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About the Institute

The Hunt Institute for Botanical Documentation, a research division of Carnegie Mellon University, specializes in the history of botany and all aspects of plant science and serves the international scientific community through research and documentation. To this end, the Institute acquires and maintains authoritative collections of books, plant images, manuscripts, portraits and data files, and provides publications and other modes of information service. The Institute meets the reference needs of botanists, biologists, historians, conservationists, librarians, bibliographers and the public at large, especially those concerned with any aspect of the North American flora.

Hunt Institute was dedicated in 1961 as the Rachel McMasters Miller Hunt Botanical Library, an international center for bibliographical research and service in the interests of botany and horticulture, as well as a center for the study of all aspects of the history of the plant sciences. By 1971 the Library's activities had so diversified that the name was changed to Hunt Institute for Botanical Documentation. Growth in collections and research projects led to the establishment of four programmatic departments: Archives, Art, Bibliography and the Library.

Address:
Extension Service, U.S. Dept. Agri.

January 17, 1939.

Mrs. H. P. Bracelin,
Herbarium Department of Botany,
University of California,
Berkeley, California.

Dear Mrs. Bracelin:

I will be very appreciative if you can obtain for me another copy of the mimeographed keys to willows of the Southern Sierra Nevada. These were prepared, if I remember correctly, for a nature study group of the California teachers. I remember that Miss Smith, of Oakland, made excellent use of it in connection with the long trip she made after the nature study classes were held in the mountains. Don't put yourself to extra trouble but if you know where one can be dug up, I will really appreciate obtaining another copy.

I recently received two pictures of pachyderms in the Berlin Zoo without any identifying comment. I suspect, however, that it was you who sent them. I got a good laugh out of the one which says that "Not even an elephant wants to step on a tack".

Cordially yours,

Carleton R. Ball,
Executive Secretary.

CRB:lp

P. S. I think I am naming more hundreds of willows per annum since I left California than I did while there. Many large collections are being made in Canada and Alaska, especially the Eastern Arctic, and the Forest Service, Soil Conservation Service, and special botanical surveys in the United States turn up many more.

With personal regards and best New Year wishes to you both and to mutual friends.

Botany Dept., U.C.,
Berkeley, Calif.,
February 24, 1939

Dr. Carleton R. Ball,
Extension Service,
U.S. Dept. of Agric.
Washington, D.C.

Dear Dr. Ball

It has been over a month since you wrote asking me to procure for you a copy of the Key to the Willows of the Southern Sierras which you prepared for the San José Teachers College field work in Sequoia National Park some years ago. I have been all of this time getting it for you but at long last I am mailing the original as well as three mimeographed copies prepared at the San José College. I am awfully sorry I could not get it to you earlier. I would not give up and so here it is!

Pachyderm? I never heard of them! How could I, when the keeper, or should I say leader, of Pachyderms is in Washington and points east!!

Your postscript can be taken two ways and I decline to take it the wrong way! I'm sure you haven't any better or ^{more} enthusiastic willow ^{past} than you had in Berkeley! You may be naming more willows but that too may in part be due to the work done in Berkeley and the tons of willows that went out named by you, all over this continent. We certainly worked hard but it was fun. I am so glad, never-the-less, that you are being swamped with them and it is grand that you are getting collections from Canada and Alaska. Has it added species or range extensions to what you had when you were here? You know I am ever so interested and like to hear all about it.

I have wondered how your Tenn. Valley work goes and if you find it interesting?

I am working awfully hard on Mrs. Mexia's last collections as well as some of her personal affairs. There should be a low agin anyone dying; it leaves so much for others to clear up and untangle.

Do let me know when you and Mrs. Ball plan to come to our Fair. It is open but not all completed. I have not been over as yet though everyone seems to think it a very beautiful sight.

With the best of good wishes to each of you,
Cordially yours,

N. Floyd Bracelin

Mrs. H.P. Bracelin

My Ford is called Sally, guess why!

Address: Extension Service
U. S. Dept. Agri.

March 7, 1939

Mrs. H. P. Bracelin,
Botany Department,
University of California,
Berkeley, California.

