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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.

*Write him that Dr. J. Hermann who
with Dr. Ball had collected in the
Mojave*

Joseph Toomey
672 Bryan ave.
Salt Lake City, Utah
July 23, 1950

Dear Dr. Ball,

I am a student at the University of Utah,
working on my master's degree. For the past two
years I have taught biology in the Rigby High
School, and so I have chosen for my problem the
identification and ecology of the shrubs of
Northeastern Utah, and Southeastern Idaho. I
plan to make a key, using leaf and stem character-
istics of these plants which will be useful
for high school teachers and students in this
area. I have had courses in Taxonomy, and have
made simple keys which have been used by my students,
but I need someone to help me in positively identifying
the specimens I collect. Dr. Walter P. Cottam, of
the University of Utah botany department suggested
that I contact you, and send to you specimens of
the shrubs which I collect.

I would appreciate any suggestions which you
might have, and hope that I may hear from you soon.

Sincerely yours,

Joseph Toomey

(See over)

Prof. Joseph Toomey,
672 Bryan Avenue,
Salt Lake City, Utah.

5614 Jocelyn St., N.W.,
Washington 15, D.C.

27 July 1956

Dear Professor Toomey:

Your letter of 23 July is just here and I wish to congratulate you on your thesis subject. We need much more of local floras or shrubby floras done in a fairly popular but accurate way. Such work encourages nature lovers and makes for greater respect for taxonomy by them and their friends. I will be glad to help you in any way possible.

First, let me make it clear that I handle only willows (*Salix*). By profession I am an agronomist (forage and cereal crops) but I graduated in botany at Iowa State and had started on the willows before I entered the U.S. Dept. of Agriculture. The Forest Service and the Biological Survey (now Fish and Wildlife Survey), and later the Soil Conservation Service, had to know all the willows so I kept up my work with them throughout my agronomic service, as part of my official duty.

I will name willow collections for you at any time very gladly. I am just as happy to do it when all of the material is returned to you, because I learn a lot from the study. On the other hand, I am glad to have duplicates when they are available, because my large herbarium (now 22,000 sheets of *Salix*) gives me the basis I need for determining specimens in every stage of growth or development.

5.7. If you need to have other groups of shrubs determined, I am sure that Dr. Blake of the National Arboretum Herbarium, Plant Industry Station, Beltsville, Maryland, will be glad to help you. Dr. Wm. A. Dayton or Dr. Elbert L. Little, Jr., of the Forest Service, U.S. Dept. of Agriculture, will be equally glad to help, I am sure. Both are away at present, Dr. Dayton at the International Bot. Congress and Dr. Little in Puerto Rico. Both will be back by Oct. 1, I think.

You may know that Prof. Ray J. Davis, of the Dept. of Botany, Idaho State College at Pocatello, is getting out a flora of Idaho. I think that it goes to press this year. I have done the willows for that. Prof. Ralph R. Wilson of the School of Forestry at the same College, is working on a book on the shrubs or woody plants of Idaho, and I have done the willows for him too. I have determined the willows from the herbariums in Idaho and also Washington State College at Pullman, not far from Moscow, Idaho.

I have collected quite widely in both Utah and Idaho, and have named the *Salix* collections for many collectors in Utah, including Dr. Cottam himself, and also the extensive collections from the Uinta Mountains by Dr. Edward H. Graham.

Prof. John F. Reed of the Dept. of Botany of Univ. of Wyoming is collecting extensively in Teton Co., Wyo., against the Idaho border, and I think he is giving special attention to ecology also. I think he is dealing wholly or chiefly with the shrubby plants also, ~~not~~ but I may be wrong.

I feel sure that any of these men will be glad to work with you on this project, if you care to get in touch with them. I can send you a copy of the treatment of Idaho willows if you wish. Some years ago, while at the Univ. of Calif., I made a key to the Sierran willows which a group of high-school teachers used successfully to name all the species they found.

sent my paper on *willows* separately
ed mink

Joseph Toomey
672 Bryan ave.
Salt Lake City, Utah
July-9, 1950

Dr. Carleton R. Ball
3814 Jocelyn St., N.W.,
Washington 15, D.C.

Aug. 9 (Dr. Ball's letter of 14/11/50)

Dear Dr. Ball;

I would like to thank you for the interest you have taken in my thesis. I want to thank you especially for information leading to the positive identification of the plants which I am studying. I will certainly make use of the names which you sent to me.

I am now collecting as many different kinds of shrubs from scattered areas as I can, and I am pressing enough so that any of the willows which I send may be kept. I have collected duplicates of the same willow from different habitats, including sucker growth, on the chance they may be different species which I do not recognize. I would appreciate it if you have any suggestions on how you want them collected, for I have just cut off the most characteristic parts to press. None of them are in flower at this time as you know. I will send them as soon as I have a good number collected and pressed.

I would like to say that this study is purely a local one for the area surrounding the High School at which I teach. I have tried to find something which was simple enough for high school students to understand, yet accurate. I believe that a key which describes the shrubs which they might encounter in this area (southeastern Idaho and Northern Utah) will be more valuable to these students than a highly complicated key which only the instructor could use.

