

Rubel



Berkeley



*Rubel*, finest selection of wild blueberries, averages less than half the size of *Berkeley*, one of Dr. Coville's "Big Six" originations. *Coville* has proved to be one of the best commercial varieties. It is the most planted of the "Big Six" varieties. *Dixi* and Coville resulted from one hybridization, although the latter was introduced 13 years after the former. *Earliblue* is the earliest of the northern varieties.



Dixi



Coville

Blueberry

Breeding

GEORGE M. DARROW\*

Past

Present

Future

Earliblue



U.S.D.A.

The cultivated blueberry industry is still based entirely on the varieties resulting from breeding and selection work of the late Frederick Vernon Coville, of the U. S. Department of Agriculture. He not only had the imagination to see what might be done with wild blueberries but also carried the research through to the establishment of an industry. Raised in New Hampshire and familiar with the flora there, Dr. Coville made his first two selections (Brooks and Russell) among the wild blueberries of his

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native State in 1908-1909. He made his first crosses between them in 1911. He enlisted the help of many individuals in obtaining the largest and best fruited wild blueberries for use in breeding. Although he tested many selections from many areas, those from which our northern highbush varieties have come were selected by him in New Hampshire and New Jersey. Between 1911 and 1936, when Dr. Coville retired, about sixty-eight thousand seedlings had fruited, and about two thousand acres of named varieties resulting from his work had been planted. He and his associate, Oliver M. Freeman, left seedlings and

seed from which about thirty thousand more seedlings have been fruited. Because those seedlings represented the accumulated experience of more than twenty-five years of breeding, some of them were finer than the ones Dr. Coville named. Fifteen more varieties have been named and introduced. Thus, varieties selected from about a hundred thousand seedlings (together with Rubel) are the basis of the cultivated industry today.

### Beginning of an industry

The first varieties from Dr. Coville's breeding—Pioneer, Cabot, and Katharine—were named and introduced in 1920 and Greenfield and Rancocas were introduced in 1926. Though relatively small-fruited by today's standards, these varieties together with the Rubel selected from the wild, were superior enough to warrant the beginning of an industry. In 1928 the Jersey and Concord, in 1930 the Stanley and June, and in 1931 the Scammell were introduced. The industry in Michigan is still largely based on Pioneer, Rancocas, Rubel, and Jersey. In 1936, before he retired, Dr. Coville named two other notable varieties, Weymouth and Dixi. Weymouth is a large, early, rather dwarf, low quality variety, and Dixi is a large, late, high quality one. Actually three steps in increase in fruit size were made—the introduction first of Pioneer and Cabot; next that of Jersey, Concord, Stanley, and Scammell; and third, that of Weymouth and Dixi.

Dr. Coville was helped very greatly in his work by able grower cooperators: for the first twenty years especially by Elizabeth C. White and the J. J. White Company, of Whitesbog, New Jersey, on whose property seedlings were grown and selections propagated and tested. Later the Atlantic Company and the Crabbe Company, of New Jersey, and H. G. Huntington, of North Carolina, as well as others assisted in growing seedlings and in making selections. Grower cooperation was so successful that it is still being continued.

Table 1 gives the estimated acreage, in percentages, now planted to each of the thirty varieties originated by Dr. Coville, listed in order of their dates of naming or introduction.

**Table 1**

Percentage of Estimated 1958 Acreage<sup>1</sup> Planted to Each of 30 Varieties Originated by Frederick V. Coville.

| Variety    | Year Hybridized | Year Introduced | Estimated Acreage |
|------------|-----------------|-----------------|-------------------|
| Pioneer    | 1912            | 1920            | 0.5               |
| Cabot      | 1913            | 1920            | 0.5               |
| Katharine  | 1913            | 1920            | 0                 |
| Greenfield | 1913            | 1926            | 0                 |
| Rancocas   | 1915            | 1926            | 4.0               |
| Jersey     | 1916            | 1928            | 32.0              |
| Concord    | 1916            | 1928            | 0                 |
| Stanley    | 1921            | 1930            | 5.0               |
| June       | 1919            | 1930            | 0                 |
| Scammell   | 1915            | 1931            | 1.0               |
| Redskin    | 1913            | 1932            | 0                 |
| Catawba    | 1913            | 1932            | 0                 |
| Wareham    | 1915            | 1936            | 0                 |
| Weymouth   | 1928            | 1936            | 14.0              |
| Dixi       | 1930            | 1936            | 1.0               |
| Atlantic   | 1925            | 1939            | 1.0               |
| Burlington | 1916            | 1939            | 1.0               |
| Pemberton  | 1921            | 1939            | 3.0               |
| Berkeley   | 1932            | 1949            | 5.0               |
| Coville    | 1930            | 1949            | 8.0               |
| Wolcott    | 1934            | 1950            | 7.0               |
| Murphy     | 1934            | 1950            | 1.0               |
| Angola     | 1934            | 1951            | 0.5               |
| Ivanhoe    | 1933            | 1951            | 0                 |
| Bluecrop   | 1934            | 1952            | 2.0               |
| Earliblue  | 1936            | 1952            | 4.0               |
| Herbert    | 1943            | 1952            | 0                 |
| Croatan    | 1934            | 1954            | 0.5               |
| Blueray    | 1934            | 1955            | 0                 |
| Collins    | 1936            | 1959            | 0                 |

<sup>1</sup>About 9 per cent of the estimated 1958 acreage is planted to Rubel, a variety selected from the wild by Elizabeth C. White.

### The "Big Six" varieties

The varieties termed the "Big Six" comprise the six more recently introduced varieties that bear very large berries, ripening from early to late. Although Jersey still makes up about thirty-two per cent of the total acreage, the new "Big Six" are being propagated rapidly and have such superior horticultural qualities that they are rapidly replacing older smaller berried varieties. Table 2 indicates their rating for several characters.

The ancestry of the "Big Six" is given in Table 3. It will be noted that one lowbush and five highbush varieties se-

**Table 2**  
The "Big Six" Highbush Blueberry Varieties  
Rated for Several Characteristics.<sup>1</sup>

| Variety   | Season <sup>2</sup> | Size <sup>3</sup> | Color | Dessert-quality | Cold-resistance | Scar |
|-----------|---------------------|-------------------|-------|-----------------|-----------------|------|
| Earliblue | 9                   | 70                | 8     | 8               | 7               | 8    |
| Blueray   | 7                   | 60                | 8     | 9               | 8               | 7    |
| Bluecrop  | 6                   | 70                | 9     | 8               | 8               | 9    |
| Berkeley  | 5                   | 65                | 10    | 6               | 7               | 8    |
| Herbert   | 3                   | 60                | 6     | 10              | 8               | 8    |
| Coville   | 2                   | 65                | 8     | 9               | 7               | 8    |

<sup>1</sup>Ratings from 1 to 10: 10 the best and 1 the poorest.

<sup>2</sup>Season ratings (early to late): 9 earliest variety listed, about 5 days between units.

<sup>3</sup>Size measured in number of berries per half-pint cup.

lected from the wild enter into their makeup.

