Coville’s Serendipitous Association with Blueberries Leading to the Whitesbog Connection

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Subject Category: History

Abstract: What led up to the association between Frederick Coville and Elizabeth White? This 26 year association began in 1911 and continued until Coville’s death in 1937. The commercial highbush blueberry industry was born and became established during this period. Frederick Vernon Coville was born March 23, 1867 in Preston, NY, graduated from Cornell University in 1887 and was hired by the U.S. Department of Agriculture as a botanist in 1888. His USDA office, labs and greenhouses were in downtown Washington, D.C. Washington’s urban environment was the first of a number of key circumstances that influenced and hastened blueberry domestication and commercialization. Coville was concerned that his four children (Stanley 11, Katherine 9, Cabot 3, and Frederick 1) would never learn the rural skills that he had acquired in his childhood in central New York. This concern was addressed by spending several summer vacations in rural areas of New England. A geologist friend in Washington, Arthur Keith, told him about a farm, next to his parent’s farm, that was for sale near Greenfield, NH. The Covilles bought the 40 acre, former Alexander property, on May 2, 1905. The second key factor was the abundant blueberry populations of, both highbush and lowbush that flourished in the surrounding fields. In 1906, less than a year after coming to Greenfield, Coville said: “that
my interest was attracted to the subject of blueberry culture”. Previous attempts by others at establishing plantings had generally been unsuccessful. Coville collected seeds in 1906, and a colleague, George W. Oliver, began germination trials that fall. In 1907, Coville began greenhouse studies in Washington on the requirements for growing blueberries. When he returned to Greenfield in 1908, he brought and planted 179 seedlings that had been grown in Washington. Survival was 97% following a dry summer on the low-pH blueberry soil. The first outstanding bush for using in crosses was selected in July of 1908 in a pasture of his neighbor, Fred Brooks, for whom it was named. This was a very fortunate find, with many berries over 0.5 inches in diameter and with excellent flavor. ‘Brooks’ became a parent or was in the parentage of 13 of the first 15 USDA releases. In the short span of time from 1906 to 1910, he determined that blueberries require a moist but not wet soil and most importantly a low pH. Also determined were nutrient requirements, winter chilling importance, propagation techniques, and breeding procedures including self-sterility and seedling management. All of this information was published in the 101 page Experiments in Blueberry Culture, USDA Bul.193, Nov. 15, 1910. The Whitesbog connection began in Jan. 1911 after Elizabeth White had read Experiments in Blueberry Culture and had written to the USDA offering land and assistance. Commercialization followed this final indispensable key.

**Index Words:** blueberry domestication, history, Frederick Vernon Coville, cultural requirements, soils, pH, propagation, breeding, Elizabeth White, Whitesbog, NJ.

**The Era.** It was 1911 and William Howard Taft was President. The US Army, Signal Corps bought the second and third military planes from the Wright Brothers. Government
specifications required a top speed of 40 mph from the planes but a blazing 42 mph was achieved in trials! The first Indianapolis 500 was held with a winning speed of 74.6 mph. Henry Ford’s Model T was in the third year of a 19 year production run.

Less noteworthy in 1911, but of great importance to those of us involved with blueberries, was an article in the February issue of National Geographic Magazine. The title was “Taming the Wild Blueberry” and the author was Frederick Vernon Coville. Here in a publication circulated throughout the world was the information required for growing and improving blueberries.

“Taming the Wild Blueberry” was based on the U.S. Department of Agriculture’s scientific publication, Experiments in Blueberry Culture, Bulletin 193, published on November 15, 1910. Prior to these studies, most attempts to move blueberry plants from the wild and maintain them in managed culture had been unsuccessful. In the short span of time from 1906 to 1910, he determined that blueberries: required a moist but not wet soil with low pH, had a low nutrient requirement, and required winter chilling. He developed propagation procedures by cuttings, grafting and budding. In 1909 he recognized that self-sterility could be an issue after few seeds and no plants resulted from selfing ‘Brooks’ an outstanding wild plant found near Greenfield, N.H. This was the first attempt to improve blueberries through controlled crosses. Elizabeth C. White, a commercial cranberry grower in Whitesbog, N.J., contacted Dr. Coville after reading Experiments in Blueberry Culture and offered encouragement and assistance. Cooperation in selecting wild breeding material, growing of seedlings and cultivar selection continued for the next 26 years. ‘Pioneer’ in 1920, was the first cultivar released from their breeding effort, however, ‘Rubel’, a selection from the wild that is still grown today, was found in 1912. A total of 15 cultivars were released before Coville’s death in 1937. Another 14 of his
crosses were released after his death. These 29 cultivars still accounted for 75% of the commercial U.S. acreage in 1992.

