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The Genus *Vaccinium* L. (Ericaceae) in Virginia

LEONARD J. UTTAL

ABSTRACT

Fifteen species of *Vaccinium* L. (Ericaceae) are reported as native to Virginia. These are treated floristically and taxonomically. Instead of a single highbush species, *Vaccinium corymbosum*, five are proposed. Hybrids are discussed. Keys to sections and species are provided. Distribution for each species and one hybrid by counties within the state is shown on maps.

INTRODUCTION

The genesis of this study lies in a disagreement I have with Vander Kloet (1980) who holds that there is but a single highly variable species of highbush blueberry, *Vaccinium corymbosum* L. Authors, such as Duncan & Kartesz (1981), Wunderlin (1982), Crovello, Keller, and Kartesz (1983), and Clewell (1985) have adapted this concept with alacrity. Suddenly a very difficult genus has become easy! My experience, however, agrees with that of Ward (1974), page 192, that "the genus *Vaccinium* . . . is difficult but not in any way an irresolvable tangle of intergrading populations. The vast bulk of individuals encountered in the field may be assigned . . . to discrete, and wholly recognizable species."

To be sure, in the wake of habitat disturbance, noted even in the 18th century by P. Kalm (Benson 1937), hybridization in the section *Cyanococcus* Gray, is rife, and causes identification difficulties. Given reasonably undisturbed areas, however, hybrids have not wiped out parents, and to lump the parents together creates an "artenkreis," which is not a taxonomic category. The biology of a single highbush species becomes a catch-all which may as well include the lowbush species, as highbush and lowbush species hybridize frequently enough (Camp 1945). In the southeastern United States, there is a glanduliferous species with sweet black fruit, *Vaccinium virgatum* Ait. (*V. amoenum* Ait., *V. ashei* Reade), the "Rabbit-eye," which bridges the gap between lowbush and highbush taxa, related to *V. tenellum* Ait. I do not think *V. virgatum* has any place in the synonymy of *V. corymbosum*, where it is placed by Vander Kloet (1980).

To study the *Vaccinium* problem in eastern North America, Virginia is a good place in which to begin because it has the most species of the genus, fifteen, within its borders, more than any other North American state or province. Several species reach northern or southern range limits inside Virginia.

To avoid a provincial outlook, opportunities were taken to collect from Gaspé to Minnesota and south to Florida. It has been very illuminating to

compare plants of commercial blueberry plantations and managed wild populations with their natural forebears in various places.

Over 1500 specimens of Virginia *Vaccinium* were studied and annotated during this work.

TAXONOMIC TREATMENT

Vaccinium in Virginia

Dwarf stoloniferous shrubs to clump-rooted arborescent shrubs and creeping vines; leaves alternate, deciduous, deciduous-persistent, or evergreen, entire, serrate, or serrulate; flowers solitary, racemose, or paniculate, axillary or terminal; calyx 4-5 lobed, lobes spreading or appressed, attached to a hypanthium; corolla tubular, campanulate, or ovate, with 4-5 narrowly or widely spreading lobes; stamens 8 or 10, included or exserted, filaments hairy, anthers two-celled, awned or awnless, opening through a terminal pore; style slender, exceeding the stamens; fruit a few- to many-seeded, usually edible berry, red, blue, or black when ripe, or sometimes greenish, yellowish, or purple, often glaucous, 4-5 celled, sometimes appearing 8- or 10-celled by false partition. Six sections in Virginia, after Sleumer (1941), comprising fifteen species.

KEY TO THE SECTIONS OF *VACCINIUM* IN VIRGINIA

- a. Anthers awned
 - b. Stamens exserted 1. Sect. *Polycodium* (Raf.) Rehder
Type species *V. stamineum* L.
 - b. Stamens included 2. Sect. *Batodendron* (Nutt.) A. Gray
Types species *V. arboreum* Marsh.
- a. Anthers awnless
 - c. Creeping evergreen vines
 - d. Flowers 4-merous, berries red 3. Sect. *Oxycoccus* (Hill) Koch
Type species *V. oxycoccus* L.
 - d. Flowers 5-merous, berries black 4. Sect. *Herpothamnus* (Small) Sleumer
Type species *V. crassifolium* H. C. Andrews
 - c. Upright deciduous or deciduous-persistent shrubs
 - e. Flowers 4-merous 5. Sect. *Oxycoccoides* Hook. f.
Type species *V. erythrocarpum* Michx.
 - e. Flowers 5-merous 6. Sect. *Cyanococcus* A. Gray
Type species *V. corymbosum* L.

1. Sect. *Polycodium*

Upright irregularly branched shrubs with deciduous, dull membranaceous leaves; twigs not verrucose; flowers 5-merous, in leafy-bracted panicles; hypanthium continuous with pedicel; corolla open in bud, campanulate, deeply lobed; anthers awned, exserted; berry mostly astringent, rarely sweet, greenish, yellowish, or pale blue to purple, often glaucous. DEERBERRIES, SQUAW-HUCKLEBERRY. Eastern North America, Mexico. One or two species, one in Virginia, *Vaccinium stamineum* L.

2. Sect. *Batodendron*

Upright medium to arborescent shrubs with deciduous-persistent leaves, nitid on upper surface; flowers 5-merous, in leafy bracted panicles; hypanthium articulate with pedicel; corolla closed in bud, campanulate, shallowly lobed, anthers awned, included; berry inedible, shiny black. FARKLEBERRIES. Southeastern United States, western West Indies, Mexico. Three species, one in Virginia, *Vaccinium arboreum* Marsh.

3. Sect. *Oxycoccus*

Slender trailing evergreen hydrophilous vines; flowers 4-merous, axillary or pseudoterminal, 1-4 in short racemes, terminating long, slender, 2-bracted pedicels; hypanthium articulate with pedicel; corolla divided nearly to base, the lobes strongly reflexed; anthers connate, unawned, exposed; berry red, sour, many-seeded. CRANBERRIES. Circumboreal. Three species, one in Virginia, *Vaccinium macrocarpon* Ait.

4. Sect. *Herpothamnus*

Slender trailing evergreen vines to ascending low shrubs; flowers 5-merous, in scaly-bracted short racemes, axillary or rarely terminal; hypanthium articulate with pedicel; calyx-lobes wide, acute; corolla depressed-urceolate with short lobes; anthers unawned, included; berry shiny black, sweet. CREEPING-BLUEBERRIES. Southeastern United States. Two species, one in Virginia, *Vaccinium crassifolium* H.C. Andrews.

5. Sect. *Oxycoccoides*

Deciduous low to medium shrubs with non-verrucose branches; leaves reticulate, ciliate, membranaceous; flowers 4-merous, solitary-axillary, dangling on ebracteate slender pedicels; hypanthium continuous with pedicel; calyx-lobes deltate, often ciliate; corolla deeply divided, the lobes slender and reflexed; anthers exposed, not connate, unawned; berry red, insipid (sometimes sweet and black in nearby West Virginia). BEARBERRIES, MOUNTAIN-CRANBERRY. Southern Appalachians of North America, east Asia. Two species, one in Virginia, *Vaccinium erythrocarpum* Michx.

6. Sect. *Cyanococcus*

Deciduous to persistent-leaved shrubs, with verrucose twigs, low, diffuse, and stoloniferous to high, crown-forming, and clump-rooted; leaves subcoriaceous to membranaceous, entire, serrate, or serrulate, glabrous or pubescent, sometimes glanduliferous; flowers 5-merous, in compact racemes, the short pedicel scaly-bracted; hypanthium articulate with pedicel, calyx lobes persistent; corolla tubular, urceolate, or ovoid, with short recurved lobes; anthers unawned, included; berry blue, often glaucous, to purple or black, shining or dull. The true American BLUEBERRIES of field and commerce. Atlantic drainage of North America. Sixteen species, ten in Virginia: *Vaccinium angustifolium* Ait., *V. caesariense* Mackenz., *V. corymbosum* L., *V. elliotii* Chapm., *V. formosum* H.C. Andrews, *V. fuscatum* Ait., *V. myrtilloides* Michx., *V. pallidum* Ait., *V. simulatum* Small, *V. tenellum* Ait.