Dr. Coville named no varieties from his breeding work in North Carolina but left thousands of seedlings fruiting there. He used selections from the wild North Carolina highbush in this breeding. It was well that he did, for some of the selections proved to be resistant to a serious southern blueberry disease—stem canker. From the four varieties, Angola, Wolcott, Croatan, and Murphy, relatively resistant to the stem canker, have been named and are already important varieties there (Table 4). Although highly resistant for about twenty years, they are now showing some canker infection, probably caused by new strains of the causal fungus to which these varieties are at least partially susceptible, as shown by their resistant rating.

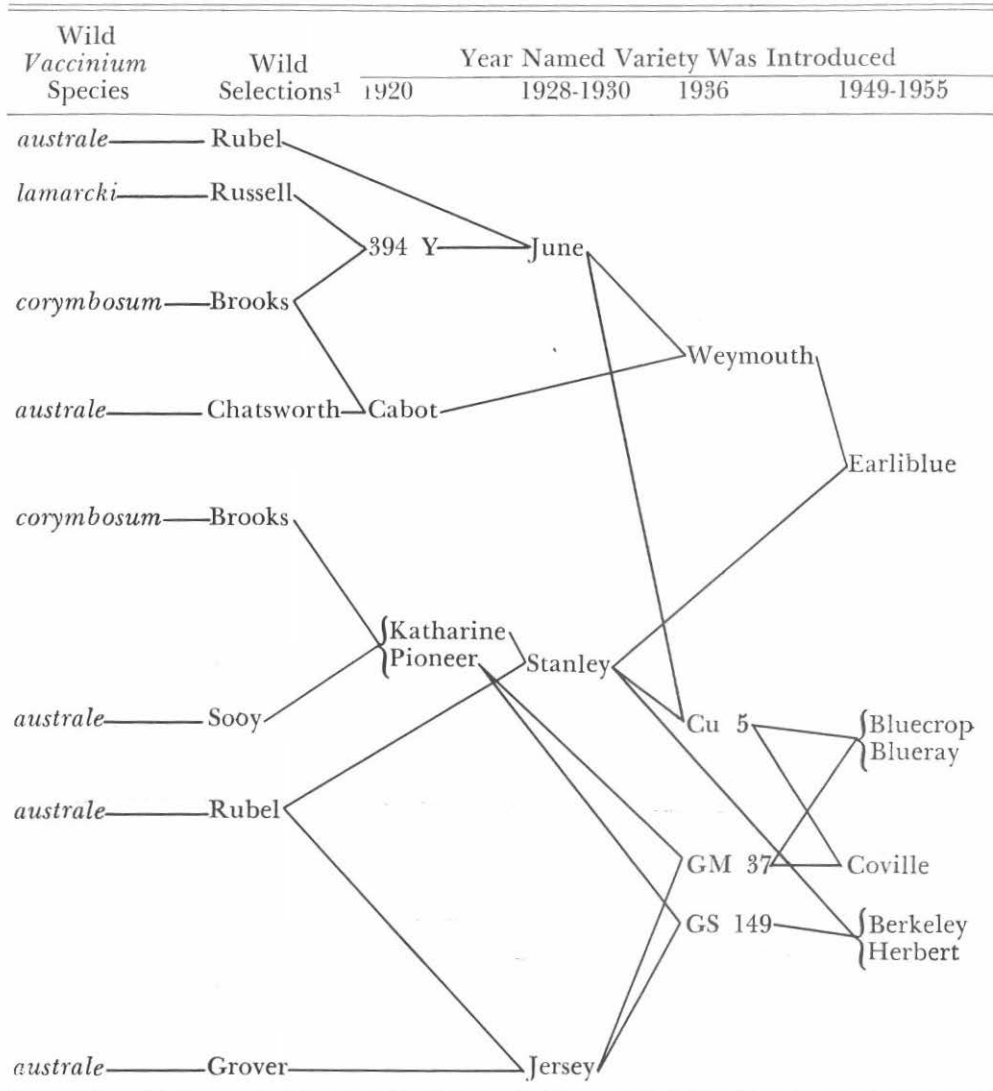
#### 1958 seedlings—the "Big Ten"?

About twenty thousand acres of cultivated blueberries are being grown today, the acreage having doubled about each six years for many years. Blueberry is the one temperate climate fruit crop with rapidly increasing acreage. The crop for 1957 was valued at fifteen million dollars. To enable the industry to continue to expand, varieties superior in several

respects to older ones must be bred and introduced. With this in mind the writer and his associates have extensively bred blueberries since 1939 to obtain varieties that might keep the good qualities of the "Big Six" and not have their more serious limitations. They have carried on the breeding in cooperation with State agricultural experiment stations (especially those of New Jersey, North Carolina, Georgia, Florida, and Maine) and with private cooperators (especially S. A. Galletta of New Jersey, A. C. Elliott of Michigan, J. H. Alexander of Massachusetts, and Gale Harrison, Gordon Love and Jackson Batchelor of North Carolina). Varieties to be introduced in the next ten to fifteen years may be sufficiently superior to the "Big Six" to justify acreage increases in line with the past rate of increase.

The crosses made recently are aimed toward obtaining larger size berries for fresh market, non-dropping, *i.e.*, holding on the bush till all are ripe (for lower picking costs), light blue color, high flavor, firm texture, hardy flower buds and plant, canker resistance (in North Carolina), mummy berry resistance (in the North), and earlier and later ripening. Crosses already fruited indicate that these objectives can be obtained, if selections are made from large numbers of seedlings.

**Table 3**  
Ancestry of the "Big Six" Blueberry Varieties



<sup>1</sup>Rubel, Chatsworth, Sooy, and Grover were selected from New Jersey; Russell and Brooks from New Hampshire.

**Table 4**  
Highbush Blueberry Varieties for North Carolina  
rated for several characteristics.<sup>1</sup>

| Variety | Season <sup>2</sup> | Canker resistance <sup>3</sup> | Size <sup>4</sup> | Color | Dessert-quality | Cold resistance | Scar |
|---------|---------------------|--------------------------------|-------------------|-------|-----------------|-----------------|------|
| Angola  | 10                  | 8                              | 80                | 6     | 7               | 6               | 9    |
| Wolcott | 9                   | 9                              | 80                | 7     | 6               | 6               | 9    |
| Croatan | 9                   | 6                              | 75                | 8     | 8               | 6               | 9    |
| Murphy  | 8                   | 9                              | 80                | 7     | 7               | 6               | 9    |

<sup>1</sup>Ratings from 1 to 10: 10 the best and 1 the poorest.  
<sup>2</sup>Season ratings (early to late): 10 earliest variety listed; about 5 days between units.  
<sup>3</sup>Ratings for canker resistance may change if new strains of the canker fungus affecting these varieties appear.  
<sup>4</sup>Size measured in number of berries per half-pint cup.

