The Growth of Six Species of Mexican Oaks at The Los Angeles County Arboretum and Botanic Garden, 2005–2022

DONALD R. HODEL, JAMES E. HENRICH, EMILY VICIOSO, AND JAMES KOMEN

Abstract

We planted mostly multiple plants of six species of mostly evergreen Mexican oaks, *Quercus affinis*, *Q. crassifolia*, *Q. polymorpha*, *Q. resinosa*, *Q. rysophylla*, and *Q. sartorii*, out of 3.8-ℓ (1-gallon) containers at The Los Angeles County Arboretum and Botanic Garden in Arcadia in 2005. We measured and evaluated their growth over 17 years. Nearly all trees have performed admirably, demonstrating their adaptability and suitability to an occasionally summer-irrigated landscape and/or urban forest, and would make superb ornamentals in coastal southern and likely central California. These trees will be much prized for their strong, robust growth of good to excellent conformation with few or no structural defects, handsome leaves, and mostly evergreen habit.

Introduction

Mexico encompasses innumerable ecological zones stretching from deserts to tropical rain forests and is a meeting place of temperate vegetation from the north and tropical vegetation from the south. Thus, it is no surprise that it is blessed with an incredibly rich and diverse flora. One of the groups of plants that is unusually diverse in Mexico is the oaks (*Quercus*). Indeed, with more than 160 indigenous species (Coombs 2012, Valencia 2004), Mexico is the primary center of oak diversity in the world. Here we describe and illustrate how six of these species have grown over 17 years at The Los Angeles County Arboretum and Botanic Garden in Arcadia, California.

Materials and Methods

In late 2001, co–author Hodel visited northeastern Mexico, an area rich in oaks, and was able to collect seeds of several, mostly evergreen oak species. Hodel distributed some of the seeds to various botanical gardens in southern California but he retained, germinated, and grew on a portion of them. In 2005, five of these species, along with a sixth from western Mexico from another source (*Quercus resinosa*), were planted out in what became informally known as the "Mexican Garden" on the northwest side of Tallac Knoll at The Los Angeles County Arboretum

and Botanic Garden in Arcadia. The Arboretum (34.143854, -118.051627, 150 m elevation) is in Sunset Climate Zone 20 (Lane 1988), with typical summer day temperatures from 29.5 to 37.8 C (85 to 100 F) and typical winter night lows from 0 to 4.5 C (32 to 40 F). However, slightly sub-freezing temperatures occur nearly every winter and in the last eight years, summer temperatures have reached 48 C (118 F) on a few days. Annual rainfall averages about 40 cm (16 inches), nearly all occurring from November through March.

At planting, most trees were 30 to 50 cm tall in 3.8-ℓ (1-gallon) containers. They received no special care other than occasional, mostly summer, irrigation. They were unpruned for seven years after planting out and light pruning was done in 2012 to remove ground–touching branches to lift the canopies and correct minor structural problems (Hodel et al. 2013). Another light pruning was done in 2018. However, that most of the oaks had adequate, if not superb, conformation and structure without any pruning after seven years from planting and little pruning thereafter is a testament to the trees' inherent ability to grow well with little human intervention. Tree height was estimated in 2013 with a small, crude, handheld, cardboard device and measured in 2022 with a laser range finder (TruPulse® 200L, Laser Technology, Inc., Centennial, CO, USA 80112); trunk diameter at standard height (DSH) was determined with a tape measure in 2013 and 2022; and canopy spread (north-south and east-west) was measured with a laser range finder in 2022.

We calculated change and percent change in height and trunk DSH from 2013 to 2022, mean annual increases in height, trunk DSH, and canopy spread from 2005 to 2022, mean annual increases in height and trunk DSH from 2005 to 2013 and 2013 to 2022, and standard deviations.

