma* Barratt had distributed as No. 40 Herb. H. & T. a *Salix* "common on the Islands and shores of Lake Winnipeg" of which I have seen a male specimen in Herb. G. It seems to belong to *S. serissima*, but Rydberg (Fl. Rocky Mts. 191 [1917]) has taken up Barratt's name for a species which he places next to *S. serissima*, and which is found from Manitoba to British Columbia and the Mackenzie River valley. I have seen no material from these regions which I could identify with Rydberg's *S. erythrocoma*. Andersson had named his var. *erythrocoma* in 1858 *S. (pentandra) lucida pilosa*, and in both places he cites, besides the Winnipeg material, "Columbia River" and "Fort Franklin," mixing, apparently, forms of different affinity as I have already explained under *S. serissima*.

The second species created by Andersson in 1867, is *S. lancifolia* of which



the type was collected by Dr. Lyall "in insula Vancouver." Of this species a photograph and fragments of the type and a co-type from Herb. G. are before me. It represents, in my opinion, only a form of *S. lasiandra* with "ramulis puberulis," and if we keep it as a variety as Bebb did we have to include the hairy forms of California. It may be that we can separate the typical southern *lasiandra* from the northern variety, and that both varieties produce a hairy form, in which case the southern form should have a new name. I have tried to distinguish these two varieties by the difference in the length of the pedicels which seem to be usually shorter in the southern type, and by other characters, but as far as I can see there is hardly a character sufficiently constant to be found. Even the typical *S. lasiandra* often shows a partly rusty pubescence on the very young shoots and leaves, but some very tomentose specimens of the pubescent form from California look rather different. On the other hand we find on specimens from the Columbia in Oregon to the Yukon Territory all degrees of glabrousness to a well-marked tomentum on the shoots or on one-year-old branchlets, the presence of rufous hairs on the young leaves being sometimes rather conspicuous, while on other material the pubescence is entirely grayish. We need a series of well-collected specimens from each region to decide the taxonomic value of the different characters.

The typical *S. lasiandra* is found from southern California to the Columbia in Oregon, in New Mexico near Santa Fé (in a form which I have mentioned above) and in certain forms in southwestern Colorado (Montezuma, San Miguel and Gunnison Counties) which hitherto have been partly mistaken for *S. amygdaloides* and *S. laevigata*. In Nevada and Sierra Counties of California and in western Nevada it seems to grow together with var. *caudata*, and there are certain specimens before me which I am actually at a loss to refer to either variety. Towards the north *S. lasiandra* (in its glabrous form which as I said may possibly be separated under the varietal name *macrophylla*) occurs from Oregon (where I have seen it from the following counties: Josephine, Douglas, Marion, Multnomah, Wasco, Columbia), Washington (counties: W. Klickitat, Pierce, King, Chehalis, Clallam) to British Columbia (coast region, but also in Kootenay), and it has been collected in northwestern Alberta (Peace River Landing, J. M. Macoun, No. 21266; O.) and in the Yukon Territory (vicinity of Dawson). The hairy form may be separated at present as

6b. *S. lasiandra* var. *lancifolia* Bebb in Watson, Bot. Cal. II. 84 (1879), probabilitur tantum ex parte. — Macoun, Cat. Can. Pl. I. 450 (1883), pro parte; II. 358 (1890). — *S. lancifolia* Andersson in Svensk. Vetensk. Akad. Handl. VI. 34, t. 2, fig. 23 (Monog. Salic.) (1867); in De Candolle, Prodr. XVI.<sup>2</sup> 206 (1868). — A typo praecipue differt ramulis hornotinis dense saepius etiam annotinis biennilusque plus minusve vel partim pubescentia villosa grisea vel fusca vestitis, foliis initio (saltem parvis ad basim pedunculorum) subtus plus minusve distincte ferrugineo-sericeis.

In Andersson's type the pedicels of the fruits are somewhat pilose and measure from 1 to 1.5 mm. I refer to this variety the following specimens:



YUKON TERRITORY. Vicinity of Dawson, May 29, 1914, *A. Eastwood* (No. 113, f.; A.); June 29, 1914, *A. Eastwood* (No. 304, fr. im.; A.); June 30, 1914, *A. Eastwood* (No. 466, fr.; A.).

BRITISH COLUMBIA. Vancouver Island, 1858, *D. Lyall* (fr. type; K.); district of Renfrew, common along streams, August 7, 1902, *C. O. Rosendahl* (No. 900 [=60283, O., fr.; "4-10 m."]); Victoria, in a field, July 23, 1887, *J. M. Macoun* (No. 24557, O., fr.); Cedar Hill, near Victoria, May, 1885, *Fletcher* (No. 24556, O., m., f.); New Westminster district, Chilliwack Lake, July 11, 1906, *W. Spreadborough* (No. 79555, O., fr.); New Westminster Junction, April 29, 1889, *J. M. Macoun* (No. 24553, O., f.); Agassiz, damp places, May 20, 1889, *J. M. Macoun* (No. 24552, O., m.); Kootenay district, Revelstoke, swamps, May 3 and 25, 1890, *J. M. Macoun* (No. 11 [=24554, O., n., f.]); Deer Park, Lower Arrow Lake, June 10, 1890, *J. M. Macoun* (No. 24559, O., fr.).

WASHINGTON. Chehalis County: Gray's Harbor, May 13, 1897, *F. H. Lamb* (No. 1033, fr.; M.; amentis ad 9 cm. longis); Hoquiam, May 13, 1897, *F. H. Lamb* (No. 1032, m.; M.); Quinault, at edge of lake, flooded at high water, June 25, 1902, *H. S. Conard* (No. 160, st.; G.; "20 ft. high"). Pierce County: Cascade Mts., upper valley of the Nisqually River, on banks of streams and in swamps, *O. D. Allen* (No. 109, f., fr.; A., M.; "tree 25 ft. high"). King County: Lake Union, June 25, July 12, 1898, *T. E. Savage*, *J. E. Cameron* and *F. E. Lenoeker* (fr.; M.; distributed sub nom. *S. cordata*). West Klickitat County: Columbia River, bottom lands, April 23, May, 1881, *W. N. Suksdorf* (m., f., fr.; A.); April, 1882, same coll. (m.; G.; ex Herb. Bebb).

OREGON. Douglas County: on the upper Umpqua River, August 17, 1880, *G. Engelmann* (fr.; M.); Calapooya Valley, woods near river, alt. 240 m., July 25, 1899, *M. A. Barber* (No. 101, fr.; G.). Marion County: Salem, low ground, along Mill Creek, at Center St. Bridge, April 12, July 13, 1918, *J. C. Nelson* (Nos. 2033, m., 2377, st.; A.; forma parce pilosa). Multnomah County: without exact locality, June, 1880, *J. Howell* (m., f.; G.); Sauvie's Island, April, 1879, *J. and Th. Howell* (m., f.; M.); same place, June, 1882, *Th. Howell* (m., fr.; M.).