Results of the breeding work now under way is illustrated by the seedlings raised in 1958 at Beltsville from seed obtained in previous years. The four primary objectives of these crosses were to produce berries that would be—very late, very hardy, frost-hardy, and high-flavored. Other seedlings in the cooperative program were raised by the North Carolina, South Georgia, and Florida Agricultural Experiment Stations. The following list includes most of the high-bush seedlings raised at Beltsville.

| <i>Cross and Purpose</i>  | <i>Number</i> |
|---------------------------|---------------|
| <i>For lateness</i>       |               |
| Coville × Shaw Late       | 878           |
| <i>For hardiness</i>      |               |
| Ashworth × G-65           | 3,680         |
| Ashworth × 11-93          | 3,200         |
| 11-93 × Ashworth          | 1,748         |
| E-3 × E-118               | 224           |
| 11-93 × E-118             | 190           |
| <i>For frost hardness</i> |               |
| 11-93 × Bluecrop          | 698           |
| Herbert × Bluecrop        | 2,938         |
| <i>For high flavor</i>    |               |
| Earliblue × BM-22         | 342           |
| BM-22 × Berkeley          | 160           |
| Earliblue × M-37          | 1,127         |
| 11-93 × M-37              | 1,480         |
| 11-93 × M-12              | 900           |
| 11-104 × 11-93            | 825           |
| 11-104 × F-72             | 1,110         |
| F-72 × 11-93              | 1,683         |
| E-3 × 11-93               | 2,456         |
| E-3 × G-65                | 950           |

For the first objective—lateness—one cross was made to test the Shaw Late selection from the wild for its breeding value for lateness. For the second objective—hardiness—five progenies were raised to complement progenies already in the field, one parent being either Ashworth or selection E-118 (Ashworth × Earliblue). For the third objective—frost hardiness—two progenies to complement others already fruited or being raised were grown. For the fourth objective, the ten progenies were all raised primarily for high flavor but the high-flavored selections were crossed with others so that selection for greater firmness and size, better color, and so forth would be possible. In other years the crosses might be for other objectives, such as better scar, earliness, or disease resistance.

**The job ahead**

Perhaps the easiest way to point out what is needed in future breeding and how big a job remains, even with the limited vision of 1958, is to list some current objectives and to make brief comments on present varieties. If the limitations of each variety were corrected in a new variety of the same season, we might easily have varieties whose fruit would be worth a thousand dollars an acre more than at present. Thus, for the "Big Six" and the newly introduced Collins, sister to Earliblue, the following summary of desirable qualities may be given:

|           | <i>Desirable Qualities</i>                     | <i>Undesirable Qualities</i>                     |
|-----------|--|--|
| Earliblue | Early, firm, non-dropping                      | Not hardiest, fair scar, not best flavor         |
| Collins   | 2nd early, firm, non-dropping                  | Same as above                                    |
| Blueray   | 3rd early, firm, fine flavor productive, hardy | Tight cluster, wet scar                          |
| Bluecrop  | 4th early, light blue, firm, hardy             | Not best flavor, drops some, hard to propagate   |
| Berkeley  | 5th early, lightest blue, firm, large          | Too bland flavor, fair scar, drops, not hardiest |
| Herbert   | 7th early, best flavored, largest, hardy       | Too dark, too soft, fair scar                    |
| Coville   | 8th early, high flavored, large, firm          | Fair scar, acid, not hardiest                    |



Thus, if a new "Big Ten" set of varieties (to extend the season still further) with a five-day sequence of ripening had the hardiness of Bluecrop, the flavor of Blue-ray, the color of Berkeley, the scar of Burlington, the non-dropping of Earliblue, the fine cluster of Berkeley, and the size of Herbert, such varieties could warrant the growing of a much greater acreage than at present. And for North Carolina and westward in the South highbush varieties with greatly improved color, flavor, firmness, size, and canker and mite resistance are needed to further a greatly expanded acreage there.

There is also need for breeding for resistance to mildew, witches'-broom-rust, and leafspots, resistance to the blueberry mite, resistance to leaf hoppers that transmit the stunt virus disease or resistance to infection by stunt, and to cane blights.

#### Improving the rabbiteye

A southern species, *Vaccinium ashei*, commonly called the rabbiteye blueberry, was surveyed by Dr. Coville but until recently had not been used to any extent in breeding. With the help of extensive surveys by J. M. Batchelor, F. L. O'Rourke, and by many other people, superior selections were located in western Florida and southern Georgia. The remarkable vigor, productivity, and tolerance to drought and heat of this selection make it a superior horticultural plant. Its berries have better scars than those of most northern varieties and a great range of flavor and other desirable characteristics. Full-grown bushes have averaged more than a bushel of berries each.

A breeding program with the rabbiteye blueberry is now under way to obtain superior varieties for fresh market, canning, and freezing in the Deep South. Many thousands of hybrid seedlings have been grown and many selections tested. From this breeding work, six varieties, which seem sufficiently good to form the basis of a commercial industry, have been named. These are Callaway, Coastal, Tifblue, Homebell, Garden Blue, and Menditoo.

These first selected varieties correspond to the early highbush varieties and con-

tinued breeding within the rabbiteye varieties may be expected to result in very superior new ones. Varieties with the flavor of Callaway, the color of Tifblue, the size of Black Giant, and the vigor and productiveness of Garden Blue are needed.

The rabbiteye and highbush have been crossed to obtain pentaploids. These hybrids produce little or no pollen, but do set fruit with pollen from either parent. Possibly by backcrossing, the fine qualities of rabbiteye may be bred into highbush varieties and those of highbush into rabbiteye.

