

PROVINCE OF BRITISH COLUMBIA



The Cascara Tree in British Columbia

BY

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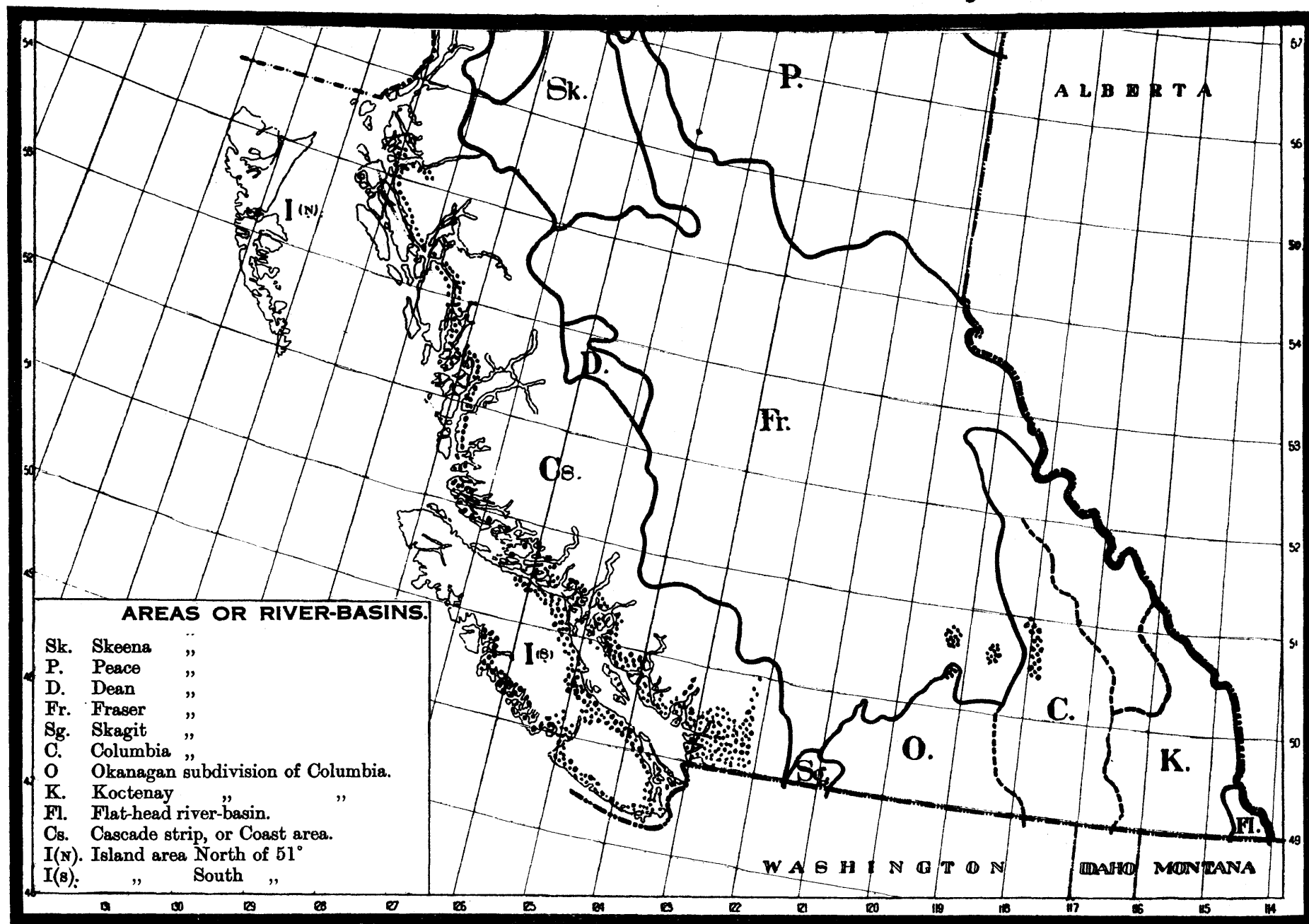
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BOTANICAL SURVEY OF BRITISH COLUMBIA.

Distribution of **RHAMNUS PURSHIANA, DC.**



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(1) INTRODUCTION

Soon after the outbreak of hostilities in Europe, the Provincial Department of Agriculture appointed an Agricultural Production Committee to consider what part British Columbia could play in furnishing products, formerly supplied by European countries, now cut off on account of the war. The personnel of this. Committee:- Mr. J. B. Munro, Deputy Minister, Chairman; Ernest MacGinnis, Secretary; and Geo. H. Stewart and J. A. Grant, Members.

It was found that Great Britain, United States, Canada and other non-European countries imported large quantities of different kinds of medicinal plants, many of which could be grown in this Province. Some, in fact, such as Dandelion, Burdock, Couchgrass, etc., are common introduced weeds, yet tons of these were annually imported from Europe. The cessation of these imports resulted in a great increase in prices, for example: during the first year the price of Dandelion roots rose from 35¢ per pound to 70¢ or more in New York.

In 1940 the Hon. Dr. K. C. MacDonald, Provincial Minister of Agriculture, appointed Dr. H. T. Gussow, (Dominion Botanist., Ottawa), Dr. W. Newton (Dominion Experimental Farm, Saanich, B. C.), Mr. J. W. Eastham (Provincial Plant Pathologist), Thos. Braidwood Esq., and the writer, as members of an "Advisory Sub-Committee on medicinal and drug plants" to render advice as to what could and should be done to supply the urgent requirements for essential medicinal or drug plants.

This Committee met in conference with representatives of the Departments of Agriculture, Education, Trade and Industry, in the Parliament Buildings, Victoria., for a general discussion of this subject as it affected all Departments. The importance of British Columbia as a source of Cascara bark was emphasized; also, the necessity of conservation to ensure a perpetual supply, and prevent its depletion or extinction.

The writer was requested by this Conference to revise his bulletin "The Cascara tree in British Columbia" (published by the Dominion

Government in 1922 as Forestry Branch Circular No. 13) to bring it up-to-date, for publication by the Provincial Government, so this is respectfully submitted in response to that request.

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August, 1942.

NOTE—Numbers in brackets throughout the text refer to the bibliography at the end.

THE CASCARA TREE IN BRITISH COLUMBIA

Since the publication of "The Cascara tree in British Columbia" in 1922, much valuable research has been carried on in continuation of our study of the conservation and economic utilization of this tree in British Columbia, and this bulletin is a revision of the above publication, incorporating a summary of the results of our researches and investigations up to the present time.

The tree *Rhamnus Purshiana*, DC. is most commonly known as the Cascara tree, the pharmaceutical preparation is officially termed "Extract of Cascara sagrada," from the Spanish *Cascara* = bark, and *sagrada* = sacred. This must not be confused with Cascarilla bark (*Cascarillae cortex*) which is obtained from *Croton cascarilla*, L. and allied species native to the Bahama Islands.

