GLATFELTER, N.M.--- NOTES ON SALIX LONGIPES.

Compliments of the Author

Notes on Salix longipes.

By N. M. GLATFELTER.

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NOTES ON SALIX LONGIPES, SHUTTLW. AND ITS RELATIONS TO S. NIGRA, MARSH.

BY N. M. GLATFELTER, M. D.

This willow * was collected by C. W. Short at the falls of the Ohio river, Louisville, Ky., 1840; by Rugel at St. Marks, Florida, 1843, one of the original specimens being contained in the Missouri Botanical Garden Herbarium; by Dr. Engelmann at Belleville, Ill., 1849 (the specimen in the same herbarium unnamed); by L. F. Ward at Washington, D. C., 1880; by B. F. Bush in many counties of Southern Missouri (State Hort. Rept. 1895). In addition to the range as reported by Bush, the writer has observed it in St. François, Washington, Iron, Jefferson, and St. Louis counties, 1895, 1896, and also all the way along the St. Louis and San Francisco R. R. from St. Louis to Springfield, Greene Co., Mo. The northern limit in Missouri, according to present knowledge, is therefore a line drawn from the mouth of the Kansas river to the city of St. Louis. South of this it will probably be found in every county of the State, excepting several chiefly alluvial or swampy. In some parts of this region it appears to prevail, according to Mr. Bush, even to the exclusion of *S. nigra*. Mr. Henry Eggert also collected it in several of the southern counties, 1893; at Nashville, Tennessee, July, 1897; near Houston, Winston Co., Ala., Sept., 1897; and in western Tennessee. Mr. Bush collected it at Sapulpa and

* *Salix occidentalis*, var. *longipes*, Sargent, Silva. 9:109, 1896, and *S. Wardi*, Bebb, same authority. *S. Wardi*, Glatfelter, Science, n. series 2:582. 1895. *S. Wardi*, Bebb and *S. occidentalis*, var. *longipes*, Bebb, Garden and Forest, no. 394. 1895. *S. nigra*, var. *Wardi*, Flora of Washington, Bull. 22. 1881. *S. Floridanum*, Chapm. Fl. South. U. S. 1860. *S. longipes*, Shuttlw. in Anderss. Öfvers. af Vet. Akad. Förh. 114, 1858, and Monograph. Sal. 1868.

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Catale, Indian Territory, 1894; Dr. Chas. Mohr at Apalachicola Bay, 1892; Mr. Nash at Eustis, Lake Co., Florida, 1894; Mr. Ashe in Brunswick Co., N. Carolina, 1895; Mr. Heller in Kerr Co., Texas, 1894; Mr. Wright in N. Mexico, 1851. The writer has examined the available material from all the places mentioned, and he is under obligations to the U. S. National Museum, the Missouri Botanical Garden, and the Gray Herbarium of Harvard University, as well as Messrs. Bush, Eggert, Mohr, and Ashe.

An impartial investigation can no longer leave any doubt that Andersson's description of *S. longipes*, Shuttlw., in his monograph, covers all essential points inclusive of *S. Wardi*, Bebb, and that the latter name as distinctive of the species should be dropped. Inasmuch as the name *S. occidentalis*, Bosc, 1824, was applied to a species growing in the island of Cuba, and the material not at hand to show its relation to *S. longipes* of the United States, it seems best not to speculate on the matter. Mr. Bebb from the very first saw that the peculiar willow referred to him by Mr. Ward for identification, was allied to *S. longipes* (see Fl. Washington). His later separation of it into a distinct species can only be accounted for on the ground of insufficient material. As late as September, 1895, after the date of publication of the new species, he wrote me, "having only a beggarly account of unsatisfactory material of *S. longipes*," and, in the same letter, referring to my description of *S. Wardi*, writes "here is something which puzzles me 'the pubescent growing shoots hoary and heavy' of *S. Wardi* — this surely is a local departure for there is not a trace of anything of the kind on *Wardi*." This mistaken idea of Mr. Bebb's probably affords the clue. *S. longipes* was regarded as pubescent and by various degrees merging into the still more pubescent *S. occidentalis*. Now the fact is, the so-called *Wardi* has usually hoary pubescent shoots, and in many cases pubescent leaves, their pubescence however being lost before full maturity.

If the *Wardi* species were thus restricted only to the smooth form, most of the material that has come under my observation would be excluded. The writer has expressed elsewhere * his inappreciation of the value of pubescence as a character, in respect to another species of willow.