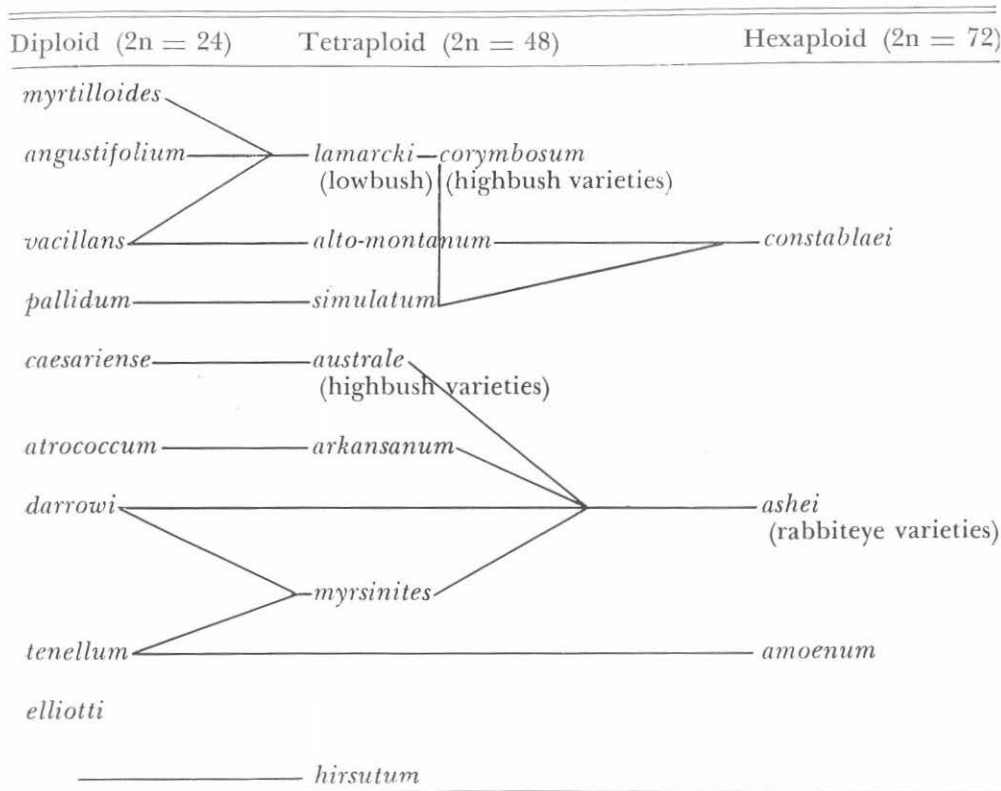
#### The cluster-fruited species

To obtain high yields under cultivation, selections of cluster-fruited species are essential. They may produce ten to twenty quarts a bush while equally large bushes of species bearing berries singly may bear only a quart. Hence, the present productive cultivated varieties have come from four species of the cluster-fruited type, *lamarcki*, *corymbosum*, *australe*, and *ashei*. These species (3 tetraploids and 1 hexaploid, respectively) are extremely heterozygous and have a great range of characters from which to select superior varieties. The possibilities in breeding within these species are still enormous. The botanical group to which they belong is native to eastern North America from Florida and Louisiana to Newfoundland and Labrador and includes twenty or more species. These other species also have a great range of desirable horticultural characters not found in the four species from which come cultivated varieties.

The chromosome numbers are given and relationships of the eastern cluster-fruited species are suggested in Table 5.

All the species with the same chromosome number seem to be completely interfertile. Fertility between different chromosome levels cannot be predicted. Diploid species do not cross naturally with tetraploids; tetraploids cross with hexaploids and give partially fertile pentaploids; and a few diploid species cross [with difficulty] with the hexaploid *ashei* and give tetraploids, but none so far tested cross with *constablaei*; also a hexaploid.

**Table 5**  
 Botanical relationships of eastern North American  
 Cluster-fruited blueberry species<sup>1</sup>



<sup>1</sup>This table attempts to show the relationships of the 9 diploid, 8 tetraploid, and 3 hexaploid species. Currently the U. S. Department of Agriculture and cooperating experiment stations are using 11 species in breeding: *myrtilloides*, *angustifolium*, *atrococcum*, *darrowi*, and *tenellum* of the diploids; *corymbosum*, *lamarcki*, *australe*, and *myrsinites* of the tetraploids; and *constablaei* and *ashei* of the hexaploids, and still have crosses with at least 2 others, *vacillans* and *alto-montanum*.

As stated previously, improvement of present varieties by recombining qualities already in them is in progress and needs continuing, but the lowbush and the two highbush species have made possible the present flourishing industry. The longer time program of adding new qualities from these and many other species needs further attention. Nine of these cluster-fruited species may be useful, as follows:

*Vaccinium darrowi* and *V. tenellum*. Varieties obtained by crossing each of these two southern lowbush, spreading diploid species, first with the rabbiteye to obtain tetraploids and then with highbush, should extend blueberry growing even to the southern tip of Florida, and

give tetraploids with far greater heat and drought resistance, earliness, and low chilling than available now.

*V. myrsinites*. This southern evergreen lowbush, spreading tetraploid native even south of Miami can be crossed directly with the highbush to give heat and drought resistance. Though crosses so far have been rather disappointing, only a beginning has been made.

*V. constablaei*. This hexaploid seems to have a long rest period and may be especially useful in crossing with rabbiteye to furnish later, hardy varieties. Again, the first crosses have been disappointing but much wider exploration of the use of this species is needed.



*V. vacillans* and *V. alto-montanum*. These two lowbush species, a diploid and tetraploid, respectively, are much hardier than *tenellum*, *darrowi*, and *myrsinites* and may be useful in obtaining hardy varieties with drought resistance, however, *vacillans* is very susceptible to "stunt" virus, and in breeding for virus resistance the use of plants free of virus selected in severely infected areas may be necessary. At times *alto-montanum* appears to be simply an autotetraploid of *vacillans* or *pallidum* and at other times it has the half-high or highbush stature of an allotetraploid derived from *vacillans* hybridized with some highbush species.

*V. angustifolium*. This lowbush diploid of the *lamarcki* type ranges far north into Canada and seems about two weeks earlier than present highbush varieties. Possibly it might keep and transmit its earliness as well as its hardiness if made into a tetraploid.

*V. myrtilloides*. This light-blue-fruited northern diploid lowbush is hardy rather far north and may be useful in breeding hardy northern sorts.

*V. atrococcum*. A very early, black diploid highbush of which selections that ripen all their berries at one time and still do not drop have been found. If made into a tetraploid, it might be useful in breeding for early non-dropping varieties.

Some of the more important desirable characters of these nine species so far recognized may be summarized as follows:

*Lowbush species:*

*V. alto-montanum*, 4×—drought resistance, low- to highbush.

*V. angustifolium*, 2×—earliness and hardiness, prostrate, lowbush.

*V. darrowi*, 2×—heat and drought resistance, very low chilling, lowbush.

*V. myrsinites*, 4×—heat and drought resistance, very low chilling, lowbush.

*V. myrtilloides*, 2×—hardiness, blue fruit, lateness, lowbush.

*V. tenellum*, 2×—heat and drought resistance, low chilling, lowbush.

*V. vacillans*, 2×—drought resistance, lowbush.

*Highbush species:*

*V. atrococcum*, 2×—earliness, non-dropping, vigor, highbush.

*V. constablaei*, 6×—highbush, long rest period, hardiness.

### Other genetic material

Much genetic material is available in species outside the eastern cluster-fruited group. To mention a few, on the Pacific Coast is *V. ovatum*, the evergreen blueberry with its fruits in clusters (it is the "Evergreen Huckleberry" of the florist trade); in the high mountains of central and northern South America are closely related species that may hybridize with *ovatum* directly or, after chromosome doubling and crossing, may give large, fine-fruited sorts of very different flavors than those of the eastern highbush; *uliginosum*, a hardy lowbush, has already been used in breeding by the Washington Experiment Station and may be a source of hardiness and resistance to cracking and to the western stem diseases, including rust; *myrtilis*, a non-cluster species native to much of northern Europe and to the northern tip of Alaska, may be useful in extending blueberry growing to the far North if productive fertile hybrids with cluster-fruited species can be obtained; *membranaceum*, a non-cluster species, native to the Cascade and Rocky Mountain areas of western North America, is large-fruited and extremely drought resistant. Sheep graze on the succulent leaves of the bushes after all grass has dried up, and a well-developed program of introducing its drought-resistance into cultivated varieties is needed.