KEY TO VACCINIUM OF VIRGINIA

- a. Young twigs verrucose
 - b. Shrubs 1 m or less high, of indefinite form
 - c. Leaves with stipitate glands on lower leaf surface 1. *V. tenellum* Ait.
 - c. Leaves without stipitate glands
 - d. Leaves shiny bright green on lower surface
 - e. Leaves entire 2. *V. myrtilloides* Michx.
 - e. Leaves serrate 3. *V. angustifolium* Ait.
 - d. Leaves dull green to glaucous on lower surface, not shiny 4. *V. pallidum* Ait.
 - b. Shrubs 1-4 m, crown forming or round-arborescent
 - f. Leaves 0.7-3.5 cm long, numerous and box-like 5. *V. elliotii* Chapm.
 - f. Leaves 3-10 cm long, fewer, not box-like
 - g. Young twigs circumferentially pubescent (puberulent)

- h. Leaves dark green, darkening on drying; twig and leaf hairs dingy; twigs and bud scales brown-green to black, corolla precocious, apically narrowed; berry black, insipid 6. *V. fuscatum* Ait.
- h. Leaves medium to pale green, not darkening on drying; twig and leaf hairs whitish; twigs green; bud scales flesh-color to red; corolla coetaneous, cylindrical; berry blue, palatable 7. *V. corymbosum* L.
- h. Leaves glaucous to dark green, not darkening on drying, often with red veins on under surface; twig and leaf hairs dark to white; twigs glaucous to brown, often red; corolla various; berry blue or black; a hybrid between *V. formosum* and *V. fuscatum* *V. x marianum* Wats.*
- g. Young twigs glabrous or pubescent (puberulent) in two lines
 - i. Twigs and leaves strictly glabrous, or the latter sometimes ciliate
 - j. Leaves 4-10 cm long, 2.5-4.5 mm wide, widest below middle, eciliate
 - k. Leaf bud scales reddish with slender aristae 2-4 mm long; corollas cylindrical, 8-12 mm long, coetaneous; berry blue 8. *V. formosum* H.C. Andrews
 - k. Leaf bud scales brown to black, aristae 1-2 mm long; corollas cylindrical, 6-9 mm long; berries blue or black; a hybrid between *V. formosum* and *V. fuscatum* *V. x marianum* Wats.*
 - j. Leaves 1.5-3 cm wide, widest at middle or above, sometimes ciliate; leaf bud scale aristae \pm 1 mm long
 - l. Leaves 1.5-2 cm wide, eciliate; corolla tubular, 4-6 mm long 9. *V. caesariense* Mackenz.
- l. Leaves 2-3 cm wide, sometimes eciliate, but usually ciliate, at least basally, corolla campanulate, 5-8 mm long 7. *V. corymbosum* L.
- l. Leaves 2-3 cm wide; eciliate, often red-veined on undersurface; corolla cylindrical or narrowed apically, 6-9 mm long; a hybrid between *V. formosum* and *V. fuscatum* *V. x marianum* Wats.*
 - i. Young twigs pubescent (puberulent) in 2 lines, leaves \pm pubescent on lower surface, \pm ciliate
 - m. Leaves ovate-acuminate; twigs olive; berry shining purple-black 10. *V. simulatum* Small
 - m. Leaves elliptic to elliptic-obovate, acute to short-acuminate; twigs green; berry blue 7. *V. corymbosum* L.
 - m. Leaves ovate-acuminate; twigs glaucous, green or brown, often red; berry blue or black; a hybrid between *V. formosum* and *V. fuscatum* *V. x marianum* Wats.*
- a. Young twigs smooth or wrinkled but not verrucose
 - n. Upright deciduous shrubs
 - o. Leaves bristly-serrate and reticulate; berry red 11. *V. erythrocarpum* Michx.
 - o. Leaves entire, non-reticulate; ripe berry never red
 - p. Leaves shiny on upper face; stamens included, berry black 12. *V. arboreum* Marsh.
 - p. Leaves dull; stamens exserted; berry various but never black 13. *V. stamineum* L.
 - n. Trailing woody evergreen vines
- q. Plants of dry or wet sands; corolla 5-merous;
 - berry black, sweet 14. *V. crassifolium* H.C. Andrews
 - q. Plants of bogs and ponds; corolla 4-merous;
 - berry red, sour 15. *V. macrocarpon* Ait.

*In using this key, readers may be expected to trace some specimens ambivalently in the eastern part of the state to *Vaccinium formosum* and *V. fuscatum*; e.g., plants quite like the entirely glabrous *V. formosum* but which are more or less hairy, or like the pubescent *V. fuscatum* but glabrescent or even glabrous, and bearing either blue or black berries. Corollas will generally be cylindrical and from 6 to 9 mm long. Such plants are believed to represent hybrids and back crosses, mostly in disturbed sites, involving these two

species and seem to form a continuum between them. In most cases, such plants may be derived in the key in the four accesses to the hybrid *Vaccinium x marianum* above.

Because this hybrid forms a continuum between the parent species (which I find disparate and not wiped out by hybridization in undisturbed sites) some botanists do not care to separate the parent species and lump them under a single species concept, *Vaccinium corymbosum*. None of these plants relate to the lectotype of *V. corymbosum* designated by Vander Kloet (1980), and which is from New Jersey (Uttal 1986c). Furthermore, with all its diversity, *Vaccinium corymbosum sensu strictu*, from north of the glacial limits, is quite a different plant from our Coastal Plain elements. It occurs locally as a post-glacial relict in the southern Appalachians.

Putative hybrid swarms involving *Vaccinium formosum* and *V. fuscatum* sprout frequently on roadside clearings adjacent to native woods and swamps in eastern Virginia. Vigorous young plants take on a roundish form with strongly ascending branches and leaves, and can cause serious problems in identification. Because such plants tend to grow in the sun, the veins on the undersurface of the leaves and the twigs are often reddish. This is often a useful clue to their determination.

This hybrid has received its name because the type plate of *Vaccinium marianum* Watson, Dendrol. Brit. pl. 124. 1824, matches some of these hybrids which may be called *Vaccinium x marianum* Watson *pro sp.* (*V. formosum x fuscatum*). See figure 1.

Other hybrid blueberries are not derived in the key because in Virginia they are not so frequent as the abundant *Vaccinium x marianum*, which is self-perpetuating, and because most encountered will be in the presence of parents and with experience, should not be difficult to determine. For exhaustive keys to blueberry hybrids, readers are referred to Camp (1945). Users of Camp's key should realize that the nomenclature of the devisor is now somewhat archaic, and may wish to make adaptations in concepts that reflect more current trends.

TAXONOMY

Synonymy is informal and is meant mostly to include those names found in manuals popularly used in Virginia, namely: Small (1933), Fernald (1950), Gleason (1952), Gleason and Cronquist (1963), Radford, Ahles and Bell (1968), Brown and Brown (1972), Strausbaugh and Core (1978), and the atlas of Harvill, Bradley, Stevens, Wieboldt, Ware and Ogle (1986). A few names not in these manuals are included where they seem of special significance. For complete formal synonymies, at least in sect. *Cyanococcus* with references, interested persons are referred to Vander Kloet (1978a, 1978b, 1980) Vander Kloet and Hall (1981), Camp (1945), and Uttal (1986b, 1986c). Nomenclature is essentially based upon that of Camp (1945), as modified partly by Ward (1974), Vander Kloet (1983), and Uttal (1986b, 1986c).

1. *Vaccinium tenellum* Ait., Hort. Kew. ed. 1. 2:12. 1789. Small Cluster Blueberry.

Cyanococcus tenellus (Ait.) Small

Colonial dwarf shrub, 1.5-4 dm high. Twigs green, verrucose, pubescent,



Figure 1. The type plate of *Vaccinium marianum* Wats. (photographed) superimposed on a specimen of *Vaccinium x marianum* Wats. *pro. sp.* Type plate photograph used with permission of Dumbarton Oaks Garden Library. Photograph by author.

virgate when young, diffusely branched later. Leaf bud scales reddish to blackish, minute (1-1.2 mm long), cuspidate but hardly aristate. Leaves deciduous, spatulate to narrowly elliptic, 2-3.5 cm long, 0.5-1.5 cm wide, in early part of season markedly ascending, the margin thickened, glandular serrate, the lower surface nitid silver-gray and beset with few to many black stipitate glands, pubescent mainly on the midvein or rarely glabrous, the apex acute and mucronate or rounded, the base long-cuneate, sessile. Corolla 4-6 mm long, narrowly urceolate, usually deep-pink tinged apically, in close overlapping scaly-bracted racemes, precocious (late March-early May). Berry shining black, dryish, 5-8 mm in diameter, insipid (June-July).

Southeastern Virginia to Mississippi and North Florida in sandy woodland borders, thin acid woods, pine barrens. Seemingly heliophilic, responds aggressively to fire and clearing and is often abundant on sandy roadbanks. Type locality "North America," probably South Carolina whence introduced to Kew by William Young, Jr. in 1772.

Diploid ($2n=24$). Hybridizes with *Vaccinium pallidum* in Prince George and Brunswick Counties, and doubtlessly elsewhere. Reported by Camp (1945) to hybridize with other diploids (*V. elliotii*, *V. fuscatum*, *V. caesariense*). Progeny may be expected in Virginia. The only species in Virginia with stipitate-glandular leaves, and thus unmistakable. Related to the "Rabbit-eyes" of the deep south, *V. virgatum*, some of which are quite palatable, commercially propagated and adaptable to Virginia gardens.