The Oaks

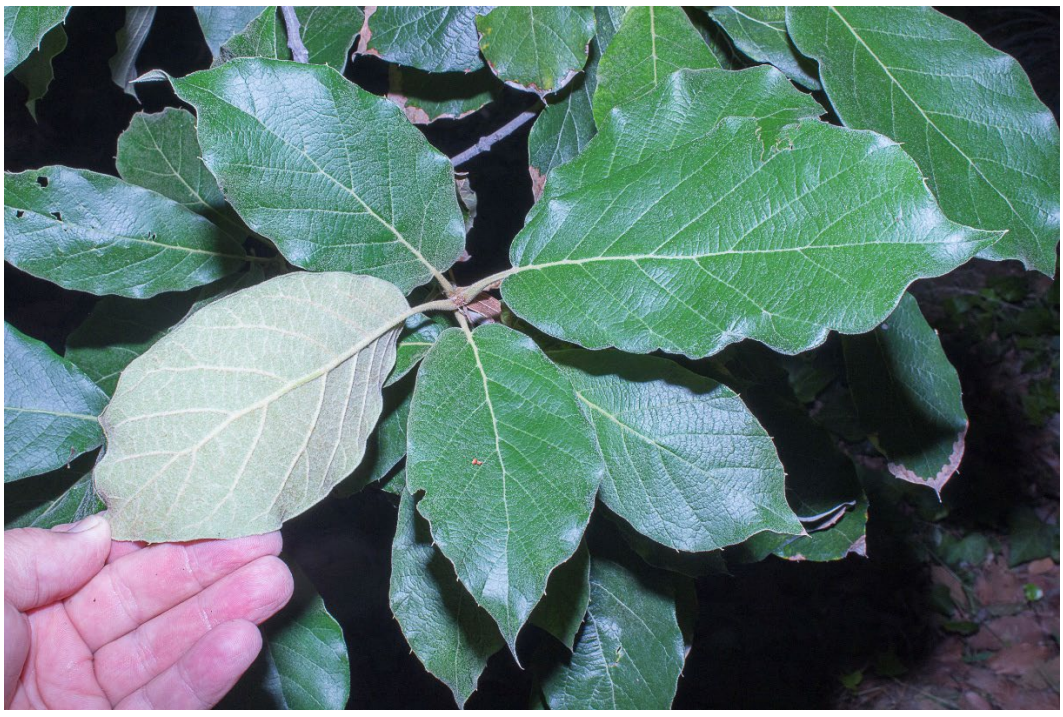
The height ranges given below are for old, large trees in habitat and many cultivated specimens might not attain such lofty dimensions. Tree hardiness or temperature ratings are always somewhat subjective and mostly represent absolute lows that the trees will survive although they might sustain major damage; while the trees in our study would likely survive an occasional night of -18 C (0 F) they would probably not tolerate situations where temperatures regularly drop that low. Descriptions are from OW (2022) and the cultivated plants at the Arboretum.

Quercus affinis occurs in moist oak–pine forests and cloud forests from about 1,150 to 2,850 m elevation over a wide range of north–central and central Mexico but mostly along the Sierra Madre Oriental (OW 2022). Seeds of this species were collected at 1,700 m elevation above Zaragoza in Nuevo León and have been distributed as *Quercus* sp. "Zaragoza." It grows to 23 m tall but is often much smaller (**Fig.1**) and when young the bark is smooth and greenish or greenish gray (**Fig. 2**) but on older trees is dark gray and slightly checkered (**Fig. 3**). Leaves are 2–12 × 1–3

1. Arborist Ken Greby inspects a *Quercus affinis* in 2012, seven years after planting out from a 3.8-ℓ container, prior to pruning to "lift" the canopy. Note the upright growth and good conformation of this specimen.

2–4. *Quercus affinis*. **2.** (upper left) Bark of young trees is smooth and greenish or greenish gray. **3.** (upper right) Bark of older trees is dark gray and slightly checkered. **4.** (bottom) Leaves are oblong to lanceolate, entire or sometimes with few short, bristle-tipped teeth in the distal half, glabrous, and glossy dak green.

5. The only specimen of *Quercus crassifolia* in our study in 2012, seven years after planting out from a 3.8-ℓ container. Note the upright growth and good conformation of this specimen.



6–8. *Quercus crassifolia*. **6.** (upper left) Bark on young trees is smooth and grayish. **7.** (upper right) Bark of older trees is dark gray with longitudinally arranged plates. **8.** (bottom) Leaves are handsome, obovate to elliptic or ovate, thick, leathery with heavily impressed veins, and glossy green adaxially, silvery tomentose abaxially.

cm, oblong to lanceolate, entire or with few short, bristle-tipped teeth in the distal half, glossy dark green, and glabrous (**Fig. 4**). The relatively small leaves of the four individuals are attractive, dark, glossy green and remind one of those of the weeping Chinese banyan (*Ficus benjamina*).