The blueberry is becoming a major fruit crop. Commercial fields are productive compared with those of other berry crops. Large areas, not well adapted to most other crops, are adapted to its production. The importance of the blueberry in the years ahead seems directly related to the breeding of improved varieties. For example, if all varieties had scars as good as the scar of Bluecrop, the market would not need to be afraid of the berries spoiling on the counter and could handle blueberries with a lower markup price in much greater volume. If all varieties were non-dropping, like the Earliblue, and were still high-flavored when all were ripe, all the berries could be harvested at one time and at a lower cost than at present. These and other qualities should make a steadily increasing acreage of blueberries warranted.

The following list gives some objectives in blueberry breeding, their purposes, and suggests materials to be used

| <i>Objective</i>                   | <i>Purpose</i>  | <i>Suggested Parents</i>  |
|------------------------------------|---|---|
| Dry scars                          | Fungi that rot berries enter partly through wet, large scars; breed varieties with dry scars for all conditions.  | Burlington and Bluecrop have good scars; rabbiteye varieties excellent scars; some highbush selections dry scars. |
| Non-dropping                       | For cheaper harvesting, replace all varieties with those retaining high flavor and not dropping till all berries are ripe.  | Earliblue, Collins, selections, and possibly <i>atrococcum</i> .  |
| Late ripening                      | Obtain late tetraploids, ripening till frost to extend season.  | Rabbiteye ( <i>ashei</i> ) (6x), <i>tenellum</i> (2x) or <i>darrowi</i> (2x).                                     |
| Earlier ripening                   | Shorten flower-to-ripe-fruit period from 45 to 35 days.   | <i>atrococcum</i> , a diploid black, very early highbush species; also selected lowbush diploids and tetraploids. |
| Large size                         | Reduce cost of picking.   | No. 11-93 highbush.   |
| Cold hardiness to -50° F.          | Extend growing areas to northern New York and northern New England.   | Ashworth and other selected wild hardy low- and highbush.   |
| Cold hardiness                     | Obtain still greater hardiness, perhaps to -70° F.  | Explore use of <i>myrtilis</i> , a non-cluster species hardy to north tip of Alaska, among others.                |
| Short rest period                  | Extend growing areas to southern Florida.   | <i>darrowi</i> and <i>myrsinites</i> .  |
| Heat and drought resistance        | Obtain varieties adapted to climate of South.   | <i>darrowi</i> , <i>myrsinites</i> , <i>tenellum</i> , <i>ashei</i> (rabbiteye).                                  |
| Extreme drought resistance         | Obtain upland varieties.  | <i>membranaceum</i> (a non-cluster species of Cascade Mountains).   |
| Canker resistance                  | Obtain first-class canker-resistant varieties for the South.  | Canker-resistant selections.  |
| Varieties of <i>V. ovatum</i> type | Obtain plants with large, better flavored berries worth cultivation on Pacific Coast.   | Species related to <i>ovatum</i> from Guatemala to Ecuador.   |
| Double chromosome numbers          | Use colchicine for new possibilities.   | Diploids, tetraploids, hexaploids, and hybrids.   |
| Other characters                   | Resistance to witches'-broom, mites, mildew and mummy berry; ripening at continuous low temperatures; greater vigor for cropping on 2-yr.-old plants; low bushes for ease in garden bird control; and adaptation to soils of higher pH. | Selections from hybrid progenies and from wild populations.   |

The following is a chronology of the U. S. Department of Agriculture blueberry breeding program, showing workers and results, from 1906 to 1958:

1908-1936—*Frederick V. Coville, Leader; Oliver M. Freeman, Assistant.* Grower Cooperators: Elizabeth C. White, Atlantic Company, and H. G. Huntington. B. C. Crabbe, Plant Collector.

1908-1909—Brooks and Russell selected in wild.

1911—First crosses.

1911—Sooy and Rubel selected in wild.

1920—First varieties named: Cabot, Pioneer, Katharine.

1926—Second varieties named: Greenfield, Rancocas.

1927—Blueberry - chromosome article published.

1928—Third varieties named: Jersey, Concord.

1936—Larger fruited varieties named: Weymouth, Dixi.

1938-1960—*Federal and States Cooperating.* George M. Darrow, Leader, 1938-1957; D. H. Scott, Leader, 1946-. Assistants: 1940-1942, H. E. Fischer; 1938-1945, E. M. Meader; 1946-1948, F. L. Goll; 1958-, R. J. Knight.

1940—Atlantic, Burlington, Pemberton, named.

1949-1955—"Big Six" named: Berkeley, Coville, Bluecrop, Earliblue, Herbert, Blueray

1950-1954—First canker-resistant series named: Wolcott, Murphy, Angola, Croatan.

1950—First two hybrid rabbiteye varieties named: Callaway, Coastal.

1955—Second set of rabbiteye varieties named: Homebell, Tifblue.

1958—Second set of rabbiteye varieties named: Garden Blue, Menditoo.

1959—Collins named.

