Little Big Plant, Box Huckleberry *(Gaylussacia brachycera)*

Rob Nicholson

Box huckleberry's foliage looks somewhat similar to boxwood (*Buxus* spp.), which explains its common name. (PHOTO BY ROB NICHOLSON)

It is one of the charms of the science of botany that the most subtle species can contain the most elegant mysteries. Such is the case with box huckleberry (*Gaylussacia brachycera*), an evergreen subshrub with small, glossy, leathery leaves. Box huckleberry grows in the full shade of mixed pine–oak forests in sporadic locations from Pennsylvania to Tennessee (including a fairly recently discovered site in North Carolina [Wilbur 2004]). While this species has been known to botanists for centuries, it is an example of how knowledge builds on knowledge and how even familiar subjects can still be a source of discovery.

This low-growing shrub is in the Ericaceae (heath family), an assemblage of plants that includes heaths (*Erica*) and heathers (*Calluna*), rhododendrons and azaleas (*Rhododendron*), blueberries and cranberries (*Vaccinium*), and madrones (*Arbutus*). It is a fairly large family with species found throughout much of the world. The huckleberries, along with the blueberries, are grouped in a subfamily called the *Vaccinioideae.* Blueberries (*Vaccinium*) and huckleberries (*Gaylussacia*) are traditionally separated botanically by the number of chambers (called locules) within the fruit and the size of the seeds.

While the name huckleberry may bring forward associations to Mark Twain's all-American rascal, Huckleberry Finn, the genus *Gaylussacia* shows a predominantly South American bent. The center of species diversity for the genus is southeastern Brazil, with 37 species found in the hills and mountains near the Argentine border. A few more species are Andean, but then a separation of 1,100 miles (1,770 kilometers) occurs before reaching any of the North American species, the closest being *Gaylussacia dumosa* in southern Florida. Eight *Gaylussacia* species are known from the eastern United States and Canada, but none have been found in Mexico, Central America, or the Caribbean—a somewhat mysterious gap.

The huckleberries have traditionally been further divided into three subgroups called sections: section *Vitis-idaea,* with only *Gaylussacia brachycera;* section *Decamerium,* with three North American species; and section *Gaylussacia,* with *G. mosieri* of the Florida panhandle and all the South American species. (Some recent research [Floyd 2002] questions whether *Gaylussacia* should be divided into sections at all.) So this odd distribution of species and subgroups presents the first botanical puzzle that heavily involves the little box

huckleberry: on which continent did the huckleberries first evolve, and how did they then spread? And where did this unique species—*Gaylussacia brachycera*—come from?

Have Berries, Will Travel

The migration route traveled by *Gaylussacia* between the southern and northern landmasses is unclear, with one botanist (Camp 1941) postulating a gradual migration over a former landbridge, a connection to the east of the Isthmus of Panama. Another (Floyd 2002) suggests the possibility that the genus originated in North America, rather than South America.

Gaylussacia brachycera is different from all other species within the genus in that it lacks glands upon its leaf surfaces, and is therefore segregated into its own section. Its original discoverer, the French botanist André Michaux, thought it to be a *Vaccinium* and published it as such in 1803. However, it has an ovary split into ten chambers like its brethren *Gaylussacia* rather than the five chambers usually associated with blueberry, and it also has large seeds rather than the tiny seeds typical of blueberries. Anyone who has sampled wild huckleberries knows they have more crunch than blueberries and are probably less developed as a food crop because of this seediness.

I had reason to believe I had found a "missing link" on the path between North and South America while collecting in the high pine forests of northeast Mexico. I came upon a low-growing, thick-leafed plant that I immediately took to be a species of *Gaylussacia* because of its close resemblance to box huckleberry. I was excited by the biogeographic implications, and cuttings were collected and brought back to the botanic garden for propagation. When the resulting plants finally flowered I was able to dissect the flowers and determine the plant's true identity. If it was a blueberry then the ovary of the flower would have five compartments, if a huckleberry, then ten. I focused my microscope on the sectioned ovary and saw a pie of five wedges resolve itself. The plant was determined to be a Mexican species of blueberry, *Vaccinium kunthianum*. It was my ultimate anti-Archimedean moment, the crashing flip side to "Eureka!"

