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A Garden of Biotic Delights[1]

by Richard L. Hoffman

Burkes Garden is the premier biological hotspot in Virginia, and for one scientist who has visited it for over 50 years, it is an endless source of discovery and renewal.

The word garden is used worldwide to denote a place that offers either nutritional or emotional gratification. One dictionary states, "Any fertile, highly cultivated territory remarkable for the beauty of its vegetation." After all, consider the Garden of Eden as a prototype!

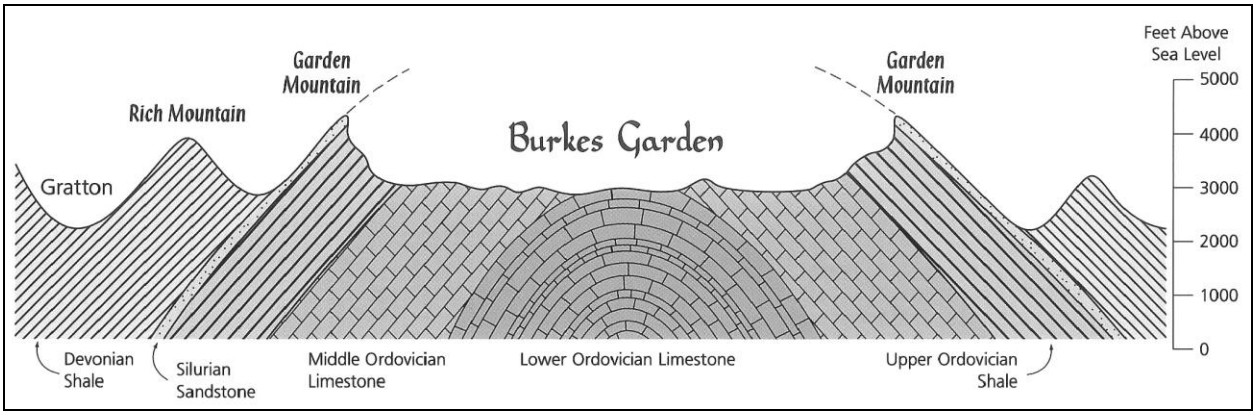
Just a little extension of the concept lets us imagine a garden of intellectual pleasures, and from the standpoint of natural history, Burkes Garden fulfills all expectations and more. For years I have asserted to one and all that it is in fact **THE** premier biological hotspot in Virginia, if not the entire southern Appalachian region. How can such a sweeping generalization be justified?

The traditional idyllic garden usually owes its singularity and charm to a specific combination of factors: climate, landscape, position. Exactly the same factors combine to give Burkes Garden an unrivaled diversity of plant and animal life. Central physiographic position in the Appalachians, sufficient elevation to provide northern climate, diversity of underlying rock and soil types and abundant rainfall all contribute to the overall effect.

[1]Originally published (with additional photographs) in the Spring 1996 issue of *Virginia Explorer* (volume 12, number 2, pages 7-11). Reprinted with permission of the Virginia Museum of Natural History, Martinsville, VA.

Structurally, Burkes Garden, located in the northeastern sector of Tazewell County, is what geologists call a breached anticlinal dome. It is eight miles east to west, and five miles north to south (*see diagram below*), and is formed in the shape of a bowl turned upside down. The rim of this bowl is today's Clinch Mountain, averaging about 4,000 feet along most of its crest but welling up to 4,700 at Beartown Mountain, at the western end. Anticlinal valleys are common in the Appalachians, but are typically long and slender, usually canoe-shaped. They are formed when sedimentary beds are forced upward into long parallel-sided arches. As erosion removes the tops of the mountains formed, the softer limestones inside are exposed to erosion, while the surrounding, overlying beds of resistant sandstone remain as the crests of modern ridges. Burkes Garden's size and shape alone are unique within the entire Appalachian system, and both provide the foundations for the singular biodiversity that has developed there.