This early cultural work and variety development provided the basis for commercial plantings in New Jersey. Interest spread to other states, with the first planting in Michigan in 1924, North Carolina in 1928 and Washington in the 1930s. By 1949 there were 2674 acres in New Jersey, 1731 acres in Michigan, 568 acres in North Carolina and 207 acres in Washington, according to the U.S. Bureau of Census.

**Blueberry Domestication.** Most of the important fruits of the world have been cultivated for hundreds if not thousands of years. DeCandolle (1964) traces grape cultivation in Egypt for more than 4,000 years. Only occasionally can a person’s name be associated with the original domestication. Strawberries are one of the few examples. Strawberries from the wild were grown in French gardens as early as 1324 according to Hyams (1953). Domestication began in 1715 when the French Naval Officer, Frezier, took *Fragaria chiloensis* Duch. Plants from Chile back to France. There the botanist Duchesne successfully made the cross with *F. virginiana* Duch. that led to the modern, large-fruited cultivated strawberry.

Dates and a name are much easier to document for highbush blueberry domestication. The date was 1906 and the name was Frederick Vernon Coville, born March 23, 1867 at Preston, N.Y. He attended Oxford Academy in Oxford, N.Y. and went on to Cornell University were he was described as the leading scholar in his class and also its leading athlete. Baseball remained a lifelong interest. Graduation from Cornell was in 1887. (Brown and Palmer, 1967). On the 100th anniversary of his birth, Brown and Palmer (1967) go on to describe Coville in the years leading up to and concurrent with the blueberry studies: In 1988 he entered the Department of
Agriculture and became the botanist on the Geological Survey of Arkansas. *A List of the Plants of Arkansas*, accepted as a standard work to this day, was published by Coville and John C. Branner in 1891. Also in 1891, he accompanied the Death Valley expedition as the botanist. As a result, there was published in 1893, *Botany of the Death Valley Expedition*, described as one of the classic studies of desert vegetation. Other investigations in the far west included useful plants of the American Indians, and grazing management. Grazing-management policies of the Forest Service became, in large measure, the outcome of these investigations. He was credited with the efforts that lead the Carnegie Institution to establish its Desert Botanical Laboratory at Tucson, Ariz. in 1903. Collaboration with Lester F. Ward brought about the National Herbarium in 1894 that combined the collections of the Department of Agriculture and the Smithsonian Institution. Coville was appointed the first curator and continued in the post until his death. In collaboration with Frederick Law Olmsted and H.P. Kelsey he edited *Standardized Plant Names*, the indispensable text that assigned English names to plants previously known only in Latin or Greek.

The National Arboretum will probably be Frederick V. Coville’s most remembered accomplishment. Both George Washington and city designer, Pierre L’Enfant, had envisioned such an institution, but by 1897 only a few small gardens and some plantings in the Mall and on Capitol Hill had materialized. The need was recognized for a scientific institution that might be likened to Kew Gardens in England, with research and educational capabilities, a herbarium, botanical library and photographic files. Disputes over location and jurisdiction and by lethargy in high places, had kept such an institution from being established. Coville’s fellow botanists and scientists gave their blessings for him to attempt to overcome the impasses. Brown and Palmer (1967), describe the effort in these words: “Launching the undertaking proved a task
formidable enough and consumed more than 30 years of unremitting effort, punctuated with recurring setbacks and disappointments.” After enlisting sponsors, convincing Congress, examining hundreds of acres of land on foot, arranging soil surveys and eventually drafting the legislation, the enabling Act was passed in 1927. In 1929 he became the unsalaried acting director.