#### *Plant Collectors*

J. M. Batchelor, 1938-1941

F. L. O'Rourke, 1941-1944

#### *University Cooperators*

W. H. Camp, 1940-1944

#### *Experiment Station Cooperators*

##### *North Carolina:*

E. B. Morrow, 1938-1956

G. W. Schneider, 1956-1958

Gene Galletta, 1959-

##### *Georgia:*

Otis Woodward, 1940-1945

W. T. Brightwell, 1945-

##### *Florida:*

R. H. Sharpe, 1949-

##### *New Jersey:*

J. H. Clarke, 1938-1945

F. A. Gilbert, 1948-1950

Gene Galletta, 1950-1953

J. N. Moore, 1956-

##### *Massachusetts:*

J. S. Bailey, 1946-

##### *Maine:*

E. P. Eggert, 1954-1956

Leslie Whitten, 1956-

##### *New Hampshire:*

E. M. Meader, 1948-

#### *Principal Grower Cooperators*

##### *North Carolina:*

J. M. Batchelor, 1947-

Gale Harrison, 1941-

G. Love, 1950-1958

H. C. Huntington, 1931-1950

##### *New Jersey:*

Atlantic Company, Lester Collins, 1940-1946

Atlantic Company, Galletta Brothers, 1947-

H. B. Scammell, 1938-

##### *Connecticut:*

Sayre B. Rose, 1946-

##### *Massachusetts:*

J. H. Alexander, 1946-

##### *Michigan:*

A. C. Elliott, 1947-

#### *References for Additional Reading*

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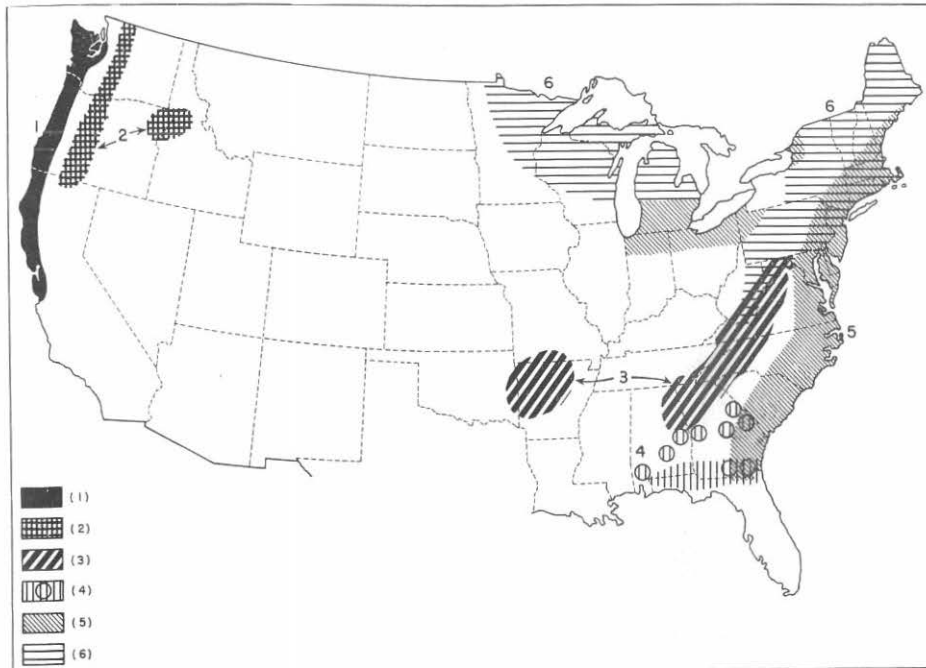
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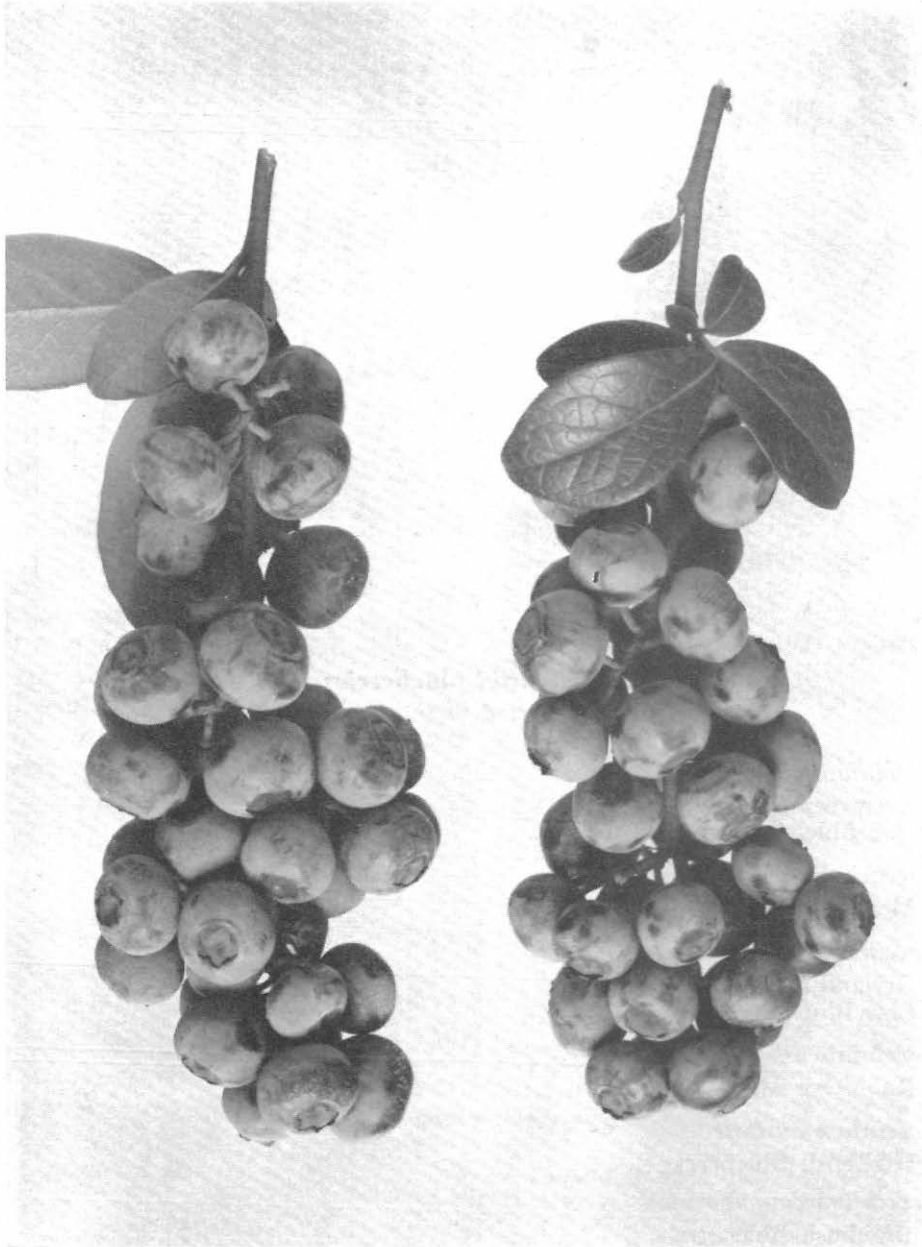
**Areas in which the wild blueberries**  
are extensively harvested in the United States.

- (1) *Vaccinium ovatum*  
Evergreen Blueberry  
Box Blueberry
- (2) *Vaccinium membranaceum*  
Mountain Blueberry
- (3) *Vaccinium pallidum*  
Dryland Blueberry  
Low Blueberry
- (4) *Vaccinium ashei*  
Rabbiteye Blueberry
- (5) *Vaccinium australe*  
Highbush Blueberry  
*Vaccinium corymbosum*  
Highbush Blueberry
- (6) *Vaccinium lamarcki*  
Lowbush Blueberry