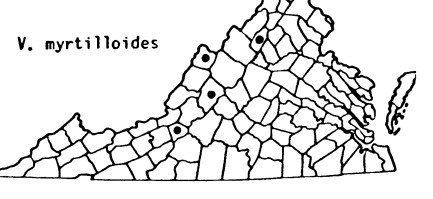
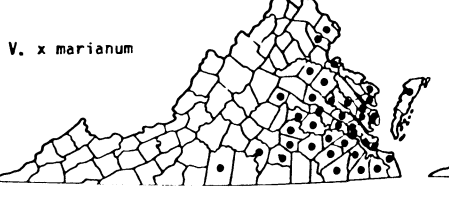
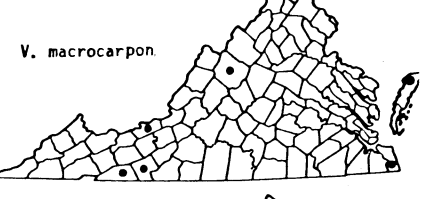
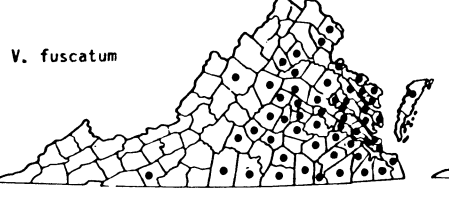
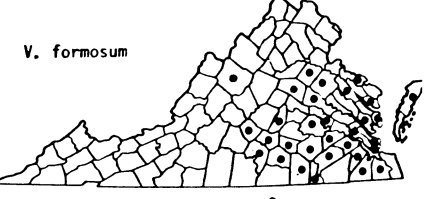
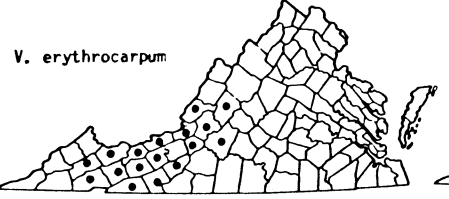
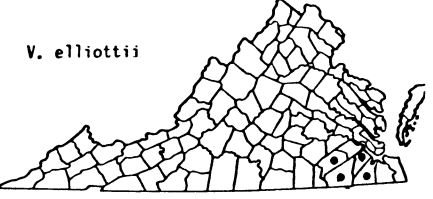
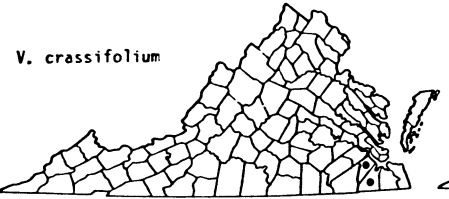
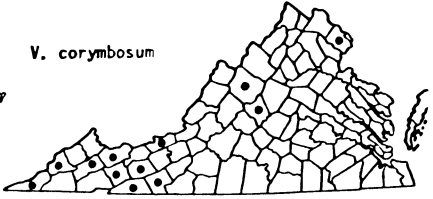
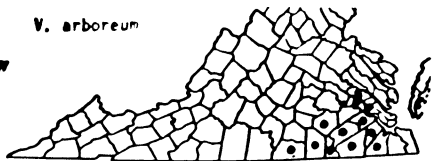
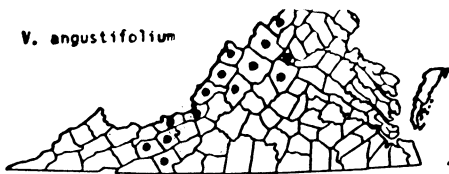
2. *Vaccinium myrtilloides* Michx., Fl. Bor. Am. 1:234. 1803. Velvet-leaf Blueberry; Sourtop.

V. angustifolium var. *integrifolium* Lepage

V. canadensis Rich.

Colonial dwarf shrub, 2-5 dm high. Twigs green, verrucose, circumferentially closely white-setaceous, or setaceous only in two lines, diffuse to ascending. Leaf bud scales blackish with conspicuous curved slender aristae 1.5-2 mm long. Leaves deciduous, elliptic to sublanceolate, 1.5-4 cm long, 0.75-1.5 cm wide, spreading; bright green on upper surface, paler and nitid on lower surface, densely white-setaceous or setaceous only on veins and margin, the margin entire, the apex acute and mucronate, the base cuneate, sessile to subpetiolate, the subpetiole setaceous. Corolla broadly cylindrical-campanulate, 4-5 mm long, white or pale pink-tinged, in short, scaly-bracted axillary racemes, coëtaneous (May-June). Berry bright frosty blue to dark blue, 4-8 mm in diameter, pleasantly acid to sweet (July-August).

The only transcontinental *Cyanococcus* species, characteristic of taiga bogs from the Northwest Territories and British Columbia to Montana east to Labrador, south to Virginia, where it is known from only four rocky-stony mountain tops in four counties at elevations in excess of 900 meters (see distribution maps). The Roanoke County station is the southernmost known in North America. As with most blueberries, this species bears best in the sun. On one mountain top in Highland County, there is a substantial thriving exposed colony in red sandstone chips which fruits well. About 0.3 kilometers down from this colony there is a small less vigorous and apparently barren



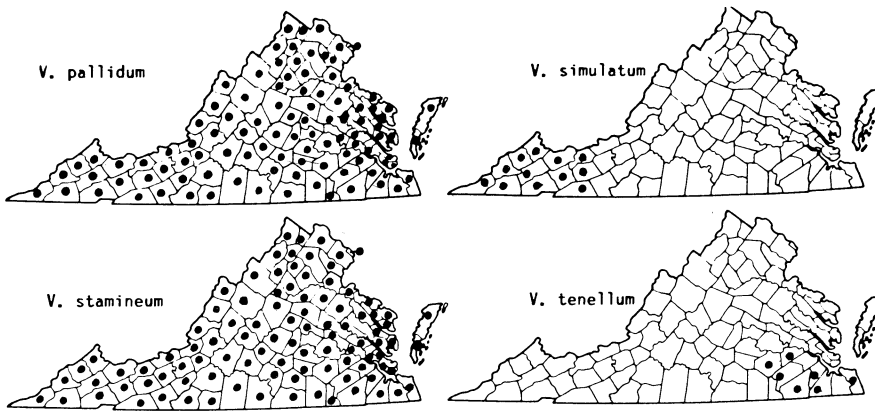


Figure 2. Distribution of *Vaccinium* species in Virginia by county.

satellite colony, perhaps spread by birds, shaded by *Kalmia latifolia* L. Type locality Lake Mistassin, Quebec, microfiche!

Diploid ($2n=24$). No hybrids reported from Virginia though it is capable of hybridizing with *Vaccinium pallidum* if it is near in the field, as it can be.

This species occurs in two intergrading races, the characteristic densely setose one, and a race which is hirsute only in two lines on the twigs and on the lower leaf face veins. The former tends to have the frosty blue acid fruit, the latter the dark blue sweet fruit. Both races occur in Virginia, and hitherto have been reported only in Quebec (Lepage 1951) and West Virginia (Uttal 1986a). For the biological and phenotypical disposition of the glabrescent race see Vander Kloet and Hall (1981).

All four Virginia specimens were misidentified by original collectors, three as *Vaccinium angustifolium*, which is superficially similar but always has serrate leaves, and one as a putative but improbable hybrid *V. angustifolium* x *myrtilloides*. If the plant has entire leaves which are shiny on the under face and grows on a rocky-stony mountain top, it can be no other than *Vaccinium myrtilloides*. It is probably inconceivable that the glabrescent race seems so local. I believe that search will prove there lie in herbaria many such specimens from many places which have been misidentified because the collectors were convinced that *Vaccinium myrtilloides* plants must always be densely hirsute, which, of course, is not true.

Vaccinium myrtilloides, characteristically a plant of taiga bogs, apparently satisfies its hydrophilic requirements on stony Virginia summits through frequent mists and downpours characteristic of such places.

3. *Vaccinium angustifolium* Ait., Hort. Kew. ed. 1. 2:11. 1789. Upland Lowbush Blueberry; Sugarberry.

Cyanococcus angustifolium (Ait.) Rydb.

V. angustifolium var. *hypolasium* Fern.

- V. angustifolium* var. *leavifolium* House
- V. angustifolium* var. *nigrum* (Wood) Dole
- V. brittonii* Porter ex Bickn.
- V. lamarckii* Camp
- V. pensylvanicum* Lam.

