

Some Observations on Growth Form in the Sand Post Oak (*Quercus margarettiae*) and Historic Reports of Boynton's Oak (*Quercus boyntonii*) in Virginia

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ABSTRACT

The Sand Post Oak (*Quercus margarettiae*) is a small tree typical of sandy upland sites in the Coastal Plain of the southeastern United States, including southeastern Virginia. Unusual rhizomatous growth forms of the species were observed at three Virginia sites by the author. In each case, the strongly clonal stems could be traced to the root system of a tree-sized individual of *Quercus margarettiae*. Literature reports of similar growth patterns in Virginia *Quercus* were also discovered for White Oak (*Quercus alba*) and purported specimens of Boynton's Oak (*Quercus boyntonii*), a species known historically from Alabama and Texas. Upon examination, specimens from Virginia identified as *Q. boyntonii* proved instead to be *Q. margarettiae* and it is supposed that their dwarfed and perhaps clonal nature led to their misidentification as *Q. boyntonii*. Examples from the literature and personal observations are used to describe some poorly documented growth forms found in oaks with particular reference to clonal growth produced by tree-form individuals.

Key words: clonal, *Quercus boyntonii*, *Quercus margarettiae*, rhizomatous, sandhill.

INTRODUCTION

The Sand Post Oak (*Quercus margarettiae* Ashe) is a small to medium-sized tree of the southeastern U.S., where it is most often encountered on coarse-textured soils dominated by well-drained sands or gravels (Godfrey, 1988; Nixon & Muller, 1997). Field work in Virginia since 2001 has revealed the presence of a somewhat aberrant growth form of *Q. margarettiae* which mimics that of "running" oak species present south and west of our area.

During field work in the southeastern Coastal Plain since the early 1990s, the author has encountered low, sprout-form oaks as a prominent ground cover in numerous upland ecosystems maintained by fire. In many cases, the diminutive size of these oaks is ascribed to the effects of repeated fire or mechanical stress, most often with good reason. There exists, however, a subset of these species that reach their maximum height (and sexual maturity) at shrub size and often possess a decidedly rhizomatous habit

regardless of disturbance by fire or mechanical means. The growth form and reproduction of these taxa (such as *Quercus pumila*, *Q. minima*, and a distinctive "form" of *Q. virginiana*, among others) has been widely acknowledged in the literature. In this paper, a poorly documented growth form is discussed in which arboreous individuals of *Quercus* simultaneously produce rhizomatous colonies of low stems.

OBSERVATIONS

Within severely fire-suppressed upland habitats of the Virginia Coastal Plain, low, rhizomatous patches of *Q. margarettiae* were encountered at three sites in two counties (New Kent and Suffolk City) during the 2002, 2003, and 2004 growing seasons. These stations are located on "sandhill" deposits associated with the Blackwater and Chickahominy rivers. In each instance, the rather dense colonies of low stems were located first and later noted to be relatively near tree-form individuals of the same species. Excavation of stems in

the coarse soils revealed not the individual root systems characteristic of seed-derived stock, but long, slender, horizontal rhizomes terminated by short, leafy stems. In each case, these were connected to a nearby tree-form *Q. margarettiae*. Also in each case, no recent evidence of stressors (such as mechanical clearing or fire) were noted that might produce such a sprout response, nor was any evidence of fertile stems found. Specimen data is as follows:

Suffolk City: International Paper Company property-undulating *Quercus laevis* - dominated sandhills 1.8 km southeast of Cherry Grove Landing. Common within Turkey Oak (*Q. laevis*) - Longleaf Pine (*Pinus palustris*) sandhill habitat. Other associates include *Lyonia mariana*, *Gaylussacia frondosa*, *Kalmia angustifolia*, *Vaccinium crassifolium*, *Carex floridana*, etc. Specimens taken from a low, sprawling form of the species which locally forms dense thickets in the presence of tree-sized *Q. margarettiae*. John F. Townsend #2839, 10 July 2002 (Deposited at Massey Herbarium of Virginia Tech [VPI] and the herbarium of the College of William and Mary [WILLI]).

New Kent Co.: Collected from woods just west of Co. Rt. 618, just north of bridge over Chickahominy River. Dry, sandy river terrace. Specimens collected from the root systems of a tree-sized *Q. margarettiae*. John F. Townsend #3144, 15 August 2003 (VPI).

New Kent Co.: New Kent Forestry Center property - sandy peninsula of upland woods within floodplain of Chickahominy River, 3.5 km SE of Providence Forge. Dry, open woods with *Dichanthelium boscii*, *D. ovale* var. *addisonii*, *D. fusiforme*, *Scutellaria elliptica*, *Arabis lyrata*, *Carex muhlenbergii*, *Pityopsis graminifolia* var. *tenuifolia*(?). Abundant low, rhizomatous stems in the area in addition to trees of normal stature. John F. Townsend #3264, 9 July 2004 (VPI, WILLI).