CALIFORNIA. San Bernardino County: San Bernardino, January, 1881, *S. B. and W. F. Parish* (No. 546 partim, m.; A.); March, 1882, same coll. (No. 546 partim, m., f.; M.; this specimen shows a much less dense pubescence than the preceding one); March 19, 1894, *C. S. Sargent* (m.; A.; ut praecedens); same place, 1882, *C. C. Parry* (No. 303, n.; M.; agrees with the first No. 546); January 12, 1881, *W. S. Wright* (Nos. 23, 24, 25, m.; C.; ut praecedens, folia anni praeteriti partim persistentia); without locality, 1882, *C. C. Parry* (No. 304, fr.; M.; only young shoots thinly pubescent); Fawnokin (?) Park, alt. 2100 m., June 3, 1901, *S. B. Parish* (No. 4996, st.; St.; ut praecedens). Los Angeles County: Pasadena, March 7, 1882, *M. L. Jones* (No. 3042, m., f.; A.); Los Angeles, 1881, *J. C. Nevin* (No. 472, m., fr.; G.); river bottom, April 2, 1893, *A. J. McClatchie* (m., f.; N.). Santa Cruz County: Santa Cruz, March, 1894, *C. L. Anderson* (f.; A.). Tulare County: Kern Lake, Kern River, by river above falls, July 19, 1897, *W. R. Dudley* (No. 2028, f.; St.; ramuli tantum hornotini tomentelli); General Grant Park, meadow near Soldier's Camp, August, 1900, *W. R. Dudley* (No. 3095, fr.; St.; ut praecedens); same Park, meadow east of Dorst Creek, August 5, 1900, *W. R. Dudley* (No. 3058, st.; St.; ut No. 2028); Marble Fork at crossing of Colony Mill Trail, August 17, 1900, *W. R. Dudley* (No. 3039, fr.; St.; quam praecedentes glabrior).

I have seen from Tulare County in Herb. St. some specimens collected by Dudley (Nos. 1492<sup>a</sup>, 1848, 2079, 2088, 3218) which seem to represent a forma foliis parvis anguste lanceolatis et breviter petiolatis quasi simulans var. *caudatam*. These specimens need further observation. Another small and narrow-leaved form of which the leaves are distinctly glaucous beneath



was collected by W. L. Jepson, Napa River Basin, Howell Mt., May 8, 1893 (No. 29s, fr. juv.; Jeps.; folia semi-evoluta ad 6:1 cm. magna).

6c. *S. lasiandra* var. *caudata* Sudworth in Bull. Torr. Bot. Club, xx. 43 (1893); in Bull. U.S. Dept. Agric. Div. For. xiv. 121 (Nomencl. Arb. Fl.) (1897), pro parte max. — Bebb<sup>1</sup> in Gard. & For. viii. 372 (1895), ex parte. — Sargent, Silva N. Am. ix. 116, t. 470 (1896); Man. Trees N. Am. 174 (1905), pro parte. — Ball in Trans. Acad. Sci. St. Louis, ix. 74 (1899), pro parte max. — Schneider in Ill. Handb. Laubh. i. 29, figs. 15b-c, 1904. — Piper in Contrib. U.S. Nat. Herb. xi. 213 (Fl. Wash.) (1906), pro parte max. — Piper & Beattie, Fl. S.E. Wash. 73 (1914). — Henry, Fl. S. Brit. Col. 96 (1915). — *S. pentandra caudata* Nuttall, N. Am. Sylva i. 61, t. 18 (1843). — *S. Fendleriana* Andersson in Öfv. Svensk. Vetensk. Akad. Förh. xv. 115 (1858), pro parte, quoad spec. Geyeri No. 287. — Howell, Fl. N.W. Am. i. 617 (1902), pro parte max. — Rydberg, Fl. Colo. 94 (1906), pro parte max.; Fl. Rocky Mts. 191 (1917), pro parte max. — Ball in Coulter & Nelson, New Man. Rocky Mts. Bot. 130 (1909), pro parte max.; in Bot. Gaz. lx. 397 (1915). — Visser in Muhlenb. ix. 71 (Add. Fl. S. Dak.) (1913). — Wootton & Standley in Contrib. U.S. Nat. Herb. xix. 213 (1915), pro parte. — *S. arguta* Andersson in Svensk. Vetensk. Akad. Handl. vi. 32, t. 2, fig. 22 (Monog. Salic.) (1867), pro parte et excl. var.; in De Candolle, Prodr. xvi.<sup>2</sup> 206 (1868), pro parte et excl. var.  $\beta$ ,  $\gamma$ ,  $\delta$ . — ? *S. arguta* \**S. pallescens alpigena* Andersson in Svensk. Vetensk. Akad. Handl. vi. 33 (Monog. Salic.) (1867). — ? *S. arguta*  $\theta$  *alpigena* Andersson in De Candolle, Prodr. xvi.<sup>2</sup> 206 (1868). — *S. lasiandra* var. *Fendleriana* Bebb apud Watson Bot. Cal. ii. 84 (1879), pro parte max.; in Coulter, Man. Rocky Mts. Bot. 334 (1885), pro parte max. — Sargent, Rep. For. N. Am. 167 (1884). — *S. lucida* var. *lanceolata* Hooker ex Bebb in Gard. & For. viii. 373 (1895), pro synonym. — *S. lasiandra* Rydberg in Mem. N.Y. Bot. Gard. i. 110 (Cat. Fl. Mont.) (1900), non Bentham. — Britton & Shafer, N. Am. Trees 190, fig. 148 (1908), pro parte max. — *S. caudata* Heller in Muhlenb. ii. 186 (1906). — Daniels in Univ. Mo. Stud. Sci. Ser. ii. 247 (Fl. Bould., Colo. 99.) (1911).

In its typical form this variety is well marked, and its history has already been discussed by Ball (1899). As I have previously stated Ball included Andersson's *S. Fendleriana* which, however, sensu stricto belongs to typical *S. lasiandra* or to a new form of it. Britton and Shafer have applied the name *S. lasiandra* Bentham to var. *caudata* and taken up the name *S. Lyallii* for the true *S. lasiandra*. The distribution of var. *caudata* according to the material I have been able to examine is as follows: From northern New Mexico (Rio Arriba County, fide Wootton and Standley) the eastern

<sup>1</sup> According to Bebb the oldest name for this variety is *S. lucida* var. *lanceolata* said to have been used by Hooker, Fl. Bor.-Am. ii. 148 (1839), but Hooker did not make such a variety, he only mentions a *S. lucida* " $\beta$  foliis lanceolatis" without indicating which of the specimens enumerated by him represents this form. Bebb stated that the type of Hooker's variety "is no. 39 of the Hooker, Barratt and Torrey distribution" in the Kew Herbarium. I have not yet seen this specimen which was collected by Drummond in the Rockies at Jasper Lake, and I believe it does not belong to var. *caudata* but to *S. lucida*.



borderline runs northward through eastern Colorado (where it seems not to cross the 103rd degree W. L.), Wyoming and Lawrence and Harding Counties in western South Dakota (Black Hills, fide Ball<sup>1</sup> and Visser) to Montana (where it seems to be present only in the south and west; I have seen specimens from Carbon, Gallatin, Jefferson, Powell, Sanders and Flat Head Counties). In the north I know var. *caudata* from eastern Kootenay (Farnie) in British Columbia, and from Calgary in Alberta. The western borderline<sup>2</sup> runs from Yale district in British Columbia southward through Washington (east of the Cascades), Oregon (Umatilla, Wallowa, Union, Morrow, Malheur and Klamath Counties) to Nevada (Washoe, Ormsby, Elko, Lincoln Counties) and part of the northeastern slopes of the Sierra Nevada in California (viz., A. Eastwood, No. 386, Placer County, Deer Park, Heller, No. 12720, Yuba River below Cisco and several specimens of Dudley's from Sierra County). In the south I have seen it from Utah (southward to Piute and Washington Counties) but not from Arizona. The typical form of var. *caudata*, according to Nuttall, is that with "ramulis junioribus hirsutis," and as it is the case with other species of this group we can also distinguish a glabrous form. I should regard var. *caudata* as a good species were it not for a series of forms which look rather intermediate between it and typical *S. lasiandra*. It may be that these intermediates might be regarded as hybrids but at present I think it best to defer a more decisive statement until I have been able to become better acquainted with certain forms of eastern California, western Nevada, southwestern Colorado, eastern Oregon and western Idaho. Very interesting are the specimens from Tulare County, California, mentioned on p. 18 which look more like var. *caudata* than typical *S. lasiandra*. It may be that these forms with small and narrow leaves together with similar ones from Sierra, Nevada, Placer and Eldorado Counties represent a new variety which is most closely related to var. *caudata* but possesses the same glaucescent lower leaf-surface as the typical *S. lasiandra*.