(2) CONFUSION OF POPULAR NAMES

Much confusion has resulted through the use in some localities of the name "bearberry" and "barberry" when referring to the cascara tree. The fact that the true bearberry (*Arctostaphylos Uva-Ursi*) and two species of barberry (*Berberis Aquifolium* and *Berberis nervosa*) are native in British Columbia, and are also of medicinal value, is not generally known. In appearance they cannot be confused, having no resemblance to each other. The true bearberry is a low, trailing, small-leaved, evergreen shrub, with somewhat dry, tasteless berries, resembling cranberries in size and colour. It is one of two plants known in British Columbia as "Kinnikinnic," a name applied by Indians to plants used in place of, or mixed with tobacco—the roasted leaves are smoked.

The native barberries are small, evergreen shrubs, with spines along the margin of the leaves, like holly. They have showy racemes of yellow flowers followed by equally attractive clusters of blue berries. Both are known locally as "Oregon grape". In horticulture often called Mahonia.

The cascara tree, being deciduous—that is, having leaves that fall in autumn—cannot be mistaken for either bearberry or barberry, which, as before stated, are evergreen, and it is highly desirable

that the application of those names to the Cascara tree should be discouraged and discontinued, so that no misunderstanding may arise between manufacturing druggists and collectors of bark in British Columbia. This tree is much more common in British Columbia than is generally supposed; but at the present time is recognized by only a small percentage of people in the Province.

(3) RANGE OF DISTRIBUTION

Rhamnus Purshiana, DC. is a native of the Pacific North West mainland and adjacent Islands, from northern California to the vicinity of Prince Rupert on the northern coast of British Columbia, and has been recorded (4) from Cordova, Alaska where it forms a scrubby growth.

The first commercial supplies appear to have been collected in Oregon and exported to eastern manufacturers, but, through wasteful harvesting of the bark, supplies became so depleted that collectors had to go farther afield where trees were smaller and more scattered. Oregon supplies were frequently adulterated (probably accidentally) by including bark from *Rhamnus californica*, Esch. whose range extends from southern California to the Klamath region of Oregon. The bark of this species produces nausea, and care had to be taken to check supplies from northern California and southern Oregon to see that no bark of *Rhamnus californica* was included.

As the Oregon supplies became depleted, Washington State became the main source of supply, and as *Rhamnus californica* did not extend to that State, Oregon distributors gladly accepted all Cascara bark from collectors in Washington State until, by a continuation of the same methods of harvesting, the Cascara supplies diminished as they had done in Oregon.

As early as 1915, agents came West to secure adequate supplies of bark for eastern manufacturing druggists, one agent with an order for 400 tons, being unable to secure it in Oregon and Washington, came to British Columbia to have it completed. About that time, this Province became the chief source of supply.

Although the main stand of the Cascara tree is west of the Coast and Cascade mountain Ranges, it has been recorded (4) from Idaho and Montana in the United States.

(4) DISTRIBUTION IN BRITISH COLUMBIA

In British Columbia the main supplies, as far as known at the present time, are found on land adjacent to the Straits of Georgia, on the West Coast area of the mainland, and the East Coast of Vancouver Island. The range of distribution in the Province, however, is much wider; it has been recorded intermittently from various localities along the mainland coast to the vicinity of Prince Rupert, and on Vancouver Island from the south to Barkley Sound, (5) or about half way up the west coast. The greatest supplies have been obtained from the lower Fraser Valley and tributary valleys, and from Vancouver Island from around Cowichan to Campbell River. (See Frontispiece).

It is found in small quantities in the Columbia basin around Arrow-Lakes, and the Upper Fraser basin at Salmon Arm and adjacent territory east of the Coast range, corresponding to the United States range in Idaho and Montana. As the tree becomes better known it is probable, that the range will be considerably extended.

(5) HOW TO RECOGNIZE THE CASCARA TREE

(a) Habit.—The habit is frequently shrub-like, with several large branches separating near the ground. More often it forms a small tree 20 feet or, rarely, 50 feet in height with a diameter of 12 or 15 inches, though occasionally, but rarely, reaching twice that diameter. (Fig. 2.)

(b) Bark.—The bark, when freshly cut is of a bright yellow colour, becomes dark brown on exposure to light, has a bitter taste when chewed, and colours the saliva yellow. If bark is wrapped in white paper the yellow colour (due to presence of frangulin) is transmitted to the paper. The dry bark, when broken, snaps with a clean fracture.

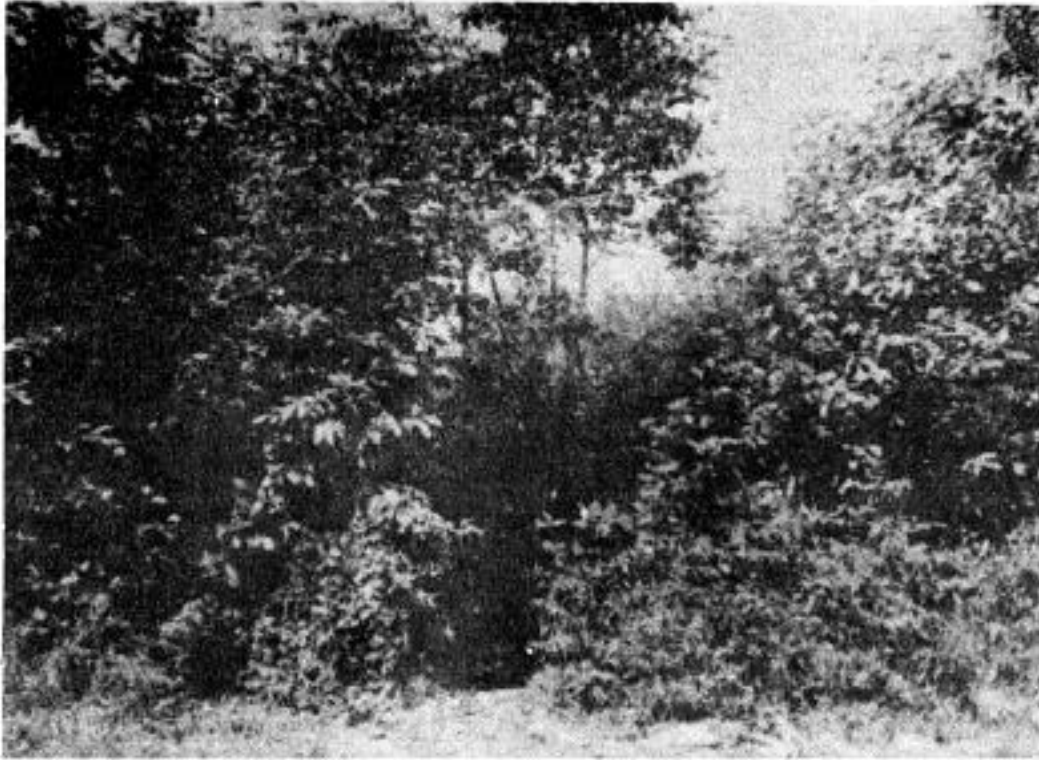


Fig. 2. A typical group of cascara trees. In the centre the specimens are of the tree form at each side they are of the shrub-like form. The smallleaved vegetation in the foreground is composed of spiraea, salmonberry, and young willows (Photo. by the Author).

