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### BLUEBERRY CULTURE

Blueberry Culture? Most of us in New Jersey do not associate the name "Blueberry" with the delicious fruits of *Vaccinium corymbosum*. These berries with their small unobtrusive seeds are best known to us as "swamp huckleberries", while the huckleberries with large seeds that crackle between the teeth, fruits of the genus *Gaylussacia*, we distinguish as "upland huckleberries".

These two kinds of huckleberries go to the Philadelphia and local markets without distinction and, because of the great proportion of large seeded berries, huckleberries do not there enjoy an especially good reputation except with the comparatively few people who know how to distinguish the "swampers" from the "upland berries". In Boston and other parts of New England the fruits of several species of *Vaccinium* are known as blueberries and are in great demand, while the *Gaylussacia* fruits with the big crackly seeds are called huckleberries and recognized as exceedingly poor. For the cultivated fruit therefore, the name blueberry has been adopted as not likely to be a handicap in any market.

When the best huckleberry bush among several million has been located in some Jersey swamp and transferred to the plantation at Whitesbog the fruit becomes the aristocratic cultivated blueberry.

The broad foundation of my share of the work of taming the Blueberry was laid by my maternal grandfather James A. Fenwick and my father Joseph J. White in their development of cranberry culture.

The cranberry and blueberry plants while so dissimilar in habit; the first being a trailing evergreen vine, and the second a tall deciduous bush with woody stems sometimes exceeding two inches in diameter; belong to the same botanical genus, *Vaccinium*, and have many characteristics in common besides both being native to the swamps of the Jersey Pines where the wild cranberry vines are found with gander bush, *Chamaedaphne calyculata*, and other plants in the wetter portions, while scattered thru them on the hummocks or old stumps and on slightly higher ground grow the swamp huckleberry bushes.

More than sixty years ago grandfather Fenwick began experimenting to see if cranberries could be cultivated; for, though not the first, he was one of the pioneers in this branch of horticulture. When he died in 1882 the care of the forty acres of bog he had developed fell to my father who previously had had considerable experience in cranberry culture.

As a girl it was my delight to accompany father on his trips to the bog. He taught me to stand with my back to the sun, and look in my own shadow to get the best light in which to see and admire the developing buds or berries, how to distinguish the many injurious insects and their work, and recognize when the bogs were too wet or too dry. He would explain to me his plans for extensions and improvements and in general made me a comrade in the business, and when he was engaged with work in which I could not follow I wandered about getting acquainted with the beautiful bog wild flowers or sampling the fruit on the huckleberry bushes which grow in such profusion on the dams and margins of the bogs.

A year or two after leaving school I began staying at the bogs during the cranberry picking season to give tickets to the pickers and ever since have taken an active part in the work at the bog.

I thus came to have a wide and very friendly acquaintance with the people of the pines for ten to twenty miles around who picked our cranberries, and, in season the wild huckleberries, and this has been a most important factor in locating the bushes needed for cultivation.

Father and I often discussed the possibilities of cultivating the swamp huckleberries, but after spending an hour sampling the fruit on bush after bush; finding the berries on one too sour for our taste, on another rather flat and insipid, on a third too small to bother with and so on for many plants, and finding only an occasional bush on which the good sized berries had a most delicious flavor, peachy, father calls it, we always decided that unless we could have only these best plants we did not want to cultivate any.

We knew that to have a plantation of any size and of the quality we desired it would be necessary, in some way, to propagate in quantity from a few fine plants. We had a vague impression that it was considered impossible to start huckleberry plants from slips or cuttings and feeling unable to cope with this problem, for a long time we did nothing.

Early in 1911 in the Monthly List of Publications issued by the U. S. Dept. of Agriculture was announced the publication of a bulletin entitled "Experiments in Blueberry Culture" by Frederick V. Coville, which I immediately sent for.

It proved to be a considerable book of 100 pages, discussing broadly the principles governing the growth of blueberries in common with cranberries and allied plants which differ so widely from the principles governing the growth of most agricultural crops.

To me it was most fascinating reading for never before had I known that the soil of our bogs was acid, as was the water of our streams, that it was this which made our bog water brown, as in acid water the humus is held in solution while in Alkiline waters it is deposited and the water becomes white. Never before had I known that associated with the roots of blueberry, cranberry and most other plants which grow in acid soils is a symbiotic fungus which in some still unexplained way assists these plants in obtaining the nitrogen necessary for their growth.