7. *S. lucida* Muhlenberg in Neue Schr. Ges. Naturf. Fr. Berlin, iv. 239, t. 6, fig. 7 (1803); in König & Sims, Ann. Bot. ii. 66, t. 5, fig. 7 (1806). — Michaux f., Hist. Arb. Am. iii. 327, t. 5, fig. 3 (1813); N. Am. Sylva iii. 81, t. 125, fig. 3 (1819). — Pursh, Fl. Am. Sept. ii. 615 (1814). — Hooker, Fl. Bor.-Am. ii. 148 (1839), pro parte, et prob. incl. var.  $\beta$ . — Barratt, Salic. Am. No. 17 (1840). — Torrey, Fl. N.Y. ii. 208, t. 119 (1843). — Carey in Gray, Man. 417 (1848); ed. 2, 417 (1856); ed. 3, 417 (1862); ed. 4,

<sup>1</sup> I have seen the specimens cited by Ball from Rochford, (*F. Murdock, Jr.*, No. 4375, st.; C.) and the Deadwood plant has been collected by Ball himself. On the other hand neither he nor Visser mentions *S. lucida* from this region, but there is a specimen before me collected by W. P. Carr, Deadwood, creek banks, July 10.13 (No. 44, st.; M.) which undoubtedly is *S. lucida*, as determined by Rydberg. In Herb. C. (sheet No. 385835) there is a sterile specimen of Visser's No. 112 from Little Missouri River, July 23, 1910, named *S. Fendleriana* which belongs to an entirely different section.

<sup>2</sup> Ball (1909) gives the range as "New Mexico to Canada and west to the coast" but he does not mention var. *caudata* (1915) in Piper & Beattie, Fl. N.W. Coast. So far as I know it is absent from the coast region.



417 (1863). — Andersson in Svensk. Vetensk. Akad. Handl. vi. 30, t. 2, fig. 21 (Monog. Salic.) (1867), excl. f. *angustifolia* et var. *macrophylla*; in De Candolle, Prodr. xvi.<sup>2</sup> 205 (1868), ut in 1867. — Macoun, Cat. Can. Pl. i. 450 (1883), pro parte max. — Newhall, Trees N.E. Am. 76, fig. 38 (1890). — Bebb apud Watson & Coulter, Gray Man. ed. 6, 481 (1890). — Britton & Brown, Ill. Fl. i. 495, fig. 1176 (1896); ed. 2, i. 593, fig. 1454 (1913). — Sargent, Silva N. Am. ix. 121, t. 473 (1896), excl. syn. ex parte; Man. Trees 174, fig. 146 (1905). — Sudworth in Bull. U.S. Dept. Agric. Div. For. xiv. 121 (Nomencl. Arb. Fl.) (1897), excl. syn. ex parte. — Ball in Proc. Iowa Acad. Sci. vii. 145 (1900). — Rydberg in Britton, Man. 313 (1901); Fl. Rocky Mts. 191 (1917). — Fernald in Rhodora, vi. 1 (1903). — Schneider, Ill. Handb. Laubh. i. 29, figs. 12k-k<sup>1</sup>, 13 (1904). — Hough, Handb. Trees, 81, figs. 93-94 (1907). — Jones, Willow Fam. 27 (1908). — Robinson & Fernald, Gray's Man. 321, fig. 644 (1908). — Britton & Shafer, N. Am. Trees, 189, fig. 147 (1908). — Small & Carter, Fl. Lancaster Co., Pa., 92 (1913). — Illick in Bull. Dept. For. Pa. xi. 91, t. 29 (Penn. Trees) (1914). — *S. (pentandra) lucida* Andersson in Öfv. Svensk. Vetensk. Akad. Förh. xv. 115 (1858), quoad var. *latifoliam* et *ovatifoliam* pro parte. — The Shining Willow is as Fernald (1903) rightly observed "one of the handsomest and easiest recognized" not only of the New England but of all the American willows. Nevertheless it seems to have been often confused with *S. amygdaloides*, *S. lasiandra* and *S. serissima*, as the limits of its range as outlined on Hough's map (1907) and given by other authors are not borne out by the material I have been able to see and by a careful examination of the statements of different authors. If we commence in the northeast we find as the northeasternmost point of its geographical distribution the valleys of the Exploits and Gander Rivers in Newfoundland. From here the eastern borderline runs south through Nova Scotia to northern New Jersey (Essex and Passaic Counties) and northern Delaware (New Castle County, fide Keller & Brown, Handb. Fl. Philadelphia, 116 [1905]), where it turns to the west along the southern border of Pennsylvania (I do not know of its presence in Maryland and West Virginia or northern Kentucky which regions are included in its range on Hough's map) through central Ohio and the more northern parts of Indiana and Illinois, appearing in Iowa only in Fayette and Chickasaw Counties (see Ball, 1900), and so far as I can ascertain being absent from northern Missouri, northeastern Kansas and Nebraska (where it is indicated by Hough). From South Dakota I know the species only from a specimen collected in the Black Hills (see note on p. 20), and it is not mentioned by Saunders (in Bull. Exper. Sta. S. Dak. LXIV. 132 [1899]), while from North Dakota I have seen nothing but a specimen of Lunell's from the Turtle Mts. in Rolette County, and Lunell (in Am. Midl. Nat. iv. 298 [1916]) mentions no other locality but Willow Creek near Dumseith which is in the same county. Therefore I do not understand why Hough includes not only the whole of South and North Dakota but also the northeast corner of Wyoming and the eastern third of Montana in the *lucida* range. There is likewise no proof that it occurs in Manitoba, Assiniboia,



Saskatchewan, northeastern Alberta, Athabasca and the Northwest Territories as far north as Great Bear Lake. Apparently *S. serissima* and *S. lasiandra* have been taken for *S. lucida* of which the northeasternmost locality from where I have seen material is the Hill (or Hayes) River in Manitoba (R. Bell, August, 1880, No. 24585, fr.; O.). But it seems very rare (or represented by *S. serissima*) in these regions and in western Ontario, becoming frequent to the east of Lake Huron in southeastern Ontario and southern Quebec.