This study has certainly opened my eyes to things which I hadn't even noticed before. For example, there is one species of willow which is very abundant in all the canyons around the Salt Lake Valley, but yet I didn't even know it existed. If nothing else, this study is helping me to see nature.

Thank you for the pamphlet which you sent. I can surely use any book or pamphlet which helps to distinguish the willows of Utah and Idaho.

Sincerely yours,

Joseph Toomey
Joseph Toomey

Prof. Joseph Tournay,
672 Bryan Avenue,
Salt Lake City, Utah.

3814 Jocelyn St., N.W.,
Washington 15, D.C.

14 August, 1950.

Dear Professor Tournay:

Your letter of 9 July (probably really 9 August) is just here and I am much interested in your viewpoints regarding the collecting of specimens and the making of keys.

Separately I am sending available reprints and in No. 149 (illustrating Plant Organs, etc.) you will find a discussion of the two principal kinds of twigs or shoots on willows, and of the three somewhat different shapes of leaf on each kind of twig and occupying the basal, ventral, and apical portions thereof. I think that I discussed that growth differences (physiology) were primarily responsible for these observed differences.

In practice, it is desirable to collect at least two kinds of specimens from each plant in the foliage state. These are the relatively short and branching portions which bore flowers and fruit earlier and therefore have relative small leaves; and the longer, usually unbranched summer or autumn shoots with much larger leaves. One of each would make up one specimen. On some plants, however, you may find a larger series of evident differences in the branchlets. Then too the color of the twigs, especially the younger, often will vary of the shaded and the sunny side of the plant, or of the upper and lower side of the twigs if all are in sun. This is the chemical effect of light and heat, corresponding to our tan. I should have noted that occasionally you find an extremely vigorous sprout from a trunk or cut stem, with relatively enormous leaves.

I collect as many as 4, or 5, or even 7 sheets for my herbarium from a single plant when there is enough visible variation. In that way we come to know what species looks like and can really describe it and key it. One tenth as many collections made on that basis would make herbariums twice as valuable per specimen as at present. Of course, collections made in early spring do not show these series. Resident collector, tag spring plants and collect later in the season from them, or tag in fall and collect the spring aspects the next year.

As to keys, the old practice of keying on one character in very brief keys has prevented students from knowing a variable genus like *Salix*. I use at least two complete keys now, one based primarily of floral characters and the other based primarily on ~~MAJOR~~ vegetative characters. Fernald has carried this to an unprecedented extent in the new Gray's Manual. There are 16 pages of keys (of four kinds, synoptic, staminate, pistillate, and foliage) and apparently 16 pages of text. But the text pages contain 1 1/2 pages of keys to varieties, so actually there are 17 1/2 pages of keys and only 14 1/2 pages of text. If they keys were good, this might be justified.

One paper you will wish to study, if you have not yet, is Botanical Studies in the Uinta Basin of Utah and Colorado, by Edward H. Graham, Annals of the Carnegie Museum 28, with 432 pages and 13 plates, 1937. In his introductions he gives a long list of experts who helped him with special groups of plants.

You will know Tidestrom's Flora of Utah and Nevada, in Contrib. U.S. Natl. Herb. He credits me with the treatment of *Salix* but I only had some suggestions about it.

No. 141 in the reprints sent you is merely a phot. of Dr. W. Z. A. Satchell. My reprints are all gone, but the account of what he did for the willows of Alaska in two summers can be found in Madrona 5: 231-232. 1940.

P. S. I inclose copy of key to Idaho Willows. I sent a copy to Wilson. He had it copied there and returned one of his copies to me. I have not checked it against my draft but assume that he did.

Cordially yours,

Carleton R. Ball

Prof. Joseph Townsley,
672 Bryan Avenue,
Salt Lake City, Utah.

3814 Jocelyn St., N.W.,
Washington 15, D.C.

27 August, 1950.

Dear Professor Townsley:

When I wrote you on 14 August, discussing the making of collections, and also books on Utah Botany, I added a postscript in which I think that I said I was inclosing copy of my mss. on Willows of Idaho. Unfortunately, the carbon sheet was torn and not all of the postscript appears on my carbon copy.
^{ed}

But I find a pencil~~note~~ note on it which states that the manuscript lacked the keys and that I had neglected to tell you so. I have an extra copy of the keys and am glad to inclose it here. Hope it helps you some.

If you have had good weather, you must have had a lot of fun collecting during the summer vacation. I sure would like to get up in the Wahsatch Range again myself. I suppose old Mt. Timpanogas is still there.

Cordially yours,

Carleton R. Ball

174 So. 1st. West
Rigby, Idaho
September 16, 1950

Dr. Carleton R. Ball
3814 Jocelyn St., N.W.,
Washington 15, D.C.

Dear Dr. Ball:

I want to thank you again for all the help you have extended to me. The keys and descriptions were very welcome, though I must admit that my lack of experience caused me no end of trouble in tracing the plants down to my satisfaction. The pamphlets you sent were very interesting, and I am sure that they and all the other material which I can read will give me a better understanding of the problems which I face.