Colonial dwarf shrub, 1-6 dm high. Twigs green, verrucose, pubescent with incurved hairs in two lines, depressed-ascending. Leaf bud scales red-brown to black with non-slender aristae 0.75-1.5 mm long. Leaves deciduous, elliptic to narrowly ovate, 1-3.5 cm long, 0.6-1.5 cm wide, bright to deep green on the upper surface, nitid and paler on lower surface, the veins prominent, glabrous or more or less pubescent on lower surface veins, the margin serrate, often ciliate, the apex acute and mucronate, the base cuneate, sessile to subpetiolate, the subpetiolate glabrous to pubescent (morphotypes with glaucous twigs and leaves which occur in West Virginia (Uttal 1986a), have not been seen in Virginia). Corolla cylindric-urceolate, 4-6 mm long, white or pink-tinged, in short, scaly bracted axillary racemes, coëtaneous (May-June). Berry glaucous blue, dark blue, or, rarely, black, 4-11 mm in diameter, very sweet (July-August).

Newfoundland and Labrador to Manitoba and Minnesota to northern Illinois, Virginia and Delaware. Local in Virginia on stony mountain ridges and levels at elevations mostly over 900 meters, rarely as low as 700 meters. Rare in the Blue Ridge, apparently preferring the sandstone of the western ridges.

Tetraploid ($2n=48$). The largest population in Virginia seems to be that of the high levels of Salt Pond Mountain in the vicinity of the Mountain Lake Biological Station. It grows under a large population of the tetraploid high-bush blueberry *Vaccinium corymbosum sensu strictu* and forms frequent "half-high" hybrids with the latter. This hybrid has been formalized under the name *Vaccinium x atlanticum* Bicknell *pro sp.* by Rehder (1940), type locality Nantucket Island. In the north, this is one of the commonest hybrids in sect. *Cyanococcus*, but this Giles County site is almost certainly the southernmost place for it because the parent species are not known to occur together south of this station. Camp (1945) reports that *Vaccinium angustifolium* hybridizes with tetraploid *V. pallidum* on Salt Pond Mountain. This is possible, but if it occurs I have missed it. I have not seen tetraploid *V. pallidum* on Salt Pond Mountain, only typical diploid plants, which grow commonly with *V. angustifolium* and *V. corymbosum* with no evident hybrids. The hybrid discussed above is the only one involving *V. angustifolium* I have found in Virginia. Tetraploid *V. pallidum* and *V. angustifolium* both grow on Bald Mountain in Craig County, but seem to be sufficiently separated to forestall pollinator agents from foraging both together.

Vaccinium angustifolium is a highly polymorphic species without substantive morphological discontinuity between any taxa here subsumed, as demonstrated by Vander Kloet (1978a). Pubescence density seems to be intergradient and random. Plants from high, exposed habits have the brightest green and smallest leaves, lowest stature, and most compact root systems. Those from forested levels growing in dense shade have relatively deep green large leaves, are the tallest plants, and have the most rambling root systems

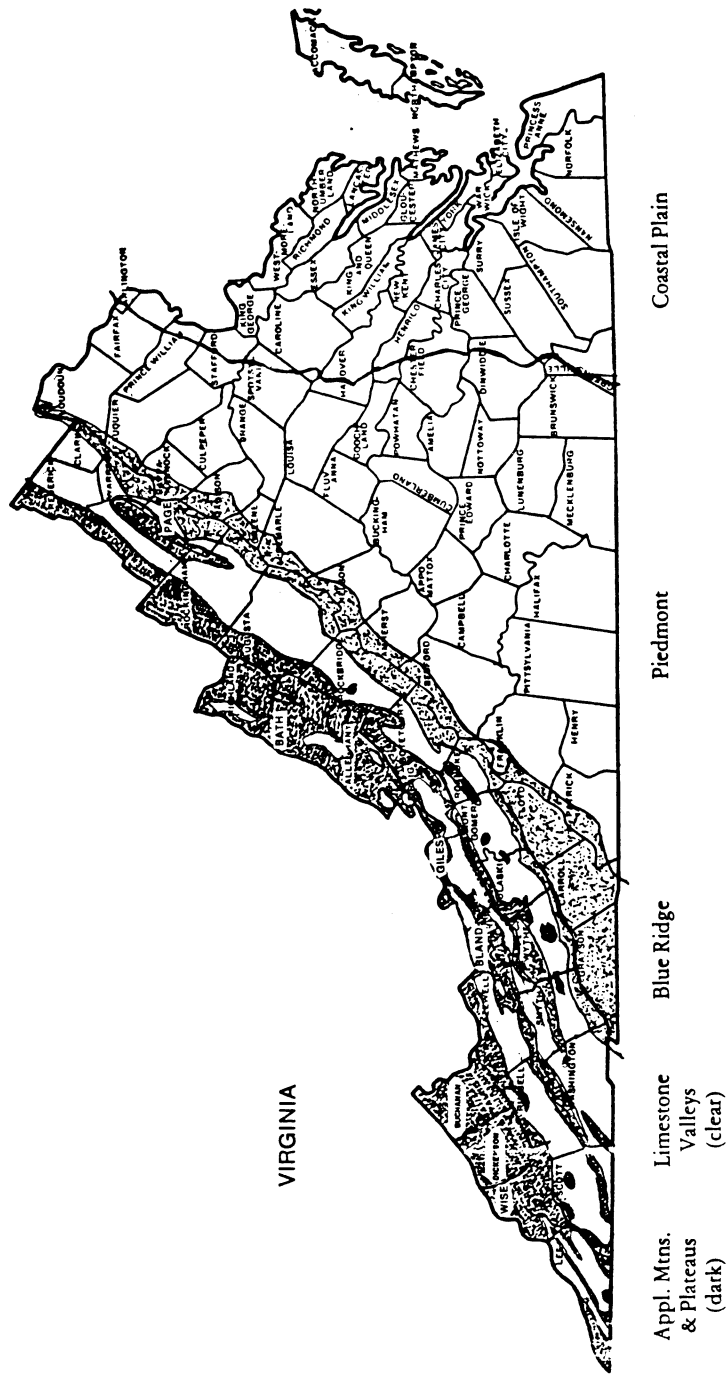


Figure 3. Base map of Virginia for county index and showing physiogeographic provinces for relationship to *Vaccinium* species distribution. A. M. Harvill, Jr., delin. Used with permission.

(*V. lamarckii*). These are regarded as environmentally induced differences, and, at any rate, are inconsistent. As with most blueberries, this species is most fruitful when exposed to the sun. Plants of mountain levels growing in dense shade hardly bear. Yet, if disturbed, as in clearings on the Biological Station property at Mountain Lake, the plants become thicker and more productive. This is the commercial lowbush blueberry of pies and muffins managed by burning heath-dominated rocky fields in Maine and similar northern areas.

Oddly, the very different *Vaccinium pallidum*, especially when it has serrate leaves, is often misidentified as *V. angustifolium*. The former never has a shiny lower leaf face, and its veins are not prominent. If the lowbush mountain plant in hand has a shiny lower leaf face with conspicuous veins and serrate leaves it is *Vaccinium angustifolium*.

4. *Vaccinium pallidum* Ait., Hort. Kew., ed. 1, 2:10. 1789. Hillside Lowbush Blueberry. Dryland Blueberry.

Cyanococcus pallidus (Ait.) Small

C. vacillans (Torr.) Rydb.

V. alto-montanum Ashe

V. vacillans Torr.

Colonial low shrub, 1.5-8 (10) dm high. Twigs pale green, glaucous, or yellowish, sometimes red-tinged in sun, verrucose, glabrous to pubescent (puberulent) in two lines with incurved whitish hairs, or rarely circumferentially pubescent, diffusely branched. Leaf bud scales pink-tan to dark brown (fuscous), 0.8-2 mm long, with short aristae 0.3-1 mm long. Leaves deciduous, ovate to broadly elliptic, obovate, or spatulate, 2.0-5.2 cm long, 1.3-3.2 cm wide, spreading or strongly ascending, yellow-green, pale green, to blue-green on upper surface, paler green to glaucous on under surface, dull, not at all nitid, the veins usually not prominent, sometimes with two sessile glands on the midrib, more or less pubescent but more often glabrous, the margin entire, sub-serrate, or glandular-serrate (all variations may occur on the same plant), the apex either acute and mucronate or rounded, the base narrowly to widely cuneate, winged-subpetiolate, the subpetiole 1 mm long. Corolla cylindrical to urceolate-campanulate, 4-8 mm long, in short scaly-bracted axillary racemes, greenish white to white, more often pale to brick red-tinged, especially in the sun, precocious (late March-early May). Berry glaucous blue to ink blue or blue-black, 4-12 mm in diameter, bland to sweet (July-August).

Maine to Minnesota, south to upland Georgia, Alabama, Kansas, Oklahoma and Arkansas, on the Coastal Plain to South Carolina. Next to *Vaccinium stamineum* the commonest species of *Vaccinium* in Virginia, found in every county. Xerophilic and heliophilic, occupying thin oak and oak-hickory woods, shale barrens, mountain and hillside heathlands, sandy knolls and roadsides. This species is resistant to fire and drought and it readily invades cleared or abandoned sites. Type locality "North America."