(c) Buds.—The cascara is the only deciduous tree in British Columbia whose buds are not covered by bud-scales. The young leaves have a fine coat of rusty brown hairs on the under surface (see Fig. 3.). These hairs serve the purpose of bud-scales in protecting the leaves in the bud. In the winter, therefore, the tree can be identified by its buds alone. The young branches vary in colour from purplish-brown to reddish-brown, often resembling those of red alder. The bark of young trunks varies from dark grey to almost black, with lengthwise stripes or fissures, somewhat resembling young trunks of broad-leaved maple (*Acer macrophyllum*).

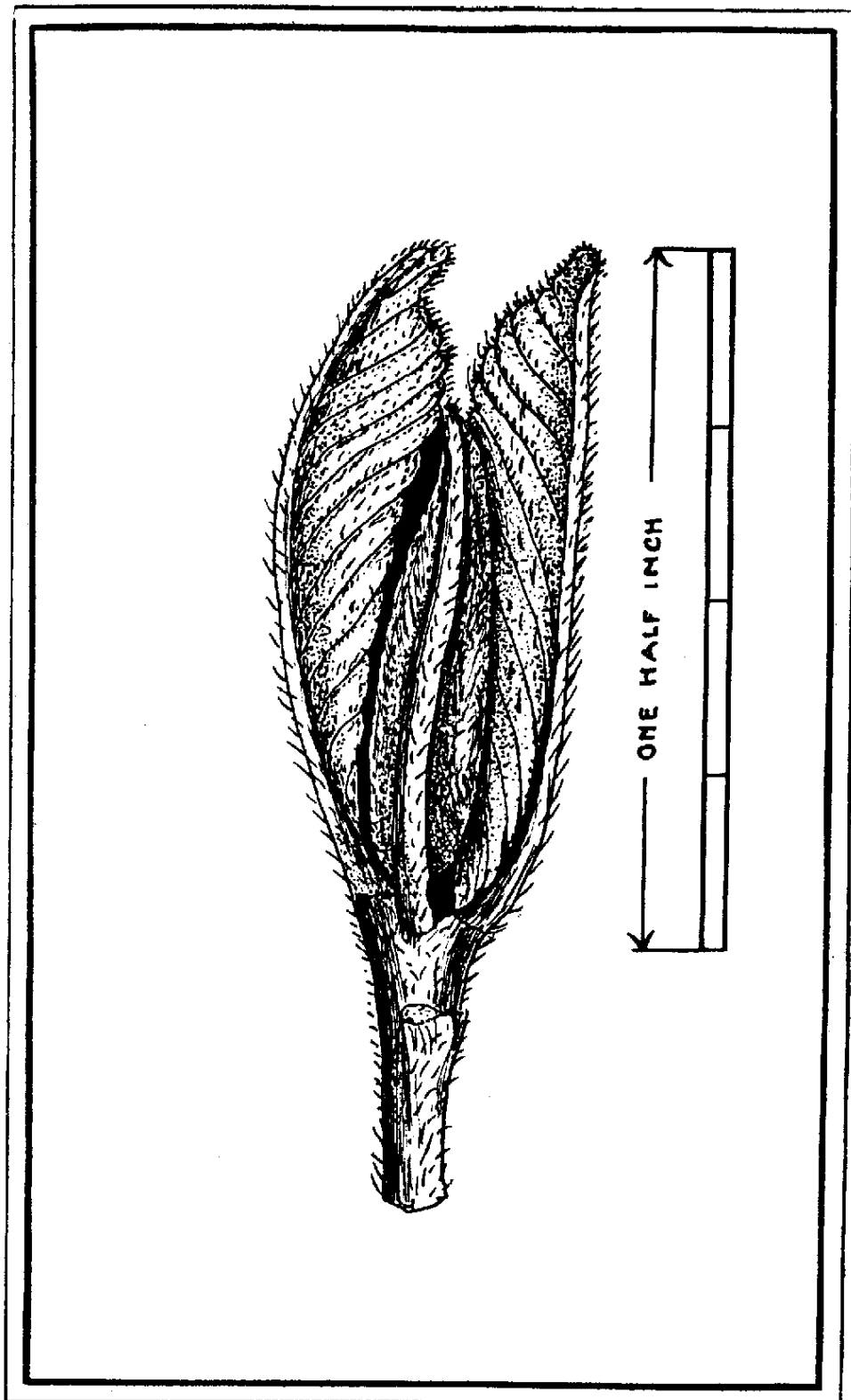


Fig. 3. The leaf-buds are never protected by bud-scales. The rusty brown hairy buds are distinctive of this tree in British Columbia (Drawing by the Author).

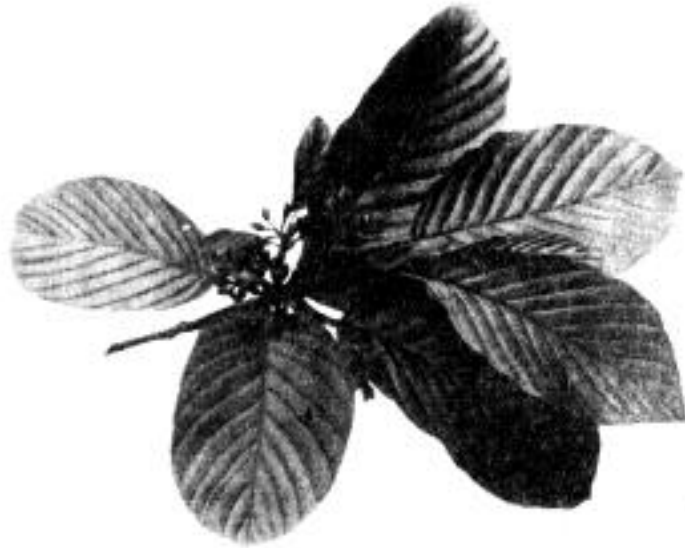


Fig. 4. Flowering shoot of the cascara tree (Photo. by the Author).

(d) Leaves.—The leaves may be easily recognized from the illustration; the beautifully regular, prominent veins, and the finely serrated margin, are characteristic. Young trees of cascara frequently retain their leaves throughout the winter, especially in sheltered situations. (Fig. 4)



Fig. 5. The small, greenish flowers are borne in clusters near the ends of branches (Photo. by the Author).