The National Geographic Society was a life-long interest. He served on the Board of Directors for at least six years before becoming chairman of the Research Committee in 1920, a position he maintained until his death. Close ties were established with Gilbert Hovey Grosvenor, who was director of the National Geographic Society from 1899 to 1919 and president from 1920 to 1954. In addition, Grosvenor was editor-in-chief of National Geographic Magazine from 1903 to 1954. Coville is pictured with Grosvenor, President Theodore Roosevelt and Admiral Robert E. Peary, the arctic explorer, in National Geographic Magazine, October 1963, page 542. This issue commemorated the 75th anniversary of the magazine. The picture was taken during a dinner in 1914 to honor Roosevelt before his National Geographic lecture about South American explorations. Interesting genealogy is associated with the Coville and Grosvenor families. Gilbert Grosvenor’s wife, Elsie May Bell Grosvenor, was the daughter of inventor Alexander Graham Bell. Frederick Coville’s son, Cabot, married Lilian Waters Grosvenor, daughter of Gilbert and Elsie May. The children of Cabot Coville, Gilbert Grosvenor Coville, born 1928, and Cabot Coville, Jr., born 1932, have Alexander Graham Bell as a great-grandfather and Fredrick V. Coville as a grandfather.

Many honors were bestowed on Frederick V. Coville, but among the most important were the honorary degree of Doctor of Science conferred by George Washington University in 1921, Fellow of the American Association for the Advancement of Science and the George
Robert White Medal of Honor from the Massachusetts Horticultural Society for his outstanding work with blueberries.

**Blueberry Studies by Coincidence.** Coville was worried that his four children, (Stanley 11, Katherine 9, Cabot 3, Fredrick 1) growing up in Washington D.C. would never learn the rural skills that he had acquired in his childhood in central New York state (Swain, 2006). A geologist friend in Washington, Arthur Keith, told him about a farm for sale in Greenfield, New Hampshire. He bought 40 acres, and an abandoned house and barn for $400 on May 2, 1905. Blueberries, both highbush and lowbush, flourished in the fields no longer grazed by cattle around Greenfield. The highbush were picked by hand or shaken and the lowbush raked for sale in Boston and local cities. Hand-picked berries averaged about $0.11/quart and raked or shaken $0.02/quart. In 1906, less than a year after coming to Greenfield, his interest was attracted to the subject of blueberry culture. He began looking at the diverse blueberry plants in the area. Convinced that it should be possible to cultivate blueberries instead of simply harvesting wild ones, Coville arranged for George W. Oliver, a colleague at the Bureau of Plant Industry, to germinate some blueberry seed in the fall of 1906. This was Coville’s first experiment with blueberries.

**Blueberry Cultural Requirements.** A popular idea that blueberries could not be transplanted or cultivated existed when the studies were begun in 1906). Experiment stations in Maine, Rhode Island, New York and Michigan had attempted to grow the blueberry as a fruit but none had been commercially successful. However, blueberries from the wild were sold on the Boston market. Shipments began in early June from North Carolina, followed later in the month from Pennsylvania, New Jersey and New York. In late June or early July they came from
Massachusetts and New Hampshire, followed by Maine, Nova Scotia and New Brunswick in August and September. If the berries were hand picked the quality was generally good. Coville (1910) noted “The blueberry withstands the rough treatment incident to shipment so much better than most other berries that with proper handling it should always reach the market in first-class condition.” The owners of land with blueberry plants commonly paid pickers two-thirds of the price they received from the sales. If the berries were harvested with rakes, which reduced the harvest cost about 75 per cent compared with hand harvest, the fruit was often partially crushed, and the berries covered with soured juice. He did not consider raked lowbush blueberries suitable for sales on the fresh market. Records from a shipper in southern N.H. indicated that prices and demand for his hand-picked, wild highbush blueberries were good.

Coville’s interest was sufficiently attracted to the economic potential that existed if larger berries could be produced, that could be harvested more rapidly from bushes growing in a cultivated plantation. To that end, in the fall of 1906 he began testing methods for germinating seed in cooperation with Mr. George W. Oliver, of the Bureau of Plant Industry. The method developed was to remove the seeds from fully matured and slightly fermented berries, sow them in a shallow wooden flat with fibrous kalmia peat on the bottom to insure good drainage and cover them with a germinating medium of peat, sand and a small amount of loam soil. Germination of seeds sown in August occurred in about five weeks and with proper handling in the greenhouse, robust plants were produced by the beginning of summer. Plants from these experiments were used for determining the soil requirements for growing blueberries.