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***Gaylussacia* seeds (seen here) are larger than those of *Vaccinium*, giving huckleberries a distinct crunchiness when eaten.**

Depending on which taxonomic interpretation one subscribes to, *Gaylussacia brachycera* is a unique species among the huckleberries, or has two very close relatives in southern Brazil. Alternative positions have constantly swirled around box huckleberry; Camp (1941) wrote "it would certainly appear to merit generic rank," while recent molecular genetic studies by Dr. Jennifer Whitehead Floyd (2002) show that the box huckleberry may be intermediate between the huckleberries (*Gaylussacia*) and blueberries (*Vaccinium*) and may be an ancient hybrid involving species from each camp. But if it is a hybrid, what were the parents? And where might the ancestral lines be? Further molecular genetics studies may finally crack the riddle or even return the species to the *Vaccinium* fold, where it started with Monsieur Michaux two hundred years ago.

How Old Is Old?

Gaylussacia brachycera was first found around 1796 by the French botanist André Michaux at Warm Springs, Virginia, a locale now shrouded in confusion. Two other collectors found it in the early 1800s, both in West Virginia. Fifty years would pass before another, more northern stand in Perry County, Pennsylvania, was discovered by Spencer F. Baird, a young professor of natural history at Dickinson College who later went on to be Secretary of the Smithsonian Institution.

***Facing page:* Black huckleberry (*Gaylussacia baccata*) is distributed throughout the eastern United States and eastern Canada. This deciduous *Gaylussacia* species is noted for its bright red autumn foliage.** (PHOTO BY NANCY ROSE)

How Old Are You Now?

THE MEASUREMENT of age in living plants can be done with a limited number of species. Only those ligneous (woody) plants that live in temperate or arctic regions and are exposed to annual weather cycles will dependably create rings that correlate to age. The title holder for oldest plant is still under contention. Among the most vaunted contenders are the Great Basin bristlecone pines (*Pinus longaeva*) of California's White Mountains with tree ring counts of over 4,000. A specimen of the magnificent alerce tree (*Fitzroya cupressoides*) in Chile has recently been shown to have ring counts of over 3,600 years, and some Saharan cypress (*Cupressus dupreziana*) in Algeria are probably over 2,500 years old.

These species all form rings and are arborescent species, having a single trunk. Interesting also, they are all conifers. Tropical trees don't form dependable dating rings, so despite the great size and age that some of these attain, they are bystanders in the contest. Also excluded are those species that aren't trees. Clump forming shrubs or herbaceous perennials, such as azaleas and iris, can persist for many generations and slowly increase their size and number of stems. The limits of age on shrubs are unknown, although some documented plantings in botanic gardens are well into their second century.

In fact, some of the oldest plants may appear as entire forests or large assemblages of individuals. Many poplar (*Populus*) species, including quaking aspen (*P. tremuloides*), can send up multiple individual trunks from a single vast spreading and interconnected root system. These colonies can expand and contract over time depending upon competition, climate, and catastrophic events such as forest fires. Entire mountainsides have been revealed to be covered by a single clonal stand of many trunks connected by a subterranean network of roots. With clonal colonies such as these, estimating age is next to impossible, though in two notable cases this has been attempted. One is the box huckleberry, as described in this article. The other is creosote bush.

The shrub *Larrea tridentata,* known as creosote bush because of its prodigious production of resin, grows in arid regions of the southwestern United States and north central Mexico. Growth of creosote bush colonies begins with the original founding event, the germination of a seedling. As the plant grows, its lower branches come in contact with the soil and develop their own roots. Over time the interior portions of the clump die and a ring of plants, slowly increasing in diameter over time, is formed. In the 1980s, botanist Frank Vasek radiocarbon dated chunks of deadwood at the centers of the oldest and largest rings and derived an average growth rate for creosote bush in his region. By applying this rate to the largest clone (for which he found no wood at its epicenter) a phenomenal figure of 9,400 years was obtained (Vasek 1980). This champion plant is now known as "King Clone" and is protected on a 17-acre preserve.