Coincidentally, reports in the literature were uncovered that mirrored these field experiences in Virginia quite well. Fernald (1942) mentioned this rather unusual growth form in relation to collections he made in southeastern Virginia:

“In dry woods near the Nottoway River, near Peter’s Bridge in Sussex and Southampton Counties, there occur dense circles of low oaks with prolonged subterranean rooting stems. These low shrubs, often only 2.5-5 dm. high are all sterile and they do not have the foliage of any of the low and stoloniferous species of the extreme South. Returning in June, 1941, to study them further and, if possible, to secure

young fruit, we were so fortunate as to find, southwest of Lambs, a very complete circle of such young leafy shoots directly under the outer tips of the branches of a large standing White Oak. Digging down at the inner side of the circle we found that the deceptive sprouts were attached to roots, often 3-6 cm. in diameter, of the large tree. Such sprouting in *Quercus alba* is not mentioned in any discussions of the species which have come to hand. It is represented by our nos. 12,134 and 12,998.”

Also during field work in southeastern Virginia, Fernald noted making collections of “*Quercus stellata* var. *boyntonii*”, a very rare and insular rhizomatous species of the Texas and Alabama sands. This species was still rather poorly circumscribed and understood in the 1930s and 1940s, being wrested from obscurity only in the mid-1950s (Muller, 1956). In fact, very few populations of this taxon are known today. Fernald’s (1937: 342) report of the taxon in Virginia reads as follows:

“The comparatively rich woods were full of *Clematis ochroleuca*, *Carex striatula* Michx., *Scrophularia marilandica*, the upland *Houstonia tenuifolia* and other species we saw nowhere else during the summer, and some of the scrubby oaks were *Quercus stellata* var. *boyntonii* (Beadle) Sargent (*Q. boyntonii* Beadle), the range given by Small (Man.) as “Appalachian Valley, Ga. and Ala.”

In his enumeration of species in the same volume, Fernald (1937: 404) lists:

“*Quercus stellata* Wang. var. *boyntonii* (Beadle) Sarg. Sussex County: shrubs 1-1.5 m. high at border of dry sandy woods, Burt, F & L no. 6191.”

At the same site, Fernald also reported the related *Quercus margarettiae* (as *Q. stellata* var. *margaretta*):

“*Quercus stellata* Wang. var. *margaretta* (Ashe) Sarg. Sussex County: dry sandy woods, Burt, F & L nos. 6189 and 6190.”

Fernald never mentions the flowering or fruiting disposition of these shrubs, one of the critical features needed for the identification of the permanently dwarfed *Quercus boyntonii*.

Given that the various taxa of the post oak complex have been taxonomically confusing over the years (e.g., *Quercus drummondii*, *Q. similis*, *Q. boyntonii*) and that Fernald never mentioned finding fertile material, it seemed that the prodigious rhizome production of *Q. margarettiae* witnessed in 2002-2004 could have also led to Fernald’s report of *Q. boyntonii* as a member of the Virginia flora. Moreover, the presence of

specimens identified by Fernald as “*margaretta*” in consecutive number with those identified as “*boyntonii*” at the same site indicates that the two collections perhaps belonged to the same taxon or even individual.

Fernald likely used Small (1933) to identify his specimens. Small’s Manual of the Southeastern Flora differentiates *Q. boyntonii* based on “Leaf-blades cuneate in outline, brown or yellowish beneath, the 3-7 lobes low and rounded” and listing the habit of the species as “Shrub 1-5 m. tall...” *Quercus stellata* and *Q. margarettiae* were keyed based on “Leaf-blades obovate in outline, gray or yellowish beneath, the 3 –5 ample lobes often broad and dilated”, with *Q. margarettiae* being further differentiated based on “Leaf blades with rounded upper lobes...” The habit of *Q. margarettiae* is listed as a “Shrub, or tree sometimes to 10 m. tall...” Given the subtleties of leaf form often used to differentiate the white oaks, this description seems inadequate to characterize the differences between these three species, especially in sprout or shrub forms.

Two specimens at the Gray Herbarium, Harvard University, labeled by Fernald as *Q. margarettiae* var. *boyntonii* (Fernald’s #6191, discussed above, as well as his #8237) were studied by the author in 2004 and compared with true *Q. boyntonii* material, as well as *Q. stellata* and *Q. margarettiae*. These specimens indeed proved to be collections of sterile *Q. margarettiae*, differing from *Q. boyntonii* in characters of leaf shape (shallow terminal lobes in *Q. boyntonii*, lateral and terminal in *Q. margarettiae*), leaf and twig vestiture (densely pubescent in *Q. boyntonii*, glabrous or nearly so in *Q. margarettiae*), and twig dimensions (relatively stout in *Q. boyntonii*, relatively slender in *Q. margarettiae*). Interestingly, one of the two specimens (Fernald and Long #8237) was collected at the same locality as Townsend #2839, where the odd growth form of *Q. margarettiae* was first noticed by the author.