Fig. 6. The flowers are followed by beautiful black berries, attractive to birds (Photo. by the Author).

(e) Flowers and Fruits.—The flowers, which appear in June, are small, of a greenish colour, borne in clusters near, the ends of the branches, and are followed in August or September by beautiful black berries, somewhat sweet, and very attractive to birds. The berries contain two or three seeds., which germinate readily. (Figs. 5 & 6.)

(6) MEDICINAL VALUE

Cascara bark was introduced into medicine about 1877 , since then a great deal of research work has been carried out by chemists in various parts of the world in efforts to ascertain or isolate the active principle so peculiar to Cascara. In a paper published by the Wellcome Chemical Research Laboratories (London) entitled the “Chemical Examination of Cascara Bark” (1) Dr. H. A. D. Jowett, Senior Research Chemist in that Institution summarizes and critically reviews the results of Prescott; Limousin; Wenzell; Meier and Webber; Lamm and Fristedt; Moss and Jardine; Schwabe, La Prince; and other chemists up to September 1904 when the paper was presented to the Scientific Section of the American Pharmaceutical Association in Kansas City, Mo.

Dr. Jowett shows that the results of these workers were often opposite and contradictory. One said in 1871 that Cascara extract produced no griping; two German chemists said in 1876 they observed griping effects; it was later found they worked with *Rhamnus frangula*, not *Rhamnus Purshiana*. The Year Book of Pharmacy in 1886 says “to obtain best results, the bark (*Rhamnus Purshiana*) must be of comparatively recent collection”, it whereas the current belief among pharmacists is that the bark should age from one to three years.

In 1892 La Prince claimed to have separated the active principle in crystalline form and named it Cascarine. In 1897 Dohme and Engelhardt claimed to have discovered that the active principle was a glucoside which they named Purshianin.

Dr. Jowett proceeds to give highly technical qualitative and quantitative analyses, illustrated by chemical formulae, equations, and tables. In his summary of results he says “No crystalline product could be isolated from this extract, and therefore no clue whatever could be obtained as to the chemical nature of the active principle.” “Cascarine and Purshianin represent impure products and not chemical entities”.

In our research on the “Cascara content of *Rhamnus Purshiana*” carried out at the University of British Columbia by Dr. R. H. Clark and K. B. Giilie (3) during the years 1921-23, “the results of experiments show that complete hydrolysis does not destroy the activity of the extract. Consequently the active principle would not appear to be a glucoside.” This paper was published in the *American Journal of Pharmacy*, Philadelphia, June, 1942.

The chief value of Cascara extract as a medicine is that it possesses tonic laxative properties, and so far, no substitute has been found to take its place. There are laxatives and purgatives in great numbers, and these are more or less habit forming, especially in chronic cases. Cascara extract is reputed to tone or strengthen the peristaltic muscles of the intestinal wall, so that after a period of use, less is required, and as these muscles regain their normal function the use of Cascara is no longer necessary. Hence its use in all hospitals throughout the civilized world as a tonic laxative.

In regard to reported cases of griping, this is very rare. The current belief at the present time is that it is necessary to keep the bark for one to three years to "age" before preparing the extract. This is unnecessary, as keeping the bark that length of time can only mean that something oxidizes, and this oxidation, if necessary, can be done in the factory.

Forty-five extracts were prepared from fresh dried bark and wood of twenty-three Cascara trees, and only one of the forty-five produced griping. The remainder of this extract was treated with hydrogen peroxide, and tested again with satisfactory "no griping" results.

For sixty-five years the west has been supplying thousands of tons of Cascara bark, apparently assuming that the active principle is only found in the bark; but in 1923 one of the important discoveries made during the researches of Clark & Gillie (3) at the University of British Columbia was that it was also contained in the wood. A summary of the work done here will show the range of variation of Cascara content both in the bark and in the wood, and the comparative value of wood and bark.

Twenty-three Cascara trees varying in age from six to sixty-five years were collected at different periods of the year, from different habitats, and records kept of age and size.

Forty-five preparations of Liquid Extract of Cascara were made in accordance with the procedure given in the U. S. Pharmacopoeia; twenty-nine prepared from the bark, and sixteen from the wood, substituting the same weight of pulverized wood instead of bark. These forty-five bottles, each consecutively numbered from 1 to 45, were given to Vancouver General Hospital for controlled tests and reports on the efficiency of each. One thousand three hundred and forty doses were administered over the period from October 1921 to April 1923 and, from the reports received from the medical staff, a "percentage of efficiency" was obtained "by dividing the number of doses given into the number of times the dose was effectual." (3)

The percentage of efficiency varied in the bark from zero in one tree, to 91% in another; the tree with zero showed 12% in the wood.

The percentage of efficiency varied in the wood from zero in one tree to 78% in another; the tree with zero showed 67% in the bark.

The following table shows the comparative drug content in the wood and bark, and the range of variation in each.

TREE NO.	Percentage of IN WOOD	Efficiency IN BARK	SEASON COLLECTED.
1	<u>78</u>	72	Sept., - Nov., 1921
3	25	<u>60</u>	Sept., - Nov., 1921
4	21	<u>44</u>	Sept., - Nov., 1921
7	75	not tested	Sept., - Nov., 1921
10	43	<u>55</u>	March - Apr., 1922
11	25	<u>44</u>	March - Apr., 1922
14	<u>12</u>	0	August, 1922
15	<u>48</u>	20	August, 1922
16	<u>28</u>	<u>45</u>	August, 1922
17	0	<u>67</u>	August, 1922
18	50	<u>60</u>	August, 1922
19	38	<u>38</u>	August, 1922
20	37	<u>75</u>	August, 1922
22	44	<u>46</u>	August, 1922
23	33	<u>91</u>	April, 1923

The drug content, on the whole, is higher in the bark than in the wood as indicated by the underlined percentages, in three trees the drug content was higher in the wood than in the bark.

PREPARATION OF CASCARA EXTRACT FOR HOME USE

Many enquiries have been made as to whether private individuals can make an infusion for their own use.

Much of the modern extract is prepared under the official name "Aromatic Fluid Extract of Cascara Sagrada." This consists of the Extract of Cascara bark made in a percolator of industrial dimensions; to the Extract thus obtained are added various ingredients to give the otherwise bitter medicine an agreeable taste and odour. The finished product contains about 20% alcohol as a preservative against deterioration by the growth of fungi in the Extract.

For simple home use a small quantity of bark can be dried, powdered like coffee and stored in a can or sealer. Use this like coffee in a percolator (not a "drip" coffee pot) and allow it to percolate until the drug is exhausted. Evaporate the percolate to about one-third or less of its original volume; and bottle it. As the efficiency of the bark varies in different trees, one can tell after the first dose whether one teaspoonful or more in half a glass of water is required to give effective results. This infusion can not be kept indefinitely.