Dear Mrs. Bracelin:

Your letter of February 24 and the accompanying copies of the mimeographed keys to Southern Sierran willows were received and I greatly appreciate the trouble you have taken to locate these copies and send them to me.

In running through my accumulated material it appears that your good letter of September 22 has not been acknowledged. I especially appreciate your description of Mrs. Mexia's last days and greatly regret that I could not have seen her again before her passing. I shall always highly prize that last specimen from Mexico both for sentimental reasons and for its exceedingly large scientific value, as I think I wrote you before. You will have the difficult task of winding up her scientific affairs but you will also have the pleasure of much more intimate memories than some of the rest of us.

So far as the flora of the arctic is concerned, we are getting the gaps closed. Dr. H. M. Raup, now of the Harvard botanical group, was in the area covering northern Saskatchewan, northern Alberta and northeastern British Columbia in 1932 and 1935. I have just received his material containing three new species and one new variety as well as specimens which close gaps and extend ranges. I have not yet had time to examine all of it. This coming summer he is going still farther north to the area of the British Columbia Yukon border along the Divide between the Mackenzie and Yukon basins. This should pretty effectively cover the unknown areas in that part of the northwest. A Catholic priest, Father Dutilly, has been collecting extensively east and north of Hudson Bay while Dr. Gardner of Montreal is working in Labrador. With all of this material we shall be able to get a good picture of the arctic.

men I am enclosing copy of a letter recently sent to Dr. Maxon of the National Museum. As I understand it, the specimen was received from you. By the way, Mr. Tracy has just obtained a species from Trinity Summit which I think is the farthest west for it in the United States.

With personal regards to you and family, I am

Cordially yours,

Carleton R. Ball,
Executive Secretary

P.S.: Undoubtedly your Ford is called Sally because in it you sally forth to uproot willows and devastate the countryside, thereby making more work for the Soil Conservation Service and the Forest Service, and thereby again contributing to the relief of unemployment. May the good work go on.

June 19, 1933.

Miss Emily Smith,
West Coast School of Nature Study,
Sequóia National Park,
California.

Dear Miss Smith:

I am enclosing a key to the willows of the southern Sierras. I have included all the species and varieties which are likely to occur within the limits of the Park and probably have included some which do not occur there, as I am not familiar with the Park, nor have I had time to check on the species actually collected within it. Trouble with my eyes and the pressure of other work made it impossible for me to prepare this key immediately on receiving your request. I trust, however, that it will arrive in time to be useful.

You will note that I have not made it a dichotomous key. I have arranged the species in four groups. Under these groups the keys are either dichotomous or trichotomous. As two of the groups are rather sharply limited, Group 2 being the Sandbar willows, and Group 4 being the prostrate species, it really leaves only two groups in which to hunt for material. A strictly dichotomous key is desirable but difficult to construct when only foliage characters are used, although it can be done.

With personal regards and best wishes for the pleasure and success of the school, I am

Very sincerely yours,

Carleton R. Ball
Research Associate

CRB:CSB

UNIVERSITY OF CALIFORNIA

DEPARTMENT OF BOTANY

BERKELEY

October 13, 1937

Dr. Carlton R. Ball
Extension Service
U. S. Department of Agriculture
Washington D. C.

Dear Dr. Ball:

Professor McMinn told me that you have a field key to the willows of California. I wonder if I might have a duplicate copy or borrow a copy in connection with a manual which I am getting ready for my classes. This manual is designed to take the place of Jepson's manual which is now out of print. McMinn said that this key is being used either by Fresno State Teacher's College, or San Jose State Teacher's College, which he did not recall.

I appreciate very much your sending me the copies of reprints of the Washington Academy of Sciences. Not being a subscriber to that journal I do not get that material.

Sincerely,

Herbert L. Mason

Herbert L. Mason
Associate Curator of the
Herbarium.

HLM:bd

(over)

Extension Service, USDA

October 24, 1937

Dr. Herbert L. Mason,
Department of Botany,
University of California,
Berkeley, California.