"Experiments in Blueberry Culture" gave me an entirely new view of my old ~~fix~~ friends, the huckleberry bushes and cranberry vines, and proved that there was a careful, scientific worker in the Department of Agriculture who had already made very considerable progress in propagating blueberry plants; the very man whose help we needed.

We wrote the Department offering to cooperate in their further experiments in blueberry culture. The offer was accepted. In March of 1911 Mr. Coville sent me from Washington a few blueberry plants, seedlings of the best bush, the "Brooks", he had up to that time located in New Hampshire. He visited the plantation from time to time and in this way and by correspondence kept me advised as to the progress of his experimental work in Washington. When in 1914 it became desirable for the Department to try in the field a large number of hybrid seedling blueberry plants, the testing ground was rented at Whitesbog and since then father and I have cooperated on an extended scale with the Department of Agriculture, as represented by Mr. Coville, in its experiments in blueberry culture.

When we started, back in 1911, it was very evident that the first thing necessary was to locate some superior plants to begin with. I realized at once that this could best be done with the aid of my friends who made a business of picking huckleberries. During the season they visited thousands of plants in the course of each day's work, and if I could get them interested it would be a simple matter for them to mark for me the occasional exceptionally fine bush they found.

The first season, that of 1911, I spoke to one man about it and he selected three bushes for me. The summer of 1912 several people were interested so I had some rude gauges made and twenty or more plants were marked while in fruit, to be moved when the dormant season arrived. By the summer of 1913 I had my plans for locating plants quite perfected. For each huckleberry picker who was interested I provided a neat little aluminum gauge 16 mm or a trifle less than  $5/8$  of an inch in diameter, three 2 oz. jars for samples of the largest berries on a bush and a paper of typewritten directions. In the jars were wooden plant labels for the bushes and there was also a bottle of a weak solution of formalin, 15 parts of water to 1 part of formalin, to keep the berries in good condition.

The finder was to receive a dollar for marking any bush the largest berry on which would not drop thru the gauge, and in addition be liberally paid for the time spent in guiding me to it.

That summer, however, my hopes were doomed to disappointment for a severe frost while the plants were in bloom almost wiped out the crop of wild huckleberries, and apparently only one bush with big berries was left uninjured in New Jersey; at least that was all that was marked for me.

Fortunately the bottles and gauges were not perishable and kept perfectly for the season of 1914 when I was really embarrassed by the number of plants marked. There were about sixty of them and in November, after the plants had become dormant I spent three weeks in superintending the digging. The plants were scattered over such a wide area; some being down at Jenkin's Neck eight miles below Chatsworth, some near Vincentown, some in the neighborhood of Cranberry Hall and in most any swamp between. Five bushes a day was the very best I could accomplish, more often it was less.

For 1915 and 1916 I raised my offered price for bushes but required that there be at least five berries on the bush that would not drop thru the gauge.

Here I would like to pay a tribute to the pine people who have assisted me to locate these plants. You have heard many stories greatly exaggerating their bad points the past year or two and it is but fair that you should hear the other side.

The typed directions that I furnished were of very little use except as an aid in formulating my own ideas, but this was because of the readers' lack of training in that direction rather than lack of native intelligence. When we get in the woods and swamps I am the one who reads haltingly and with imperfect understanding and must rely implicitly on my piney guide. I have never ceased to wonder how they do it. We will leave some little traveled woodland road for a less traveled path, then we will leave that behind and wander around

in some pathless thicket where all the bushes look alike to me, then my guide will say, "that there bush was right around here; that's the tree I broke;- there it is now": and they will show my little labels some of them carefully covered up at the base of the stems so that no one may find and move them.

Almost everyone who has marked a bush for me has warned me of the danger I am running of someone sending me a sample of fine berries and then putting the labels on a bush with worthless fruit, but I have yet to find the slightest evidence of such a thing being done.

I have tried moving the dormant huckleberry bushes ~~either~~<sup>both</sup> spring and fall and find that either time does very nicely if the plant is easily accessible, but as a rule the autumn is the more convenient season. The swamps are slow to freeze and slow to thaw; in consequence there are usually several weeks between the time the leaves fall and the freezing of the ground while in spring the time between the thawing of the ground ~~while~~ and the starting of the new growth is very brief. The swamps are also much wetter in the spring.