The writer recently tried the old method, used before the percolation method, in testing the efficacy of bark which was collected twenty years ago. This is done by securing an enamelware pan free from cracks or chips in the enamel, so that no metal comes in contact with the liquid. Some dried bark is broken in pieces of less than half an inch and placed in the pan; enough boiling water is added to cover all the bark, this is allowed to "simmer" for four hours, all the time watching to add more boiling water to keep the bark covered. At the end of four hours pour off the dark-brown liquor into a shallow enamel or earthenware vessel through a piece of thin cloth to hold back sediment and particles of bark. The vessel is now placed-water bath fashion—in or over a larger pan of boiling water till the liquor evaporates to about one-third its original volume. It now becomes a thick, almost black liquid which can be bottled for future use. In the case of the twenty-year old bark, half a teaspoonful in half a glass of water showed it still retained its efficiency.

(7) WASTE OF CASCARA TREES

It is estimated that the average yield of bark per tree is ten pounds; occasionally, a large tree with thicker bark may yield as much as two or three hundred pounds, but many of the trees which have been "peeled" yielded less than ten pounds.

This means that for every ton of bark 200 trees have been killed or, to supply the average annual requirements of Cascara, three hundred thousand trees are destroyed each year. It is not surprising that the resources of Oregon, Washington and now British Columbia have become rapidly depleted during the past sixty-five years.

In a recent (1940) reconnaissance survey of the Cascara resources of the Coast of British Columbia, undertaken by Mr. A. B. Anderson (5) on behalf of the Forest Branch, Victoria, he estimates that 90% of the original stand has been stripped and destroyed; most of this has been done since 1914. During the eight-year period 1914-1922 one and a half million pounds of bark were stripped and shipped from a limited area in the Fraser Valley (5). In other words one hundred and fifty thousand trees were killed in that area, because of the ruthless and wasteful method of securing the bark.

At the present time in clearing land for agricultural purposes in the Coast area cascara trees are cut along with maple, willow, and other species and the whole piled and burned, whereas if the settlers knew the value of the bark it could be saved and sold. Similarly in clearing land in towns and cities for building purposes many cascara trees are destroyed with no use being made of the bark. On one lot measuring 140 feet by 110 feet (see Fig. 7). which came under the notice of the writer, ninety-four cascara trees were burned. It was estimated that the bark on these ninety-four trees was worth at the time about \$80.



Fig. 7. Part of a vacant lot measuring 140 ft. by 110 ft. on which 94 cascara trees were destroyed. Several of the trees in the background are cascara (Photo. by the Author).

(8) WASTEFUL METHOD OF HARVESTING BARK

For the past sixty-five years the usual method of harvesting the bark has been to run an axe or similar implement lengthwise (Fig. 8.) through the bark, insert the edge of the tool under the cut, and strip the bark from the base as high as it could be pulled off the trunk. This invariably results in the death of the tree through starvation of the roots. It is surprising how many people are ignorant of the fact that the roots receive their food after it has been manufactured in the leaves, and that this food must pass down to the roots via the bark. The writer has seen many hundreds of stark white skeleton trunks of Cascara trees left to die and rot as a result of this method of harvesting the bark, and this is entirely responsible for the rapid depletion of the northwest resources. Furthermore, since it has been discovered that an equivalent weight of wood contains about 50% of the drug content found in the bark; and at a conservative estimate there is about ten pounds

of wood left to rot in the forest for every pound of bark taken from it, this means a total loss equivalent to five times the amount collected. In other words, 25,000 trees would have sufficed to supply the same amount of medicine that was obtained from the bark of 150,000 trees.

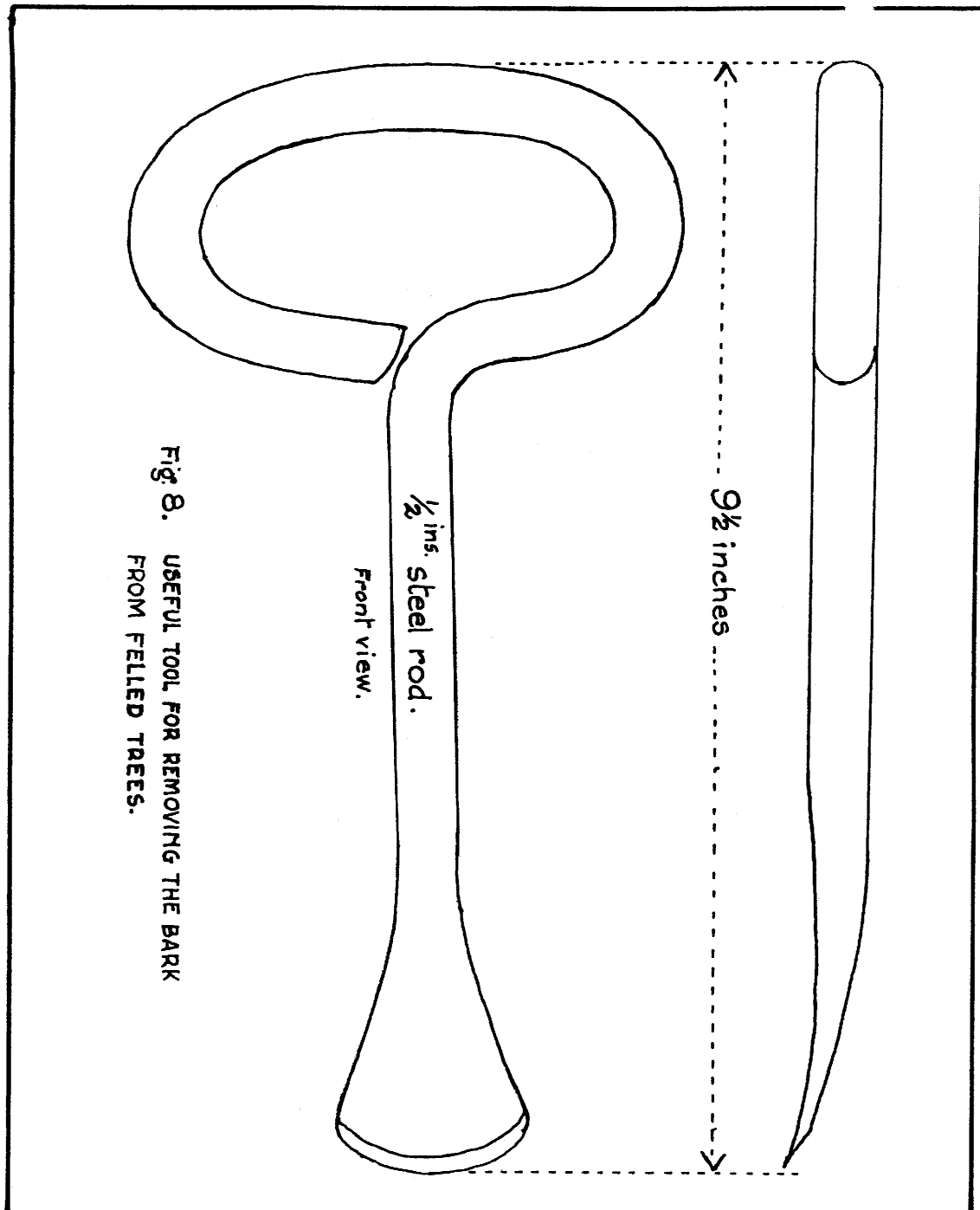




Fig. 9. One of the 94 plants referred to at Fig. 7. When stumps like these are left, new shoots arise. These were cut in June, 1920. (Photo. by the Author).