As Fernald has pointed out the typical *S. lucida* in the northeastern part of its range is frequently represented by var. *intonsa* Fernald in *Rhodora* VI. 2 (1903) (*S. lucida* var. *macrophylla* Fernald apud Williams in *Rhodora* III. 277 (1901), non Andersson) which chiefly differs by the characters indicated in the key, p. 3. In this region occurs besides var. *intonsa* a narrow-leaved form to which the name f. *angustifolia* Andersson has been applied. Andersson published this name in 1858 (in *Öfv. Svensk. Vetensk. Akad. Förh.* xv. 115) as "*S. (pentandra) lucida angustifolia*, foliis acuminatis, non cuspidatis," and he did not cite a type but he added as a subforma "*— lasiandra* Bth." In *Proc. Am. Acad. Sci.* IV. 54 (*Salic. Bor.-Am.* 8) (1858), the arrangement differs in so far that we read "var. *angustifolia*. — Forma *lasiandra* (*S. lasiandra*, Benth. . . .)" and there is added a "Forma *pilosa*" which in *Öfv. Svensk. Vetensk. Akad. Förh.* xv. 115 (1858) was kept as a variety of the same taxonomic value as *angustifolia*. This f. *pilosa* has nothing to do with the narrow leaved form in question (see p. 16). In 1867 (in *Svensk. Vetensk. Akad. Handl.* VI. 32 [Monog. *Salic.*]) Andersson again kept a variety *angustifolia* but here he made the two forms *rigida* and *tenuis*. What he called *rigida* apparently belongs to *S. serissima* (see p. 13), while f. *tenuis* can hardly be correctly interpreted without type material. Much clearer is Andersson's statement in 1868 (in *De Candolle Prodr.* XVI.<sup>2</sup> 205) where he says under *S. lucida* "3° *angustifolia* foliis anguste lanceolatis, basi subattenuatis, apice vulgo longius attenuatis. Locis alpestribus." We may apply this name to the narrow-leaved northeastern form, but in many respects it would be better to propose a new name for it because the application of Andersson's name is far from clear. Such a f. *angustifolia* occurs in the typical *S. lucida* as well as in var. *intonsa*, judging by the material before me. Its obtuser leaves often resemble those of a young plant or of a seedling of the type, while the normal upper leaves may be described as: e basi obtuse cuneata lanceolata, plus minusve sensim longe caudato-acuminata, ad 5:1-10: 1.5 cm. magna.

SECT. IV. BONPLANDIANAE Schneider. See *Bot. Gaz.* LXV. 15 (1918). — *S. Harbisonii* with brittle-jointed branchlets needs further investigation and is referred to this section only provisionally.

8. *S. jaliscana* Jones. — See key, p. 4 and Schneider in *Bot. Gaz.* LXV. 16 (1918).



9. *S. Bonplandiana* Kunth. — See key, p. 4 and Schneider, l. c. 17.

9b. *S. Bonplandiana* var. *pallida* Andersson. — See key, p. 4 and Schneider, l. c. 19.

9c. *S. Bonplandiana* var. *Toumeyii* Schneider, l. c. 20. — *S. Bonplandiana* Sudworth in Bull. U.S. Dept. Agric. Div. For. xiv. 121 (Nomencl. Arb. Fl.) (1897), ex parte, non Kunth. — See key, p. 4. — This willow is often described as "evergreen" but this is not true. It only sometimes keeps part of its leaves until spring, a peculiarity that may be observed in other species, for instance in *S. lasiolepis* in southern California. So far as I know there is no willow that could be called evergreen.

10. *S. laevigata* Bebb in Am. Nat. viii. 202 (1874); in Watson, Bot. Cal. ii. 83 (1879); in Bot. Gaz. xvi. 103 (1891); apud Coville in Contrib. U.S. Nat. Herb. iv. 198 (Bot. Death Valley Exp.) (1892). — Sargent, Rep. For. N. Am. 10 Cens. U.S. ix. 167 (1884); Silva N. Am. ix. 113, t. 468 (1896); Man. Trees N. Am. 171, fig. 143 (1905). — Greene, Man. Bot. San Francisco Bay, 299 (1894). — Parish in Zoë, iv. 347 (1894). — Sudworth in Bull. U.S. Dept. Agric. Div. For. xiv. 120 (Nomencl. Arb. Fl.) (1897), incl. var.; For. Trees Pacif. Slope, 217, fig. 88 (1908). — Ball in Trans. Acad. Sci. St. Louis, ix. 70 (1899). — Jepson, Fl. W. Mid. Cal. 136 (1901); Fl. Cal. i. 339 (1909); in Mem. Univ. Cal. ii. 176, t. 56, figs. 4-6 (Silva Cal.) (1910). — Abrams, Fl. Los Angeles, 100 (1904); suppl. ed., 100 (1911). — Eastwood, Handb. Trees Cal. 37 (1905). — Jones, Willow Fam. 26 (1908). — Britton & Shafer, Trees N. Am. 187, fig. 144 (1908). — Rydberg, Fl. Rocky Mts. 191 (1917). — Schneider in Bot. Gaz. lxxv. 21 (1918). — *S. laevigata angustifolia?* Bebb apud Rothrock in Wheeler Rep. vi. Bot. 374 (1878); in Watson, Fl. Cal. ii. 83 (1879). — *S. laevigata* var. *congesta* Bebb, l. c. (1879). — Ball in Trans. Acad. Sci. St. Louis, ix. 71 (1899).

A well-marked species obviously the western counterpart of the eastern *S. longipes*, and closely related to *S. Bonplandiana*. The typical glabrous *S. laevigata* corresponds to *S. longipes Wardii* while the pubescent type of *S. longipes* is analogous to *f. araquipa* of *S. laevigata*. Here, as in the sections previously dealt with, each species seems to develop a pubescent and glabrous form or variety which usually seem to be connected by intermediates. I have tried to indicate the main differences between the species and varieties of this section in the key. Ball (1899) regarded *S. lasiandra* and *S. nigra* as the nearest relatives of *S. laevigata* but apparently he was not, at that time, acquainted with *S. longipes* and *S. Bonplandiana*.

I have seen *S. laevigata* from almost every county in California. In Nevada I have seen it only from Lincoln County (Goodding's Nos. 608 and 636), and it occurs probably also in Ormsby and Washoe Counties, but all I have seen from those parts of the state are rather uncertain forms of partly hybrid origin. The easternmost point of its distribution is in Arizona (Mohave and Yavapai Counties). Rydberg (1917) mentions it also from Oregon and Utah, and I believe it is to be found in southern Oregon and southwestern Utah but I have not yet seen material from those states.



Bebb distinguished two varieties: *angustifolia* and *congesta*. For var. *angustifolia* which he himself calls an "ambiguous variety" he cites as type a specimen of E. L. Greene from Yreka, Cal., which is No. 795, May 18, June 30, August 31 (m., f., fr., st.; C., sheet Nos. 4343 and 4344). I fail to find a good character by which to distinguish it from normal *laevigata* of which, of course, narrow-leaved forms occur, but the type of var. *angustifolia* is in no way "approaching *S. nigra*" as Bebb stated. For var. *congesta* Bebb did not cite a type, but merely said: "Aments short, densely flowered, scarcely exceeding the ample leaves of the peduncle: capsules globose-conical, shortly pedicelled." In Herb. C. (sheet No. 3515) and G. I found Bolander's No. 4632, from New Castle, Placer County, April, 1865, determined by Bebb himself (1877) as var. *congesta*, but I am unable to distinguish this specimen from typical *laevigata*; Ball (1899) referred to var. *congesta* Howell's No. 1393, Kellogg and Harford's No. 925 and Palmer's No. 362. The last I regard as belonging to f. *araquipa*, while No. 925 (Herb. N.) is rather doubtful and looks to me more like a form of *S. lasiandra* with stunted aments. Howell (Fl. N.W. Am. 617 [1902]) has made *S. congesta* a species occurring "along rivulets near the Klamath River and southward," and in his herbarium at Eugene, Oregon, his No. 1393 is designated as the type. It came from Hornbrook, Siskiyou County, northern California, Klamath River region. The material is young, the leaves are not yet sufficiently matured, and they possess some stomata in the upper surface. It looks much like *araquipa*, but needs further observation. Bebb's varieties do not seem to possess any taxonomic value. There is however the pubescent form f. *araquipa* Jepson (Fl. Cal. 339 [1909]. — ? *S. occidentalis* Eastwood, Handb. Trees Cal. 36 [1905], pro parte) within the range of the species, and it apparently prevails in the southern and southwestern parts of the state. The main difference from the type is in the more or less tomentose branchlets of the first and partly also of the second season, and there is hardly another character by which it may be distinguished, for it seems to be connected with the type by many intermediates.