Endeavoring to arrive at the idea of the specific difference between *S. longipes* and *S. Wardi* from the descriptions hitherto given in so far as correctly represented, one is much more impressed by their almost perfect parallelism than by their divergence. The upshot has been that locality alone has been the determining factor in classing a given specimen either as *Wardi* or *longipes*, because of its collection at Washington or in Missouri on the one hand, or at more southern points on the other, as if the range were too large to be covered by one instead of two species.

S. longipes has, like many other willows, considerable variation even in the same locality, while some of the more widely separated localities enhance the variation still more. Andersson, in Monog. Sal., says that *S. occidentalis* intergrades through forms of *S. longipes* (f. *venulosa* and f. *gongylocarpa*) with *S. nigra* by innumerable intermediates. Letting *S. occidentalis* go as already stated, and confining our attention to the interval from *longipes* to *nigra*, how much of this intergrading should be assigned to variation *per se* and how much to hybridism, it is perhaps impossible to determine. Wherever I have had the opportunity to observe the growth of these willows in the field, the intergrading can readily be accounted for by the latter mode. Possibly the same would hold true of other localities.

The specimens from N. Carolina approach *S. nigra*. Mr. Bush's specimens from the Indian Territory, judged by the leaf alone, seem affected by the same, but the fruiting catkins surpass even the ordinary forms of *longipes* in length. Specimens from Texas plainly show the in-

* See Art. *S. cordata* × *sericea*. Bot. Gaz., p. 394, 1896.

fluence of *nigra*. One specimen identified by Heller as *nigra*, has the leaves of *nigra*, but the fruit of *longipes*. Another specimen identified by him as *longipes venulosa*, has fruit like a specimen from Watson, Mo., collected and named *S. nigra* by Mr. Bush. Specimens from N. Mexico show greater departure from the typical forms, and appear to approach nearer *S. nigra*. Of course in a case like this it is impossible to make any statement with assurance, on account of the limited accessible material. Specimens from Apalachicola Bay and elsewhere in Florida agree well with Washington and Missouri specimens. Those from Washington have shorter pedicels on an average than the others here mentioned, the latter presenting in general the widest divergence from *nigra* and being the purest examples of *S. longipes*.

While there appear no material differences between all the forms which have been united under *S. occidentalis* as exhibited in the United States and *S. Wardi*, Bebb, it can not be questioned that *S. nigra*, Marsh. is distinct. This distinction is presented to us by a number of prominent characters. First, *S. longipes*, Shuttlw. is a much smaller tree, the largest observed being rather under 30 ft. high and 9 in. in diameter at base, though usually much smaller. *S. nigra*, growing on the same spot, may attain double this size or more. Second, the bark of the trunk and larger branches is deeply cross-checked and firm, not flaky and shaggy as is *nigra* when old. This, once seen, serves to distinguish it from all other native willows even when bare of foliage. Third, the intense, whitish glaucous under surface of the leaves, together with the usually tomentose, young, very leafy shoots (though tomentum of the twigs is almost equally marked in some examples of *S. nigra*), enforces recognition even at a distance, or from a swiftly moving train. The impression thus made is assisted by a massiveness of foliage due to a vigorous growth of young shoots from the preceding year's branchlets, the ends of which are, at least in its more northern limits,

winter-killed. The resultant is a remarkably different expression in external outline from that caused by the more slender, somewhat drooping withes of *nigra*. Fourth, the twig can not be snapped off at its junction, being in marked contrast with the exceedingly brittle base of the *nigra* twig. The well-matured twig is gray with a brownish tinge, and often pubescent into the second year, while those less matured are reddish-brown and smooth. Fifth, the base of the leaf varies from the acute, through round, to the auricular form, the latter a feature not observed, to my knowledge, in any other willow. In *nigra*, the variation is at most only from the acute to the obtuse or roundish form. Sixth, the leaves are larger, the upper surface of a paler green; stipules larger, generally obtuse, seldom pointed, as they invariably are in *nigra;* aments mostly longer; fruit larger, discoloring a darker brown; pedicels longer; anthers a paler yellow. Seventh, *S. longipes* is exceedingly chary as to habitat, selecting almost invariably rocky, or at least gravelly portions of the stream, avoiding the alluvial stretches as if they were poisonous. This statement is confirmed by the independent observations of both Mr. Bush and Mr. Eggert, and also by Chapman. *Nigra*, on the other hand, occupies every situation or soil wherever it finds sufficient moisture. The former, though less hardy, appears to be a more vigorous grower. These appear to comprise all the important distinctions.