Fig. 10. The same clump as shown in Fig. 9 two months later (Photo. by the Author).

(9) CONSERVATION METHOD OF HARVESTING BARK

Stripping the bark off standing trees must stop, because it results in the death of the trees. If the tree is cut down to within one foot of the ground, new shoots sprout from the stump, and these in from three to four years will produce flowers, and berries on which birds feed and disperse the seeds throughout the region.

Even though these stumps may not be suitable for bark for many years, they are annually aiding in the increase and dispersal of new trees far and wide. (Figs. 9 & 10).

This method also permits the collector to get more bark from each tree, because bark which was beyond his reach on the standing tree is now readily accessible.

Had this method been adopted in Oregon and Washington in the early days, their supplies would have been replenished several times, because the trees reach their most profitable age in from fifteen to twenty-five years. It is poor business to strip small trees; if left a few years longer, the bark will greatly increase both in area and in thickness.

The bark may be collected any time during the dry season, from April to the end of August, and should not be exposed to wet during the drying process., neither should the inner surface of the bark be exposed to the sun; otherwise an undesirable dark colour will result, instead of the natural yellow colour being retained. The bark is generally hung over wires to dry, and naturally curls inward forming tube-like pieces, or "quills" as they are sometimes called. These can be broken into smaller pieces to facilitate packing into 100-pound sacks or bales. The bark of the smaller twigs may be used as well as that from the larger trunks; in fact the thin bark is more valuable than the thick. Lichen or moss should be removed by a stiff brush, otherwise the value will be affected and the price reduced. The bark is usually supplied in pieces about 8 inches long, 1 inch wide, and up to 1/6 inch in thickness.

(10) UTILIZATION OF THE WOOD

As previously mentioned, the present method of using only the

bark, means that only one-sixth of our Cascara resources are being utilized, the other five-sixths—wood and inaccessible bark—is left to rot.

It has been found that the effectiveness of the Extract depends on how the wood is prepared. For example:—Tree No. 5 had bark which gave an Extract of 60% efficiency; coarsely ground wood of the same tree gave an Extract of 56% efficiency; but finely ground wood of the same tree gave one of 75% efficiency, in this case higher than that obtained from the bark. The important point here is the difference of nearly 20% between coarsely and finely ground wood of the same tree.

Therefore, it is suggested here that to make the maximum use of our resources, the tree when felled should be cut into logs of suitable lengths, the branches tied in bundles, and all shipped to the factory with the bark adhering. It should be possible for some one to invent or construct a machine—similar to a “hog” machine which converts saw mill waste into coarse sawdust for fuel—so that the Cascara logs when fed into it will be reduced to fine sawdust, this will include sawdust of bark and wood together, and from this the Extract can be prepared by percolation in the usual way.

To do this, it would be highly desirable, if not necessary, to have the manufacturing druggist located at a central point to receive the trees with the minimum cost of transportation. The price could be at so much per cord instead of per pound, this would obviate variations in weight between green or dry trees, and trees could be cut at any season of the year, instead of as at present, only when the bark is easily separated from the wood.

(11) NEED OF LOCAL MANUFACTURING DRUGGIST

The preparation of Cascara products alone would probably not keep a manufacturing druggist employed the year round, so it would be necessary to furnish other important medicinal plants to ensure full operation of the factory, which could also act as a clearing house for crude drugs for export to other parts of the world.

There are so many medicinal plants which could be grown on a

commercial scale for a local manufacturer, whereas present high freight rates on medicinal plants shipped to eastern firms absorb so much that it is scarcely worth while.

A manufacturing druggist's plant with water frontage, would permit the collection of both Cascara and other medicinal plants by scows or barges from points on the Fraser River, or either side of the Straits of Georgia at a minimum cost compared with the freight rates on so many thousands of tons of bark to manufacturing firms in Great Britain, Eastern Canada and the Eastern States. At the same time, a local manufacturer would obtain local grown raw material of other medicinal plants, without having to pay freight on imported European supplies. In other words, we become growers, manufacturers, and exporters, instead of importers of manufactured preparations. This is of importance to the Provincial Department of Trade and Industry.

(12) DRUG FARMING DEPENDENT ON PERPETUAL CASCARA SUPPLY

Drug farming in British Columbia would provide interesting and profitable employment for many families, some of whom find difficulty in maintaining an existence on their land under present conditions. Some have a surplus of produce but find difficulty in marketing it.

Experiments have been carried out at the University Botanical Gardens over a period of more than twenty years to find out what medicinal plants and herbs can be grown commercially in this Province to keep a manufacturing druggist's plant in operation throughout the year. The results of these experiments have been quite encouraging, many species formerly obtained from Europe can be grown here with a greater poundage per acre, and with an equal or higher drug content per pound.

Therefore, our first aim is to ensure a perpetual supply of Cascara; without this, there is no inducement to bring a manufacturing druggist to the Coast. With a factory here we can make the maximum use of our Cascara resources and eliminate the present waste. Then, and not till then, drug farming will be an important

source of revenue, and all the auxiliary services connected with it, drying, packing, shipping, transportation, manufacturing and exporting will add to the payroll of the Province.

The results of our experiments on the cultivation and analyses of medicinal plants suitable for British Columbia would constitute a bulletin larger than this one., and would be premature or useless until a factory is established to use the products of herb and drug plant farming. This will be of importance to the Provincial Department of Agriculture.

(13) REPLENISHING DEPLETED AREAS AND PLANTING NEW CENTRES

The co-operation of the Forest Branch would be invaluable in this work; a comparatively small outlay by this Branch would greatly augment the forest resources. An excellent beginning has been made by enacting regulations governing the collection of Cascara bark (See Appendix). This should go far towards halting the promiscuous cutting and waste of trees, and the permit system will supply the basis for a more accurate estimation of each year's harvest.

The Forest Branch have their forest wardens and forest rangers throughout the field in various parts of the Province. They also have the Green Timbers Forest Nursery where thousands, perhaps millions, of young trees are raised for reforestation or afforestation.