11. *S. longipes* Shuttleworth apud Andersson in Öfv. Svensk. Vetensk. Akad. Förh. xv. 114 (1858). — Glatfelter in Rep. Mo. Bot. Gard. ix. 43, t. 5, fig. 1, t. 6, fig. 1 (Note on *S. longipes*, 1) (1897), pro parte. — Small, Fl. S.E. States, 341 (1903). — Sargent, Man. Trees N. Am. 169, fig. 141 (1905), pro parte. — Hough, Handb. Trees 76 (1907), pro parte. — Britton & Shafer, N. Am. Trees, 186 (1908), pro parte. — *S. occidentalis* Sudworth in Bull. U.S. Dept. Agric. Div. For. xiv. 119 (Nomencl. Arb. Fl.) (1897), non Bosc. — *S. occidentalis longipes* Sudw., l. c., excl. synonym., pro parte. — For further synonymy and literature see Schneider in Bot. Gaz. LXV. 21 (1918).

From the synonymy which I (1918) have given, it may be seen that this species was described first by Bosc apud Koch (1828), as *S. occidentalis*, from specimens collected by Sieber "in insula Cuba." I have not seen a type, but there can be no doubt that Poeppig's specimens from Cuba, Prov.



Camaguey, "ad las Pedras," February, 1824, which have been distributed as *S. occidentalis* Bosc represent the typical form of this species. Unfortunately this name cannot be used on account of the older *S. occidentalis* Walter (1788). This Willow is apparently mentioned next in 1824 by Elliott (Sketch Bot. S.-Carol. Georg. II. 671) who says: "We have a remarkable variety of this plant [*S. nigra*], the young branches and leaves pubescent, somewhat hoary, almost tomentose; but I have been able to perceive no other difference either in the shape or size of the leaves of the tree or in the period of flowering." To this willow Nuttall (N. Am. Sylva I. 79 [1843]) refers as follows: "*S. nigra*, Mich. Arb. vol. 2, plate 125, fig. 1. A variety of this tree occurs in South Carolina and Florida in which the leaves are villous and the scales of the ament densely lanuginous. In the herbarium of Mr. Schweinitz it is marked, on the authority of Elliott, as a species *S. subvillosa*." This name has to be regarded as nomen nudum. The next name given to our willow is *S. longipes* Shuttleworth apud Andersson (1858). Andersson describes at the same time a var. *pubescens* with the synonym *S. gongylocarpa* Shuttleworth, and he cites for both: "Hab. prope St. Marks, Florida: Ruel" (corrected in Proc. Am. Acad. IV. 53 [Sal. Bor.-Am. 7] into Rugel). In this publication Gray says in a note to var. *pubescens*: "This is the *S. subvillosa* Ell. in Herb. Schweinitz ex Nutt. N. Am. Sylva, I, p. 79, — a work to which Prof. Andersson had no access, — also mentioned in Ell. Bot. S. Car. & Georg. 2, p. 671, under *S. nigra*." So far as I can see the typical *S. longipes* as well as the type of var. *pubescens* cannot be separated, but represent only extreme states of the same form. In 1858 Andersson made no mention of *S. occidentalis* Bosc but in 1867 (Monog. Salic. 23) he treats it as a separate species, and refers *S. longipes* as a subspecies to *S. nigra* with the varieties *venulosa* and *gongylocarpa*, now using the last name for his var. *pubescens* of 1858. The same treatment is given by him in the Prodrum in 1868, but here he reduces *S. longipes* to a distinct variety of *S. nigra* with the forms *venulosa* and *gongylocarpa*. In his remarks to *S. occidentalis*, Andersson, in 1867, said that this species "perspectis formis intermediis *S. nigrae*, quas *venulosam* et *gongylocarpam* hic nominavi" is connected with *S. nigra*, and in 1868 he stated that f. *venulosa* is "ad *S. nigram* transitus" while f. *gongylocarpa* is "*S. occidentali* proxima." There is hardly any doubt that *S. occidentalis* from Cuba and *S. longipes* (sensu str.) from Florida cannot be separated even as varieties. The last one has been again described by Chapman (1860) as *S. floridana*<sup>1</sup> and by Small (1913) as *S. amphibia*. Andersson's f. *venulosa* represents a different form with which I have to deal later.

According to the material I have seen the range of typical *S. longipes* extends from Cuba to northern Florida from which state I have examined specimens from the following counties (south to north): Monroe, Dade, Lee, Brevard, Lake, Volusia, Taylor, Wakulla, Franklin, Columbia, Duval, Palm Beach, and from Folkston, Charlton County, in adjacent south-

<sup>1</sup> *S. floridana* Small, Florida Shrubs 9 (1913), with 2 stamens is unknown to me, and I do not know whether or not it represents Chapman's species.



eastern Georgia. In northern Florida (Franklin, Wakulla, Leon, Gadsden, Jefferson, Duval Counties), in Georgia (Charlton and Richmond Counties), in South Carolina (Aiken, Charleston and Saluda Counties), in eastern North Carolina (Craven County) and in the southeastern corner of Virginia (Norfolk County at Dismal Swamp) *S. longipes* is represented by a somewhat uncertain form which I at present cannot separate from what I call var. *venulosa* from the west. (See also my remarks under *S. Harbisonii* below); while north of the 36th parallel and in the central states var. *Wardii* takes the place of the typical form. The separation of these three varieties is by no means easy, and it needs well collected material properly to determine each of them.

11b. *S. longipes* var. *venulosa* Schneider in Bot. Gaz. LXV. 14 (1918). — *S. Pitcheriana* Barratt, Salic. Am. No. 22 (1840), nomen nudum, secundum specimen originale. — ? *S. nigra* \**S. marginata* Andersson in Svensk. Vetensk. Akad. Handl. VI. 21 (Monog. Salic.) (1867). — ? *S. marginata* Wimmer in Herb. Vindob. ex Andersson, l. c., pro synonym.; Small, Fl. S.E. States 341 (1903), ex parte. — *S. nigra* \*\*\* *S. longipes venulosa* Andersson in Svensk. Vetensk. Akad. Handl. VI. 22 (Monog. Salic.) (1867). — *S. podocarpa* Engelm. MS. in Herb. Gray, confer Andersson, l. c. 22. — ? *S. nigra* α. *marginata* Andersson in De Candolle, Prodr. XIV.<sup>2</sup> 201 (1868). — *S. nigra* γ *longipes* 1° *venulosa* Andersson, l. c. — Heller in Contrib. Herb. Frankl. & Marsh. Coll. I. 26 (Bot. Expl. S. Tex.) (1895). — *S. occidentalis* var. *longipes* Bebb in Gard. & For. VIII. 363 (1895), ex parte. — Sudworth, in Bull. U.S. Dept. Agric. Div. For. XIV. 119 (Nomencl. Arb. Fl.) (1897), ex parte. — *S. nigra* Heller in Contrib. Herb. Frankl. & Marsh. Coll. I. 26 (1895), sec. spec. citat. No. 1621, non Marsh. — *S. longipes* Glatfelter in Rep. Mo. Bot. Gard. IX. 43, t. 6, fig. 4 (1897), pro parte, non Shuttleworth. — Small, Florida Shrubs, 9 (1913), pro parte.

