# *QUERCUS HINCKLEYI* × *Q. VASEYANA*, A PUTATIVE HYBRID FROM PRESIDIO COUNTY, TEXAS

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## ABSTRACT

*Quercus hinckleyi* C. H. Mull. occupies a small geographic range in Presidio County, Texas, where it is sympatric with *Q. pungens* Liebm. and *Q. vaseyana* Buckl. A specimen of *Quercus*, recently discovered growing near the perimeter of a subpopulation of *Q. hinckleyi*, exhibits morphological and morphometric features of both *Q. hinckleyi* and *Q. vaseyana*. This paper reviews the morphology – with emphasis on leaf morphology − of the latter two species and reports new morphometric data on their leaves. Corresponding data collected from the unusual *Quercus* specimen are then compared and contrasted with those data. Based on this comparative analysis, the peculiar *Quercus* individual appears to constitute the first reported case of natural hybridization between *Q. hinckleyi* and *Q. vaseyana*. *Phytologia 92(3): 400-406 (December 1, 2010).*

**KEY WORDS:** *Quercus hinckleyi*, *Q. vaseyana*, *Q. hinckleyi* × *Q. vaseyana*, hybrid, leaf morphology.

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*Quercus hinckleyi* C. H. Mull. (Hinckley oak) is a rare, diminutive (≤1 m high) oak known only from limestone and sandstone substrates at elevations of 1070-1370 m in southern Presidio County and adjacent Brewster County, Texas, where it is sympatric with two other oaks, *Q. pungens* Liebm. and *Q. vaseyana* Buckl., which show more extensive geographic distributions (Powell, 1998; Turner et al.,

2003; Poole et al., 2007). Muller (1951, p. 71) treated these two species of oaks as only varietally distinct, which was "demanded by the large number of intermediates occurring in Brewster Co." We follow Nixon (1997), however, in his treatment of *Q. pungens* and *Q. vaseyana* as distinct species.

*Quercus hinckleyi* was federally listed as threatened in 1988, principally because of its restricted geographic distribution, small population size, and low reproductive rate (U.S. Fish and Wildlife Service, 1988), and "very little" data have been generated on the species in recent years (U.S. Fish and Wildlife Service, 2009). Although hybridization among oak species is common (Powell, 1998), no clear instance of hybridization of *Q. hinckleyi* with any other species has been reported to date. Here we describe a specimen that appears to be an $F_1$ hybrid between *Q. hinckleyi* and *Q. vaseyana*.

## MATERIALS AND METHODS

While collecting leaf samples from a population of *Q. hinckleyi* near Shafter, Texas, we discovered a single mature individual oak bearing two types of leaves on any given branch: small distal leaves grossly resembling the leaves of *Q. hinckleyi* and large proximal leaves with some gross resemblance to the leaves of *Q. vaseyana*. This apparent hybrid plant was growing approximately five m downslope from a motte of typical *Q. hinckleyi* on a ridge composed of limestone and sandstone strata. This plant was approximately 4 m in height (Fig. 1a), in marked contrast to the nearby *Q. hinckleyi*, none of which exceeded 1 m in height (Fig. 1b). We were unable to locate a specimen of *Q. vaseyana* within a 50-m radius of the putative hybrid, but the taxon is known to occur in the Shafter area. Gross and microscopic observations of leaf morphology of the two parental species and the putative hybrid, as well as morphometric data on the leaves, were based on herbarium specimens at SRSC, including three from the vicinity of Shafter: *Q. hinckleyi* (*S. Weyerts 104*); *Q. vaseyana* (*A.M. Powell & S. Powell 3733*); and *Q. hinckleyi* × *Q. vaseyana* (*M.K. Terry 950*).

## RESULTS AND DISCUSSION

As with most oaks, the most informative findings that distinguished *Q. hinckleyi* and *Q. vaseyana* consisted of differences in leaf morphology. Fig. 2a shows the gross leaf morphology of a typical *Q. hinckleyi* specimen, *S. Weyerts 104*. Fig. 2c shows that of a typical *Q. vaseyana* specimen, *A.M. Powell & S. Powell 3733*. Table 1 shows comparative leaf data on *Q. hinckleyi* and *Q. vaseyana*.