Quercus crassifolia occurs in open oak–pine forests and cloud forests from about 600 to 2,700 m elevation from Guatemala to northern Mexico, and some of the areas where it is found are especially cool and relatively moist (Coombes 2012). Indeed, it performs well in cool, moist climates and has been rarely but successfully cultivated in the United Kingdom since the 1940s and has also been grown in New Zealand, which has a similar climate, and Spain, which has a drier, Mediterranean climate. It grows to 27 m tall (Fig. 5) and when young the bark is smooth and grayish (**Fig. 6**) but on older trees is dark gray with longitudinally arranged plates (**Fig. 7**). The handsome leaves are 8.9–24.9 × 4.8–9.9 cm, obovate to elliptic or ovate, thick, stiff, leathery with heavily impressed veins, wavy or shallowly and broadly lobed distally and these lobes ending in short bristly teeth, dark green adaxially, and silvery tomentose abaxially (Coombes 2012, OW 2022) (**Fig. 8**). Newly emerged leaves are bright red and hairy adaxially, silvery tomentose abaxially (Coombes 2012).

Quercus polymorpha (net–leaf white oak, Mexican white oak, Monterrey oak) occurs from Guatemala through Mexico to southern Texas in the United States, where it inhabits riparian gallery forests, margins of thorn scrub, dry tropical forests, oak–pine woodlands, and cloud forests from about 400 to 2,000 m elevation (FNA 2013). Discovered in southern Texas only within the past 35 years, it has quickly gained popularity for landscape and urban forestry use in there and is becoming more common in Austin, San Antonio, and Houston. It grows to 18 m tall and 13.7 m wide (**Fig. 9**) and when young has brownish and checkered bark with longitudinally arranged plates (**Fig. 10**) but on older trees is gray (**Fig. 11**). Resistant to oak wilt disease in Texas and adjoining areas, it has attractive but, as the specific epithet alludes, unusually variable leaves. They are 6.4–15.2 × 3.0–7.9 cm, variously shaped from oblong–elliptical to oval or lanceolate, variously lobed or toothed, with impressed veins, and dull to grayish green (FNA 2022, OW 2022) (**Figs. 12–13**). Newly emerging leaves are reddish bronzy and hairy (**Fig. 14**).

Quercus resinosa is endemic to Mexico, occurring in the relatively dry and semi–arid central plateau from Nayarit and Durango to Michoacán and east to San Luis Potosí. It inhabits dry, rocky, and gravelly hills, slopes, and ridges in grasslands, often in pure stands or forms open woodlands with other oaks and pines from about 1,300 to 2,600 m elevation (McVaugh 1974, OWA 2022). This oak grows to 15 m tall with a spreading canopy (**Fig. 15**) and has a trunk to 70 cm DSH with dark, grayish brown, longitudinally furrowed, flaking bark (**Figs. 16–17)**. It is famous for its exceedingly handsome and large leaves (**Fig. 18**), 10–30(–50) × 8–18(–30) cm, broadly obovate, margins flat to revolute of slightly wavy and with small, rounded teeth or with 6 to 12 pairs of

9. *Quercus polymorpha* in 2012, seven years after planting out from a 3.8-ℓ container, showing superb, upright conformation.

10–12. *Quercus polymorpha*. **10.** (upper left) Bark on young trees is brownish and checkered in longitudinally arranged plates. **11.** (upper right) Bark on older trees is gray. **12.** (bottom) Leaves are various, oblong–elliptical to oval or lanceolate, lobed or toothed, with impressed veins, and dull to grayish green.

13. Leaves of *Quercus polymorpha* are unusually variable in shape and size.

14. Newly emerging leaves of *Quercus polymorpha* can be brightly reddish bronzy.

15. The only specimen of *Quercus resinosa* in our study in 2012, seven years after planting out from a 3.8-ℓ container. Note the upright growth and relatively good conformation of this specimen.

16–18. *Quercus resinosa*. **16.** (upper left) On young trees, bark is dark, grayish brown, and prominently longitudinally furrowed. **17.** (upper right) Bark becomes slightly less furrowed on older trees. **18.** (bottom) Leaves are exceptionally large and handsome.

short, blunt teeth, dark glossy green adaxially with scattered pubescence, abundant whitish yellow tomentum abaxially, and that emerge bright red, which make it highly esteemed and sought after among rare plant collectors (McVaugh 1974, OWA 2022). Considering its habitat, this species might very well be the lowest water use of the six species discussed here.