Diploid ($2n=24$), sometimes tetraploid ($2n=48$). The following hybrids have been noted in Virginia: *Vaccinium pallidum* (tetraploid) x *simulatum* = *Vaccinium* x *carolinianum* Ashe *pro sp.*, Smyth County; *V. formosum* x *pallidum*, perhaps a result of reduced gametes in the first species, which is tetraploid, in Prince George and Henrico Counties; *V. fuscatum* x *pallidum* =

Vaccinium x margarettae Ashe pro sp. = *V. vacillans* var. *crinitum* Fern. (Fernald 1950), one of the most common hybrids of this species, in nine counties; *V. pallidum x tenellum*, Prince George County. *Vaccinium elliottii x pallidum* is reported by Camp (1945) and may be expected in southeast Virginia. A rare natural intersectional cross (*Cyanococcus x Polycodium*), *Vaccinium pallidum x stamineum*, from Halifax County, is in the Harvill collection in Longwood College. The leaves and stature are closest to *Vaccinium stamineum*, but the twigs are verrucose. Crosses involving these two sections can be made artificially (Darrow and Camp 1945). *Vaccinium caesariense x pallidum* does not seem to have been reported from Virginia.

In eastern Virginia, on open roadsides adjacent to residual swamps and forest, there occur hybrid populations consisting of roundish stiffly ascending mid-high plants. It is believed these are hybrid complexes involving *Vaccinium pallidum*, *V. formosum*, and *V. fuscatum*, since all three may be found in natural residual habitats near these swarms. A fine example of such a hybrid swarm exists in Ethridge Estates, a housing development in Prince George County two kilometers south of Petersburg city limits on US 301, along Chemin and Falda Roads. Residual native habitat adjoining this swarm consists of drained swamp in which grow *Vaccinium formosum* and *V. fuscatum*, and an oak-wooded sandy knoll arising in the swamp on which *V. pallidum* is common. Due to its omnipresence and ruderal tendency, *Vaccinium pallidum* is the most versatile contributor to blueberry hybrids in Virginia. Hybrids are best determined with experience and are easier to interpret in the field than from dried specimens.

Rehder (1940) was the first to unite the concepts *Vaccinium pallidum* and *V. vacillans* under the first name, which has priority. The details of the *Vaccinium pallidum-vacillans* introgression are thoroughly dealt with in Vander Kloet (1978b) so there seems no need to reiterate them here. Strausbaugh and Core (1978) noted these two concepts intergrade in West Virginia. Unfortunately, others who favor the single species concept, such as Radford, Ahles and Bell (1968), have incorrectly selected the later name *Vaccinium vacillans* with the result that it has become erroneously entrenched in usage.

There is a problem with the tetraploid race, which has been named *Vaccinium alto-montanum*, regarded as a derivative of the *V. pallidum* complex. Such plants are found on dry mountain ridges, and consist of tight clones, glaucous twigs, subcoriaceous glabrous revolute leaves, and large, very sweet berries. They are relatively tall, from 8-10 dm. Vander Kloet (l.c.) states he cannot safely separate these populations from others in the complex, either in the field or in the herbarium, and includes them in the complex. My experience is similar, but the difference in ploidy level between this genotype and its species associates and possible ecological isolation suggests a need for further study of its true taxonomic status.

This lowbush blueberry seems to be always at hand. If the leaves are dull pale green to glaucous on the under face, and the twigs are light green, glaucous, or, most often, yellowish, one may be sure the plant is *Vaccinium pallidum*.

5. *Vaccinium elliotii* Chapm., Fl. S. U.S. 260. 1860. Mayberry.
Cyanococcus elliotii (Chapm.) Small

Crown-forming monopodial to vasiform fastigate-stemmed deciduous shrub, 1-4 m high, the bark dark brown to gray, sometimes colonial, as when disturbed. Young twigs olive-green to dark brown, rarely glabrous, to circumferentially pubescent, verrucose, slender, numerous, when pressed appearing scalarly disposed or two-ranked. Leaf bud scales reddish to black, mostly less than 1 mm long, with minute arista about 0.5 mm long. Leaves tardily deciduous, persisting into winter on suckers, elliptic to ovate, 0.7-3.5 cm long, 0.3-1.5 cm wide, rich green and lustrous on upper surface, gray-green and subnitid on lower surface, not turning red in the fall (the leaves of other high-bush blueberry species in Virginia turn red in the fall) glabrous to more often pubescent, almost always hairy on the midrib, margin serrate to entire, notably thickened but not revolute, the apex acute and mucronate, the base broadly to moderately cuneate, sessile. The leaves superficially resemble the leaves of Box (*Buxus* L.), or Chinese Privet (*Ligustrum sinense* Lour.). Corolla narrowly cylindro-urceolate, sometimes narrowed apically, 4-7 mm long, white, or more often pink-tinged, precocious (late March-early April), the flowers borne on short scaly-bracted axillary racemes, the bracts conspicuously red, winter buds round and conspicuously pink-red. Berry dull to shining black, rather dry, of poor flavor, 5-8 mm in diameter (May).

Coastal Plain, southeastern Virginia to Florida to Arkansas and east Texas. Wooded flood plains, wooded streambanks, ravines, sandy flatlands. Type locality: probably South Carolina (Camp 1945).

Diploid ($2n=24$). Hybridizes with *Vaccinium fuscatum* in Southampton County and cities of Suffolk and Chesapeake. Hybrids with *Vaccinium caesariense*, *V. pallidum* and *V. tenellum* are reported from elsewhere by Camp (1945) and are possible in Virginia.

Many communicants agree with me that uniting all highbush cyanococoids into a single highly polymorphic species *Vaccinium corymbosum sensu* Vander Kloet (1980) is extreme. Though some differ with me as to how many species should be recognized, all agree that *V. elliotii* is one of the most distinctive. In deep undisturbed habitats, *V. elliotii* is unswamped by hybrids. The hybrids I have found are on dry disturbed flatlands, and are readily recognizable. The limitation of a small-leaved, slender-twigged cyanococoid to a specific range which is not duplicated in any other part of the homogenized single-species concept range, is phenotypic-geographic evidence that cannot be overlooked. It is interesting that the leaf measurements Vander Kloet (1.c.) gives for his *Vaccinium corymbosum*, 21 ± 4 mm wide, 46 ± 8 mm long, excludes *V. elliotii* on the small side, and many individuals of other species, i.e., *V. formosum*, *V. fuscatum*, *V. corymbosum* s.s. on the large side. If the highbush shrub at hand has numerous glossy box or privet-like leaves 3 cm or less long, and numerous slender scalar twigs, and comes from southeast Coastal Plain Virginia (and further south and west on the coastal plain), it is *Vaccinium elliotii*.

This is a very handsome shrub neglected by horticulture. The vase-like graceful form, the numerous small glossy leaves which last well into

November, and its tolerance of both shade and sun would seem to make it a useful specimen or corner shrub.

6. *Vaccinium fuscatum* Ait., Hort. Kew. ed. 1. 2:11. 1789. Black High-bush Blueberry.

Cyanococcus atrococcus (Gray) Small

V. atrococum (Gray) Heller

V. atrococum (Gray) Porter

V. arkansanum Ashe

Straggly to crown-forming monopodial to fastigiate stemmed deciduous (persistent to evergreen in south Georgia and Florida) shrub, 1-3 m high, the bark dark brown to gray, often shredding; sometimes colonial, as when cut or fire damaged. Young twigs olive-green to brownish-black (fuscous), circumferentially pubescent with close dingy incurved or shaggy hairs, verrucose, coarse and irregularly branched. Leaf bud scales red-brown to black, averaging 2 mm long, of which 1 mm is a rather stout, talon-like arista. Leaves membranaceous (to coriaceous in south Georgia and Florida), narrowly to broadly elliptic (widest at the middle), dull deep green on upper surface, gray-green on lower surface, turning aged-brown on drying, hence the species name *fuscatum* (mistakenly taken by Camp (1945) to refer to the black berries) close to shaggy dingy-pubescent, especially on lower surface, usually ciliate, the margin entire, slightly revolute, the apex acute and mucronate, the base cuneate, subpetiolate, the subpetiole 1-1.5 mm long, dingy-pubescent. Corolla 5-8 mm long, cylindro-urceolate to more often ovate, narrowed apically, greenish or yellowish-white, very often pink-tinged, precocious (late March-April), the flowers in short axillary scaly-bracted racemes, the bracts reddish. Berry shining black, insipid, 5-8 mm in diameter (late May-July).