It was supposed, and so stated, that the time of flowering is about 10 days (2 to 3 weeks in Silva) later than of *nigra*, but this year's observation, in the vicinity of St. Louis, shows no material difference. A comparison is somewhat difficult, since this same season a variation of about 20 days in the blossoming of individual trees of *nigra* was noticed. Nevertheless, it has to be admitted that so much in this matter of flowering depends upon the varying character of the seasons, that nothing short of a series of observations would prove conclusive.

Again, in Mr. Bebb's original description he puts the

number of stamens as usually 3. While at the base of an ament there may be sometimes only 3, higher up I find the number varying from 4 to 7, in one instance 5 to 12!

Andersson says the stigmas are entire, and my previous observation was confirmatory in part. I now find, if examined when young, that the stigmas are, just as in *nigra*, almost always notched. The capsule of *Wardi* has been stated to be "minutely granular" (Fl. Washington), or "minutely glandular under a lens" (Garden and Forest). My examinations have failed to confirm these statements. In respect to the form of the capsule, the variation runs parallel with that of *nigra;* length of pedicel varies much, graduating into that of *nigra*.

The distinction into broad-leaved and narrow-leaved forms is too indefinite or unstable to be of importance, the variation in this respect being coincident with the similar variation of *nigra*. And lastly, the statement made in previous descriptions, of the prolonging of the flowering branchlet as a peculiarity of *Wardi*, is not distinctive. This character is generally present in the *nigra* of this region, but, owing to inferior vigor, is less developed.

Now, having passed in review the above mentioned striking differences, it seems most remarkable that there is almost precise agreement in their venation, a statement which would not be true, to my knowledge, respecting any other two species of willows. For the mode of venation should be regarded as usually one of the most constant and distinctive characters of the species of this genus. The foregoing observation has more especial reference to the extreme minuteness of the reticulation, a unique characteristic of the whole *nigra* group. The only difference noticed is the greater tendency of the primaries of *nigra* to form loops and the marginal line.*

I have found evident hybrids between *longipes* and *nigra* in all the localities visited. As might have been expected,

* See my paper on Venation of Salix. Rept. Mo. Bot. Gard. 5 : 52.

the intergrading is complex, just as it is between *nigra* and *amygdaloides*, or between *sericea* and *cordata*, the characters of one or the other parent predominating, or constituting an almost equal compromise between the two. If the specimen in hand approaches *nigra*, the under surface of the leaf will have simply a pale cast, the capsule will be smaller, stipules pointed, ament and pedicel shorter, bases of the twigs brittle, the tree larger. Since *longipes* is peculiarly and intensely glaucous, while *nigra* is of a brilliant green, the gradual stages from one to the other may be, in a measure, gauged by the difference in degree of this character.

The late Mr. Bebb had some notions of a close relation existing between "*Wardi*" and *S. amygdaloides*, as if the former were the "geographical equivalent" of the latter. I regard *amygdaloides* a step farther removed from "*Wardi*" (*longipes*) than is *nigra*. These three willows have, however, one peculiar mark or bond of connection, so far as I know, limited to this group, in that they all have now and then what may be called palmate-veined leaves,— small oval or elliptical leaves more or less palmate-veined, which when present are found near the base of young shoots (Plate 6).

In the vicinity of St. Louis, we have growing together in the same locality *longipes*, *nigra*, and *amygdaloides*. We should expect hybrids therefore as follows: *nigra* × *amygdaloides; nigra* × *longipes; amygdaloides* × *longipes; nigra* × *amygdaloides* × *longipes*. Now, the *nigra* × *amygdaloides* hybrids are extremely common, amounting probably to 50 per cent.of the total black and *amygdaloides* willows. The combination *nigra* × *longipes* has already been commented upon in this paper. The combination *longipes* × *amygdaloides* is identifiable with great difficulty. The same of course is true of the combination *longipes* × *nigra* × *amygdaloides*. However, I have collected several specimens which, I can not doubt, are hybrids of either one or the other of these latter forms. The earlier flower-

ing of *amygdaloides* might seem a barrier to such a union, but when closely noted it is found the variation in this respect is greater than formerly suspected; besides, the union need not be directly with the pure form of *amygdaloides* but with its hybrid *amygdaloides* × *nigra*, flowering later.