Quercus rysophylla (loquat–leaf oak), which might be the gem of these six oak species, occurs in moist oak–pine woodlands and clouds forests from about 575 to 1800 m elevation in the states of Nuevo León, Tamaulipas, and San Luis Potosí in Mexico (OW 2022). The loquat–leaf oak grows to nearly 25 m tall (**Fig. 19**) and when young has brownish, coarsely and longitudinally checkered bark (**Fig. 20**) that on older trees is dark gray and finely checkered (**Fig. 21**). Its outstanding feature is its exceedingly handsome leaves, which are 6.1–22.1 × 2.0–7.1 cm, elliptical to obovate–lanceolate, with wavy margins proximally but spine–tipped lobes distally, thick, stiff, leathery with prominently impressed veins, and glossy green (OW 2022) (**Fig. 22**).

Quercus sartorii occurs in moist oak–pine forests and cloud forests from about 1,200 to 2,300 m elevation in the states of Veracruz, Nuevo León, Hidalgo, Puebla, Oaxaca, and Tamaulipas in Mexico (OW 2022). It grows to over 27 m tall (**Fig. 23**) and on young trees the bark is smooth and greenish (**Fig. 24**) but on older trees it is gray and slightly checkered (**Fig. 25**). Leaves are 5.1–24.9 × 2–8.1 cm, lanceolate to ovate–lanceolate, wavy or broadly lobed and these ending in spine tips, and glossy green (OW 2022) (**Fig. 26**).

Results and Discussion

After 17 years in the ground, nearly all trees have performed admirably, demonstrating their adaptability and suitability to an occasionally summer irrigated landscape, and would make superb ornamentals in coastal southern and likely central California. These trees will be much prized for their strong, robust growth of good to excellent conformation with few or no structural defects, handsome leaves, and mostly evergreen habit.

During their first 10 years or so the trees were generally of upright, pyramidal habit because encroaching, competing vegetation was minimal. Now, after 17 years, in most cases, their upper canopies have begun to widen and, in many instances, touch those of adjacent trees, and their habit has changed slightly to that of a typical forest tree in a closed-canopy situation. While these species might be briefly deciduous in cold-winter areas, dropping leaves in late winter just prior to spring growth flushes, they have been nearly evergreen at the Arboretum. After the slight sub-freezing temperatures of January 2013, most of the oaks had retained nearly all their leaves with only a few leaves going off color at the very tops of the trees. The exception is *Quercus polymorpha*, which typically has a majority of the canopy showing fall color in late winter or early spring and does so nearly every year, regardless of temperature.

19. *Quercus rysophylla* in 2012, seven years after planting out from a 3.8-ℓ container. Note the upright growth and superb conformation of this specimen.

20–22. *Quercus rysophylla*. **20.** On young trees, bark is brown and coarsely checkered. **21.** (upper right) Bark becomes gray and finely checkered on older trees. **22.** (bottom) Leaves are exceptionally handsome, stiff, leathery with prominently impressed veins, and glossy green.

23. Arborist Ken Greby inspects a *Quercus sartorii* in 2012, seven years after planting out from a 3.8-ℓ container, prior to pruning to "lift" the canopy. Note the good conformation of this specimen.

24–26. *Quercus sartorii*. **24.** (upper left) Young trees have smooth, greenish bark. **25.** (upper right) Older trees have gray, slightly checkered bark. **26.** (bottom) Leaves are lanceolate to ovate–lanceolate, wavy or broadly lobed and these ending in spine tips, and glossy green.

27. Co-author Emily Vicioso stands by the largest *Quercus affinis* in our study at The Arboretum with a trunk 36.8 cm DSH in 2022.

28. *Quercus affinis* first flowered at The Arboretum in 2016.

29. Although a fast and vigorous grower, chlorotic leaves plagued *Quercus affinis* during their first 10 years, a condition that is no longer present.

Judging from their habitat, the oaks are likely relatively low-water users and once established would probably need only occasional summer irrigation in coastal plains and valleys of California

but would need regular irrigation in hotter, interior areas. All would likely tolerate brief periods of temperatures to -18 C (0 F) with little or no damage (OW 2022).

Growth Summary of each Species after 17 Years (2022)

Quercus affinis—The four specimens have a mean height of 13.3 m, a mean trunk DSH of 30.8 cm, and a mean canopy spread of 8.4 m north–south × 6.6 m east–west. They ranged from 11.3 to 16.4 m tall with trunks 22.9 to 36.8 cm DSH (**Fig. 27**). They first flowered in 2016 (**Fig. 28**). This species has been a fast and vigorous grower, despite being plagued with chlorotic leaves during their first 10 years (**Fig. 29**), a condition that is no longer present.