Maine to southern Ontario, Indiana, to Florida, Tennessee, Arkansas and east Texas. Flatlands, wooded hillside seeps, swales, swamp hummocks, stream banks, pocosins, edges of bogs and bays. In Virginia most common on the Coastal Plain and on the Piedmont, rare in mountains. Apparently absent from southwestern highlands, where it is replaced by *Vaccinium simulatum*. Often associated with *Kalmia latifolia* L. and *Lyonia ligustrina* (L.) DC. Type locality "North America," probably South Carolina, whence introduced to Kew by William Young, Jr. in 1770. BM, photocopy!

Camp (1945), limiting himself to the coriaceous, persistent leaved phase of southern Georgia and Florida, speculated the type came from that region. Young operated principally in coastal North and South Carolina, according to Britten (1894), and there is no evidence he traveled further south. The type specimen, kindly photocopied and described for me by A.O. Chater of the British Museum, is "aged brown," and has the leaf shape and membranaceous character of those of plants now growing in South Carolina which are like those in Virginia. Clearly the name *Vaccinium fuscatum* belongs to these northern plants. If anyone separates the north Florida and south Georgia persistent coriaceous leaved plants from the rest of the complex, they will require a new name. *Vaccinium holophyllum* (Small) Uphof has been listed as a synonym but its small leaves suggest a hybrid with *V. darrowii* Camp.

Two primary races in Virginia, one diploid ($2n=24$), which may be

known as the "atrococcoid" race, with narrowly elliptic leaves 3-6 cm long, 1.2-3 cm wide, found throughout the species range in Virginia, and a tetraploid ($2n=48$), with broadly elliptic larger leaves, 5-8 mm long, 2.5-4 mm wide, which may be called the "arkansanoid" race, mostly limited to the Coastal Plain in Virginia. Phenotypically, the two races overlap; intermediates are not safely distinguished. The two races could well hybridize due to gamete reduction. For these reasons, the two races are kept as one species, which is considered by Ward (1974) to intergrade with the diploid coriaceous leaved plants of Georgia and Florida.

For possibly the same reason of gamete reduction, *V. fuscatum* hybridizes extensively with *V. formosum* without swamping out the parents. For a discussion of this hybrid and its backcrosses see text material immediately after species key above.

Vaccinium fuscatum is known to meet *V. corymbosum* at one station in the mountains, around Spring Pond in Augusta County. The two species form a large common population without any evidence of hybridization.

Mme. C. Cusset, of The Paris Museum of Natural History, kindly described the type of *Vaccinium disomorphum* Michx. for me and I am satisfied it is *V. fuscatum*.

7. *Vaccinium corymbosum* L., Sp. Pl. 1:350. 1753. Highbush Blueberry.
Cyanococcus corymbosus (L.) Rydb.
V. constablaei A. Gray

Straggly to crown-forming monopodial to fastigiate-stemmed deciduous shrub, 1-4 m high, the bark red-brown to gray, often shredding, sometimes depressed and colonial when stressed, as by high mountain environment or fire or cutting. Young twigs bright green to blue-glaucous, circumferentially shaggy-white pubescent or pubescent (puberulent) in two lines with whitish incurved hairs, or even glabrous; verrucose, irregularly branched. Leaf bud scales flesh-color to red, 2-3 mm long, terminating in a rather stout talon-like arista. Leaves membranaceous to subcoriaceous, narrowly to broadly elliptic, 3-8 cm long, 2-3 cm wide, medium to pale green to blue-glaucous on upper surface, pale green to glaucous on under surface, not darkening on drying, shaggy white pubescent to pubescent only on the veins, and then often only on the basal section of midrib, or glabrous, margin entire, subserrate, or sharply serrate, sometimes revolute, more often flat, very often white-ciliate, especially toward the base, the apex acute to acuminate and mucronate, or less often rounded, the base cuneate, subpetiolate, the subpetiole 1-1.5 mm long, usually white-setose. Corolla various; cylindrical, broadly urceolate, subcampanulate or subglobose, 5-10 mm long, the shorter, broader types usually in the south, the cylindrical in the north, greenish to milk-white to dull pink or red tinged, coëtaneous (May), the flowers in short axillary scaly-bracted racemes, the bracts flesh color to dull red. Berry glaucous blue to ink blue, very sweet to mediocre, 5-10 cm in diameter (August).

Nova Scotia to Michigan to West Virginia, Ohio, and Indiana, south in mountains to Tennessee and South Carolina. A hydrophilic species of bogs, pools, damp forest soil, and pond edges. In Virginia, occasional in the mountains on high levels (Giles County), pond edges and bogs in Augusta and south-

western counties, stream banks. Often associated with *Lyonia ligustrina*. Type locality "North America," collected by P. Kalm in May 1749 or 1750, restricted to Gloucester County, New Jersey by Uttal (1986b). Lectotype microfiche!

Virginia plants tetraploid ($2n=48$). Hexaploids are reported by Camp (1945) from high mountains of Tennessee and North Carolina, and have been named *Vaccinium constablaei*, but these are not reliably differentiated phenotypically from *V. corymbosum*, and the name has been used incorrectly for Virginia plants, as by Radford, Ahles, and Bell (1968). Hybrids with *Vaccinium angustifolium* in Giles County are reported under that species. I know of no other hybrids involving *V. corymbosum* in Virginia, but they may occur with *V. simulatum* in high southwest Virginia as such is reported by Camp (l.c.) in North Carolina. Hybrids with the tetraploid phase of *V. pallidum* are theoretically possible, but in Virginia, at least, these and *V. corymbosum* are ecologically isolated from each other.

The complexity of *Vaccinium corymbosum* has been explained by Camp (1945) as due to origin from migration of other species out of the south in the Pleistocene and their coming together in the north. Populations of *Vaccinium corymbosum* contain various morphotypes in a continuum. There is too much variation in this species for any satisfactory infraspecific taxonomic treatment.

A highbush blueberry collected from damp soil in the mountains of Virginia with green to glaucous non-darkening leaves which tend to be widest above the middle will be *Vaccinium corymbosum*.

8. *Vaccinium formosum* H.C. Andrews, Bot. Rep. 2, pl. 27. 1800. Swamp Highbush Blueberry.
Cyanococcus virgatus (Ait.) Small
V. australe Small
V. corymbosum L., auth., not *V. corymbosum* L. *sensu strictu* Camp (1945).

Crown-forming deciduous shrub with fastigate gray-barked stout stems, or suckering when disturbed, 2-5 m high. Young twigs pale green to glaucous, glabrous, lithe, verrucose, often red-tinged. Leaf bud scales pinkish-red, 2-4 mm long, the last 1.5-3 mm consisting of a flagellate arista. Leaves firm, ovate-lanceolate to lance-elliptic, broadest below the middle, 4-10 cm long, 2.5-4.5 cm wide, rich glossy green on upper surface, the veins somewhat impressed, pale green to glaucous on under surface, the veins prominent, often red-tinged, glabrous, the margin entire, strongly revolute, the apex acuminate and mucronate, the base moderately to broadly cuneate, subpetiolate, the subpetiole 1 mm long, glabrous. Corolla showy, cylindric, 8-12 mm long, milk white or pink-tinged, coëtaneous (late April-May), the flowers abundantly borne in short scaly-bracted racemes, the bracts pink-red. Berry dark blue with bloom, 7-12 mm in diameter, depressed-spherical, of excellent flavor (June, early July). As with most cyanococcoids, fruits most productively in the sun. The principal ancestor of the commercial and home-grown highbush blueberry, attractive for flower, leaf (which superficially resembles that of privet *Ligustrum japonicum* Thunb.), fall color and excellent fruit.

Coastal Plain from southern New Jersey to north Florida and southeast Alabama. Swamps, marshes, flood plains, flatlands. Type locality "North America," probably South Carolina, whence introduced to Kew in 1770 by William Young, Jr. Type plate!

Tetraploid ($2n=48$). Hybridizes and forms a continuum (*Vaccinium x marianum*) with *V. fuscatum*, but does not wipe out parents. For a discussion of this hybrid see under *Vaccinium fuscatum* and in text immediately following species key. Hybridizes with *V. pallidum* in Prince George and Henrico Counties: see discussion under that species. For a discussion of nomenclature, see Uttal (1986b).

It is interesting that *Vaccinium formosum*, a Coastal Plain plant, grows in Magnolia Swamp, near Wilder in Augusta County, in the Ridge and Valley Province, a refugium for several Coastal Plain disjunct plant species (Harvill 1972).

If the plant in hand is a glabrous tall highbush blueberry with large depressed-globose glaucous fruits, large acuminate glossy green leaves which are widest below the middle, and markedly attenuate leaf bud scale aristae, it is *Vaccinium formosum*.

9. *Vaccinium caesariense* Mackenzie, Torrey 10:230. 1910. Highbush Blueberry.