Fig. 2b shows two conspicuously different leaf types on the same branch from a herbarium specimen of the putative hybrid, *M.K. Terry 950*. At the apices of the branches, the nodes bear small (0.5−1.5 cm long) leaves that look superficially similar to *Q. hinckleyi* leaves, while the proximal nodes bear large (3−4 cm long) leaves that look somewhat similar in size and lobing to leaves of *Q. vaseyana*.

The marked morphological differences between *Q. hinckleyi* and *Q. vaseyana* extend to characters of microscopic leaf morphology. Fig. 3a shows the absence of stellate hairs on a typical abaxial leaf surface of *Q. hinckleyi* (sparse stellate hairs can occur in this species, but uncommonly). Fig. 3c shows abundant (almost confluent on the veins) stellate hairs on the abaxial leaf surface of *Q. vaseyana*. Fig. 3b shows an intermediate character state, viz., sparse occurrence of stellate hairs on the abaxial leaf surface, which is typical of the putative hybrid.

The conspicuous qualitative and quantitative differences between *Q. hinckleyi* and *Q. vaseyana* in their foliar character states (Table 1) could conceivably render it difficult to recognize a hybrid between the two with any certainty. In this instance, however, we have clear intermediate character states (e.g., the intermediate density of stellate hairs in the putative hybrid), plus the unusual situation in which the putative hybrid bears two types of leaves on the same branch, recognizable as representing both of the disparate parental leaf types. Given the unique morphology of *Q. hinckleyi* and the limited number of other oak species in the Shafter area, there is little room for doubt as to the identity of the putative parents of the plant concerned. Microsatellite data, currently under study, should provide further information as to the parentage of the plant in question.

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Table 1. Comparisons of taxonomically valuable foliar characters exhibited by *Q. hinckleyi*, *Q. vaseyana*, and the putative hybrid *Q. hinckleyi* × *Q. vaseyana*

| Leaf Trait | *Q. hinckleyi* (*n* = 35) | *Q. vaseyana* (*n* = 124) | Hybrid (*n* = 1) |
|---|---|---|---|
| Length (mm) of blade | 12.7 ± 2.8 (7−)8−15(−19) | 37.0 ± 9.8 (≤ 60) | 27.9 ± 33.7 (≤ 40) |
| Width (mm) of blade | 9.1 ± 2.0 6−12 (−15) | 15.6 ± 4.8 (≤ 40) | 19.1 ± 29.9 (≤ 31) |
| Shape | subrotund to ovate | oblong-elliptic to lanceolate | oblong-ovate |
| Apical teeth | spinose | mucronate | mucronate-spinose |
| Apex | acute or obtuse | mostly acute rarely obtuse | acute |
| Base | cordate or auriculate | cuneate to rounded, rarely subcordate | rounded, slightly cordate |
| Margins | strongly crisped, slightly revolute | flat or somewhat crispate | flat |
| Lobing | 2−4 | 4−8 prominent lobes | 4−6 lobes to almost no lobing |
| Toothing | spinose | mucronate, variable | cuspidate or mucronate |
| Veins | raised on both surfaces, more prominent and red basally beneath | raised on both surfaces, more prominent beneath | almost flat on upper surface, markedly raised and red basally beneath |