It is suggested that wardens and rangers, within the zones of natural distribution of Cascara, should report any open or cleared areas in their district suitable for planting young Cascara trees; and state the approximate number of trees they could set out to augment or replenish depleted stocks.

The Forest Nursery should have little difficulty in raising hundreds of thousands of one or two-year-old Cascara saplings to be set out by the men in the field. Two men in one week could set out several thousands of trees; one man travelling ahead with a mattock makes the hole, the second man inserts the young tree and tramps the soil. With fresh nursery stock, planted without unnecessary delay, results should be close to one hundred per cent.

It is not suggested that large plantations should be set out, merely enough to form nuclei for the natural dispersal of the seeds by birds. The trees thus planted will be ready for harvesting in from fifteen to twenty years, but for many years before that time elapses, they will have borne flowers and berries in such quantity that a large number of Cascara trees will be established over a considerable area around the original plantations, and these also will supply seed for still wider dispersal.

Experimental plantations could be set out in other areas on the lower mainland, and on islands in the Gulf of Georgia, especially in the vicinity of burned or "logged off" lands, and records made of their progress from time to time.

A few years of such co-operation by the Forest Branch, together with the Regulations controlling the harvesting of bark will do much towards aiding nature in the reclamation of the 90% loss in the original stand, and the restoration of our forest resources to normalcy.

(14) THE COLLECTION AND STRATIFICATION OF SEED

In some years the berries are produced in enormous quantities. About 1914 the writer, while making a survey of the Cascara resources in the Haney and Dewdney regions, came across an area being cleared for farm land. This area had scores, perhaps hundreds of tall slender Cascara trees, and the clearing gang was busy chopping them down and burning them up. At each blow of the axe a shower of berries fell to the ground, so many that the rough wagon road was strewn with them, and some of the deep ruts were full of them. With a broom and shovel, one could have collected a 100 pound sack of berries in less than half an hour.

The following year, in response to several requests for seeds, a camp trip was made to the Alouette River Valley in the hope of collecting about fifty pounds of berries. The first day was spent in locating accessible trees, but the berries, being in the copper coloured stage were not quite ripe. By the third day millions of berries had been located and it was decided to start collecting on the morning of the fourth day. But something unforeseen had

happened; the birds had been there first, the trees had been almost completely cleaned off. So four days brought a total result of less than one pound of berries. This personal knowledge is passed on for the benefit of other seed collectors.

After collecting the berries, one of the common mistakes made is to free the seeds from the berries and keep them till fall or spring. This accounts for the published records (4) of from 6% to 8% germination.

Almost 100% germination can be obtained if treated as follows:

Get some almost dry fine sand, dry enough to run between the fingers, sprinkle a thin layer over the bottom of a tin box, then sprinkle a single layer of berries, cover them with another layer of sand, and continue with alternate layers of berries and sand. It is possible that many seeds become fully ripened during storage in this way, and such "stratified seeds" may be sown in late fall or in spring without reducing their viability. When ready to use the stratified seed, take a handful of berries and sand and rub them between the two palms of the hand to separate the seeds. The writer finds that broadcast sowing of this mixture of seeds, sand, and berry pulp over a prepared seed bed gives excellent results. Next forked out and planted in rows if necessary, the distance apart depending on how long they are to remain before final planting. Spacing about eighteen inches apart will afford ample room for the young plants to make a good root system for two or even three-year-old saplings. If they are to be left longer before transplanting, the distance apart should be increased, or every alternate sapling lifted.

If seeds are freed from berries and allowed to become dry, many may die; others may take a year to germinate, but a small percentage may germinate right away; hence the misleading records of viability.

(15) COMMERCIAL PLANTING

Many enquiries are made regarding the desirability or necessity of private commercial plantations of Cascara trees; a few small plantations have been started, as experimental areas rather than

plantations equivalent to our large orchards. Probably the largest is one about four acres at Salmon Arm, on which approximately five thousand trees were planted about 1930, most of them grown from seed. They were planted four feet apart in rows nine feet apart, this would permit the removal of alternate trees to allow the remainder to make better growth. Eight feet apart is about as close as they can be for commercial success. If overcrowded, the individual trees become tall and slender., the competition of roots and the limitation of light inhibits the rate of annual increment of wood and bark.

The distance of “not more than 2 feet apart in rows 3 feet apart” as suggested by the Superintendent of the Dominion Experimental Station at Sidney, B. C. (Last paragraph appended to Circular No. 15) (2) is much too close for commercial plantations. They would have to be thinned out before they would be commercially profitable, the returns would not be sufficient to pay for labour in removing not only alternate trees, but every alternate complete row.

In regard to the question as to the desirability or necessity of private plantations, it may be stated that with the recent measures taken to conserve and replenish our natural resources, and to control the method of harvesting the bark, and especially if the wood also is utilized, the future drain on our resources will be approximately one-fifth of what it has been in the past. The necessity—if it ever existed—of private plantations in British Columbia will vanish.

There are cases however, where planting may be desirable, to augment a meagre income from other sources. Numerous correspondents have stated that they have parcels of land up to about forty acres, with perhaps only ten acres cleared and in cultivation. The rest is wild, bearing a growth of Wild Cherry, Poplars, Willows, Alders, Maples, and other trees and shrubs which serve as native food plants for pest's like tent caterpillars and fall webworm. By gradually removing the wild growth, and planting Cascara to replace it, some use can be made of land which formerly bore no commercial crop, and which often proved to be a fire hazard.

Other correspondents state that part of their land is sterile, rocky, and unfit for agricultural use; would Cascara be suitable for such land? The answer is No! Cascara thrives best on land which is capable of raising more profitable crops by truck gardening, or, later on, perhaps, by drug farming.

Then there is the small farmer who has all his land under cultivation, but is interested in growing Cascara as a side line. These have been advised to plant Cascara trees along the edges of their fields where they will not interfere with their former use, they may even help the crops by acting to some extent as wind breaks, or supply shade for live stock, besides making the landscape more attractive.

In a Cascara hedge-row, many seedlings will come up in the shade and shelter of parent trees; these, as they increase in size, can be given more light by cutting down some of the larger trees which can be turned into revenue. At present, only the bark is of commercial value., but the wood of the Cascara tree furnishes a high grade of charcoal (6) which is in great demand at present for munitions. It looks like great waste to burn the wood to make charcoal, when its use for medicine would supply about five times the amount obtained from the bark. Yet at present, this wood has been left to rot in the forest and, rather than allow this to continue., it would be better to utilize it even in the form of charcoal.

(16) APPENDIX

The following copy of the Order in Council #224 regulating the cutting of Cascara bark in British Columbia; also the explanatory note which accompanies the copy of the permit form, is here appended to remove any ambiguity as to the purpose of these regulations.