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It is almost if not quite <sup>a</sup>possible to move a well developed huckleberry bush as a whole. Not infrequently the mass of roots is so large that it would require four or five men and special apparatus to move the plant entire even if it were growing in open ground instead of in the tangled swampy thickets where most frequently found. Then too, the roots are usually so interwoven with those of other plants that even if it were otherwise practical, the moving of the plant as a whole would make impossible the clean culture that we wish to practice.

At first the larger pieces of root from these wild bushes were planted directly in the field, with a part of the top left on, if it could be done; the smaller pieces of root, and the portions of the top pruned away were made into tubered cuttings and planted in cold frames according to the method developed by Mr. Coville.

Experience has proved not only that it is better to leave no top in connection with these roots, but that it is best to cut the entire plant, root and branch, into small sections and start them as tubered cuttings; even the chunks of root as large as your fist.

When a piece of root is planted directly in the field it sends up from two to a dozen or more sprouts which really make from two to a dozen or more independent plants all crowded into one hill. When treated as a tubered cutting these sprouts are divided as soon as they are well rooted, at the end of the first season, and each given sufficient space to develop to perfection. By the latter method we get the first fruit from the new plants a year later than by the first, but we get more plants and the plants not being crowded together develop more rapidly to a condition where they are capable of producing a commercial crop.

The finding and moving of these selected wild bushes has been an expensive as well as a troublesome business. On an average the bushes have cost considerably more than \$5. apiece delivered at Whitesbog. After arriving there each bush has been treated as if it were the one and only best blueberry bush that ever grew, and from it have been propagated as many new plants as our knowledge of the art of cultivating

blueberries at the time permitted.

The plants from the sixty odd bushes located the summer of 1914 have not yet fruited in the field. Of the plants from the thirty-six bushes located before that time there are only two stocks which we consider sufficiently good to propagate extensively, and five or six lots of plants have been entirely discarded. One because of its susceptibility to spring frosts, others because of disagreeable flavor, poor texture of the fruit, undesirable habit of growth or some other objectionable characteristic.

The land we are using for our cultivated blueberries is of the kind known to cranberry growers as "savannah ground" by which I understand the land between the swamps and the upland, too wet to permit large growth of the pines and too dry for the best development of the swamp cedar, and therefore comparatively treeless. I think of the dwarf laurel "Kalmia angustifolia" as one of the most characteristic plants of the "savannah ground" in Burlington County. This land has a thin layer of peat, from two to six inches deep overlying the sand.

The best method we have found of preparing this land for blueberry culture is first to cut and burn the brush and any small trees there may be; next to turf out the lower spots which carry a thick heavy growth of gander bush, the roots of which could not be turned under with a plow. At least a year before the land is to be planted, and preferably in July or August we plow deeply with a new ground plow; this turns the turf completely under and puts the white sand on top. The following summer we go over the ground a number of times in several directions, first with a disc harrow and then with a smoothing harrow sometimes using a scraper to help work the high spots into the depressions. This work is done whenever the teams are least needed elsewhere. By September, thirteen or fourteen months after the ground was plowed, it should be in excellent condition for planting.

We have planted on land where the plowing was done only three or four months before; but the longer period of preparation is much more satisfactory for the wild growths can be so much more thoroughly killed. These wild growths include unselected swamp huckleberries and many other plants with foliage so similar to the blueberries that they are not recognized as weeds by the men who do the hoeing, and so make more trouble than an equal number of plants of a different nature.

The blueberries are planted 4 ft. apart in rows 8 ft. apart. It is our intention later to take out the alternate plants leaving the spacing 8 x 8 ft. None of the plants in the field have as yet nearly reached their maximum size, but it is already plain to me that the maximum size will vary greatly with different stocks. I predict that in years to come when different varieties of blueberries have become standardized as varieties of apples are now they will be found to fall into several distinct classes for each of which a different spacing will be found most desirable.

At Whitesbog the blueberries occupy four different fields all of which come under the influence of reservoirs maintained at a higher level for the benefit of the cranberry bogs. The ground is underlaid by a hard pan 2 to 2 1/2 ft. below the surface and the water percolating thru the soil from the reservoirs follows above this hard pan and profoundly influences the water content of the soil for half a mile or

more below the reservoirs. Thus the blueberries at Whitesbog are in a manner subirrigated. For a considerable proportion of the planting there it has been found necessary to install tile drainage. The behavior of the blueberry plants in the field clinches absolutely the fact established by Mr. Coville's work in the greenhouses at Washington, that thorough drainage and aeration of the roots are quite as necessary to the welfare of the blueberry plants as an adequate supply of moisture. They will not flourish where the soil is at all soggy.