My first visit to the Garden was in 1946, when, as a university sophomore, I was following the trail of a suspected new type of salamander. My source, a Smithsonian zoologist who combed Virginia for butterflies, painted an irresistibly compelling picture of the region and its fauna. That first quick trip – made back when the main access road from Tazewell was still unpaved and when one could acquire Burkes Garden land only by marrying into it – was immediately addictive. In 1947 I went back with a friend for three days and nights. We camped "out" inside a cave full of long-eared bats, scaled Beartown Mountain, and came away with many good discoveries in our bottles. After the lepidopterist just mentioned and a botanist of the same era, I think we were the first naturalists to collect at the Garden. And repeated visits over the next fifty years – often three or four times a summer – have continued to provide new and fascinating finds.

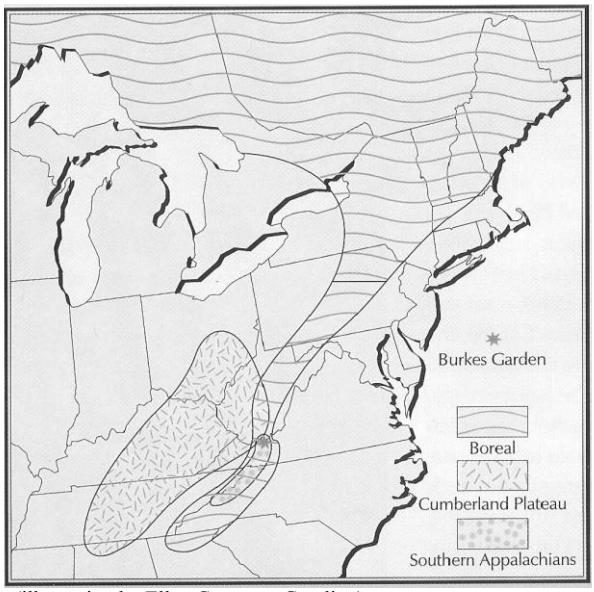


(illustration by Ellen Compton-Gooding)

What produced a mix of living ingredients brought together at this particular landscape in southwestern Virginia? Organisms adapt to specific environmental regimes, climate being one of the most important. Since mountains tend to be colder than lowlands, those species which have evolved in cool environments tend to occur chiefly toward the polar regions or in high southern mountain ranges. For this reason, many plants and animals typical of Canada occur in Virginia at Mount Rogers and other areas high enough to support Canadian climates.

Burkes Garden tops out at 4,700 feet on Beartown Mountain. Even the valley floor is 3,000 feet and higher. This is plenty of elevation to maintain the "northern" conditions required by cold-adapted organisms. Most of these used to be widespread in Virginia during glacial periods but are now isolated on high and cool islands along the Appalachians as the result of post-glacial warming. In addition to many kinds of both plants and animals that extend southward as far as the Great Smokies, such as red spruce and red squirrels, there are some which occur no farther south than Burkes Garden. A good example is a small and attractive ground beetle, *Bembidion graciliforme*.

Elevation and location interact to bring in a second category of residents. If one examines a map of the eastern United States that emphasizes elevation (*see illustration below*), it is easy to spot the concentrations of high (and cold) country extending down through central eastern West Virginia about as far as Bluefield, and another offset to the southeast, beginning at Mount Rogers and ending abruptly in north Georgia. This latter region corresponds to the Southern Blue Ridge, and contains over a thousand peaks above 4,000 feet. During previous geological times it has been both biologically continuous with, and climatically separated from, Canada. During the latter intervals it served as a refuge for glacier-displaced life, and many distinctive new endemic species originated there. Today many of these localized endemics enter Virginia only at Mount Rogers, but a number betray their former ranges towards the north by occurring at Burkes Garden, halfway between the two high country regions defined above. Several kinds of millipeds and ground beetles precisely represent this pattern of southern Appalachian endemics reaching their northernmost stand on Beartown Mountain, In 1947 my friend and I discovered the presence there of Jordan's salamander (*Plethodon jordani*)[2], its first known locality north of Mount Rogers.