The Department of Lands has taken a long step in the direction of Conservation, and the "Return of bark harvested" will enable us to know exactly what contribution British Columbia is making to the world's supply of Cascara.

THE CASCARA-TREE AND ITS CONSERVATION.

In the interest of both the general public and the individual collector it has become necessary to introduce regulations governing the harvesting of the bark of the cascara-tree because of the rapid depletion of native stands through improper methods of harvesting, usually resulting in the death of the trees stripped and collection of but a small part of the cascara available in them.

Although more than 50 per cent. of the cascara in a mature tree is contained in the woody part of the trunk and branches there are no facilities in this Province for extraction from the wood and for the present the bark only can be harvested.

All harvesting of cascara bark on Crown lands will be allowed only under permit, and in the case of privately owned lands the written consent of the private owner must first be obtained. All permits granted over Crown lands require the observance of the following conditions:

- (1.) All trees must be felled prior to peeling.
- (2.) All cascara-trees under four (4) inches stump diameter six (6) inches above the ground are reserved from cutting.
- (3.) Stumps must be left at least six (6) inches in height above the ground and no bark is to be removed from the stump.
- (4.) All limbs and branches must be peeled. down to a diameter of at least one and one-half (1 1/2.) inches.
- (5.) Every precaution must be taken to prevent injury to small sprouts growing below the stump-line.

The same principles should be applied to the harvesting of bark from privately held lands as a means of perpetuating the growth of the cascara-tree and conserving the supply of a valued tonic-laxative with properties not possessed by any other similar medicine and for which, as yet, no substitute has been discovered.

Permits to harvest cascara bark on Crown lands may be secured- free of charge from any officer of the Forest Branch, Lands Department, and at present no dues are payable on bark collected. Permits are personal and are not transferable. They do not permit the hiring of paid collectors but will be deemed to cover collection of bark by other members of the permittee's own family.

No cutting will be permitted on park lands, forest plantations, or experimental areas.

These permits and regulations imposing minimum restrictions are instituted as a first experiment in controlled cutting. They have two equally important objectives: to protect and perpetuate a public asset and to protect and perpetuate the collector's income. They aim to ensure for you and succeeding generations the largest possible income every year in perpetuity. Their success will depend in large measure on the co-operation of the permittees; and their failure is likely to necessitate much more stringent control with fees and royalties to cover cost of administration. The co-operation of every collector and dealer is solicited. Respect the regulations imposed for your protection. Report any infringement you encounter.

British Columbia is the only part of the British Empire where this tree is native. It is found only where moisture is plentiful and especially along the Coast. Those who may be interested in propagating the tree will find valuable information in Bulletin No. 108, "Propagation of the Cascara Tree," published by the Provincial Department of Agriculture; a copy may be had on application addressed to the Parliament Buildings, Victoria, B.C. This bulletin also contains illustrations and descriptive matter enabling ready identification of the tree.

Penalties ranging from \$25 to \$300. are provided for infraction of the regulations or any term or condition of any permit issued thereunder.

PROVINCE OF BRITISH COLUMBIA.	FOREST BRANCH.	DEPARTMENT OF LANDS.
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No.

Permit to harvest Cascara Bark on Crown Lands

....., of,
is hereby authorized to harvest cascara bark from Crown lands from the date of this permit until December 31st, 19....., subject to the following conditions:—

- (1.) All trees must be felled prior to peeling.
- (2.) All cascara-trees under four (4) inches stump diameter six (6) inches above the ground are reserved from cutting.
- (3.) Stumps must be left at least six (6) inches in height above the ground and no bark is to be removed from the stump.
- (4.) All limbs and branches must be peeled down to a diameter of at least one and one-half (1½) inches.
- (5.) Every precaution must be taken to prevent injury to small sprouts growing below the stump-line.
- (6.) The following return of bark harvested will be completed and this permit form will be returned to the issuing Forest Officer when collecting has been completed, and in any case not later than January

31st, 19.....

.....
(Date of issue.)

.....
Forest Officer.

RETURN OF BARK HARVESTED.

Total number of pounds collected (dry weight)

Sold to: lb. Buyer

I have read and understand the terms and conditions of this permit and solemnly declare that I have complied therewith in every respect. I further declare that the return of bark collected as stated above is correct to the best of my knowledge and belief.

.....
(Date.)

.....
(Permittee.)

CUTTING REGULATIONS—CASCARA BARK

(Order-in-Council#224, February 28, 1942.)

1. Cascara bark shall not be harvested on privately- owned lands or on lands held under licence or lease without the written consent of the private owner, licensee or lessee as the case may be.
2. Any person desirous of harvesting Cascara bark from Crown lands shall first obtain a permit for such cutting from any officer of the Forest Branch, Department of Lands.
3. Permits so issued shall be subject to the following conditions:
 - (a) All trees must be felled prior to peeling.
 - (b) All Cascara trees under four (4) inches stump diameter six (6) inches above the ground are reserved from cutting.
 - (c) Stumps must be left at least six (6) inches in height above the ground and no bark is to be removed from the stump.
 - (d) All limbs and branches must be peeled down to a diameter of at least one and one-half (1 1/2) inches.
 - (e) Every precaution must be taken to prevent injury to small sprouts growing below the stump line.
4. Permittees shall report to the Forest Branch, Department of Lands, in such form as may be prescribed by the Chief Forester the amount of bark harvested annually from Crown lands under permit.
5. Every person who violates or fails to comply with any provision of these regulations or any term or condition of any permit issued thereunder shall be liable on summary conviction to the penalty provided under the “General Provisions” of the “Forest Act.”

(17) BIBLIOGRAPHY

1. "Chemical Examination of Cascara Bark," by Dr. H. A. D. Jowett. Paper No. 47 published by the Wellcome Chemical Research Laboratories, London, E. C. (1904).
2. "The Cascara Tree in British Columbia," by John Davidson, F. L. S., Circular No.13, published by the Forestry Branch, Department of the Interior, Ottawa., Canada. (1922.)
3. "The Cascara Content of the Wood and Bark of Rhamnus Purshiana," by Dr. R. H. Clark, and Mr. K. B. Gillie, published by American Journal of Pharmacy, Philadelphia, Pa., Vol. 96, (1924).
4. "Cascara," by T. J. Starker, Professor of Forestry and A. R. Wilcox, Forest Examiner, U.S.F.S., published by American Journal of Pharmacy, Philadelphia, Pa., Vol. 103, Nos. 2 and 3, Feb. and Mar., (1931).
5. "A Preliminary Reconnaissance of the Cascara Resources of the Coast of British Columbia," by A. B. Anderson, Unpublished MSS. Report to the Forest Branch, Provincial Department of Lands, Victoria, B. C., (1-941).
6. "Wartime Drug Supplies and Empire Production," by Dr. M. Ashby, Bulletin of the Imperial Institute, London, Eng., Vol. 29, 1941.