Straggly to crown-forming monopodial or fastigiate stemmed deciduous shrub, sometimes suckering when disturbed 1-2 m high. Young twigs blue-glaucous, glabrous, verrucose, slender, numerous, irregularly branched. Leaf bud scales pinkish, 1-2 mm long, including a short arista 0.5-1.5 mm long. Leaves moderately firm, narrowly elliptic to lanceolate, 3-6 cm long, 1.5-2 cm wide, blue-green on upper surface, strongly glaucous on undersurface, veins not impressed on upper surface, and not conspicuous on lower surface, glabrous, the margin entire, revolute, the apex acute to acuminate and mucronate, the base cuneate, often shortly so, subpetiolate, the subpetiole 0.5-1.0 mm long, glabrous. Corolla 4-6 mm long, narrowly cylindrical, dull white. Flowers sparse on short scaly bracted axillary racemes, the bracts pale flesh-pink, coëtanous (May). Fruit blue, 5-8 mm in diameter, reported of good flavor (July).

Reported by Camp (1945) from southern Maine and Central New York, and on the Coastal Plain to North Florida. Not reported from Florida by Ward (1974). Its southern limits need redefinition. Rare in Virginia; eight records in the eastern part of state (see map). Easily confused with hybrid derivatives of *Vaccinium formosum*, *V. fuscatum*, and *V. pallidum*, which have wider leaves and tend to have reddish prominent veins on under surface. Swamps, bogs, open wooded slopes. Type locality Tom's River, Ocean County, New Jersey, PH!

Diploid ($2n=24$). Hybrids with other diploids reported by Camp (1945) do not appear to have been observed in Virginia. The small corollas, glaucosity, narrow small leaves, short height, and a special "twiggy" appearance are characteristic. I can not resolve this taxon by lumping it with other species and suggest that this entity needs further study.

10. *Vaccinium simulatum* Small, Fl. SE. U.S. 896, 1336. 1903. Highbush Blueberry.

Cyanococcus simulatus (Small) Small

V. constablaei Gray, auth. not *V. constablaei* Gray sensu Camp (1945)

Straggly or crown-forming monopodial or fastigiata stemmed deciduous shrub, suckering when disturbed, the bark dark red-brown to gray, often shredding, 1.5-4 m high. Young twigs olive, pubescent-puberulent in two lines with dingy incurved hairs, verrucose, coarse and irregularly branched. Leaf bud scales brown to black, 2 mm or less long, including the short arista, which is 0.5 mm or less long. Leaves membranaceous, ovate-acuminate, usually widest below middle, 5-7 cm long, 2-3 cm wide, pale to medium green on upper face, gray-green to subglaucous on lower face, not darkening on drying, under surface glabrous to more often pubescent on the non-prominent veins with dingy hairs, these often stiff on the midrib rendering a "bottle-brush" effect, often ciliate especially basally, margin sharply serrate especially apically, or subserrate, or sometimes subtire, not revolute, the apex usually long acuminate, the base moderately to broadly cuneate, subpetiolate, the subpetiole 1 mm long, setose. Corolla broad cylindro-campanulate, greenish to greenish-white, often pink or red-tinged, 5-6 mm long, flowers in short scaly-bracted axillary racemes, the bracts reddish, coëtaneous (May). Fruit a spherical shining purple-black tart, juicy berry, sometimes bluish or nearly black (August-September), when dried taking on a false glaucous cast.

In the Cumberland Mountains and Plateau of eastern Kentucky and southwestern Virginia south in the Appalachians to north Alabama and north Georgia, from 300 to 1400 mm elevation. A characteristic shrub of maple and yellow birch forested slopes in the mountains, reaching the red spruce belt in southwestern Virginia, clearings, often along streams, frequently associated with *Kalmia angustifolia*. Type locality Black Mountain, Harlan County, Kentucky, lectotype NY photo!, the type locality visited.

Tetraploid ($2n=48$), hybridizing with *Vaccinium pallidum* in Smyth County = *V. x carolinianum* Ashe; suspected of hybridizing with *V. corymbosum*, in Virginia, which it does in North Carolina and Tennessee (Camp 1945).

This species has had the name *Vaccinium constablaei* Gray applied to it by Radford, Ahles, and Bell (1968) and has passed under that name in Virginia, as by Harvill et al (1986). As explained under *Vaccinium corymbosum* above, the name *V. constablaei* is properly restricted to glaucous leaved, blue fruited plants of high mountains of Tennessee and North Carolina, which Vander Kloet (1980) included in *V. corymbosum*, and with which I concur.

11. *Vaccinium erythrocarpum* Michx., Fl. Bor. Am. 1:227. 1803. Bearberry, Southern Mountain Cranberry.

Hugeria erythrocarpa (Michx.) Small

Low to medium deciduous shrub, 0.5-2 m high. Twigs yellow-green to gray-green, somewhat 4-angled, striate-rugose, sometimes pitted but not verrucose, glabrous to, more often, puberulent in two lines to mostly pubescent with grayish incurved hairs, divergently branched. Leaf bud scales promptly dropped, 2 mm long, slender, green, non-aristate, not to be confused with the more abundant axillary flower bud scales which are formed early, 2-5 mm long, green-white to pale tan. Leaves thin, lanceolate to ovate-lanceolate, 3-7 cm

long, 1.5-3.5 cm wide, flat, pale green on upper surface, gray-green and reticulate on lower surface, glabrescent to gray-white pubescent on lower surface veins, not flushing in the fall, the margin serrate to subserrate, the teeth bristle-tipped; the apex acuminate, usually without a mucro, the base varying from cuneate to rounded, truncate, or even subcordate, subpetiolate, the subpetiole 0.5 mm long, usually pubescent. Flowers 4-merous, the sepals ciliate, acute; corolla pink or, rarely, white, coëtaneous (June-July), 9-11 mm long, in bud narrowly lanceolate, when open the four narrow long lobes tightly recurved exposing the stamens and pistil, the flowers borne singly, axillary, dangling on slender ebracteate pedicels about 1 cm long. Berry globose, red (in Virginia), 5-9 mm in diameter, insipid to pleasantly acid (in West Virginia there is a form with large sweet purple-black berries), makes good preserves (August-September). Chromosome count not seen.

West Virginia and western Virginia to North Carolina and Tennessee in mountain forests, on cliffs, rocky slopes, and summits. Common in lower western and southwestern Virginia, on rich forested mountains, in association with other *Vaccinium* species and other ericads. A vicariad species, *Vaccinium japonicum* Micq., occurs in east Asia. Type locality high mountains of North Carolina, microfiche!

12. *Vaccinium arboreum* Marsh., Arbust. Amer. 157. 1785. Farkleberry, Tree Huckleberry.

Batodendron arboreum (Marsh.) Nutt.

Deciduous-persistent tall arborescent shrub, 2-8(10) m tall. Twigs rigid and divergently branched, gray to purple-gray, becoming blackish when older, striate-angled, occasionally papillose but not verrucose, glabrous to dull white, shaggy pubescent. Leaf bud scales promptly deciduous, less than 1 mm long, often shiny, dark brown to black, cuspidate but not aristate. Leaves coriaceous, persisting into winter, widely obovate to elliptic to spatulate, 2-7 cm long, 1-4 cm wide, varnish-shiny, dark to medium green on upper surface, subnitid pale green to glaucous on lower surface, flushing in the late fall, the margin entire, subrevolute and thickened, denticled, the apex rounded to acute and mucronate, the base cuneate, short-petiolate, the petiole 1-2 mm long, usually shaggy pubescent. Flowers 5-merous, abundant, showy, born in short racemes or singly, axillary on slender pedicels 6-10 mm long which bear a single scaly bract on the lowest third subtended by bracteal leaves which are sometimes taller than the foliage leaves, corolla white, coëtaneous (April-May), globose-campanulate, the prominent lobes squarrose or recurved, the anthers and pistil concealed. Berry globose, sparkling black, 5-6 mm in diameter, (late June-November), persisting into winter, dry and inedible. Chromosome count not seen.

Southeast Virginia to Florida and Texas; southern Illinois, Kentucky and Tennessee to southeast Kansas, Oklahoma, Missouri, and Arkansas. Dry sandy or rocky woods, copses, old fields. One of the showiest shrubs in southeastern Virginia, very floriferous and favored by bees. While of no human value for fruit, it is very ornamental and a good honey source.

13. *Vaccinium stamineum* L., Sp. Pl. 1:350. 1753. Deerberry, Squaw Huckleberry, Gooseberry.