(illustration by Ellen Compton-Gooding)

We have now recognized representatives of both northern and southern mountain species coexisting at one favored spot. But the biota is still more diversified by the presence of species whose ranges are more midwestern, centered on Kentucky and Ohio, and which barely enter Virginia along its western boundaries. A good example of such an organism is the green salamander (*Aneides aeneus*), an inhabitant of crevices in sandstone cliffs, for which Burkes Garden was for years the easternmost known locality (it was later found on Walker Mountain, a few miles further east). A less conspicuous member of this group of animals is a funnel-web spider, *Coras tennesseensis*, which enters Virginia through the coal country and comes to the end of its known range in the Garden.

A perhaps more locally significant category of interesting animal residents is those which live nowhere else. The limestone floor of the bowl is replete with springs, sinkholes, and caves, and the latter are notorious for harboring local endemic species. So far we know a cave beetle and cave millipede, which share a cave with the only known nursery colony of long-eared bats, which prefer to conduct family business at elevations above 3,000 feet in the central Appalachians. A single branch draining the east face of Beartown has produced two endemic species of stoneflies in recent years. In the wooded slopes surrounding the Garden occur several additional localized millipeds.

Talk of a supposedly new species of salamander that catalyzed years of search was mythical. When the first green salamander turned up at the Garden, I realized that, with adjustments, this was the "black salamander with a golden dorsal stripe" that my informant had seen but not collected. And that itself was very fortunate,

[2]Editor's note: Virginia populations are now referable to the Gray-cheeked Salamander (*Plethodon montanus*).

because the years of search for a fantasy produced a biological harvest far more valuable than just a salamander would have.

Still another category is not without biological interest: basically lowland species which for inexplicable reasons occur isolated at Burkes Garden. Two examples will represent this group. One is the mud salamander (*Pseudotriton montanus*). Despite its species name, this animal is dominantly lowland over most of its range, occurring in muddy springs and swamps near the coast. It does occur in far southwestern Virginia, usually below 1,000 feet, but also occurs fairly commonly in the Garden's springs, at by far the highest elevation known for the species. A species of blister beetle (*Nemognatha piezata*) is basically restricted to the southern United States, reaching its northernmost locality at Raleigh, North Carolina. Northernmost, that is, until several were captured at Burkes Garden, the only known locality higher than about 500 feet and totally out of the logical range. Even the chance that a single specimen might have been transported by wind currents is unlikely – hurricanes do not track so far northwest across the Appalachians, and the beetle itself seems a little too heavy to be carried any great distance.

Collectively all of the foregoing information makes a good case to back up my contention about the really unique composition of the Garden's biota. But the point must also be stated clearly: probably what we now know is only the tip of the iceberg.

Why? Because my own field work there, despite its half-century of duration has been only superficial: a day here, an evening there, and largely concentrated on just a few sites. It is intriguing to imagine the results of a long-term carefully organized, and intensive biological survey that sampled all of the different biotopes year-round. Perhaps the Virginia Museum of Natural History can someday conduct, or play a leading role in, such an exploration, which would constitute a major milestone in the course of natural history study in both Virginia and the southern Appalachians overall.

Northern species extending southward along the mountain; southern endemics at their northernmost point and western species at their easternmost; local forms occurring nowhere else; lowland species isolated at a high elevation: What a grand diversity of dissimilar organisms commingling at a place of unsurpassed natural scenic beauty! What riddles of geographic dispersal to unravel! Any wonder that to me fifty years have enhanced rather than dulled the charm and challenge of a singular locality (one outstanding in a singular state!) that ever invokes the next visit with the promise of something new and interesting?

Go and see it for yourself: that sceptered bowl, that mountain fortress that Nature has drawn up around herself, that other Eden, demiparadise, that Burkes Garden!

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Dr. Hoffman in his laboratory. Photo by Rick Boland.