Dear Dr. Mason:

I am most sorry that I cannot send you a copy of the mimeographed key to willows of California, based on vegetative characters. I have only one copy of it myself. The circumstances are these:

Dr. -----, botanist at San Jose State Teachers College, was about to conduct a nature-lovers school in one of the National Parks in California. One of his friends, asked me if I would prepare a key to the willows likely to be found there, basing it on the vegetative characters. I did so, in one evening, as the school was about to open.

They took my typed copy and had it mimeographed, with some slight modifications, as I recall. I obtained one copy later.

I think that it was Miss Emily Smith, a botanist (amateur) of Oakland who asked me, or else it was Mrs. Bracelin. At any rate, Mrs. Bracelin knew of it at the time. I believe that she was going to the school. Miss Smith attended (Mrs. Bracelin knows her) and afterward took a trip on over to Mono and Tahoe Lakes and back by Tioga Pass. She collected willows all the way and named all the species correctly from this key, and even got some of them down to varieties.

If Miss Smith or Mrs. Bracelin cannot get you a copy or tell you how to get one, I will lend you mine.

It was not a key to the California willows but simply one for the species likely to occur in the southern Sierras.

If it would be of help to you, I probably can construct such a key for all the species and varieties of California, later this winter. There are some 30 to 35 ~~xxx~~ species and many varieties. Just now I am starting on a trip, which, with various conferences and annual meetings, will keep me busy until the New Year. However, I can work at a thing like that while on the road, and check details on my return.

I am glad to send the extracts from Jour. Washn. Acad. Sci., and others because you were so helpful to me while I was there that I am more than glad to be of service.

With personal regards to yourself and Mrs. Mason, and to mutual friends, I am

Most Cordially

Carleton R. Ball

July 13, 1933.

Miss Emily Smith
Los Gatos
California

Dear Miss Smith:

Your interesting letter of July 9 is received and I am glad to know that the key to the willows of the southern Sierras was found useful to you in your work in Sequoia National Park. As I probably stated when sending it, the key was hastily prepared, and because of the condition of my eyes was not checked in any way against actual material.

I will have no objections, of course, to its being mimeographed and distributed wherever it is likely to be useful. Doubtless it could be improved but I will be unable to do any more to it at the present time.

The great rift between the Sierras and the mountains to the east has never been thoroughly collected. Two expeditions have covered the Death Valley and Mark Kerr of Independence is collecting in that section. Northward from Independence to Mono Lake and on to Lake Tahoe has not been covered with any thoroughness. We do not know how far S. laevigata and S. gooddingii extend to the northward. The long leaf or sand bar willows will especially repay investigation. The species will be S. exigua but probably more than one variety will be present. S. lutea and S. lutea watsoni also should occur. Any material with notes on height, habitat, etc. will be valuable.

I thank you for your courteous invitation to visit you at Los Gatos. It is possible that we may drive that way sometime before we leave for the East in the fall. The only time we have passed through Los Gatos since the family came to California was in a pouring rainstorm last winter.

With kind personal regards to yourself and your father,

I am

Sincerely yours,

CRB:CSB

Carleton R. Ball

Los Gatos, California
July 9, 1933

Dr. Carleton R. Ball,
University of California,
Berkeley.

Dear Dr. Ball:

We were most grateful and very proud to have your key to the willows in Sequoia National Park. It was very generous and kind of you to work out the key for us in so short a time -- I was ashamed to make such a last-minute request, even through my good friend, Mrs. Bracelin. We made a dozen or so carbon copies of the key for use in the field, and Mrs. Bracelin, no doubt, has told you how successfully the key worked. All of the students asked if mimeographed copies would be available later (they have our mimeographed key to trees other than willows). I shall send your key and our copy of it to Mrs. Bracelin, asking her to ask you about it -- if it will be all right for us to mimeograph it and distribute it among our students. We should like also to give copies to the ranger-naturalists in the park.

Dr. Peterson, who had trees as his part in our school, has asked for your address (asked for it some time ago and only just received it) and will write his own personal thanks to you. I didn't realize how much I was asking when, in too much haste, I asked for the key. Please accept my very sincerest thanks now for the key and your courtesy.

