

## Drawing the Line on Sweetgum: Fine-tuned Phylogeography Part I. Virginia North to the Roanoke River

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### ABSTRACT

The distributional limits of sweetgum (*Liquidambar styraciflua*) in the southern Piedmont of Virginia between the North Carolina border and Roanoke River were mapped in considerable detail. This study, which relied entirely on road surveys, is presented as an example of a simple biogeographical project that can be conducted by both scientists and amateur naturalists.

*Key words:* sweetgum, distribution, phylogeography, Virginia.

Like any other field of knowledge, biogeography progresses from the general to the specific. At one time both collectors and scientists were content with simply a continental provenance for specimens (and even then, often got it wrong). As time passed, precision increased owing both to improved maps and greater appreciation of distributional phenomena. Now it is customary to cite degrees, minutes, and seconds on specimen labels and in databases, and satellite technology is available to focus down even closer. As the system of public roads has expanded during the past century in North America, there are few places left in Virginia more than a mile or two away from easy access by an automobile. It is now possible for anybody so inclined to pursue the details of geographic distribution of plants, for instance, down to the location of individual organisms. And while this may at first seem to be an exercise into the limits of trivia, some interesting information can be obtained as a product of learning more and more about less and less. The following essay is offered in support of the premise that data accumulation can be fun as well as compulsive.

An ideal subject for the study of local microdistribution would possess several characteristics: (1) abundance and conspicuousness (a large perennial plant is better than most animals for obvious practical reasons), (2) the species selected should be easy to identify, with no possibility for confusion with any local

relatives, (3) it should be in either the expansion or contraction phase of its chorographic history, and (4) within the study area, the species should have a recognizable boundary. The common sweetgum tree (*Liquidambar styraciflua* L.) fulfills all of these requirements in Virginia (although it would not satisfy #4 in Mississippi, Kentucky, or Tennessee, where it is completely statewide). In characters of the leaves, fruits, and stems, sweetgum cannot be mistaken for anything else in its range (making data accumulation possible even in the winter), and there can be no doubt that in Virginia the species is currently expanding its range rapidly westward across the Piedmont, as will be demonstrated in a subsequent paragraph.

I started thinking about sweetgum during the late 1940s, when I was a student at the University of Virginia and was impressed by how abruptly one came into its area while driving east toward Richmond or northeast toward Washington. For some decades, information was slowly accumulated in a very unsystematic way, as dots on road maps, notes in field journals, and simply in the memory bank (neural, not electronic). At last, on becoming a staff member at VMNH, I had not just more opportunities to conduct field work in the Piedmont, but an actual obligation to get out and investigate that generally neglected part of the state. At first, while driving to or from some site, then later as something specific to do for its own reason, work with sweetgum gradually became more and more intriguing and finally took on a life of its

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<sup>1</sup>Deceased

own. At present, I think the status of this tree in Virginia south of the Roanoke River has been pretty thoroughly defined and this much information may be of interest to general naturalists. Later I will present the results of mapping still further northward, between the Roanoke and James rivers, and then from the James to the Potomac. Substantial progress has been made in these areas, and the work goes on currently.<sup>2</sup> Unfortunately, the same cannot be said for extreme southwestern Virginia, where observations so far suggest a pattern of random disjunctions: populations reflecting condensation rather than expansion, and not correlated with anything logical. That area will take longer to interpret, and locality records are much needed.

There is not much published information about the inland occurrence of sweetgum in Virginia. The in-state distribution is shown in very general terms (one large dot per county) in the Virginia flora atlases (Harvill et al., 1992; Virginia Botanical Associates, 2012). An interesting early record is in a paper about Virginia Orthoptera (Fox, 1917), which mentioned the species (and willow oak) around Orange and Gordonsville, and presciently associated both with the "lower Piedmont" biota.

It is much to be hoped that readers of this account will enlist in the crusade to draw the line and provide data from their own observations. Sweetgum watchers should observe the procedures and caveats set out in the next paragraph.

#### MATERIALS AND METHODS

I have plotted observations solely on a copy of the DeLorme Atlas & Gazetteer for Virginia (1989), although in retrospect far more detail could have been registered on USGS 7.5" quadrangles. Still, the DeLorme maps allow for a plotting accuracy of down to approximately 100 meters. Sightings have been made entirely by road cruising. Sweetgum is so distinctive that, with a little practice, one can spot even small specimens while driving slowly, either from foliage, the conspicuous fruit, the winged twigs, and even a distinctive *Gestalt* when the leaves are off. All cases of doubt (occasional red maples may be deceiving at a glimpse) have been checked "on foot." I systematically drove on east-west trending state secondary roads, preferentially from west to east, alert for the first sighting. This being confirmed and entered on the map, the car was turned around and driven slowly westward beyond the site to double-check the location. Every westernmost dot shown on the map has been

checked in this manner, many of them several times. In time, one develops a line showing the inlandmost occurrence of sweetgum on every relevant county road, to an accuracy of 100 meters or less. The "sweetgum line" has turned out to be irregular, capricious, and unpredictable, with frequent lobes, lacunae, and disjunctions. The lobes are frequently associated with water courses. In many places, the line may be locally vague owing to extensive clearing and cultivation; in such cases one relies upon extrapolation and uses a dashed line instead of a solid one. I have no idea how the seeds are dispersed: but would guess by wind because of their small size.

Obviously trees in someone's front yard may NOT be registered. A disjunct record needs to be checked carefully; sometimes traces of a former residence may be found in explanation. It would really be preferable for two or more persons to conduct such surveys, one doing the driving and the others observing and marking the map. Weekdays seem to be preferable to weekends for these types of surveys due to generally lower traffic volume on rural roads.