As may be imagined from the synonymy the history of this variety is a rather complicated one. It was first mentioned by Barratt as follows: "22. *Salix Pitcheriana* \*Barratt, MSS. Hab. Arkansas. — Dr. Pitcher. Sea Islands of Georgia. This undescribed species is allied to *S. nigra*. I possess specimens which have been obligingly communicated by John Carey, Esq., of New York. This willow is killed by the winters of the Northern States." According to this *S. Pitcheriana* is a nomen nudum. I have seen co-types in Herb. G. and N., "raised from cuttings sent from Georgia to Mr. Carey." The name *S. marginata* Wimmer which is the next oldest one, was founded on a specimen of Drummond's "ad New Orleans America borealis" in Herb. Vindob. I have not yet seen the type but I have no doubt that Drummond's No. 303, New Orleans 1832, in Herb. N. can be regarded as a co-type. It seems to me to be referable to var. *venulosa*, but the ovaries of the New York specimen are partly pilose, and Wimmer's form needs further observation. Small has used the name *S. marginata* "Weimer" for a species which in my opinion partly belongs to *S. Harbisonii*. When Andersson in 1867 first described his f. *venulosa* he did not cite a type, but only said: "Hab. in Nova Mexico," but in 1868 he



cites "Wright n. 1879." This number, in all probability, did not come from New Mexico but from the banks of the Rio Grande in Texas or further north<sup>1</sup>. I have seen two sheets of this number (in Herb. G. and N.) and there can be no doubt that f. *venulosa* Andersson has nothing to do with *S. nigra*. It represents, in my opinion, a distinct variety of *S. longipes* which has been named *S. podocarpa* by Engelman in Herb. G. (on a sheet of Lindheimer, from the Pedernales River, Texas, 1847). This name has never been rightly published and was only mentioned by Andersson (1867). I have seen good material of var. *venulosa* from the following counties of southern and central Texas: Uvalde, Bandera, Kerr, Gillespie, Kendall, Blanco, Hood, Johnson, and as I said before, I refer to this variety forms from the southeast as indicated under *S. longipes* on p. 26. If Drummond's *S. marginata* from New Orleans in Louisiana should really belong to var. *venulosa*, this station would form a connecting link between the otherwise rather widely separated ranges. The var. *venulosa* should be looked for along the coast from eastern Texas to western Florida. I am still very badly acquainted with the *Salix* flora of this region because there is but little material at my disposal, and I can get no reliable information from existing Floras.

There are Texan specimens before me which much resemble var. *Wardii*, but if we take the shape of the stipules as a character of decisive taxonomic value, we have to refer all the material from Texas to var. *venulosa* which has the pointed stipules of typical *longipes*. See also my remarks under the following variety.

11c. *S. longipes*, var. *Wardii* Schneider in Bot. Gaz. LXV. 22 (1918). — *S. cordata* 2. *S. angustata discolor* Andersson in Svensk Vetensk. Akad. Handl. VI. 159 (1867), sec. specim. in G. a cl. Andersson determ. — *S. cordata*  $\beta$ , *angustata* 1° *discolor* Andersson in De Candolle, Prodr. XVI.<sup>2</sup> 252 (1868). — *S. nigra* var. *Wardii* Bebb apud Ward in Bull. U.S. Nat. Mus. XXII. 114 (Guide Fl. Wash.) (1881); apud Watson & Coulter, Gray Man. ed. 6, 481 (1890). — *S. Wardii* Bebb in Gard. & For. VIII. 363 (1895). — Glatfelter in Science, n. s. II. 582 (1895). — Britton & Brown, Ill. Fl. I. 495, fig. 1174 (1896); ed. 2, I. 593, fig. 1453 (1913). — Sargent, N. Am. Silva, IX. 107, t. 464 (1896). — Gattinger, Fl. Tenn. 66 (1901). — Mohr in Contrib. U.S. Nat. Herb. VI. 465 (Pl. Life Ala.) (1901). — Robinson & Fernald, Gray's Man. 321, fig. 641 (1908). — Shreve & others, Pl. Life Maryland, 423 (1910). — *S. longipes* Glatfelter in Rep. Mo. Bot. Gard. IX. 43, t. 5, figs. 3-4, t. 6, figs. 3, 5, 8-10; t. 7, figs. 1-6 (1897), pro parte, non Shuttlew. — Rydberg in Britton, Man. 313 (1901), pro parte. — Small, Fl. S.E. States, 341 (1903), pro parte. — Sargent, Man. Trees N. Am. 169 (1905), pro

<sup>1</sup> The specimen in Herb. G. is expressly marked as collected in 1851. According to Gray (in Am. Jour. Sci. ser. 3, XXXI. 13 [1886] in Sargent, Sci. Papers Gray, II, 469 [1889]). Wright went in the spring of 1851, after having remained more than a year in central Texas, with Col. Graham's party to the border between Mexico and the United States. "He returned with him without reaching farther westward than about the middle of what is now the territory of Arizona." The specimens were probably collected in June in the southern parts of central Texas where var. *venulosa* seems to be very abundant.



parte. — Hough, Handb. Trees 76, figs. 89–90 (1907), pro parte. — Britton & Shafer, N. Am. Trees, 186 (1908), pro parte. — Ball in Elys. Mar. III. 21 (1910), pro parte. — This variety has been well treated by Glatfelter (1897) who, however, did not separate it from the typical *S. longipes*. The following statement of this excellent observer has certainly not lost anything of its value since he wrote it 21 years ago: “Whether or not *S. longipes* should be divided into several forms or varieties is a question, owing to insufficient accumulation of material, not yet determinable. In view of what we know at the present day of the instability of some of our species of Willows, it does not seem to fill the present demands of the scientific idea, to set up a number of forms from a limited number of herbarium specimens, and, besides, incomplete as we often find them. Without careful observations, such work must inevitably prove defective. The plant must be seen in its habitat and in quantity before a just conception of all its characters can be formed. In this way the supposedly good form will often vanish, to be supplanted by easily recognizable variations.” Glatfelter did not have very copious material of the typical *S. longipes* at his disposal, neither was he well acquainted with the forms I refer to var. *venulosa*. So far as I can see, these varieties inhabit different geographical areas which, however, meet together in certain regions, and it is mostly in these that we may observe intermediate forms. The range of var. *Wardii* is not yet sufficiently known. The type was found by Ward near Washington, D.C., where it apparently reaches the most northern point of its distribution. The northern borderline thenceforward runs along the Potomac River to Allegany County, Maryland. The next station from which I have seen a specimen is Upshur County in W. Virginia, and it has been reported from Lexington in Fayette County, Kentucky. I have not yet seen specimens or reports of it from West Virginia, Ohio, or Indiana. In Illinois it was collected in St. Clair and Madison Counties, and it seems to show its best development in Missouri, from which I have seen specimens from the following counties: (east to west) Marion, Ralls, Pike, St. Louis, St. François, Madison, Iron, Washington, Phelps, Shannon, Carter, Howell, Wright, Christian, Taney, Stone, McDonald, Newton, Jasper, Jackson. In Kansas I have seen it only from the southeast corner (Cherokee County), a specimen from the Kiowa County being doubtful. From Oklahoma I have had specimens before me from Ottawa, Drage, Rogers, Creek and La Flore Counties in the northeast and east, while those from Comanche County in the southwest may probably better be referred to var. *venulosa*. The southern borderline of its range apparently runs from La Flore County in Oklahoma through adjacent western Arkansas (Howard County) and northwestern Arkansas (Benton and Carroll Counties) and southern Missouri, and northern Tennessee (Davidson and Robertson Counties); it has been collected by Harbison as far south as northeastern Mississippi (on the Tennessee River, near Iuka, Tishomingo County), and Mohr cites it from the northwestern corner of Alabama (Lauderdale County, Tennessee River). Farther to the east I have seen var. *Wardii* from Natural Bridge, James



River, Rockbridge County, Virginia. It also occurs in Fairfax County and Elizabeth County (near Buckroe), Virginia, and it is possible that the form mentioned under var. *venulosa* from Norfolk County (Dismal Swamp) belongs to var. *Wardii* or that both varieties meet in the southeastern corner of Virginia.