Quercus crassifolia—The sole specimen is 12.1 m tall with a trunk DSH of 20.3 cm (**Fig. 30**) and a canopy spread of 5.9 m north–south × 5.4 m east–west.

30. Co-author Emily Vicioso stands next to the only *Quercus crassifolia* in our study at The Arboretum with a trunk 20.3 cm DSH in 2022.

31. The largest *Quercus polymorpha* in our study at The Arboretum was 15.1 m tall in March, 2022 and was sporting a new flush of leaves and flowers.

32. Co-author Emily Vicioso stands by the largest *Quercus polymorpha* in our study at The Arboretum with a trunk 36.8 cm DSH in 2022.

33. *Quercus polymorpha* first flowered at The Arboretum in 2018.

34. *Quercus polymorpha* first fruited at The Arboretum in 2018.

35. The largest *Quercus rysophylla* in our study at The Arboretum was 17.7 m tall in 2022.

36. The *Quercus rysophylla* at The Arboretum tended to produce a fine, strong, straight bole.

37. Co-author Emily Vicioso stands by the largest *Quercus rysophylla* in our study at The Arboretum with a trunk 53.3 cm DSH in 2022.

38. *Quercus rysophylla* first flowered at The Arboretum in 2018.

39. *Quercus rysophylla* first fruited at The Arboretum in 2018.

40. Old leaves dropping at new spring leaf flushes on *Quercus rysophylla* are attractive, glossy brown or chocolate-brown.

Quercus polymorpha—The seven specimens have a mean height of 13.3 m, a mean trunk DSH of 31.8 cm, and a mean canopy spread of 8.9 m north–south × 9.1 m east–west. They ranged from 11.1 to 15.1 m tall (**Fig. 31**) with trunks 25.4 to 36.8 cm DSH (**Fig. 32**). They first flowered and fruited in 2015 (**Figs. 33–34**).

Quercus resinosa—The only specimen is 8.6 m tall with a trunk DSH of 20.3 cm and a canopy spread of 4.7 m north–south × 5.6 m east–west.

Quercus rysophylla—The three specimens have a mean height of 11.9 m, a mean trunk DSH of 29.2 cm, and a mean canopy spread of 7.1 m north–south × 8.7 m east–west. The three trees range from 5.0 to 17.7 m tall (**Fig. 35**) with trunks have a fine, straight bole (**Fig. 36**) 7.6 to 53.2 cm DSH (**Fig. 37**). They flowered and fruited for the first time in 2018 (**Figs. 38–39**). Old leaves dropping at new spring growth flushes are attractive, glossy brown or chocolate-brown (**Fig. 40**).

Quercus sartorii—The three specimens have a mean height of 13.7 m, a mean trunk DSH of 36.8 cm, and a mean canopy spread of 9.5 m north–south × 9.8 m east–west. The three trees range from 11.0 to 15.6 m tall with trunks 27.9 to 41.9 cm DSH (**Fig. 41**). This species first flowered and

41. Co-author Emily Vicioso stands by the largest *Quercus sartorii* in our study at The Arboretum with a trunk 41.9 cm DSH in 2022.

42. *Quercus sartorii* first flowered at The Arboretum in 2012.

43. *Quercus sartorii* first fruited at The Arboretum in 2012.

fruited in 2012 (**Figs. 42–43**) and has been a prolific seed producer since, many of which germinate, raising the possibility that it could be invasive, which warrants further study.

Composite Growth of all Six Species after 17 Years

Across all species and all trees after 17 years, the mean height was 12.9 m (range 5.0 to 17.7 m), mean trunk DSH was 30.7 cm (range 7.6 to 53.3 cm), and mean canopy spread was 8.2 m north-south × 8.2 m east-west (range 4.7 to 12.0 m north-south and 4.2 to 16.3 m east-west) (**Table 1**). All species except *Quercus resinosa* had mean heights from 11.9 to 13.7 m (*Q. resinosa* 8.6 m) and all except *Q. crassifolia* and *Q. resinosa* had trunk DSHs from 29.2 to 36.8 cm (latter two species 20.3 cm each) and canopy spreads generally close to 7.0 m or more (the latter two species less than 6 m). The largest individual tree was a *Q. rysophylla*, which grew to 17.7 m tall, 53.3 cm trunk DSH, and had a canopy spread 10.2 m north-south × 16.3 m east-west.

Table 1. Growth of six species of Mexican oaks after 17 years in the ground at The Los Angeles County Arboretum and Botanic Garden, Arcadia, CA, 2022. μ = mean; σ = standard deviation.