DISCUSSION

The observations and collections outlined in this article indicate the ability of individual oaks to simultaneously produce a combination of growth forms without first being subjected to fires or mechanical disturbance. In his discussion of vegetative reproduction in *Quercus*, Muller (1951b) reported observations of the Spanish oaks *Quercus pyrenaica* and *Q. ilex* in which he noted “...many undisturbed mature trees ... exhibiting a wide circle of shoots at some distance from their bases...” The rhizomatous nature of these shoots was confirmed by excavation and likened to that of “*Quercus breweri* of California and

numerous other species. It differs principally in the fact that the rhizomatous shoots of *Q. pyrenaica* and *Q. ilex* are produced after tree habit is assumed.” In the same discussion, Muller was careful to differentiate between root sprouting due to injury and the apparently spontaneous production of rhizomatous shoots by individual trees found in level, undisturbed soils. These observations provide some of the closest parallels to the growth forms seen in *Q. margarettiae* in the Virginia Coastal Plain.

Muller (1951b) also lists some of the species in North America known to have some form of rhizomatous habit, noting that the majority of them are southwestern, western, and Mexican in distribution, owing to the tendency of the rhizomatous habit to dominate in such semi-arid regions where seedling establishment can be arduous. However, he also lists three species that are eastern exceptions to this rule: “...*Quercus minima* on the sandy Coastal Plain in Florida, *Q. margaretta* Ashe on sand beds of the Gulf Coastal Plain, and *Q. ilicifolia* Wang. confined to sandy barrens and rocky hills in the northeastern United States.” He points out that “the plants involved are confined largely to edaphically adverse habitats”, implying that their rhizomatous nature is at least partly caused by these conditions. He does not provide further details on the rhizomatous nature of *Q. margarettiae* in the Gulf Coastal Plain.

Rhizome production by mature, tree-form *Quercus* of any species is not well-reported in the literature and doubtless occurs in species other than *Q. margarettiae*, *Q. alba*, *Q. pyrenaica*, and *Q. ilex*. These observations also suggest that the line between arborescent and clonal growth forms may be vague and that taxonomic treatments of the oaks often fail to describe the range of variation in stature found in this genus, especially as it relates to species at the extremes of their range or fire regime. For instance, while *Q. margarettiae* is recognized as a “small scrubby tree” by Harrar & Harrar (1962), Muller (1951a) describes it as “low or moderate-sized shrubs branched from the base” and gives the species the vernacular name of “runner oak.” Brown & Kirkman (1990) describe it as “a small, scrubby tree with irregular growth form” and Godfrey (1988) describes the species as a “small, scrubby, deciduous tree, often forming small thickets or groves by subterranean runners.” Sargent (1961) notes a freely stoloniferous form (f. *stolonifera* Sarg.), known from Alabama and Oklahoma, but no mention is made of the propensity of trees of *Q. margarettiae* to produce such clonal patches. Little, if any, mention is made of whether these growth forms are simply reactions to disturbance (a common occurrence in fire-maintained landscapes) or are truly a part of the species’

normal growth pattern. Personal observations of *Q. margarettiae* made in the Carolinas, Georgia, and Virginia have invariably been of small trees except in areas affected by chronic fire, in which case sprouts of *Q. margarettiae* and familiar tree-form oaks (e.g., *Q. stellata*, *Q. falcata*, *Q. marilandica*, among others) grow intermixed in a low, woody vegetation layer with many herbaceous species. In these fire-maintained situations, rhizomatous growth forms are not easily recognized due to the low stature of nearly all woody species.

Due to the long history of fire suppression at the Virginia sites mentioned, the partly clonal nature of *Q. margarettiae* in Virginia seems to demonstrate that this species is capable of a combination of growth forms regardless of recent fire history. Nixon & Muller (1997) note the propensity of members of the live oak group "to produce rhizomatous growth and clonal shrubs in juvenile stages, and in response to damage, fire, and poor soil conditions..." Muller's (1961) treatise on the live oaks similarly details the occurrence of vegetative (rhizomatous) tendencies in *Q. virginiana*, and these growth forms have been encountered by the author as well. In the case of *Q. margarettiae* and more so in *Q. alba*, similar clonal tendencies are not as well-documented, and reports of clonal or shrub-form *Q. margarettiae* in the literature seldom contain any insights into the causes of such vegetative growth. The production of rhizomatous growth by mature, tree-sized oaks in stressful soil types of the Virginia Coastal Plain seems to indicate the ability of these species to behave somewhat like their clonal western congeners when conditions permit.

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