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 field 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.

S. longipes and *S. nigra* afford a most remarkable and extremely interesting example of differentiation, retaining subtle resemblances which cause one sometimes to feel hesitation in regarding them as distinct. Thus, likeness of the veining, the general forms of the leaves, including serration, the pubescence, the gray or brown bark of the branchlets, the similar roundish lenticels, the resemblance of the scales, stipules, stamens, capsules and stigmas, continuation of the flowering stem, attacks of the leaf gall-mite, all these and other characteristics, with their shades of difference, besides, constantly remind the observer of their very near relationship. In view of this, perhaps the most astonishing fact is that though covering the same geographical range over the southern portion of our country, they should not have become fused into one, or inextricably confused, as is the case with *cordata* and *sericea* where found coincident. And yet, this very persistence of

individuality, under such circumstances, is perhaps the strongest proof of their specific distinctness.

It is desirable that the range of *S. longipes* be better known. Our botanists of the South should, everywhere, look for it and report. With a view to further observations, the writer would request to have specimens sent him.

A few words in reference to the plates. The writer feels the inadequacy of such representations as can be given. A moment's look at an actual specimen is incomparably more instructive than the most painstaking attempt at reproduction. It is hardly possible to select a single leaf as typical even of a single plant, much less of a locality. In respect to the forms of leaves exhibited on the plates, let the reader therefore, not imagine that there are no other forms in the respective localities. The variations probably occur everywhere.

In conclusion, I desire to express my special obligations to Dr. Trelease for correcting copy and proof of this paper as well as for other kindly assistance.

EXPLANATION OF PLATES ILLUSTRATING SALIX.

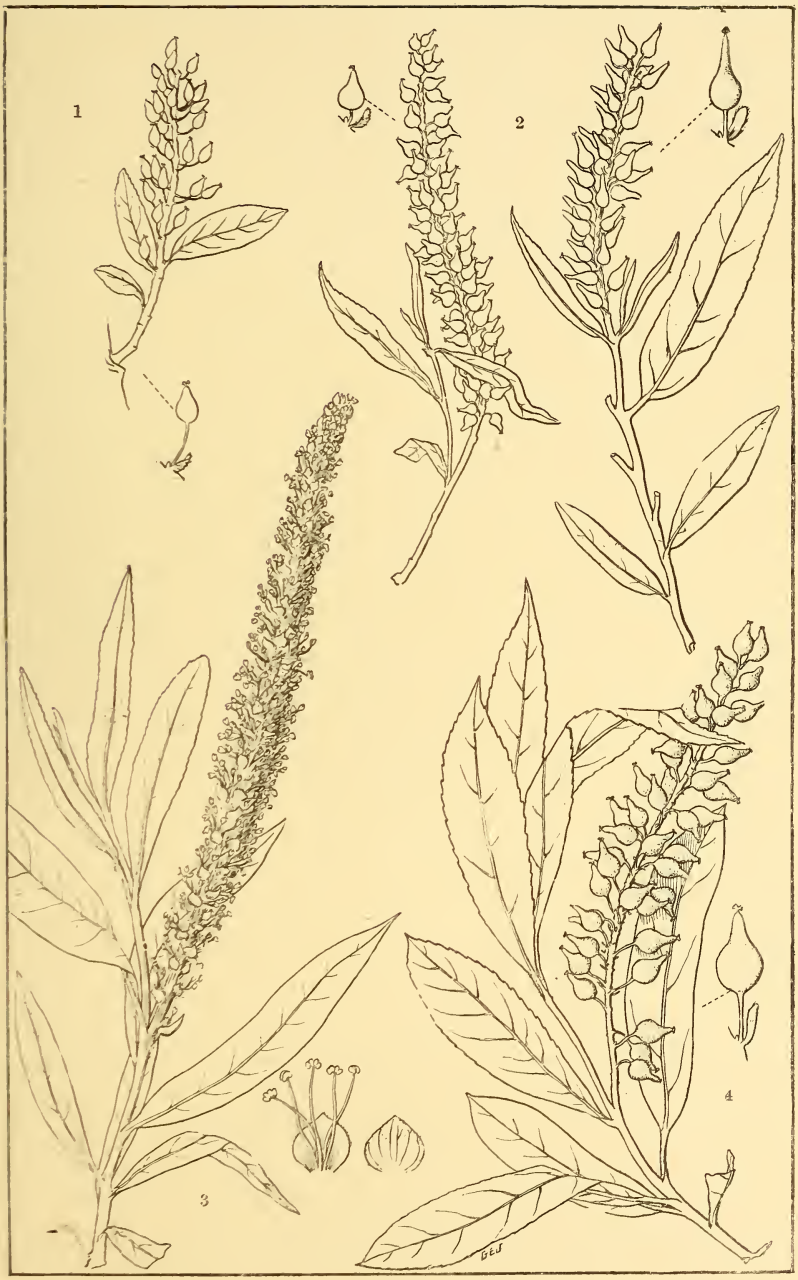
The figures are from material selected by the author, and drawn, under his direction, by Miss Grace E. Johnson. Throughout, habit sketches, leaves, stipules and catkins are of natural size, capsules are × 2, and flowers are × 4.