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Annual growth rings can be seen in the stems of woody plants in temperate or arctic regions. A cut trunk of common alder (*Alnus glutinosa*) is seen here.

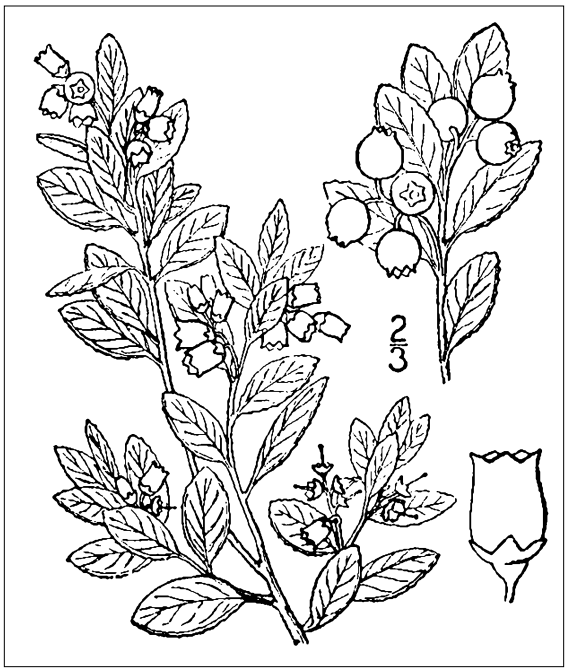
In 1919, the botanist Frederick Coville postulated (on the basis of morphological characteristics and the inability of the plant to set viable seed) that the large 1,200-foot-long (366 meters) stand in Pennsylvania seemed to be a single clone and had spread across the gentle slope by means of underground runners. It was observed that the plant grew laterally about 6 inches (15.2 centimeters) a year so he estimated that the entire clump had incrementally increased to its present size from a single seed deposited 1,200 years prior.

A sister clump, across the Juniata River from the Baird stand, was found in 1920 by H. A. Ward. This was the largest single stand ever to be found, a massive colony stretching over a mile and covering 100 acres (40.5 hectares). Coville's methodology was applied to this monster and an age estimate of 13,000 years was declared.

Based on fossil pollen studies, we now have a clearer picture of what the climate and flora of this area would have been like over 13,000 years ago, and these data alone would probably debunk the age claim. The leading edge of the glacier terminated about 75 miles (120.7 kilometers) to the north of the position of the goliath clump around 18,000 to 20,000 years before the present day. As little as 10,000 years ago central Pennsylvania was covered in a boreal forest association, one that would probably have been too cold for the box huckleberry. The current forest, a mix of conifers and deciduous species, started to come into place about 8,000 years ago.

Box huckleberry covers the forest floor at this Pennsylvania site. (PHOTO BY ROB NICHOLSON)

USDA-NRCS PLANTS DATABASE



Botanical illustration of *Gaylussacia brachycera* from Britton and Brown's *An illustrated flora of the northern United States, Canada, and the British Possessions,* published in 1913.

In the years since Coville's conjecture, the interstate highway system has had more impact on the plant than any glaciers. During the 1960s a large portion of the goliath colony was eradicated by the installation of US Route 22/322, and a forest fire also diminished it. Sadly, this construction predated the stronger environmental standards in place today in Pennsylvania, which require highway contractors to inquire about rare and endangered plants in their paths. The conservation status of box huckleberry varies among the states where it is found, but in Pennsylvania it has a ranking of S1—critically imperiled. The species global conservation status, which considers all populations in total, is G3—vulnerable. The tract of land where the original Baird clump grows is now a Pennsylvania State Park while the remnants of the goliath clump are in private hands. The owner is aware of the plant's legacy and seems proud to direct the botanically inclined to its location.

Box huckleberry's evergreen leaves and delicate bell-shaped flowers are highly ornamental.