Are there any willows on the east side of the Sierra between Mono Lake and Lake Tahoe that I can find for you? Mother and Father and I are going motoring that way for a week's vacation. We send warm regards to you and Mrs. Ball and your daughter, and we hope, if ever you are down our way, you all will come to see us on our prune and chicken ranch.

Very gratefully yours,

Emily Smith

By Carleton R. Ball*

Four Groups:

1. Leaves tending to be long (2 to 6 inches, or on sprouts longer), lanceolate, mostly acuminate, distinctly petioled, glabrous at maturity; aments leafy-peduncled; flower scales yellow, deciduous; stamens 3 to 7. Shrubs to tall trees, usually on borders of streams

Leaves large, mostly 3 to 6 inches long; branchlets stoutish
 Petioles with glands on top near base of blade; aments stout
 Leaves glaucous beneath at maturity

Leaves and glands large. Trees or shrubs of low to middle elevations

Branchlets and bud scales glabrous - - - - -

- - - - - Golden Willow

S. lasiandra Benth

Branchlets and bud scales pubescent - - - - -

- - - - - Lance-leaf Golden Willow

S. lasiandra lancifolia (Anderss.) Bebb

Leaves and glands smaller. Shrubs of middle or higher elevations - - - - -

S. lasiandra Abramsi Ball

Leaves green beneath at maturity. Shrubs of middle or higher elevations

Branchlets and bud scales pubescent - - - - -

- - - - - Caudate Willow

S. caudata (Nutt.) Heller

Branchlets and bud scales glabrous - - - - -

- - - - - Bryant's Caudate Willow

S. caudata Bryantiana Ball & Bracelin

Petioles without glands; aments slender; leaves glaucous beneath, shining above, thick-firm, subentire. Trees of lower and middle elevations

Branchlets and bud scales glabrous - - - - -

- - - - - Red Willow

S. laevigata Bebb

Branchlets and bud scales pubescent - - - - -

- - - - - Araquipa Red Willow

S. laevigata araquipa (Jeps.) Ball

Leaves smaller, mostly 2 to 4 inches long; branchlets slender; aments slender. Trees of low elevations

Branchlets, bud scales, and capsules pubescent (at least until full-sized) - - - - -

S. Gooddingii Ball

S. Gooddingii Ball

Branchlets, bud scales, and capsules glabrous - - - - -

- - - - - California Valley Willow

S. Gooddingii vallicola (Dudl.) Ball

See also species in Group 3

*Common names not given by Dr. Ball

Keys to Willows of Southern Sierra Nevada, cont.

2. Leaves midsize or longer ($1\frac{1}{2}$ to 4 inches, or longer on sprouts), linear or linear-elliptical, the blade passing imperceptibly into the short or almost obsolete petiole; flower scales yellow; stamens 2. Shrubs or small trees, typically on flood beds of streams

Leaves and younger branchlets gray - to white - pubescent; *capsules pubescent*;
style short and stigmas long. Low elevations

Leaves always entire - - - - - Gray Narrow-leaf Willow
S. Hindsiana Benth

Leaves remotely denticulate - - - White Narrow-leaf Willow
S. Hindsiana leucodendroides (Rowl.) Ball

Leaves grayish green, finely puberulent on both sides, or glabrate above; capsules usually glabrous; style mostly wanting, stigmas midlength. Middle elevations - - - - -

- - - - - Desert Narrow-leaf Willow
S. exigua Nuttall, and varieties

Leaves dark green above, glaucescent beneath, sharply but remotely denticulate; branchlets dark brown, glabrous or glabrate. Middle elevations

Leaves glabrous throughout - - - Green Narrow-leaf Willow
S. melanopsis Nuttall

Leaves pubescent, at least beneath - - - - -

- - - - - Bolander Narrow-leaf Willow
S. melanopsis Bolanderiana (Rowl.) Schneider

3. Leaves midsize (1 to 2 or 4 inches long), variable in shape but mostly lanceolate or broadly lanceolate to oblanceolate or narrowly obovate; flower scales brownish to nearly black; stamens 2. Low to tall shrubs, usually on borders of streams or in wet meadows; middle to high elevations

Leaf margins variously serrulate

Blades, and usually the branchlets, glabrous

Branchlets brown to dark brown

Leaves lanceolate, glaucous beneath.