**Cluster of Blueray blueberries.**

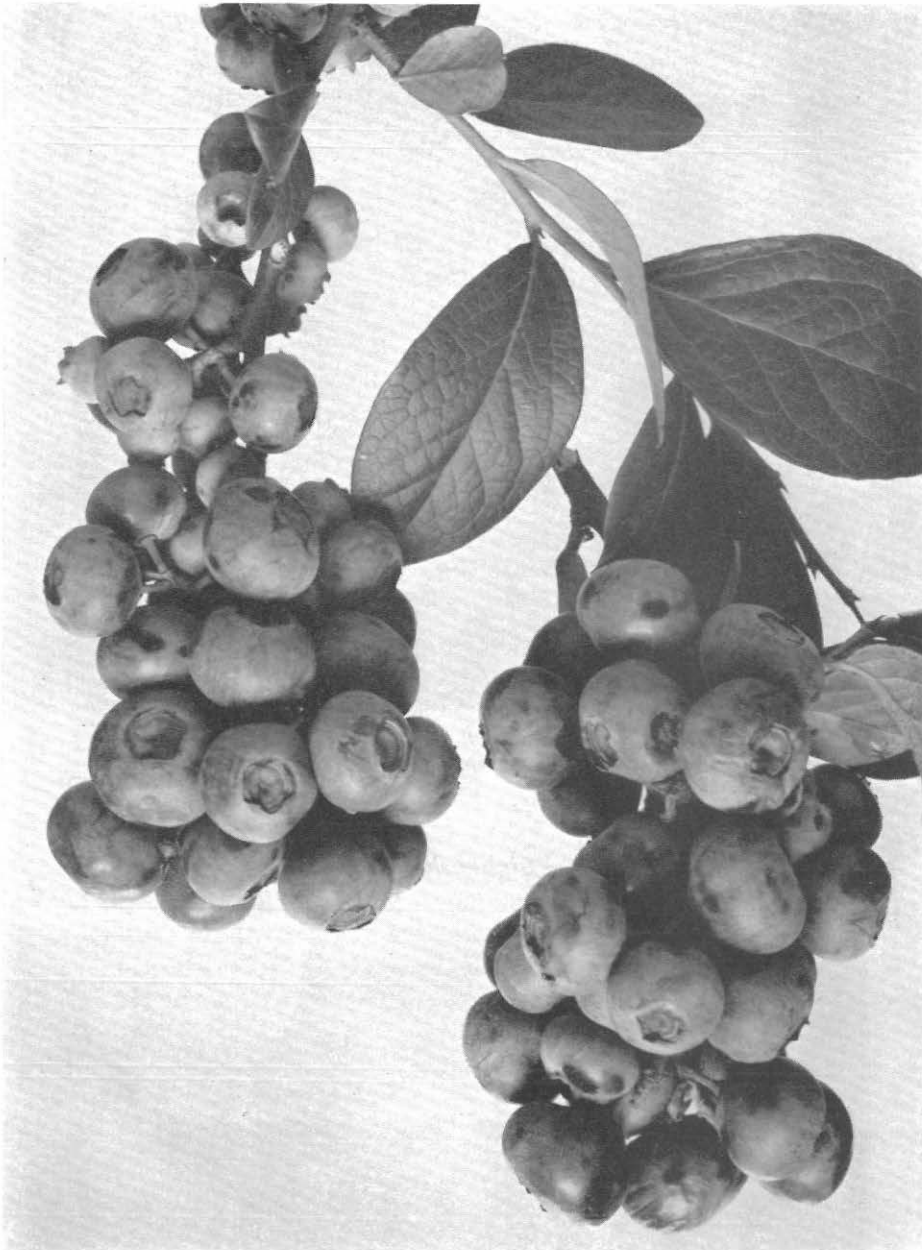
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*Vaccinium corymbosum* 'Brooks'

*These clusters of blueberries are from Brooks, the very first selection Dr. Coville made in 1908-1909 from the wild species growing in his native State of New Hampshire. Brooks and a selection of Vaccinium lamarcki, which he named Russell, and which was made at the same time and from the same location, were the parents used to obtain most of the present varieties.*



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### ***Clusters of Pioneer Blueberries***

*Pioneer, Cabot, and Katharine, were the first three hybrids named in 1920 from Dr. Coville's breeding. Pioneer is a hybrid of Brooks (a wild selection of *Vaccinium corymbosum*) and Sooy (a wild selection of *Vaccinium australe*). Although Pioneer produces blueberries of high flavor, it is being replaced by larger, hardier, and still better flavored varieties.*





*A field of the native tetraploid lowbush blueberry, *Vaccinium lamarcki*, with a heavy crop.*

*A highbush  $\times$  lowbush seedling (Russell  $\times$  Brooks) resulting from Dr. Coville's first crosses.*





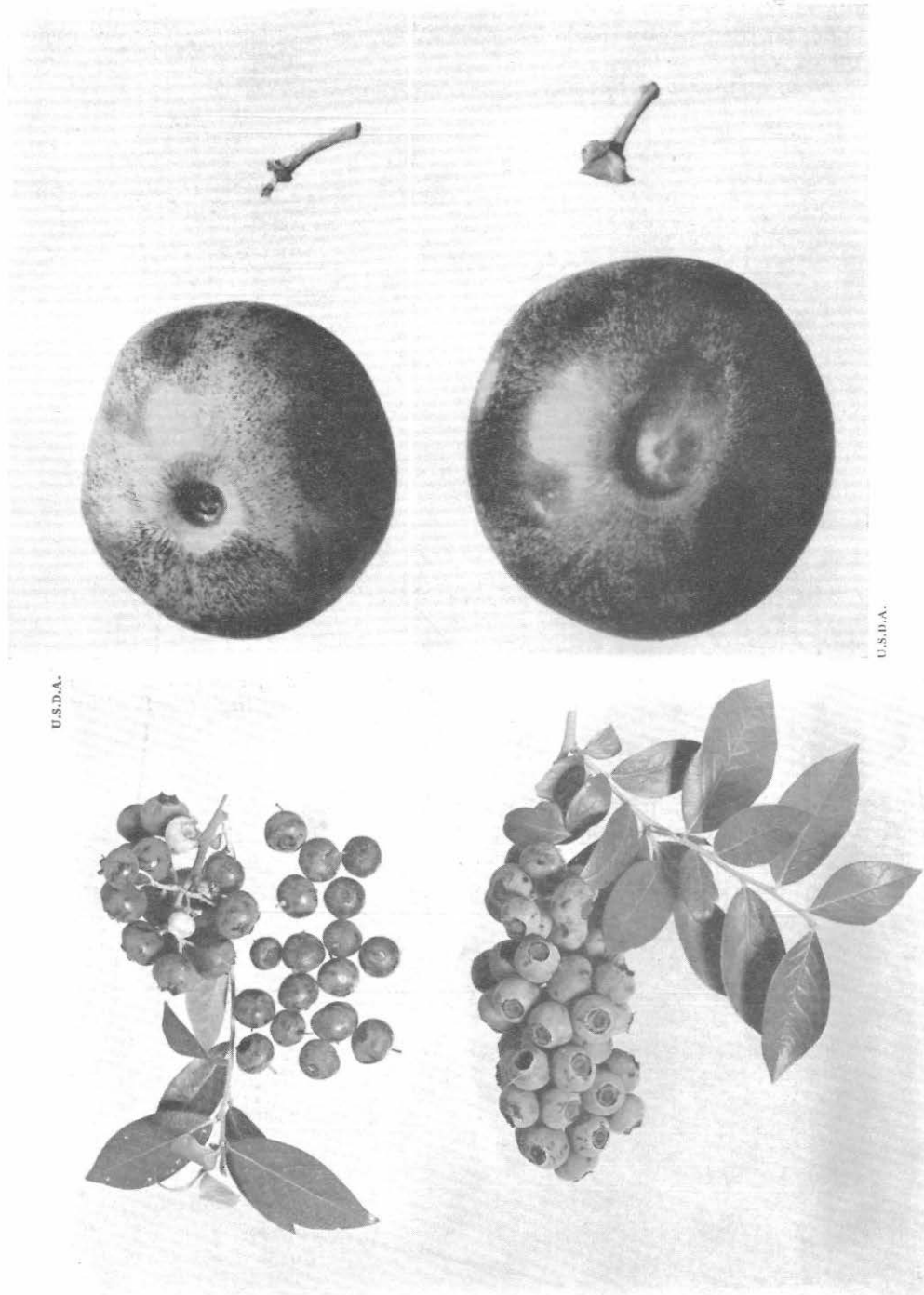
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*Picking ripe berries of the Earliblue variety,  
the earliest of the "Big Six" hybrids.*

*Under controlled hybridizing conditions, pollen is  
shaken from anthers onto a red-coated thumb nail, then  
touched to the stigmas of receptive flowers.*



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New varieties with **dry scars** (where the berry separates from the stem) are desired; even superior to that of the berry shown above (left). Such berries would keep far longer than those with wet scars (right).