The best way to distinguish var. *Wardii* is by the obtuse stipules, all the other characters are apparently too unstable, but, of course, the extremes of each variety seem to be distinct. Collectors should look for var. *Wardii* in the southern part of Ohio, Indiana and Illinois as well as in different parts of West Virginia, western Virginia, Tennessee, northern Alabama, northern Missouri and Arkansas.

12. *S. Harbisonii*, sp. nov. — *S. marginata* Small, Florida Shrubs, 9 (1913), non Wimmer. — *S. nigra* Harper in Sixth Ann. Rep. Florida Geol. Surv. 401 (1913), ex parte, non Marshall. — Frutex (fide cl. Harbison) plerumque altus vel arbor ad 10–14 m. alta, trunco ad 30 cm. crasso cortice sulcato rugoso interdum squamato vestito, ramulis fragilibus; ramuli plerumque ab initio glabri vel novelli tantum satis sparse pilosi (sed interdum novelli ut in *S. longipede* dense breviter tomentosi), hornotini glabri, olivacei vel ut annotini obscure purpurascens vel rubro-fusci, vetustiores fusco-cinerascentes; gemmae bene evolutae nondum visae; folia matura papyracea, in typo infima minora linearia, lanceolata, elliptico-lanceolata, rarius latiora obovato-lanceolata, 1:0.2 ad 2.5–3.5: 1 cm. magna, vel in aliis speciminibus majora oblanceolata ad 5:1.5 cm. magna, basi acuta ad rotundata, apice acuta ad breviter acuminata, superiora majora (normalia) anguste vel lineari-lanceolata, ad 5:1 vel 7:0.9 vel ad 10:1.6 cm. (interdum ad 13:2.7 vel in Harper No. 1499 ad 15:2 cm., basi obtuse cuneata, ab infra medium ad apicem sensim acuminata) magna, basi obtuse vel acute cuneata, apice plus minusve acuminata et saepe breviter caudata, margine satis dense breviter glanduloso-serrato-denticulata (vel in Harper No. 1499 subserrulata), dentibus circ. 3–4 pro 5 mm., superne ab initio (costa saepissime puberula vel tomentella excepta) glabra, intense viridia, ut in *S. nigra* nervata reticulataque, sed in epidermide haud stomatifera vel stomatibus sparsis (rarius numerosis) tantum secundum costam praedita, subtus ab initio glaberrima vel in costa plus minusve sericeo-pilosula (surculorum interdum distinctius pilosa), inferiora plus minusve, superiora distincte glaucescentia, pruinosa, costa flavescente plus minusve elevata, ceterum ut superne graciliter nervata et angustissime reticulata; petioli 2–10 mm. longi, superne sulcati et plus minusve tomentelli, ceterum glabri, flavescentes, apice (basi folii) saepe minute glanduliferi; stipulae nullae vel minimae, semicordatae, acutae, glanduloso-denticulatae vel in ramis vegetioribus (Harbison, No. 17, Goldsboro, N.C.) semicordatae, ad 10 mm. longae, acutae, intus interdum pauci-glandulosae et pilosulae (in speciminibus paucis satis semicordato-subrotundae 2–5 mm. longae intus eglandulosae et iis *S. longipes* var. *Wardii* non absimiles). Amenta serotina, pedunculis initio pilosis demum saepe glabrescentibus 5–25 mm. longis foliatis



suffulta, rhachi villosula; mascula subdensiflora, pedunculo vix ad 1 cm. longo excluso demum vix ultra 6:1 cm. magna, vulgo leviter arcuata; bracteae ovatae vel ovato-oblongae, obtusae vel subacutae, flavescentes, venosae, utrinque breviter villosae vel extus ad apicem plus minusve glabrae; stamina vulgo 5-7 (rarius 3 vel 9), filamentis  $1/2$ - $1/3$  dense villosis bractea demum subduplo longioribus, antheris flavis parvis globosis; glandulae 2, ventralis pleraque late ovato-rhombica, truncata vel subrotundata, dorsalis pleraque irregulariter (2-)3-partita (saepe digitata); amenta feminea sub anthesi circ. 3-5 : 0.7 cm., fructifera pedunculo ad 10-15 mm. longo excluso 5-7:1.5 cm. magna, satis laxiflora; bracteae ut in floribus masculis vel plerumque magis lanceolatae acutiores; ovaria ellipsoideo-conica, glaberrima; styli distincti sed brevissimi (vix ad 0.4-0.5 mm. longi), apice vulgo divaricato-bifidi, stigmatibus minimis emarginatis pro sectione typicis; pedicelli graciles, sub fructu 2-3 mm. longi; glandula 1, ventralis, late ovata, apice truncata vel rotundata, basi semiamplectens, quam pedicellus initio 2-3-, dein 4-6plo brevior; fructus maturi e basi subacuta ad subrotunda ellipsoidei, plus minusve rostrati, pedicello excluso (5-)6 mm. longi.

TYPE LOCALITY: Savannah, Chatam County, Georgia.

SPECIMENS EXAMINED: GEORGIA. Chatam County: Savannah, in border of swamp, April 5, 1918, *T. G. Harbison* (No. 5, f., fr., type; A.; "wide-spreading tree 30 ft. tall and 10 in. in diameter; bark rough and scaly in thick narrow ridges; twigs brittle-jointed"; folia superne ut videtur estomatifera); on ditch bank, same date, *T. G. Harbison* (No. 2, m. syntype; A.; "small brittle-jointed shrub"). Charlton County: Trader's Hill, on bank of St. Mary's River, Aug. 11, 1902, *R. M. Harper* (No. 1499, st.; N.; foliis ad 14:2 cm. magnis satis serrulato-denticulatis subtus paullo glaucescentibus, stipulis distinctis); April 3, 1918, *T. G. Harbison* (Nos. 1, fr. juv., 2, m.; A.; "small tree; bark rough; twigs brittle-jointed"; stomata in foliis superne tantum pauca ad costam visa). Richmond County: Augusta, on river bank, April 6, 1918, *T. G. Harbison* (No. 7, f.; A.; "large tree; bark rough and scaly; twigs brittle-jointed"; stipulis minimis acutis, foliis juvenilibus sed subtus leviter glaucescentibus); in swamp near the river, April 6, 1918, *T. G. Harbison* (Nos. 8, m., 9, f.; A.; "large scaly barked shrub"; in specimine femineo stipulae plus minusve evolutae semicordato-subrotundae, obtusae, 2-5 mm. longae iis *S. longipes Wardii* non absimiles; forma porro observanda); in swamp, same date, *T. G. Harbison* (No. 4, m.; A.; "large shrub or small tree; bark shallowly furrowed; twigs brittle-jointed"; forma porro observanda). Stephens County: Toccoa, along creek, April 10, 1918, *T. G. Harbison* (No. 3, m.; A.; "small tree; bark shallowly furrowed; twigs brittle-jointed"). Decatur County: Bainbridge, on bank of Flint River, March 28, 1918, *T. G. Harbison* (Nos. 1, m., 2, f.; A.; "a straggling tree 40 ft. tall and 10 in. in diameter: bark scaly; twigs brittle-jointed"; this form may be referable to the form of *S. nigra* mentioned on p. 6); on river bank, March 28, 1918, *T. G. Harbison* (No. 3, f.; A.; "a tree nearly a ft. in diameter and 35 to 40 ft. tall; bark rough, furrowed and scaly; twigs very brittle-jointed"; folia juvenilia subtus satis glaucescentia); Climax, in swamp, March 28, 1918, *T. G. Harbison* (Nos. 1, f. [satis ad *S. nigram* spectans], 2, m.; A.; "tall upright shrub with brittle-jointed twigs"; omnibus partibus juvenilibus satis griseo-tomentosis, foliis subtus glaucescentibus).