As you know, I have been collecting as many shrubs as I could during most of this last summer - don't expect too much, however, for I've been courting a girl at the same time - and I've been really enjoying myself doing it. Of course, I met a rattlesnake in Little Cottonwood Canyon (Near Salt Lake City), and I found that I was not immune to poison ivy (I used to be), but it's been a lot of fun wandering over the hills and other countryside. Old Mt. Timpanogas is still there.

My position is over now, for I am not in Idaho teaching the 9th and 10th grades. The school officials are very liberal here, and so this first month we have spent only about 3 days in the classroom, using the rest of the time to go out in the field. It has been sort of a cooperative effort on their part and mine, and we have been re-arranging, simplifying, and adding to the key I prepared last summer. It's amazing what a 15 year old student can do. I am sure that they have learned to use the key, and have learned the names of many new trees and shrubs in the process. I am sending a sample of the unrevised key to you to see what you think of the arrangement. It is not the finished product at all, however, and there are many glaring errors in it as we soon found out. However, I think the students are learning more about classification in revising it than if it were perfect.

I am also sending the willows I have collected. They are only a few representatives from the states, but as you can see from the key, I was interested in the general characters of the group last summer, and hope to study each specific genus more thoroughly after I become familiar with the group characteristics.

My knowledge of the willow species is entirely unsatisfactory. I have attempted to trace them down using your key, Holmgren, and Garrett as guides, but the results are very disheartening to me. I am very unsure of my selection. I will, however, send the name which I think belongs in the hope that you may see where my reasoning is faulty.

19. *S. Drummondiana* Barr, var. *subcoriacea* (Piper) Ball

Plants #14 - #56 were found in Utah

- #14. ¹⁴ *Salix exigua* Nutt. These were found in scattered clumps in the bottom of a dry gully in Dry Creek Canyon (East of Salt Lake City) July 31, 1950. Plants were about 5 feet high. Salt Lake Co.
- #24. ²⁴ *S. lasiolepis* And. Found in an abandoned ditch on Fort Douglas Military reservation Aug. 1, 1950. Plants about 5 feet high, followed the ditch in small clumps.
- #34. ³⁴ *Salix vitellina* L. This was a tree, about 30 feet high. It was in a pasture near a running stream, and so the lower branches were bare of leaves. Sugarhouse, Utah Aug. 6, 1950. Co.?
- #35. ³⁵ *S. vitellina* L. Tree about 40 feet high, cultivated. Sugarhouse, Utah Aug. 6, 1950
- #36. ³⁶ *S. babylonica* L. Cultivated tree, about 50 feet high. Sugarhouse, Aug. 6, 1950
- #38. ³⁸ *S. amygdaloides* Andersson Spreading tree about 25 feet high. Found in bottom of a gully near Little Cottonwood Canyon Aug. 6, 1950.
- #39. ³⁹ *S. amygdaloides* Lutes Nutt. This was a small clump near a ditch (about 5 ft.) high. It looks like sucker growth. Near Little Cottonwood Canyon, Aug. 6, 1950.
- #40. ⁴⁰ *S. amygdaloides* Lutes Nutt. This was a clump just across the road from #39. It was on a dry, gravelly hill. Near Little Cottonwood Canyon, Aug. 6, 1950.
- #43. ⁴³ *S. bebbiana* Scouleriana Barr. These were found in large groups by the roadside about 1 1/2 miles up Little Cottonwood Canyon, they were from 4-5 ft. high, and had very dark green bark. Aug. 6, 1950.
- #56. ⁵⁶ *S. amygdaloides* Andersson This plant occurred in extensive groups by running and stagnant water near the entrance to Farmington Canyon, Utah. The groups were about 10-15 feet high. Aug. 8, 1950.

Plants listed below were found in Idaho.

- #81, ⁸¹ 82, and 83. Same tree. *S. lasiolepis* L. Lutes Nutt., var. *Watsoni* (Bebb) Jepson Found along the Snake river near Ririe, Idaho. Sept. 2, 1950. Bushy tree about 30 feet high. Modoc Co.
- #81. Older, exposed south facing branch.
- #82. Younger, shaded part of tree.
- #83. Low, sucker growth.
- #84. ⁸⁴ *S. vitellina* L. Large tree, about 75 feet high, trunk 3 feet in diameter at base, soon splitting into 3 trunks, near ground. Open irrigated field near Ucon, Idaho. Sept. 3, 1950. Bonneville Co.

Salt Lake Co

Custer Co.,

The following willows were found in the bottom of a canyon along a small stream near Challis, Idaho. All were about the same height (about 10 - 15 feet), and in the same type of habitat. It was getting late, and I had a long way to drive, I did not even attempt to classify them while they were fresh. Aug. 3, 1950.

#94. S. geeyeriana Anderss.

check

#95. S. lutea Nutt., var. Watsoni (Bebb) Jepson

#96. S. lutea Nutt., var. Watsoni (Bebb) Jepson

#97. S. geeyeriana Anderss.

#98. S. caudata S. pseudocordata (And.) Rydberg

#99. S. geeyeriana Anderss.

#100. S. caudata S. pseudocordata (And.) Rydberg

#101. S. lutea Nuttall, var. Watsoni (Bebb) Jepson

#102. S. pseudocordata (Anderss) Rydberg, *depauc. small leaf*

13 Dan I do not even dare venture a guess as to what the others are.

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I realize that this is only a small beginning, but I hope to spend a lot more time on it. I do not intend to rush through it too rapidly, for I enjoy my little trips very much. They're a darn good excuse for driving, or walking out over the countryside.