One of the very definitive soil studies was begun on December 22, 1908. Rose cuttings, alfalfa seeds and blueberry seedlings were planted in a rich garden soil or a peaty soil taken from a location where wild blueberries were thriving. Both the roses and alfalfa grew
poorly in the peat while the blueberries grew well. In the rich garden soil, the roses and alfalfa
grew well while the blueberries barely remained alive. The results of this experiment seem so
incredibly obvious based on the present understanding of the requirements of acid-loving plants.
However, horticultural literature of the day made no mention of certain plants requiring an acid
soil. The assumption seemed to have been that all plants would produce maximum growth and be
most healthy when planted in a well-limed, rich, garden-type soil. The pH meters we take for
granted and use so routinely for selecting soils suitable for blueberries had not been developed.
Coville first tried litmus paper to measure acidity, but found phenolphthalein indicator the most
satisfactory for the weak acids of the blueberry soils. The findings that blueberries required an
acid soil and finding a means to accurately measure soil acidity were key to blueberry
domestication. Additional studies provided much detailed and practical information about soils
properties, nutrient requirements, and root characteristics. Blueberries did not thrive on a heavy
clay soil. Aeration conditions satisfactory for blueberries were found in both sandy soils and
soils consisting of drained fibrous peat, while soils that often became saturated with water were
not satisfactory. Heavily manured soil, favorable to many plants were detrimental to blueberries,
but occasional small amounts of liquid from a manure pit during the growing season were
beneficial. Blueberry roots were found not to have root hairs. Healthy roots were found to be
inhabited by a fungus known as endo-tropic mycorrhiza. He speculated that the mycorrhiza was
involved with nitrogen nutrition since available nitrogen levels were very low in the soils
favorable for blueberries.

Propagation tests went from the initial seed germination in 1906 to successful increases
of desirable plants by grafting, budding, division, layering, twig cuttings, and root cuttings.
Additional recommendations for propagation were published in 1920 (Coville, 1920). Also by
1910, the cycle of flower bud formation and flowering had been determined. The need for a winter chilling period for normal leafing and flowering in the spring was determined. Flower conformation was observed to almost completely prevent self-pollination and the need for insect pollination was recognized.

The first field trial was made in early July of 1908 near Greenfield, N.H. from plants grown from seed in the fall of 1907. Drought followed the planting but 97 per cent survived and 7 per cent flowered in 1909. In 1910, 70 per cent flowered. Thus by 1910, Coville’s goal of being able to asexually propagate blueberries and grow them in a cultivated plantation was almost certain. The remaining step at this point was larger berries.

**In Search of Bigger Berries.** The first wild blueberry for breeding purposes was selected in July of 1908 in a pasture near Greenfield, N.H. The Coville family spent summers near Greenfield after buying the farm in 1905. Coville began casually observing the native blueberries in the area in 1905, but a diligent search was undertaken in the summer of 1908 (Coville, 1937). In July, the first bush was found on the farm of Fred Brooks, near the Coville Farm. The selection was aptly named ‘Brooks’. Many berries on the bush were more than 1.27cm (1/2 in.) diameter, unusually light blue, firm, juicy, exceptionally flavorful with a good balance between sugars and acids. Yield on the bush that season was about 2840cc (3qt.). Coville (1937) said the following about the selection of ‘Brooks’: “I regard its selections of fundamental importance to the success of the Department’s blueberry-breeding experiments. Every breeder of race horses or of milk cows understands that the choosing of the individuals to be interbred is of the highest importance. Plant breeders usually select carefully the species they intend to interbreed, but often make the mistake of paying too little attention to the choice of
superior individual plants within the species.”

The first attempt at controlled breeding to improve the wild highbush blueberry was undertaken in 1909 with the self-pollination of flowers from ‘Brooks’. This technique, that had proven so successful with field crops such as corn and beans, produced no viable seeds. The pollinations were repeated with similar negative results in 1910. This was the first indication of self-sterility that is common in *Vaccinium* species.

Failures also often occurred when crosses were attempted among species of similar size and habit. An example was the highbush blueberry, *Vaccinium corymbosum* L. and bigbush blueberry, *V. atrococcum* (A. Gray) Heller. These resembled each other so closely that Asa Gray considered one a variety of the other. Cytological studies later showed highbush blueberries to have 48 chromosomes and bigbush to have 24 (Coville, 1927). After many attempts at crosses of diverse *Vaccinium* species and plant habits, Coville concluded that species of the most diverse appearance and characteristics, but with the same number of chromosomes, hybridize readily.