In the following commentary, "Rt." refers to roads in the county system, usually a 600 or 700 number in Virginia; often a higher number in North Carolina. Federal highways are prefixed US; state routes by VA or NC.

#### NORTH CAROLINA

*Rockingham Co.:* The boundary crosses US Hwy. 220 immediately west of Stoneville, ca. 1.5 km south of the NC Rt. 770 interchange. Sweetgum is generally distributed in the city of Eden, and crosses the state line into Virginia north of Draper along VA Rt. 856 (Pittsylvania Co.). There is also a small lobe into Virginia along the Smith River north of Eden, noted under Henry County. The distribution of sweetgum in the northcentral part of Rockingham County remains to be worked out; it is obviously in the Matrimony Creek drainage, but not seen along Garrett Road (NC Rt. 1501) where it crosses that stream just west of Eden.

#### VIRGINIA

*Henry Co.:* I have been able to locate only three small populations of sweetgum in this county, all of them just north of the state line. One is ca. 3.5 km southeast of Ridgeway, where VA Rt. 637 crosses a small tributary to Matrimony Creek; the second is at the intersection of VA Rts. 632 and 884 (Stuart Creek); the third consists of a few scattered trees south of Sandy Level, in the extreme southeastern corner of the county along VA Rt. 610.

<sup>2</sup>Editor's note: Parts 2 and 3 of Dr. Hoffman's sweetgum study will not be completed or published due to his death.



Fig. 1. Extent of inlandmost occurrence of sweetgum (*Liquidambar styraciflua*) in Virginia from the North Carolina border north to (and slightly beyond) the Roanoke River. All federal and state highways are indicated and selected county roads are shown but not labeled (except Co. Rt. 640). Points (three in Henry Co., 59 in Pittsylvania Co., and 12 in Campbell Co., plus three on the northern outskirts of Eden, NC) indicate the author's observational limits along public roads. The meandering solid line running from southwest to northeast is the inferred western distributional limit of the species. The rectangle in the inset map shows the study area.

From that point the line crosses over into Pittsylvania County.

*Pittsylvania Co.:* The line appears to be fairly straightforward, extending north-northeast along Cascade Creek, and crossing US Hwy. 58 about 100 meters east of its junction with VA Rt. 855. A prominent north-south ridge here seems to be the definitive boundary. From here, the line turns more distinctly eastward toward Chatham, just west of Whiteoak Mountain, making a notable westward lobe up the Banister River basin. US Hwy. 29 is crossed just at the southern edge of Chatham, at the junction with Business US Hwy. 29. North of Chatham, the line runs just west of Sheva and Chalk Level, crossing VA Rt. 40 about 100 meters east of its junction with VA Rt. 856. The Roanoke River (and northern edge of the county) is crossed immediately east of the mouth of Seneca Creek, into Campbell County.

*Campbell Co.:* Sweetgum is not present along Seneca Creek itself, turning eastward again to cross US Hwy. 501 about 3 km south of Gladys. Beyond this point, there is still ambiguity and uncertainty to be resolved.

#### GENERAL OBSERVATIONS

There can be no doubt that sweetgum is, in the Virginia Piedmont, an aggressive and successful pioneer species. All along “the line” as here mapped (Fig. 1)<sup>3</sup>, seedlings and young trees are usually abundant at the westernmost observed sites, especially evident in cleared fields, roadside embankments, and disturbed areas in general. Further to the east, the species seems to become assimilated into local tree communities and is rarely a dominant or competitive element. I have been unable to discern any particular preference for habitat type: hot exposed fields and moist shaded bottomlands seem to be occupied with equal success.

In my opinion, sweetgum is, in central Virginia, an austral species vigorously expanding its range westward and northward. It will be of considerable interest to continue observations into the future. How long until it gets to Martinsville and Lynchburg, or to the Blue Ridge? Drawing the line again in 50 years will surely reveal some measureable progress.

<sup>3</sup>Map prepared by Steve Roble, *Banisteria* editor, based on Dr. Hoffman’s annotated photocopies of selected pages from the Virginia Atlas & Gazetteer. His maps will be archived at the Virginia Museum of Natural History, Martinsville, VA for possible use by future researchers.

It should not be anticipated that conditions further north, particularly across the James River, will be so readily circumscribed. Already I have discovered some vexing disjunctions, well to the west of the obvious “line”, and in Fluvanna County, for instance, there are major, unexpected, westward displacements of the boundary. These will be mapped and discussed in the second part of this ongoing treatment.

Unlike the situation in the southern Piedmont, my observations in southwestern Virginia have not yet identified a distinctive “front” that can be represented by a line on a map. Rather, known occurrences of sweetgum are sporadic and disjunct, often along major streams but just as often removed at some distance from them. The impression one gets is that of a highly fragmented distribution, with little or no expansion occurring presently, and no way to anticipate where additional small populations may be located. Obviously, a long time will pass before the situation in that region is worked out.

Lastly, it might be noted that a remarkably similar westward line could be drawn in the southern Piedmont for willow oak (*Quercus phellos* L.), although that line would typically be one to several kilometers west of the sweetgum line. Regrettably, I failed to notice this situation at an early stage, and am now too burdened with other things to go back over the ground and accumulate data *de novo*. Someone should, because willow oak has the same traits that make sweetgum an easy subject. Both appear to be marching to the same drummer, but at slightly different tempos.

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