Thank you very much for the help you have given me, and I hope to send you more willows for your collection in the future. Please keep these, as I have collected three of each, and have plenty for my needs. If I am leaving out some vital part of the description let me know, and I will correct it in the future.

Sincerely yours,

Joseph Toomey
Joseph Toomey

Prof. Joseph Toomey,
174 So. 1st. West,
Rigby, Idaho.

Washington 15, D.C.

30 September, 1965.

Dear Professor Toomey:

Your letter of Sept. 16 came promptly and the package of willows a few days ago. I have given the willows prompt attention because I am on a long drive on the Alaska-Yukon willows and if I lay a packet aside I may forget it.

I inclose list of determinations and comments, for the Utah specimens and another for the Idaho specimens. I file lists by States, for ready reference.

I congratulate you on the progress you have made in recognizing the willows and am very sure that you will progress rapidly (like your pupils). It is true that you did not recognize *S. lutea* and *S. pseudocordata*, and confused some of the former with *S. amygdaloides* but I think that the notes I have given will help you to fix certain key differences in mind.

I have not had time to study my Idaho keys to see where they failed you on these two species, but will do so as soon as possible, and report further.

You will note that No. 19 was not in your list and that I therefore have no label data for it. Perhaps you have only the one specimens and, if so, I will be glad to return this one.

Many atlases do not show all the small towns, so I try to get the counties on all labels. So far as I could, I have added them in these lists. Please check and let me know of errors. I could not find Sugarhouse in Utah. I am not sure whether Farmington Canyon is in Davis or Morgan Co. And I have assumed that Little Dry Creek and Little Cottonwood Canyon are in Salt Lake Co.

I hope that you will forgive my suggestion about using but one number for one tree, instead of three (Nos. 81, 82, 83). I encourage the many men who tag individual plants for me and collect the successive stages throughout the season to use only one number for each plant, even when they collect from it in different years. That teaches much to those who use herbariums.

Congratulations on your cooperation with the pupils in field work. That is the way high school biology ought to be taught. We would have a much larger number of nature lovers and conservationists if that were done, instead of person who despise and even hate biology (botany, zoology, entomology, etc.). Keep it up. It will be equally good for those who specialize in biology later.

Many thanks for the fine series of specimens. They are already labelled, except No. 19, and will be mounted soon so that they can be glued as needed. By the way, there were two sheets of No. 38, as noted in the list. They show different sizes of leaf. If you wish one returned, please let me know.

I have not had time to look at your keys yet but will do so and make any suggestions that occur to me.

Cordially yours,

Carleton R. Ball

Write him about his key + mine
about putting number slips on twigs

14. *S. exigua* Nuttall.

July 31, 1950.

Scattered vultures about 5 ft. high, in the bottom of a dry gully in Dry Creek Canyon, east of Salt Lake City, Salt Lake Co. (most plants are more hairy).

19. *S. Drummondiana* Barratt, var. *subcaerulea* (Piper) Ball

(Not included in your list and hence no label data; please send) Note pruinose twigs and buds, and hairy oblanceolate leaves, and strong fragrance.

24. *S. amygdaloides* Andersson. (see also Nos. 38 & 36)

Small clumps of plants about 5 ft. high, following an abandoned ditch on Ft. Douglas Military Reservation, Salt Lake Co. Aug. 1, 1950. (Unusually narrow leaves. Key character is tiny vein islets which are visible on both surfaces of leaves, which are almost plane, and long-acuminate at apex. These separate it from *S. lutea*. Vegetal organs in both are glabrous.)

34. *S. fragilis* L. (not *S. vitellina*)

Tree about 30 ft. high, in pasture near running stream; browsed (✓) and so lower branches bare of leaves. Sugarhouse, Salt Lake Co., Aug. 6, 1950.

(The common European Crack Willow, widely introduced for gunpowder, shade, and sentiment. There is no true *S. vitellina*, and what is called *S. alba* var. *vitellina* is mostly hybrids between *S. alba* and *S. fragilis*, many of which came over from Europe and other have been caused here. Mormons carried *S. fragilis* abundantly to Utah.)

35. *S. fragilis* L. (not *S. vitellina*) Crack Willow.

Tree about 40 ft. high, cultivated. Sugarhouse, Salt Lake Co. Aug. 6. (narrow-leaved. see notes above).

36. *S. babylonica* L. Weeping willow.

Cultivated tree about 50 ft. high. Sugarhouse, Salt Lake Co. Aug. 6, 1950. (long summer shoot with large leaves, but bases still narrow. I assume the plant was normally weeping, and with normal foliage on older growth).

38. *S. amygdaloides* Andersson. Peach-leaf Willow.

Spreading tree about 25 ft. high, in bottom of gully near Little Cottonwood Canyon, near Salt Lake City, Salt Lake Co. Aug. 6, 1950. (2 sheets sent, with leaves of different sizes). typical.

39. *S. lutea* Nuttall.