The second wild blueberry selected for breeding purposes also came from near Greenfield, N.H. Named ‘Russell’, for Frank Russell who described it as the best lowbush blueberry on his farm. Selected in 1909, ‘Russell’ berries reached a diameter of 1.43cm (9/16 in.), were light blue and most importantly, ripened earlier than ‘Brooks’. Coville recognized that the earlier berries brought the higher prices. The first crosses between ‘Brooks’ and ‘Russell’ were made in the spring of 1911. Plants resulting from this cross were cross-pollinated with each other in 1913. About 3,000 hybrids of the first and second generations were grown to maturity in the field, with remarkable results. A wide range of many traits were expressed in the seedlings.

Elizabeth C. White, the daughter of a cranberry grower near New Lisbon, N.J., read
Coville’s 1910 publication, *Experiments in Blueberry Culture*. She was extremely fascinated by the possibility of growing blueberries in a plantation. She offered land and cooperation to Coville’s blueberry improvement projects. Her offer was readily accepted and many seedlings were tested in this ideal blueberry environment. Of equal or greater importance was the help she and the pickers of wild berries provided in finding outstanding wild selections. Pickers were given a “blueberry gage” that consisted of a plate with a hole 5/8 inches in diameter. Pictures of White and Coville show them using a gauge with holes ranging from 0.7cm (0.28 in.) to 2.5cm (1.0 in.). Pickers were asked to mark bushes that had large berries based on the gage measurement. Elizabeth White or Coville might have been taken to see the bush with large berries but usually the berry size was verified by samples the pickers saved in a bottle of formalin solution and the bush was transplanted to Whitesbog in the dormant season. ‘Sooy’, named for Ezekiel Sooy in 1911 was the first New Jersey selection. Crosses with ‘Brooks’ in 1912 provided some of the best hybrids and included the cultivars Pioneer and Katharine. ‘Rubel’, named for Rube Leek was selected in 1912, became a cultivar that is still grown today in addition to being used as a breeding parent. ‘Grover’, named for Russell Grover and ‘Chatsworth’ named for the town of Chatsworth were other important breeding parents. The cross of ‘Rubel’ by ‘Grover’ in 1916, gave ‘Jersey’, released as a cultivar in 1928 and still a major cultivar grown today. The last Coville release was ‘Dixi’ in 1936. Dixi, the Latin word meaning, I have spoken, or I am through, was to punctuate his retirement at the end of 1936. However, in addition to the 15 cultivars he released, an additional 14 of his seedlings were released after his retirement at the end of 1936 and untimely death on January 9, 1937 (Table 1.). His second objective, to develop blueberries that were large and could be rapidly harvested by hand was certainly met. The size was obtained with constant vigilance to maintaining excellent
flavor and other horticultural characteristics.

Table 1. Cultivars released by F.V. Coville and his crosses that were released as cultivars after his death in 1937

<table>
<thead>
<tr>
<th>Cultivars released</th>
<th>Year</th>
<th>After1937</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rubel</td>
<td>Z</td>
<td>Angola</td>
<td>1951</td>
</tr>
<tr>
<td>Pioneer</td>
<td>1920</td>
<td>Atlantic</td>
<td>1939</td>
</tr>
<tr>
<td>Katharine</td>
<td>1920</td>
<td>Berkeley</td>
<td>1949</td>
</tr>
<tr>
<td>Greenfield</td>
<td>1926</td>
<td>Bluecrop</td>
<td>1952</td>
</tr>
<tr>
<td>Rancoeas</td>
<td>1926</td>
<td>Blueray</td>
<td>1955</td>
</tr>
<tr>
<td>Jersey</td>
<td>1928</td>
<td>Burlington</td>
<td>1939</td>
</tr>
<tr>
<td>Concord</td>
<td>1928</td>
<td>Collins</td>
<td>1959</td>
</tr>
<tr>
<td>June</td>
<td>1930</td>
<td>Coville</td>
<td>1949</td>
</tr>
<tr>
<td>Stanley</td>
<td>1930</td>
<td>Croatan</td>
<td>1954</td>
</tr>
<tr>
<td>Scammell</td>
<td>1931</td>
<td>Earlblue</td>
<td>1952</td>
</tr>
<tr>
<td>Redskin</td>
<td>1932</td>
<td>Ivanhoe</td>
<td>1951</td>
</tr>
<tr>
<td>Catawba</td>
<td>1932</td>
<td>Murphy</td>
<td>1950</td>
</tr>
<tr>
<td>Wareham</td>
<td>1936</td>
<td>Pemberton</td>
<td>1939</td>
</tr>
<tr>
<td>Weymouth</td>
<td>1936</td>
<td>Wolcott</td>
<td>1950</td>
</tr>
<tr>
<td>Dixi</td>
<td>1936</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Rubel was selected from the wild in 1912.