New varieties should be **non-dropping** for cheaper harvesting. Earliblue (right cluster), a non-dropping newer variety, contains much of this characteristic, as compared to the widely planted Weymouth variety (left).

*Blueberry mites have destroyed most of the berries in the clusters shown below. The stem canker (at pencil point) has done much damage to the Cabot variety illustrated. Resistant varieties have largely replaced the older varieties in the South, but greater **stem canker and berry mite resistant varieties** are still needed.*



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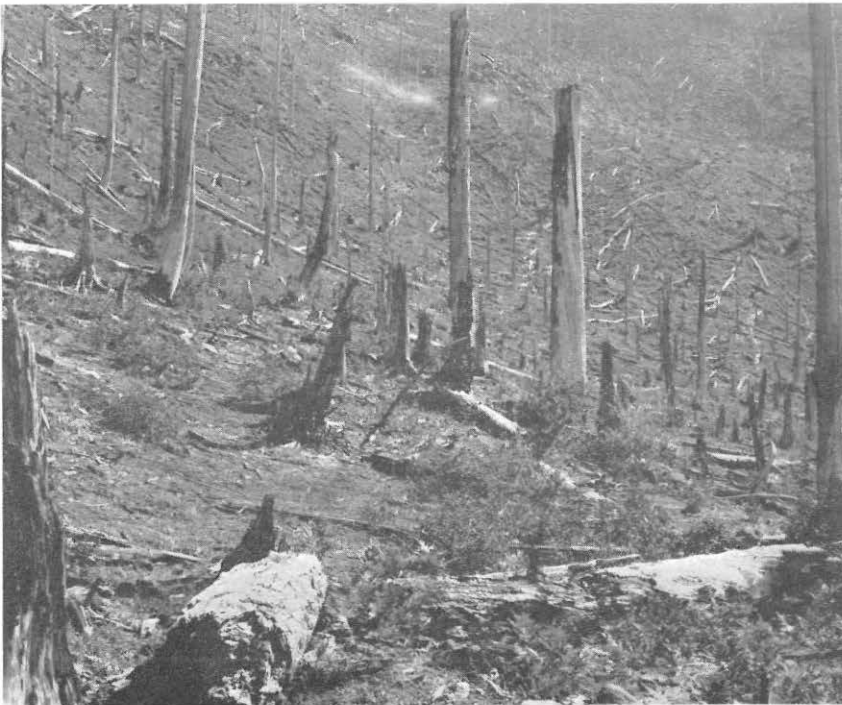
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Desirable traits in wild selections of diploid (*Vaccinium atrococcum*, right) and tetraploid (*Vaccinium australe*, left) species might be combined in producing better commercial varieties, if colchicine treatments could **double the chromosome** number of *V. atrococcum* to make cross possible.

The underbrush of this burned over area in the Cascade Mountains is *Vaccinium membranaceum*, the largest fruited species of a group closely related to the cluster-fruited blueberries. It bears its berries singly and is the most, or one of the most, drought-resistant species, producing its large, highly flavored fruit after four to six months without rain and even when the grass has turned brown and become dry from lack of water. This **drought resistant** species may be hybridized with cultivated varieties to produce an outstanding commercial variety for the West Coast area.



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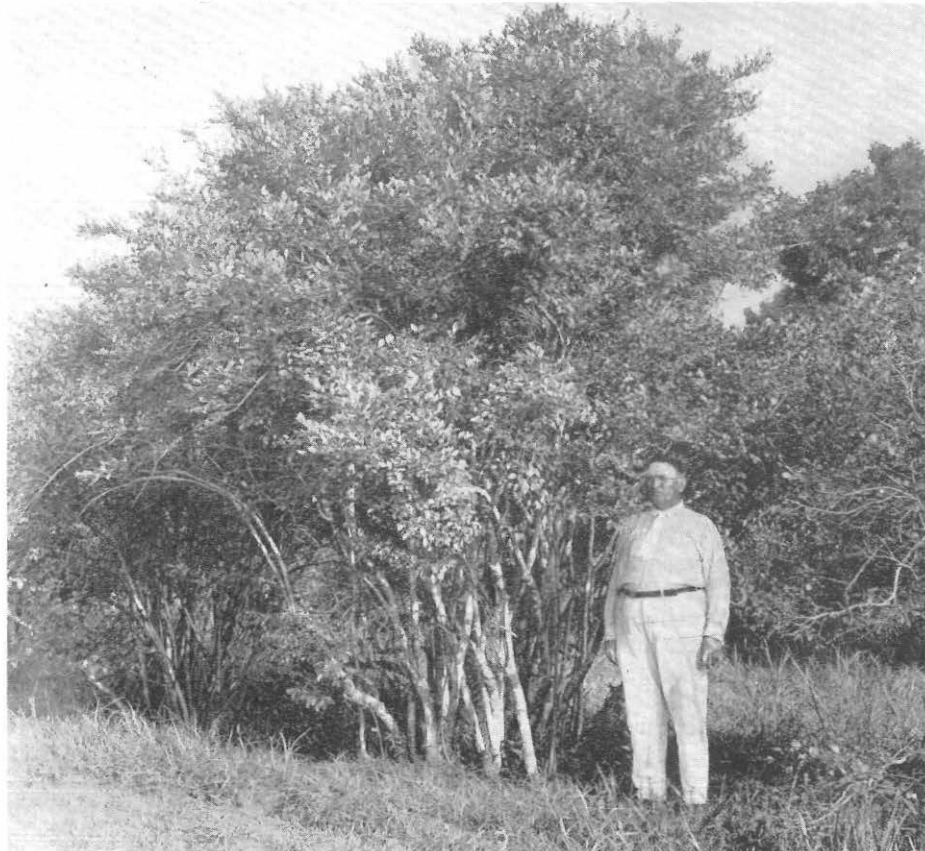




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*Vaccinium ovatum*, the Evergreen Huckleberry of florists, native along the West Coast, could be used in breeding to obtain **larger size berries**.

The vigor of the Rabbiteye Blueberry, *Vaccinium ashei*, is shown by this illustration of a bush about 30 years old in west Florida. Full grown bushes have averaged over fifty quarts. **Vigor and productiveness** are desirable qualities in breeding new plants. M. A. Sapp, shown here, transplanted his first blueberries about 1890 from the wild, and was probably the first successful blueberry grower in the U. S.



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