A Short Walk Through a Short Giant

I contacted him, got precise directions, and made a weekend pilgrimage to collect research material from this diminished Methuselah. The two Pennsylvania stands of box huckleberry are in the upper end of the ridge and valley system that stretches from Pennsylvania to Alabama. A drive along the interstate brought me to the top of a bedrock fold overlooking the broad and muddy Juniata River. As directed, I turned from the river and walked into the woods. It was a plain piece of land, a common mix with red maple (*Acer rubrum*), hickory (*Carya* spp.), chestnut oak (*Quercus prinus*), white pine (*Pinus strobus*), and eastern hemlock (*Tsuga canadensis*) standing tallest, while below these grew shadblow (*Amelanchier* spp.) with highbush and lowbush blueberries (*Vaccinium corymbosum, V.angustifolium*). It would have been quite possible, if you weren't keyed onto it, to walk past the box huckleberry thinking it a variant of lowbush blueberry, or not noticing it at all. Its thick, bright green, leathery leaves are held on wiry pinkish-green stems, and the small, bell-shaped, white and pink flowers are borne in clusters. Its fruit could easily pass for a blueberry, at least until they are chewed, at which point their larger and coarser seeds interrupt the anticipated gastronomic explosion of blueberry deliciousness.

In the filtered shade the box huckleberry grew to a height of 8 inches (20.3 centimeters) and formed a patchy patch, denser in some sections than in others. The outer edge of the colony was amoeba-like, its edge curving in and out through the trees. Nearest to the highway was an area of woods that had recently burned, and here the box huckleberry had leaves of a more anemic green, perhaps sun-scorched from want of a shady canopy. After some concentrated tramping, I found another small patch on the slope of a neighboring ridge and sampled this also over two transects. Along with the Baird stand across the river, this would make a total of three separate Pennsylvania populations in the study.

I had questioned whether genetic analysis could tease apart these stands to determine whether these large clumps were indeed a single individual run amok or were many indi-

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Box huckleberry forms a sprawling carpet of green in shaded woodlands.

viduals that had merely coalesced together. Dr. Margaret Pooler of the United States National Arboretum had begun some genetic analysis of the species and we agreed that this clonal analysis would make an interesting research subject and also help in determining conservation strategies for this rare species.

I established two perpendicular transects across the length and breadth of the clump and then sampled at equal distances along these. I brought cuttings back to the Smith College Botanic Garden, rooted them, and kept them all in separate pots as they grew. The analysis of each sample's genes would show how closely related each of the samples was to one another. If identical in genetic makeup then Coville's single-clone theory would gain credence.

To complete the study, material was also collected from a stand in north central Tennessee. The lovely town of Rugby is a quaint cluster of 20 Victorian homes in the woods, a former utopian community now under siege by antique hounds. A path through the woods leads to the Gentlemen's Swimming Hole, and here, growing with the spectacular mountain stewartia (*Stewartia ovata*), is another outsized patch of box huckleberry, which was also transected and collected for the study. Finally, a sample of the low-growing Mexican *Vaccinium kunthianum* was also sent to the United States National Arboretum for analysis.

Little Plant, Big Data

After the team at the National Arboretum did their genetic analysis they found the Tennessee stand was a single clone and the Mexican material was very distantly related. The Baird stand of Pennsylvania showed only two clones, with one clone limited to one corner of the huge clump. Those from across the river were very different. The smaller of the two showed three closely related clones. But a quarter mile away, the largest clump of all—at nearly 1,000 feet (over 300 meters)—showed but one clone. Using the estimated growth rate of 6 inches (15.2 centimeters) per year, this would make this stand 1,000 years old had it started in the middle but 2,000 years old had it begun at the end. Because of the destruction of 80% of the stand we will never know if the entire mile

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Rooted cutting of *Gaylussacia brachycera.*

length was once all connected and genetically identical. But what was left of Coville's "charming little thousand-year-old lady of the forest" may indeed be the oldest known woody plant east of the Rocky Mountains.

Space and time are key concerns of our human species and we tend to measure other species by our own familiar rulers and clocks. These large clonal plant stands put the lie to the idea that plants do not move or locomote. A plant specimen will cover distance, but in an imperceptible fashion relative to our lifespan and our ways of moving. It just moves to a slower, millennial-scale timepiece rather than the sweeping second hands that so many of us caffeine-addled commuters adhere to. Perhaps we should all aspire to so relaxed a pace.

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