We keep our blueberry plantings cleanly cultivated and the plants flourish best in those portions of the field where during the summer the surface of the soil is loose, dry white sand. As I showed the cultivated blueberry plants to one of my piney friends who had located some of the wild stocks, it was a curious sensation to hear him talk of the "huckleberry swamp" in which we were walking with our feet burned by the hot dry sand.

By scratching up a little of the sand, however, you would find the soil damp within two inches of the surface and the peaty layer turned under by the plow in a condition of moisture not unlike that existing in the spagnum moss and loose partly decayed leaves and vegetable matter on top of some old stump, where in their native swamps the wild huckleberry bushes find conditions most favorable for their growth.

I believe that the proper balancing of irrigation and drainage will always be one of the most important problems to be solved by the man or woman who undertakes the commercial cultivation of blueberries; a problem which in its details will vary in each case.

We do not yet know that our method of solving the irrigation and drainage problem will meet the needs of varying seasons, and even if it should in our case, it might not be the best method for persons undertaking blueberry culture apart from a cranberry bog already supplied with reservoirs.

We have done but little fertilizing. Where the peaty layer turned under by the plow is two inches or more in thickness the plants grow very vigorously without it. Portions of the blueberry fields however, had an exceedingly thin turf plowed under and as on these portions the plants were much less vigorous than elsewhere, early last summer we applied rotted peat turf to two rows, and treated others to an application of our cranberry fertilizer, leaving check rows in between. At the present time there is little choice between the rows which received the fertilizer and those which received the rotted turf, but both have made a much more vigorous growth than the check rows.

The fields first planted to blueberries had two compost heaps in them a year or two before we became interested in blueberries and in another place a little lime had been thrown. Though we cleared away all the compost and lime that we possibly could before the blueberries were planted the bushes on these spots have never flourished, remaining small and stunted with red sickly leaves. The spots where the ~~compost~~ lime was thrown being worse than the sites of the compost

heaps. This again corroborates the results of Mr. Coville's work in the greenhouses at Washington. The sites of the compost heaps are also the only spots where ordinary weeds have given us trouble.

As yet there has been no insect damage sufficiently extensive to necessitate remedial measures, but I have no doubt that as the plantation grows larger and the balance of nature is thereby disturbed we are going to encounter difficulties similar to those with which the growers of all other fruits contend. Believing that forwarned is forarmed in insect pests, I have paid considerable attention to the various "bugs" which enjoy a diet of cultivated blueberries in our fields. In this I am greatly indebted to the assistance of Mr. H. B. Scammell who is making a study of cranberry insects for the Department of Agriculture, and who during the past season was located at Whitesbog.

There are two insects each of which has caused the death of a number of plants by feeding on the roots, the cranberry root worm and a species of white grub.

The larvae of many insects feed upon the leaves including two of the three cranberry fire worms, the yellow head and the red striped. Among the leaf feeding larvae is one which appears especially dangerous; a black and yellow striped worm which works in colonies each member of which erects head and tail in a threatening manner the instant its host plant is touched. Very small when hatched, these worms grow to nearly two inches long and they clean up every vestige of foliage as they feed. The cranberry flea beetle has also seriously injured a number of plants by its work on the foliage.

There are several borers which kill the branches of the blueberry plants, a weevil which eats into the blossom destroying the tiny green berry, and two larvae which infest the ripening fruit. Any one of these insects might be very serious if not kept in check. The blueberries are also subject to attack by various scale insects. Being optimistic I trust that their natural enemies will long keep these potential pests down to moderate numbers.

Does blueberry culture pay? We hope and believe that it will, otherwise we would lack courage to continue the work, but as yet it has not paid in a financial way. We have been working at the problem for six years and have ten acres planted, including the government trial grounds, but as yet have sold only seventeen crates of berries. For these seventeen crates we received a very encouraging price, 22 cents a quart, but we had a special market with the Hudson River Day Line, the buyer for which runs the farm adjoining ours.

We have built up some beautiful air castles based on this price and the yield of three and four year old plants on a fraction of an acre, but as yet our castles are in the air.

If I should have the privilege of talking to you at the end of another six years of experience there will probably be some positive information to offer on this very interesting side of blueberry culture.