Polypodium candicans Small
P. neglectum Small
P. stamineum (L.) Greene
V. caesium Greene
V. melanocarpum (Mohr) Mohr
V. neglectum (Small) Fern.
V. stamineum var. *interius* (Ashe) Palmer & Steyererm.
V. stamineum var. *melanocarpum* Mohr

Straggly diffusely branched deciduous shrubs, 0.3-4 tall, bark gray, shredding. Young twigs yellowish to red-brown, glabrous, shaggy pubescent, or tomentose, smooth when fresh, rugose-striate when dry, not verrucose, glabrous to shaggy pubescent tomentose. Leaf bud scales promptly deciduous, tan to gray, less than 1 mm long, 1 mm wide, with a short mucro. Leaves thin to coarse, oblong or elliptic to obovate, usually widest above the middle, 3-10 cm long, 1-4.5 cm wide, pale to medium green on upper surface, strongly white glaucous to yellow-green on under surface, glabrous to tomentose, not flushing in the fall, the margin entire to serrate, usually ciliate, not revolute, the apex acute to more often acuminate, mucronate, the base obtuse or rounded to subcordate, rarely cuneate, 5 short petiolate, the petiole 1-2.5 mm long, glabrous to shaggy. Flowers 5-merous, borne in racemes or panicles on specialized branches subtended by leafy bracts usually much smaller than foliage leaves, but sometimes similar in size and shape, on bracteate or ebracteate slender glabrous to pubescent pedicels averaging 1 cm long, which are sometimes glaucous. Corolla promptly open in bud, campanulate, the lobes divided to middle and spreading, thus exposing the anthers and pistil, at length 4-6 mm long, the lobes purplish, greenish, or white, coëtaneous (late March-May), rarely flowering in fall. Berry various: greenish, yellowish, dull pink, pale blue, or purple, usually markedly glaucous, but the darker forms often without bloom and shiny; sour, bitter, or the dark forms mildly sweet, the best acceptable for preserves, 0.5-1.3 cm wide (June-August).

Maine to southern Ontario to Florida and northeast Texas. Dry woods, copses, ravines, old fields. In Virginia, abundant in every county; probably our most common species of *Vaccinium*. Type locality North America, microfiche!

Diploid ($2n=24$). May be artificially hybridized with members of sect. *Cyanococcus*. One natural hybrid with *Vaccinium pallidum* reported from Halifax County—see under that species.

Almost every author who takes up this highly polymorphous species complex, which seems to have many overlapping ecological and edaphic races, proposes a different arrangement of infraspecific groups. I observe that practical plant workers tend to ignore infraspecific categories because they find them confusing. The potential for variation in this apparent homoploid complex is, as with *Vaccinium corymbosum*, too infinite for reasonable classical categorization. Where does one stop? Radford, Ahles and Bell (1968) propose two varieties for the Carolinas (and, by extension, for the southeastern United States), while Ward (1974) proposes five varieties for central and north Florida alone. Camp (1945), p. 207, states "no practical taxonomic analysis of the group exists; nor can it be accomplished either by indiscriminate 'lumping' or

by the description of additional entities without a background of experimental work." Baker (1970) demonstrated that leaf and bract variation in *Vaccinium stamineum* is clinal. He proposed two varieties, which have no status as they have not been published. Such being the case, I believe it is best for now to keep all deerberries in a single polymorphic species complex, *Vaccinium stamineum*, pending more biosystematic studies needed to substantiate a more definitive treatment.

Vaccinium stamineum is often misidentified as a *Cyanococcus*, usually *Vaccinium corymbosum* or *V. fuscatum*. Reference to the smooth, non-verrucose twigs will prevent this mistake.

Valuable to wildlife, this shrub is only occasionally useful to man for its fruit. It is very floriferous, however, and bees are much attracted to it. It is probably a good honey plant.

14. *Vaccinium crassifolium* H.C. Andrews, Bot. Rep. pl. 105. 1800.

Creeping Blueberry

Herpothamnus crassifolius (H.P. Andrews) Small

Evergreen ligneous vine with stout woody root, thickened at intervals. Stem trailing, up to 1 m long, simple or branching, gray-green to roseate tan, glabrous to pubescent, smooth when fresh, slightly angled, to rugose striate when dry. Leaves coriaceous, elliptic to ovate, 7-15 mm long, 3-10 mm wide, shining light green on upper surface, gray-green on lower surface, strongly revolute, glabrous, margin remotely denticulate, the teeth ending in a brief blackish mucro; the apex acute to slightly rounded, non-mucronate, the base cuneate, or petioles 1-2 mm long, glabrous. Flowers 5-merous, in compacted 1-4 flowered axillary, or sometimes terminal, racemes shorter than the subtending leaf. Corolla about 4 mm long, depressed globular urceolate with short spreading lobes, pink to white (April-May). Berry globose, shining purple-black to black, juicy, mildly sweet, with five large seeds, 3-8 mm in diameter (August-October).

Coastal Plain from southeast Virginia to Georgia. Wet or dry pine barrens and peaty pocosins. Type locality "North America."

Diploid ($2n=24$).

15. *Vaccinium macrocarpon* Ait., Hort, Kew. 2:13, pl. 7. 1789. Large, or American Cranberry.

Oxycoccus macrocarpus (Ait.) Pursh

Evergreen slender ligneous vine rooting at nodes, the branchlets ascending, smooth when fresh, striate when dried, puberulent in two lines to glabrous, green to tan. Leaves coriaceous, elliptic-oblong, 6-17 mm long, 2-8 mm wide, shining pale green on upper surface, gray-green to subglaucous on lower surface, flat when fresh, sometimes curling inward when dry but not revolute, glabrous, margin entire or with few remote denticles, ciliate; the apex and the base rounded, with small glabrous petioles 1-1.5 mm long. Flowers 4-merous, borne singly, axillary, on filiform pedicels 1-3 cm long bearing a pair of leaf-like bracts on the upper third of length, the flower nodding. Corolla segments divided to base, the lobes 6-10 mm long, strongly reflexed, pink, the stamens and pistil exposed (June-July). Berry globose, bright red, juicy, very

acid, 1-2 cm in diameter, the source of the commercial cranberry. Fruit often borne erect (July-October), sometimes persisting into winter.

Newfoundland to Manitoba to Virginia, North Carolina and Tennessee, Ohio, Indiana, and Illinois, in some localities possibly introduced. Bogs, sloughs, glades. In Virginia, in upland ponds and glades, with one old record from southern Virginia Beach. Type locality "North America," type plate!

Diploid ($2n=24$).

Vander Kloet (pers. comm.) has reported *Vaccinium oxycoccus* L., a tetraploid, from western Virginia, but I have no confirmation of the report and do not know even where it is supposed to grow. This species is frequent in eastern West Virginia. It may be separated from *Vaccinium macrocarpon* by its generally smaller size, the leaves strongly recurved and whitened on the under face, and the pedicellar bracts being located below the middle of the pedicel.

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Book Review

Snyder, Lloyd H. and James G. Bruce. 1986. Field Guide to the Ferns and other Pteridophytes of Georgia. The Univ. of Georgia Press, Athens. 270 p. \$25 cloth; \$12.50 paper.

This compact, attractive, and durable handbook is in many ways an updating of the 1951 pioneering work, *Ferns of Georgia*, by McVaugh and Pyron. The format is similar, with a full-page drawing and full-page text (including dot map) for each species. Most of the line drawings were done by Pyron for the earlier work, with new ones by University of Georgia graduate student, Cecile Smith. The text, including description, habitat, range, remarks, etc., is concise but useful, and the drawings are clearly and sharply printed on plain white paper. The newer book includes a chart that allows quick recognition of distinctive genera; but, as with keys, it requires a reader to have experience and knowledge of technical terms for it to be of fullest use.

The nomenclature has been brought up to date with explanations of some name changes, the glossary and the checklist are both useful items, and the index allows for quick reference to species identified by common and scientific names, a definite help in a text that is arranged phylogenetically.

The present authors list 36 genera, 119 species, and 12 hybrids of pteridophytes in Georgia. Lloyd Snyder collected in all of the state's 159 counties and, remarkably, compiled over 800 county records. Surprisingly, McVaugh and Pyron indicate that they found no pteridophyte records at all in 13 counties as of 1951; they listed a total of 31 genera, 78 species, and two hybrids for the state.

This new book can serve as an almost complete field manual for a course on southeastern ferns, lacking only a very few high mountain, tropical, and extremely rare species from neighboring states. Georgia occupies a unique position in that within the state one finds high elevation northern species such as *Lycopodium selago* as well as the more tropical *Lycopodium cernuum*, *Vittaria lineata*, and *Psilotum nudum*. It is also notable that the recently (1978) described *Isoetes tegetiformans* is unknown except from four Georgia locations.

One of the innovative, most appealing features of this book is the series of photographic plates showing hybridization among three coastal plain clubmosses: *Lycopodium alopecuroides*, *L. appressum*, and *L. prostratum*. On separate pages, small inserts of photographs of peduncles, stems, and strobili, respectively, are arranged in a triangle to show at a glance the key characteristics of the parental species and their intermediate hybrids. These were prepared from the extensive research of James G. Bruce, and they help to clear up common identification problems within this widespread group.

I highly recommend this useful book to everyone interested in southeastern ferns.—
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