Small clump about 5 ft. high, apparently sucker growth, near a ditch near Little Cottonwood Canyon, near Salt Lake City, Salt Lake Co. Aug. 6, 1950. (This long sucker shoot is brown instead of yellow. This sometimes occurs in nature, and more often in drying. The dark-twigged *S. Mackenziana* was not found by you so I take this to be discolored *S. lutea*.)

40. *S. lutea* Nuttall. Yellow Willow.

Clump on dry gravelly hill just across the road from No. 39. (Typical summer growth. The species easily distinguished from *S. amygdaloides* by leaves coarsely reticulate (not plane) on both sides, especially beneath, no tiny vein islets visible even when held against light, and apexes never long-acuminate. Compare the two species on these characters).

43. *S. Seculariana* Barratt. Scouler Willow.

Large groups 4-5 ft. high, with very dark green bark, by roadside 1 1/2 miles up Little Cottonwood Canyon, near Salt Lake City, Salt Lake Co. Aug. 6, 1950. (Typical summer shoot; normal leaves on fruiting twigs more oblanceolate or broadly so, or sometimes oblong-oblan. Lower leaves are more or less obovate on many species because their bases did not broaden.)

56. *S. amygdaloides* Andersson.

Extensive groups about 10-15 ft. high, by stagnant and running water, near the entrance to Farmington Canyon, Davis Co. Aug. 8, 1950. (typical summer growth, See notes under Nos. 24 and 38.)

61. *S. Drummondiana* Barratt, var. *subcaerulea* (Piper) Ball.

Farmington Canyon, Davis co., about 3/4 of the way to the top of the mountain, elev. abt. 8000 ft., Aug. 8, 1950. Plants in the vicinity near it were Engelmann Spruce, Alpine Fir, Quaking Aspen, Service Berry Alder, Dogwood, Buckthorn, Rose, Sagebrush, and Snowberry. I took a color photograph and if good will send you one. (This is the plant entered as 19 above. (RR)).

Jefferson

- 81 a, 81 b, 81 c. (Toomey 81, 82, 83). *S. lutea* Nutt. var. *Watsoni* (Bebb) Jepson.
 Bushy tree about 30 ft. high, along the Snake River near Ririe, Madison Co. Sept. 2, 1950. (A splendid series of three from same tree, showing range of variation in twigs and leaves. Preferably, all the specimens from one plant should bear the same number, even when collected on different dates or years, and most especially when collected on the same day. This variety is separated by extremely divaricate branching and smaller leaves.)
84. *S. fragilis* L. Crack Willow. (not *S. vigellina*).
 Large tree about 75 ft. high and trunk base 3 ft. in diam., dividing into 3 trunks near ground, in open irrigated field near Ucon, Bonneville Co. Sept. 3. (Summer growth with very large leaves and yellowish twigs. See notes on Utah specimens, as to name, etc.)
94. *S. Geyeriana* Andersson. Geyer Willow. abt 7 mi. SE of
 About 10-15 ft. high, along small stream in bottom of canyon near Challis, Custer Co. August 3, 1950. (Congratulations on recognizing all three of the collections of this species. All of them seem to be somewhat depauperate, by the rather small leaves, as if the habitat was not favorable to them as to the other. Is it possible that they were not up to the "10-15 ft." height assigned to all of the plants collected in this canyon and therefore were held down by their more vigorous competitors?)
95. *S. lutea* Nuttall, var. *Watsoni* (Bebb) Jepson.
 Data as for 94. (Rather typical of previously fruiting twigs, but badly by insects and rust and the leaves losing the glaucous color below.)
96. *S. lutea* Nuttall, var. *Watsoni* (Bebb) Jepson.
 Data as for 94. (This specimen more healthy and leaves more veiny and also glaucous, but rather narrow.)
97. *S. Geyeriana* Andersson. Geyer Willow.
 Data as for 94. (Much as 94 but leaves somewhat broader.)
98. *S. pseudocordata* (Andersson) Rydberg. (not *S. caudata*)
 Data as for 94. (This is a member of Section *Cordatae*, (as is *S. lutea*) and shares many characters. It is separated primarily by its leaves green beneath, a character which it shares with *S. myrtillofolia* Andersson and *S. monochroma* Ball, of this same Section. *S. caudata* has leaves 2 to 3 times as long and much narrower in proportion, and also has glandular petioles).
99. *S. Geyeriana* Andersson.
 Data as for 94. (Very similar to 94 and 97, which see.)
100. *S. pseudocordata* (Andersson) Rydberg.
 Data as for 94. (In its more divaricate branching and broader leaves, this is rather more typical than No. 98. You will note that while its seasonal twigs are yellowish, the 1-yr and older are reddish-brown instead of yellow as in *S. lutea*.) It sometimes has pubescent young twigs and petioles.)
101. *S. lutea* Nuttall, var. *Watsoni* (Bebb) Jepson.
 Data as for 94. (Rather typical specimen, but here too the insects and rust have done damage, as in 95).
102. *S. pseudocordata* (Andersson) Rydberg.
 Data as for 94. (Somewhat depauperate but otherwise typical.)

174 So. 1st. West
Rigby, Idaho
Oct. 29, 1950

Dr. Carleton R. Ball
3814 Jocelyn St., N.W.,
Washington 15, D.C.