- - - - - Strap-leaf Willow
S. ligulifolia Ball

Leaves lanceolate or broader, green beneath. See below

- - - - - Red-catkin Willow
S. pseudocordata (Anderss.) Rydberg

Branchlets yellow or whitish; leaves glaucous beneath

Branchlets yellow, strict; leaves dark green above, serrulate - - - - - Yellow Willow
S. lutea Nuttall

Branchlets pipe-clay in color, divaricate; leaves yellowish green above, mostly entire - Watson's Yellow Willow
S. lutea Watsoni Bebb

Blades and branchlets more or less hairy

Blades green, thinly pubescent, especially beneath, serrulations conspicuous. See above - - - - -

- - - - - Red-catkin Willow
S. pseudocordata (Anderss.) Rydberg

Blades gray, pubescent on both sides, serrulations
often concealed - - - - - Eastwood's Willow
S. Eastwoodiae Cockerell

Leaf margins entire or nearly so

Leaves permanently hairy on one or both sides

Leaves hairy on both sides

Blades narrowly oblanceolate, silvery pubescent,
margins somewhat revolute; aments slender;
capsules short - - - Jepson's Willow
S. Jepsoni Schneider

Blades lanceolate or narrowly elliptic-lanceolate,
grayish pubescent; aments stout; capsules
long - - - - - S. orestera Schneider

Leaves hairy beneath, glabrate or glabrous above

Blades oblanceolate, silvery pubescent beneath;
branchlets pruinose- Blue-twig Willow

S. subcoerulea Piper

Blades oblanceolate, gray-pubescent to glabrate,
subrugose, strongly glaucous beneath;
branchlets yellowish brown, tough - - - - -
- - - - - Arroyo Willow
S. lasiolepis Benth

Blades oblanceolate to obovate, thinly gray-
or brown-pubescent beneath; branchlets
yellowish brown, divaricate, brittle - - - - -
- - - - - California Mountain Willow
S. Scouleriana Barratt

Leaves glabrous, quickly glabrous, or sometimes becoming
glabrous at maturity

Blades elliptical-ovate or oval, $\frac{1}{2}$ to 1 inch long;
branchlets reddish. Low shrub, sometimes
prostrate. See Group 4 - Mono Willow

S. monica Bebb

Blades broadly lanceolate; branchlets yellow. See
above - - - - - Watson's Yellow Willow
S. lutea Watsoni Bebb

Blades lanceolate to oblanceolate, sometimes thinly
silvery with evanescent hairs; branchlets yellow-
brown or purplish, and sometimes pruinose - - -
- - - - - Lemmon's Willow
S. Lemmoni Bebb

Blades oblanceolate to obovate, pubescent beneath
but sometimes becoming glabrous with age. See
S. lasiolepis and S. Scouleriana above

4. Leaves less than 1 inch long. Creeping or prostrate shrubs of high
elevations

Leaves narrowly elliptical, acute, gray-pubescent above,
paler beneath; aments elongated, erect - - - - -

- - - - - California Alpine Willow
S. petrophila caespitosa (Kenn) Schneider

Leaves elliptical to oval, obtuse, glabrous

Blades about 1/3 inch long, deep green above
white and rugose-veined beneath; aments minute.