Salix nigra.— Plate 5, f. 2; plate 6, f. 6, f. 7c (both from St. Louis), f. 12 (Texas); plate 7, f 1a.

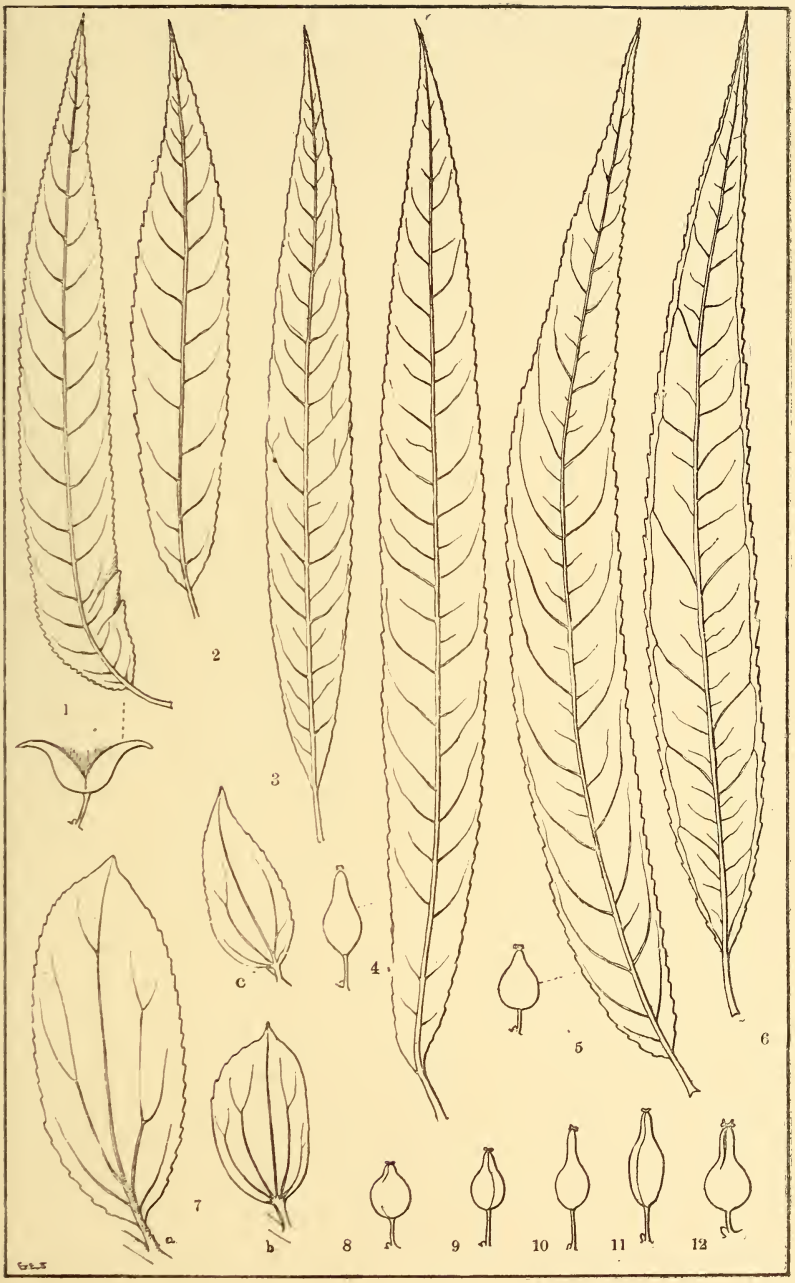
Salix longipes.— Plate 5, f. 1 (St. Marks, Florida, Rugel), f. 3 and 4 (Missouri); plate 6, f. 1 (Florida), f. 2 (North Carolina), f. 3 (Nashville, Tennessee), f. 4 (Texas), f. 5 (Missouri), f. 7a (palmate form of leaf), f. 8 (Carter County, Missouri), f. 9 (Bonne Terre, Missouri), f. 10 (Watson, Missouri); plate 7, f. 1, 2; 3 (Louisville, Kentucky), f. 4 (Washington, D. C.), f. 5 (St. Louis), f. 6 (Pilot Knob, Missouri), f. 7 (New Mexico).