Dear Dr. Ball,

Thank you very much for the determinations of the willows I sent to you. I have checked my specimens over - after labeling them with the correct name - and it has helped me to see which characters are applicable to the particular willow which I am studying. It is really a great help to know which way I should go in studying the key. It is also very discouraging not to know whether or not I have made the right determination.

I am putting my plants in a large scrapbook which I can use in the field to compare with the new shrubs I find in the field. I hope I can get as good determination as I have on the willows. Dr. Cottam at the University of Utah has also asked me to contribute a specimen of each to the herbarium, and he is especially anxious to have a series of willows which are determined by you in the herbarium.

I wish to thank you for your suggestions which you made on my field work. I am a novice at this kind of experimental work, and I am happy to follow the suggestions which you gave me. As it is, I am groping around trying to find the best accepted way of doing this work, and I'm apt to do it in such a way that it cannot be accepted. I know that if I follow your suggestions, it will be accepted.

When I attempted to determine the names of the willows I sent to you I used 3 keys, your key of the vegetative and floral characteristics, Holmgren's Handbook of the Vascular Plants of the Northern Wasatch, from the Utah State Agricultural College, and Garrett's Spring Flora of the Wasatch Region, last published in 1936 in Salt Lake City. The places that confused me were:

S. lutea You all stated that the "scales were dark brown to blackish, and persistent". Are you referring to the bud scales? The bud scales looked yellow, and this is verified by #6 page 3 on your key. Most of the leaves were 4-5 times as long as wide on the willows which I looked at, and so #2 on page 2 was slightly confusing. Some of these leaves are slightly oblanceolate, and so I was thrown off on characters #3 and 4 on page 2. These three places were hard to get by for a person of my limited training. I could see the differences in the tiny vein islets of *S. amygdaloides*. ~~XXXXXXXXXXXXXXXXXXXX~~ That is a lot of help to me, for they look so much alike. Thanks a lot for showing me.

S. psuedochorda The scales also confused me on this one, but the length and width relationships should have set me straight (Character #2 page 1) This species is not listed by Garrett, and I confused the long acuminate character with *S. caudata* in Holmgren.

S. fragilis This willow is not listed on any of the three keys which I used.

- ✓ 14. *S. exigua* It is in Salt Lake County. ✓
✓ 24. *S. amygdaloides* Salt Lake County, East of Salt Lake City
✓ 34. *S. fragilis* L. Sugarhouse is Southeast of Salt Lake City,
in Salt Lake County. It was heavily browsed in the pasture.
✓ 35. *S. fragilis* L. Salt Lake County
✓ 36. *S. babylonica* L. Salt Lake County
✓ 38. *S. amygdaloides* Andersson. Salt Lake County
✓ 39. *S. lutea* Nuttall. Salt Lake County
✓ 40. same as #39.
✓ 43. *S. scouleriana* Barratt. Salt Lake County
✓ 56. *S. amygdaloides* Andersson Davis County

61. *S. drummondiana* Barratt, var. *subcoerulea* (Piper) Barratt
This willow was found quite high in the canyon (about 6000
feet above sea level) and about 3/4 of the way to the top
of the mountain, Aug. 8, 1950, in Farmington Canyon, Davis county
I do not know why, but I did not list any of its characteristics.
I listed the common names of the plants near it. They are:
Englemann Spruce, Alpine Fir, Quaking aspen, Service berry,
Snowberry, Dogwood, Alder, Sagebrush, Rose, and Buckthorn, Honeysuck
Most of my specimens have a description of the plants which
are associated with it. I have listed only the common names,
but if you would like the information I could find their
scientific name and have that data accompany any future plants
I send to you. I have only the shrubs however, I took a
color photograph of this willow, and will send it to you
as soon as it is developed if it is any good.

S. drummondiana This species is not listed by either Holmgren or Garrett, but it is listed in your Key.

7 The others which I missed are entirely my error which I found upon re-examining them. #24 *S. amygdaloides* was confusing because of the presence of what looked like glands at the base of the leaf blade. It didn't look like the rest, and so I didn't think it could be what it actually was. I can see the tiny vein islets, however.

very attenuate bases becoming petioles, glands marginal but side petioles more

upside
down

I will list the corrections to my first report on separate sheets so they can be filed by states as you suggested. The willow which you listed as #19 is really #61. I hope I sent you the data for that one, but I will repeat it in case I overlooked it.

Again I wish to thank you for your help. It's much more pleasant to collect when I have an idea what I am collecting, and am able to recognize the plant.

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Sincerely yours,

Joseph Toomey

Joseph Toomey

The corrections for Idaho and Utah specimens added to

- ✓ 1. Lists in Idaho & Utah files
- ✓ 2. Lists in letter file.
- ✓ 3. Backs on natl herb. specimens

Professor Joseph Toomey,
174 South First West,
Rigby, Idaho.

3314 Jocelyn
Washington 15, D. C.

16 December, 1950.

Dear Professor Toomey:

Your letter of 29 Oct. was promptly but neglected because I was buried under the biggest avalanche of willows for determination which I ever have had. Hundreds from the Arctic, from Alaska to Greenland, and the same from the mountains of our western States. Mostly done now and I am trying to answer letters before end of year (and half-century).