FLORIDA. Franklin County: Apalachicola, on edge of swamp, March 26, 1918, *T. G. Harbison* (No. 9, m.; A.; "small shrub 5 ft. tall"; forma foliis juvenilibus porro observanda).



SOUTH CAROLINA. Aiken County: Hamburg, along Savannah River, September 24, 1913, *J. Tidestrom* (No. 6950, st.; M.). Beaufort County: Yemassee, open moist ground, April 22, 1917, *C. F. Batchelder* (fr. im.; stomata superne sparsa). Charleston County: Charleston, in low ground, April 8, 1918, *T. G. Harbison* (Nos. 1, f., 2, m.; A.; "small slender tree; bark shallowly furrowed; twigs brittle-jointed"; omnibus partibus juvenilibus tomentosis); in swamp, same date, *T. G. Harbison* (No. 3, fr. im.; A.; "small tree; twigs brittle-jointed: bark furrowed but not scaly; omnibus partibus multo magis glabrescentibus quam in no. 1-2; stomata superne in foliis non visa; No. 4, m.; A.; "small tree, twigs brittle-jointed"; agrees well with type; No. 5, m.; A.; "large shrub; twigs brittle-jointed"; ut praecedens; No. 7, m.; A.; "shrub 6 ft. tall; bark smooth; twigs brittle-jointed"; ut praecedens); Isle of Palms, May 30, 1902, *C. R. Ball* (No. 56, st.; O.; "12 ft."; stomata superne pauca ad nervos, folia ad 13: 2.5 cm. magna, petiolis 6-9 mm. longis). Georgetown County: Georgetown, in low ground, April 26, 1918, *T. G. Harbison* (No. 5, fr.; A.; "tall shrub; twigs brittle-jointed").

NORTH CAROLINA. Wayne County: Goldsboro, in low ground, June 8, 1918, *T. G. Harbison* (No. 17, st.; A.; "small tree"; folia ad 12: 2.6 cm. magna, superne stomatibus subnumerosis praedita; stipulae semicordatae plus minusve acutae, intus glanduliferae). Columbus County: swamps, June, 1895, *W. W. Ashe* (No. 1325, st.; C.; forma incerta).

VIRGINIA. Smyth County: about Falls of Holston River, 700 m., June 8, 1892, *J. K. Small* (fr.; A., C., M.; forma satis ad *S. Harbisonii* accedens). Norfolk County: borders of Dismal Swamp, May 16, 1877, *Th. Morong* (m., fr. im.; N.; forma porro observanda, ad *S. longipedem* accedens, sed folia superne sparse stomatifera).

The specimens referred by me to *S. Harbisonii* look, at the first sight, very much like *S. longipes* (especially var. *venulosa*). I would have taken them for this species if it were not for the brittle-jointed twigs. Besides this the presence of stomata on the upper side of the leaf, and the minute glands on the inner surface of the stipules induced me to describe a new species. After all, however, it seems hardly possible to draw a sharp line between it and *S. longipes venulosa* which has been collected in almost every locality where *S. Harbisonii* is found. I first thought that these forms might represent hybrids between *S. longipes* and *S. nigra*, a fact that would easily explain the brittle-jointed twigs, the presence of the stomata in the upper surface of the leaves, and of the glands on the stipules. *S. nigra* is, however, known only from a few of the localities where *S. Harbisonii* is growing, and this species seems to be the prevailing one in most of the places where it is found. It cannot be regarded as a mere variety of *S. longipes* on account of the brittleness of the twigs, even if we would lay no stress upon the presence of the stomata which after all seems to be a rather important taxonomic character. *S. Harbisonii* certainly needs a closer study in the field, and a final statement as to its specific value or hybrid origin can only be made when we have become much better acquainted with those forms of *S. nigra* which I have enumerated on p. 8. *S. nigra* may be more frequent than we have reason to believe now, and if it should be found together with *Harbisonii* the hybrid origin of this species could be easily understood.

I shall be glad to receive material of all the doubtful forms of the



*Pleonandrae* which I have mentioned, but it is necessary to collect from the same plant at different times, because only well-collected material will be sufficient to make more definite statements possible. Besides this it is very important that the collector make notes with regard to the habitat, the habit, the associated species of *Salix*, and whether the branchlets are more or less brittle or tough at the joint. The last character seems to be of great taxonomic value for the separation of the tough-jointed *Bonplandi-anae* from the very brittle-jointed *Nigrae* and the (more or less) brittle-jointed *Lucidae* and *Amygdalinae*.

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## A PHYTOGEOGRAPHICAL SKETCH OF THE LIGNEOUS FLORA OF KOREA

E. H. WILSON

KOREA, or Chosen, as it is now designated by the Japanese, is a peninsula bounded on the east by the Japan Sea, on the south and west by the Yellow Sea, and on the north by Manchuria and the Primorsk province of eastern Siberia from which it is separated by the Yalu River, Paiktu mountains and the Tumen River. Until quite recently it was styled the "Hermit Kingdom" by peoples of western lands and it had little or no intercourse with the outside world. The whole peninsula (including adjacent islands) is confined within Lat.  $33^{\circ} 12'$  and  $43^{\circ} 02' N.$  and Long.  $124^{\circ} 13'$  and  $130^{\circ} 54' E.$  and has a total area of 84,173 square miles (English). Geologically speaking nearly four-fifths of Korea is of granites and highly metamorphosed rocks of Pre-Cambrian age. In the central parts between Lat.  $38^{\circ}$  and  $40^{\circ} N.$  and stretching almost from sea to sea is an area of Paleozoic rocks, chiefly mud-shales, slates, and a little limestone; in the southeast is an area of Mesozoic limestones with intrusive porphyritic rocks and isolated outcroppings of this combination of rocks obtrudes itself in other parts of Korea. Basalt underlies much of the peninsula and in the volcanic areas — Paiktu mountains, highlands south of Gensan, the islands of Quelpaert (Sai-shu-to) and Dagelet (Ooryöngtō) — it has been forced to the surface and is surmounted by trachyte lavas. Each of these geological formations has certain plants peculiar to it. For example, Larch (*Larix dahurica* var. *Principis-Rupprechtii* Rehd. & Wils.) grows only on the recent volcanic soils of the Paiktu region and there forms vast forests; a Birch (*Betula Schmidtii* Regel), one of the most valuable of Korean hardwood trees, is confined to the granites and metamorphic rocks; a Lilac (*Syringa dilatata* Nakai) is found only on the paleozoic rocks of north-central Korea. The climate is the best in the Far East and the country is destined to become the health resort of the Orient. It is essentially continental in character but in the extreme south and east-southeast, near the coast it is moderated by the influence of the Japan current — a warm ocean stream similar to our Gulf Stream. On Quelpaert Camphor and Orange trees grow at sea-level and the temperature there seldom falls below the freezing-point; in the





Schneider, Camillo. 1919. "Notes on American Willows. V. The Species of the Pleonandrae Group." *Journal of the Arnold Arboretum* 1(1), 1–32.

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