Known yet only from Mt. Dana and Koip Pass - - - -

- - - - - Glacier Willow

S. nivalis Hooker

Blades bright green above, glaucous and plane beneath;
branchlets reddish-brown. Prostrate only at

9,500 to 10,000 feet. See Group 3 - - - - -

- - - - - Mono Willow

S. monica Bebb

Original
from Dr. Ball

from Dr. Ball

- Branchlets and budscales and capsules pubescent (at least until ^{fruit-sized} mature)

2. Leaves linear or linear-elliptical, the blade passing imperceptibly into the short or almost obsolete petiole (Sandbar Willows); scales yellow; stamens 2.
- Leaves and younger branchlets gray- to white-pubescent; capsule pubescent, style short, stigmas long; lower elevations if present.
- Leaves entire under all conditions *S. hindsiana* Penham
- Leaves remotely denticulate . . . *S. hindsiana leucodendroides* (Rowl.) Ball
- Leaves grayish-green, finely puberulent on both sides or glabrate above; capsules usually glabrous, style mostly wanting; stigmas midlength, middle elevations. *S. exigua* Nutt. and Vars.
- Leaves dark-green, sharply but remotely denticulate; glaucescent beneath; branchlets dark brown, glabrous or glabrate; middle elevations.
- Leaves glabrous throughout *S. melanopsis* Nuttall.
- Leaves pubescent, at least beneath *S. melanopsis Bolanderiana* (Rowl.) Schn.

3. Leaves midsize, 1-2 or 2½ inches long, variable in shape, mostly lanceolate or broadly lanceolate to oblanceolate or narrowly obovate; low to tall shrubs of middle to high elevations

Leaf margins variously serrulate

Blades, and usually the branchlets, glabrous

Branchlets brown to dark brown

Leaves lanceolate, glaucous beneath

S. ligulifolia Ball

Leaves lanceolate or broader, green beneath-- *S. pseudocordata* (And.) Rydb.

Branchlets yellow or yellowish, blades glaucous beneath

Branchlets strict, leaves dark green above, serrulate

S. lutea Nuttall

Branchlets divaricate, leaves yellowish green above (mostly entire) (*See below*)

S. lutea Watsonii Bebb

Blades and branchlets more or less hairy

Blades green, thinly pubescent, especially beneath, serrulations conspicuous (*See above*)

S. pseudocordata (And.)

Blades gray, pubescent on both sides, serrulations often concealed.

S. Eastwoodiae Ckll.

Leaf Margins entire or nearly so

Leaves permanently hairy on one or both sides

Leaves hairy on both sides

Blades narrowly oblanceolate, silvery pubescent, margins somewhat revolute; aments slender, capsules short

S. Jepsoni Schneider

Blades lanceolate or narrowly elliptic-lanceolate, grayish pubescent; aments stout; *caps. long.*

S. oresteria Schneider

Leaves hairy beneath, glabrate or glabrous above.

Blades oblanceolate, silvery pubescent beneath; branchlets pruinose

S. subcoerulea Piper

Blades oblanceolate, gray-pubescent to glabrate, subrugose, and strongly glaucous beneath; branchlets yellowish-brown, tough.

S. lasiolepis Bth.

Blades oblanceolate to obovate, thinly gray-or-brown-pubescent beneath; branchlets yellowish-brown, divaricate, brittle.

S. Scouleriana Barr.

← Leaves either glabrous, quickly glabrous, or sometimes becoming glabrous at maturity.

Blades elliptical-ovate or oval, ½-1 inch long, branchlets reddish, low shrub, sometimes prostrate (*See Group 4*).

S. monica Bebb

Blades sometimes thinly silvery with evanescent hairs, lanceolate to oblanceolate; branchlets purplish, sometimes pruinose

S. Lemmonii Bebb

Blades oblanceolate to obovate, pubescent beneath but sometimes becoming glabrous in age (*See S. lasiolepis* and *S. Scouleriana* above)

Blades broadly lanceolate; branchlets yellow (*See above*) *S. lutea Watsonii* Bebb

4. Leaves less than 1 inch long; creeping or prostrate shrubs at high elevations

Leaves narrowly elliptical, acute, gray-pubescent above, paler beneath; aments elongated, erect.

S. petrophila ^a*cespitosa*
(Kenn.) Schn.

Leaves elliptical to oval, obtuse, glabrous

Blades about 1 cm. long, deep green above, white and rugose-veined beneath; aments minute (Known yet only from Mt. Dana and Koip Pass)

S. nivalis Hooker

Blades bright green above, glaucous and plane beneath; branchlets reddish-brown (Prostrate only at 9,500-10,000 ft.; See Group 3)

S. monica Bebb