Salix longipes, venulosa.— Plate 6, f. 11 (Texas).

Salix amygdaloides.— Plate 6, f. 7b (palmate form of leaf).



SALIX.



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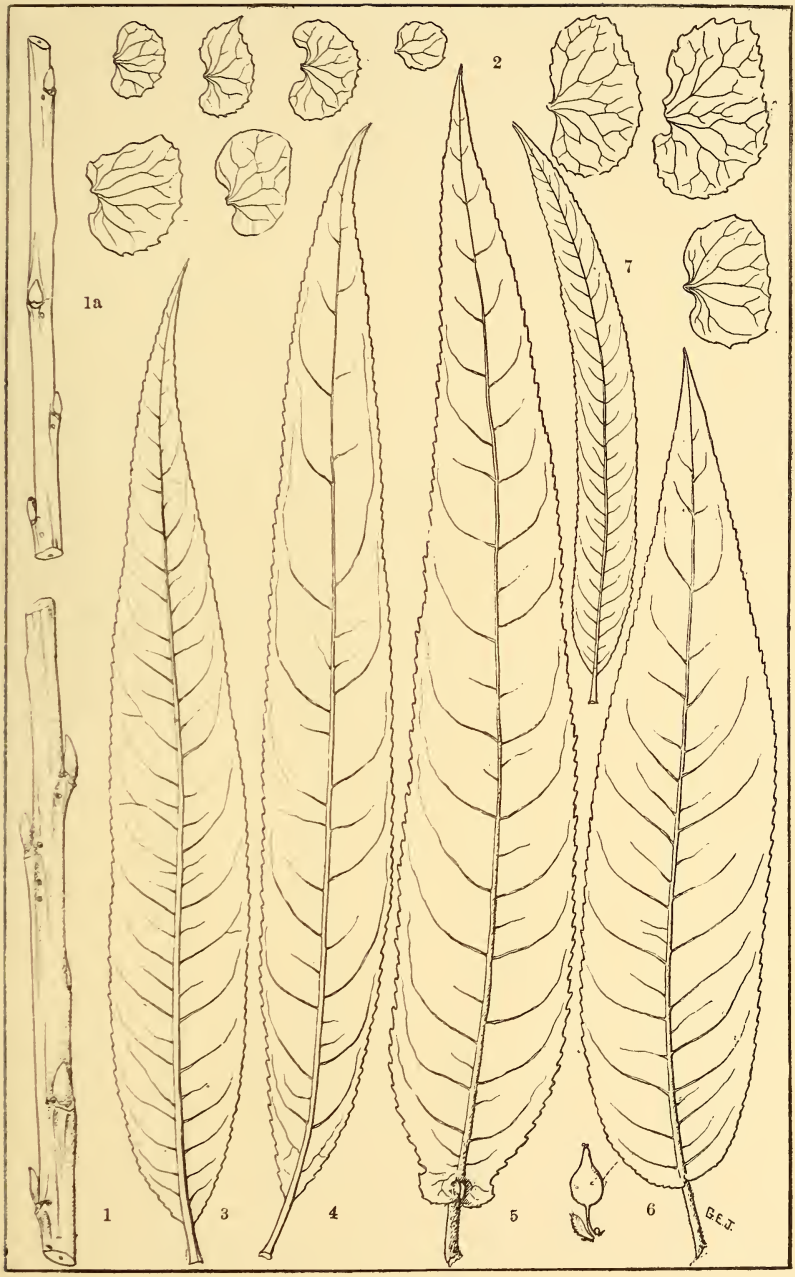

SALIX.