The value of Dr. Coville’s contribution to understanding the cultural requirements of blueberries can not be measured, but we can estimate the value of fruit from bushes he bred. In 1992 Dr. James N. Moore of the University of Arkansas and one of the distinguished blueberry breeders with the United States Department of Agriculture that followed Dr. Coville surveyed the blueberry cultivars being grown in the United States (Moore, 1993). The cultivars released or seedlings he produced that were released later are shown in their order of planted acreage (Table 2.). No less than 75 per cent of the acreage and undoubtedly a higher percentage of the production came from Coville’s cultivars or seedlings.

A Billion Dollars Worth of Blueberries. In 1992, 81,000 mt (180,000,000 lbs.) of
highbush blueberries were produced and sold from production in the United States. The Coville portion of 75 per cent was 61,000 mt (135,000,000 lbs.). At the 1992 price of $0.95/kg ($0.43/lb) the value of Coville’s portion was $58,000,000. During the 10 year period, 1983-1992, highbush production was 636,000 mt (1,400,000,000 lbs.) with a conservative 75 per cent attributed to Coville’s plants the value at $0.95/kg ($0.43/lb) was $451,000,000 (Mainland, 2001). If the years before 1983 and the years after 1992 were included along with plants grown abroad, the value would undoubtedly exceed one billion dollars.

Dr. Coville’s success with domesticating the highbush blueberry and providing the basis for a major fruit industry can only be described as incredible. It is even more incredible to consider that he was a major force in establishing the National Arboretum in Washington, and was Chairman of the National Geographic Society during this same period.

Table 2. Ranking by planted hectares in the United States in 1992 of cultivars released by F.V. Coville and his seedlings that were released after his death in 1937. Figures from Moore (1993).

<table>
<thead>
<tr>
<th>Ranking acreage</th>
<th>Cultivar</th>
<th>Hectares</th>
<th>(Acres)</th>
<th>Percentage of U.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Bluecrop</td>
<td>6173</td>
<td>15,253</td>
<td>35</td>
</tr>
<tr>
<td>2.</td>
<td>Jersey</td>
<td>3030</td>
<td>7,487</td>
<td>17</td>
</tr>
<tr>
<td>3.</td>
<td>Weymouth</td>
<td>996</td>
<td>2,461</td>
<td>6</td>
</tr>
<tr>
<td>4.</td>
<td>Croatan</td>
<td>948</td>
<td>2,342</td>
<td>5</td>
</tr>
<tr>
<td>5.</td>
<td>Blueray</td>
<td>740</td>
<td>1,829</td>
<td>4</td>
</tr>
<tr>
<td>7.</td>
<td>Rubel</td>
<td>551</td>
<td>1,362</td>
<td>3</td>
</tr>
<tr>
<td>8.</td>
<td>Berkeley</td>
<td>420</td>
<td>1,038</td>
<td>2</td>
</tr>
<tr>
<td>11.</td>
<td>Earlblue</td>
<td>189</td>
<td>467</td>
<td>1</td>
</tr>
<tr>
<td>14.</td>
<td>Collins</td>
<td>106</td>
<td>262</td>
<td>1</td>
</tr>
<tr>
<td>15.</td>
<td>Murphy</td>
<td>95</td>
<td>235</td>
<td>0.5</td>
</tr>
<tr>
<td>16.</td>
<td>Coville</td>
<td>85</td>
<td>210</td>
<td>0.5</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>13,333</td>
<td>32,945</td>
<td>75%</td>
</tr>
</tbody>
</table>

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Frederick Vernon Coville (1867-1937)
Charles M. “Mike” Mainland, NC State University (left), Joseph Darlington, grand nephew of Elizabeth White (2nd from left), Frederick V. “Rick” Coville, grandson of Dr. Frederick Coville (3rd from left) and Mark Ehlenfeldt, USDA Blueberry Breeder and Whitesbog Preservation Trust, Director, (right). Picture June 26, 2014 during Whitesbog tour by North American Blueberry Research and Extension Workers (NABREW).