Many thanks for the two pages of notes on the Utah and Idaho specimens, filling gaps and making corrections. All these have been added to the lists in the State files, the letter file, and to the labels themselves, so that is done. 61, of course, is 19 upside down, so evidently I was standing on my head that day. You had not sent me the data for 61 so I have written a new label for it.

I have looked again at your 24 *S. amygdaloides*. It was very attenuate growth and the leaves tapered indistinctly into the petioles. The glands are on the edges (margins) of the petioles and would have been on the margins of the leaf if it had widened properly at base. Then the slender petioles had curled in while drying. The petiolar glands on *S. fragilis*, *S. caudata*, *S. laniflora*, etc. are on the top or upper surface of the petiole, near the base of the leaf, and not on the margins.

S. Drummondiana is a northern species, but comes down to northern Ida. and Glacier Park, Mont. *S. bella* Piper and *S. subcoerulea* Piper have been regarded as distinct species but I am reducing them to varieties of *S. Drummondiana*. The paper is in press. Piper did not know *S. Drummondiana* when he published them. *S. fragilis* occurs commonly where the Mormons settled but is rare in the West otherwise. I thought I had it in my Idaho keys.

You will find discussion of the normal variation in leaf shapes in my paper on "Illustrating Plant Organs", which I sent you. It refers to the normal three shapes of leaves on each twig, basal, central, and apical; and to the difference in size, and some times in shape, between the leaf on fruiting twigs, the later summer twigs, and the autumn shoots or sprouts. This was discussed more fully in my paper: More Plant Study: Fewer Plant Names, publ. in Jour. Arnold Arboretum 37:371-395. Oct. 1946. If you do not have this journal, I can send you a copy of the paper to read. I would have to ask its return for I am out of reprints.

In keys, the word scales practically always refers to the flower scales, or bracts as some call them, because bud scales are never used in keys and not often even in descriptions. Almost always the bud scales have the colors (and hairiness if any) of the young twigs but may darken more in drying, or sometimes less.

Glad to know that Dr. Cottam is at the Univ. of Utah. Years ago he was an active collector and I used to get his willows for naming but have not heard for some years now.

With your letter of Sept. 16 you sent me a sample key. I am sorry that I did not get at it before. Will put it in work pile and get at it shortly.

With many thanks for your generous contributions of willows and with all good wishes for the joys of the Christmas and New Year season, this year and in the many years to come, I am

Cordially yours,

Carleton R. Ball

Professor Joseph Toomey,
174 South First West,
Rigby, Idaho.

Washington 15, D. C.

19 December, 1950

Dear Professor Toomey:

I have gone thro your key to "Native Shrubs" because if I laid it aside ^{again} it would be forgotten and unanswered, as it has been already. I hope that you will not be aggrieved because I do not find it as good as it might be. The following are my honest convictions.

I do not believe that this diagrammatic type of key is as clear or as useful as the ordinary typewritten type of key with successively indented items, numbered or lettered to enable quick comparison with the opposite.

It is not as clear and easily grasped because it runs irregularly up and to either side instead of reading horizontally and to only the right hand side. Then too you can see much less of it at a time. With the horizontally typed items, you gradually build up a mental picture which you remember and therefore do not have to consult the keys as much as time goes on. With this type of key it seems impossible to get such a picture and memory.

Also, this type of presentation is commonly used to picture phylogenetic development but as used here it certainly does not do that. Preferably this type would be used only for that purpose.

I believe firmly that we should not be afraid to use new technical terms and so enlarge the knowledge and vocabulary of youth. The auto brought in a host of new terms, which every kid knows and uses without trouble, and the same in many other new lines. Why not in botany. For example, you do not use serrate but say saw-toothed. When you teach them "serrate", you can show its relationship to the Sierras, and about as many children have seen mountains as have seen saws, nowadays

Likewise, I do not think that we should use "smooth" as the opposite of 3 different things, namely, serrate or toothed, rough, and hairy, but teach them the real words in each case. They are not stupid and they like to learn new and different words. I note that you do use the words lenticels instead of breathing pores, and involucre instead of leafy cup or saucer. Why not the others?

The variation of leaf blades and petioles could be made clearer. It might be better to say "scarcely petioled", or "blades narrowed down the petiole", or the real fact, "blades decurrent on petioles". In the same way they can learn "equilateral" and the reverse "not e--".

The terms evergreen and deciduous are not true opposites. The larch belongs to the "evergreens" but drops its leaf's in the fall while the other needle-leaved plants, and the broad-leaved "evergreens" drop them in the spring. So all are deciduous in fact.

There were a few misspelled words, such as current and hawthorne, but you will find misspellings in this letter too.

I hope that there may be something useful in these notes.