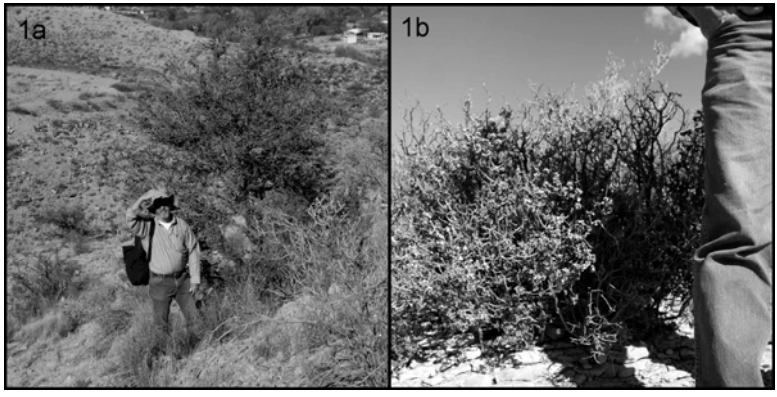


Fig. 1a. The *Quercus hinckleyi* x *vaseyana* hybrid oak with human standing beside it to show the size of the tree. b. Typical motte of *Q. hinckleyi* in January, showing the small stature of the trees.

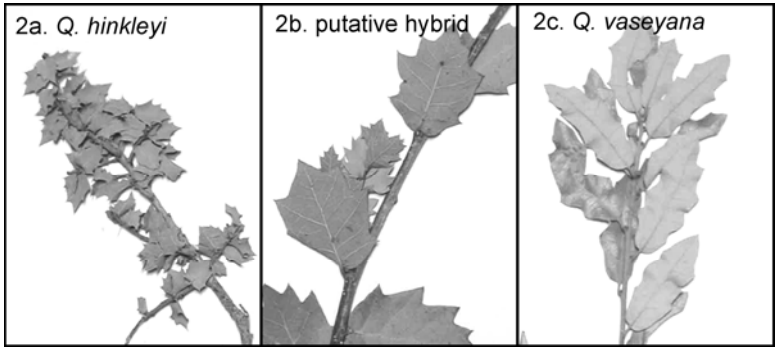


Fig. 2. Leaves of: 2a. *Q. hinckleyi, S. Weyerts 104* (SRSC); 2b. *Q. hinckleyi x Q. vaseyana* hybrid, *M. K. Terry 950* (SRSC); 2c. *Q. vaseyana, A. M. Powell & S. Powell 3733* (SRSC).

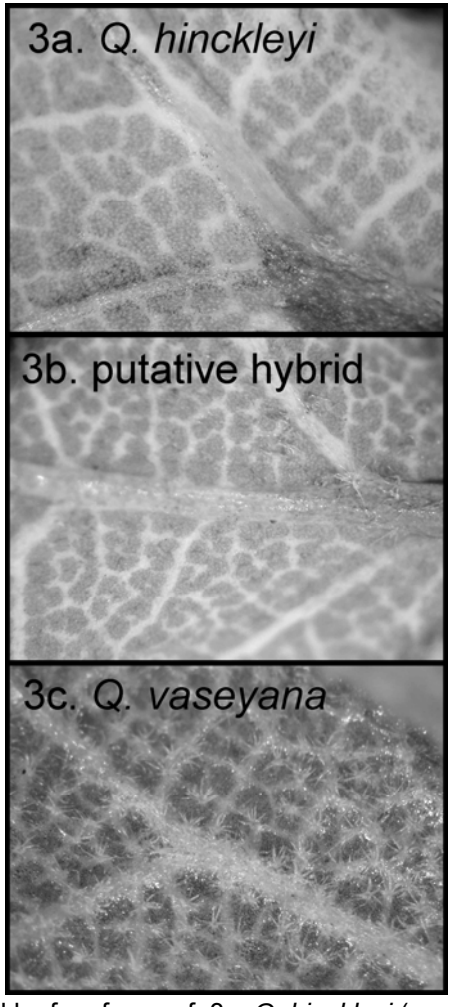


Fig. 3. Abaxial leaf surfaces of: 3a. *Q. hinckleyi* (same specimen as in Fig. 2a), showing absence of stellate pubescence; 3b. putative hybrid of *Q. hinckleyi* x *Q. vaseyana* (same specimen as in Fig. 2b), showing a minimal amount of somewhat malformed stellate pubescence on the veins; 3c. *Q. vaseyana* (same specimen as in Fig. 2c), showing abundant stellate pubescence.