Cordially yours,

Carleton R. Ball

Toomey, Joseph

SNOWBERRY
leaves are
oval shaped

at least 100
with letter
Sept 16/1990

DOGWOOD
flowers and fruit
when present found
in clusters at the
terminal ends of
the branches

MINT
narrow leaves
minty odor

HONEY SUCKLE
flowers & fruit
usually present,
found laterally
along branches

leaf margin
generally smooth

MOUNTAIN LOVER
leaf margin with
saw-tooth edges

leaves generally
2-more in. long
petiole 1-more in.

all leaves are
less than 2 in. long
petiole is less than 1/2" long

leaves & branches
not silvery-scurfy

BOXELDER
leaflets lobed
5-leaf leaflets

MOUNTAIN MAPLE
lobes are more
deeply notched

SMOOTH MAPLE
lobes are
finely cut

BUFFALO BERRY
leaves & branch
silvery-scurfy

ELDERBERRY
leaflets not
lobed, usually
5-more leaflet

lateral veins
are about equal
in length

lateral veins at
base of blade much
longer than others

leaflets
not divided

ELDERBERRY
leaflets
also divided

PICKLEWEED
without
sharp spines

simple
leaves

leaves divided
into leaflets

CACTUS
with sharp
spines

opposite
leaves

PAGE 2
alternate
leaves

leaves
lacking

leaves
present

NATIVE SHRUBS
(Angiosperms)

page 1

POISON IVY
petiole longer
than 1 inch.
leaflets usually
not lobed

SQUAMBUSS
petiole 1-less
inch long
leaflets lobed

SUMAC
buds covered by
base of petiole

MOUNTAIN ASH
buds large
easily seen

margins of
leaflets are
cut or notched

BLACK LOCUST
margins of
leaflets are
smooth

most leaves
with 9-more
leaflets

3 leaflets

thorns
lacking

OREGON GRAPE
4-8 leaflets
which are thick
and prickly, look
like holly

RASPBERRY
3 leaflets
lack stipules

ROSE
4-8 leaflets
leaf-like structure
at base of petiole

branches are
thorny

less than
9 leaflets

leaves divided
into leaflets

PAGE 3
simple
leaves

alternate
leaves

A

CURRENT
fruit fleshy
twigs light
gray

BITTER-BRUSH
leaf 3-lobed

9-BARK
fruit flattened,
double, in leafy
involucre. twigs
dark brown, old
bark peels off ver-
readily

CLIFF ROSE
leaf 5-lobed

leaf blade
usually less
than 2" long

SAGEBRUSH
large central
woody stem

leaves are
dark green
usually less
than 1 in. long

SWEET SAGE
individual stems
rise directly from
ground

THIMBLE BERRY
leaf blade usual-
ly longer than 2 inc

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leaves silver-gray
covered with white
hair, sage odor,
about 2 inch long

leaves have 3-more
large veins emerging
at base of the blade
blade about as wide
as long

O.K.
leaves have one
large single, cent
vein. blade longer
than wide

petiole is very
similar to leaf blade,
very short ($\frac{1}{2}$ "-less)
leaves usually very
small or narrow

MID-rib of leaf
extends as petiole
which is usually longer
than $\frac{1}{2}$ inch. leaves
larger and wider

leaves
lobed

PAGE 4
leaves
not lobed

simple
leaves

page 3

NARROW-LEAF POPLAR
buds covered by
several overlapping
scales

WILLOW
single bud-scale
covers bud

old bark is light--
yellow-green or gray
old bark is dark--
reddish brown

a BIRCH
most leaves 2"-less
bark reddish-brown
fruit deciduous,
not hard & cone-like

leaves longer
than broad

QUAKING ASPEN
blade is not sticky
saw-teeth coarse and
irregular, plant usually
has straight trunk

SERVICEBERRY
leaves oval

branches lack
lateral thorns

ALDER
most leaves are
about 3" long
bark gray-white
fruit persistent
cone-like

HAWTHORNE
branches
thorny

BUCKTHORN
upper part of
leaf is sticky
saw-teeth are fine
plant is low and
widely branched

leaves are
symmetrical

leaf blade
about as broad
as long

RACKBERRY
one side of
blade is larger

the two lateral veins
at the base of the blade
are longer than
the other lateral veins

the lateral veins
are about equal
in length

CHOKECHERRY
leaf blade about
twice as long
as broad

bark of trunk is
usually rough and
furrowed, Horizontal
lenticels on trunk
are not conspicuous.
lateral veins are
usually curved.

bark of trunk is smooth
has conspicuous horizontal
lenticels, or lateral
veins are straight &
parallel, and end in
teeth.

PAGE 5
leaf margin
generally
smooth

WITH saw-like
teeth on leaf
margin

leaf margin
not lobed

page 4

WILLOW
leaves deciduous
margin not inrolled

MOUNTAIN M. HOGANY
leaves small, thick
evergreen, leaf
margin inrolled

not
silvery-scurfy

RUSSIAN OLIVE
leaves and young
branches silvery-
scurfy

leaves
are
symmetrical

HACKBERRY
one side of
leaf is larger
than other

leaves much
longer than
broad

GREASEWOOD
SHADSCALE
RABBITBRUSH
MATCHWEED
petiole is similar
to the blade & very
short. leaves usually
very small and narrow

JUDAS TREE
leaves about
as broad as long

mid-rib of leaf
extends as a petiole
to the branch.
usually 22-more long

leaves not
sword-like

YUCCA
leaves long
and sword-like

leaf margin
generally smooth