Species	Accession No.	Height m[z]	DSH cm[z]	Canopy Spread N–S, E–W m[z]
Q. affinis	20050268*1	14.0	22.9	5.3, 4.6
Q. affinis	20050268*2	16.4	35.6	10.4, 9.2
Q. affinis	20050268*3	11.6	36.8	8.4, 6.2
Q. affinis	20050268*4	11.3	27.9	9.5, 6.2
Q. affinis	μ	13.3	30.8	8.4, 6.6
Q. affinis	σ	2.4	6.6	2.0, 1.9
Q. crassifolia	20050263*1	12.1	20.3	5.9, 5.4
Q. polymorpha	20050264*1	15.1	31.8	9.4, 11.2
Q. polymorpha	20050264*2	13.2	36.8	10.0, 11.6
Q. polymorpha	20050264*3	13.1	27.9	8.1, 9.0
Q. polymorpha	20050264*4	12.9	33.0	8.8, 9.3
Q. polymorpha	20050264*5	13.6	31.8	5.6, 5.6
Q. polymorpha	20050264*6	11.1	25.4	8.1, 6.0
Q. polymorpha	20050264*7	14.4	35.6	12.0, 8.9
Q. polymorpha	μ	13.3	31.8	8.9, 9.1
Q. polymorpha	σ	1.3	4.0	1.8, 1.9
Q. resinosa[y]	20010310*1	8.6	20.3	4.7, 5.6
Q. rysophylla[x]	20050264*1	5.0	7.6	4.4, 4.2
Q. rysophylla	20050265*2	12.9	26.7	5.7, 5.5
Q. rysophylla	20050265*3	17.7	53.3	10.2, 16.3
Q. rysophylla	μ	11.9	29.2	7.1, 8.7
Q. rysophylla	σ	6.4	23.0	4.3, 6.6
Q. sartorii	20050265*1	11.0	27.9	6.4, 9.4
Q. sartorii	20050265*2	14.6	41.9	10.1, 10.3
Q. sartorii	20050265*3	15.6	40.6	11.9, 9.8
Q. sartorii	μ	13.7	36.8	9.5, 9.8
Q. sartorii	σ	2.4	7.7	1.6, 0.5
All Oaks	σ	2.9	9.8	2.3, 3.0

[z]Height and canopy spread determined with a laser range finder. Trunk DSH measured with a tape.

[y]Collected in western Mexico and provided by another source.

[x]This tree not included in 2013 measurements.

Growth Changes from 2012 to 2022

Tree height and trunk DSH were measured in 2013 (Hodel et al. 2013), enabling us to compare another parameter of growth over time of all six species except *Quercus resinosa* (**Tables 2–3**). From 2013 to 2022, the five species had a mean height increase of 3.2 m (35.3%) and a mean trunk DSH increase of 16.6 cm (100.4%). The species leader in height increase was *Quercus crassifolia* (only one tree) with an increase of 4.8 m (65.8%) while the lowest was *Q. sartorii* with a mean increase of 1.9 m (16.1%).

Table 2. Change and percent change in mean height of six species of Mexican oaks from 2013 to 2022 at the Los Angeles County Arboretum and Botanic Garden, Arcadia, California. μ = mean; σ = standard deviation.

	Height m					
Species	**μ 2013**	**σ 2013**	**μ 2022**	**σ 2022**	**μ Δ Ht. (%)**	**σ Δ Ht.**
Q. affinis	9.7	1.9	13.3	2.4	3.7 (38.1)	1.8
Q. crassifolia	7.3	-	12.1	-	4.8 (65.8)	-
Q. polymorpha	10.4	1.2	13.3	1.3	3.2 (30.8)	1.0
Q. resinosa	-	-	8.6	-	-	-
Q. rysophylla[z]	12.1	3.2	11.9	6.4	-3.3 (-27.3)	0.2
Q. sartorii	11.8	1.5	13.7	2.4	1.9 (16.1)	1.1
All Oaks	10.5	2.0	12.9	2.9	3.2 (35.3)	1.3

[z]2022 measurements of this species included a specimen that was excluded in the 2013 measurements. See text for explanation of negative mean change in height (decrease in height).

Table 3. Change and percent change in mean trunk DSH of six species of Mexican oaks from 2013 to 2022 at the Los Angeles County Arboretum and Botanic Garden, Arcadia, California. μ = mean; σ = standard deviation.

	DSH cm					
Species	**μ 2013**	**σ 2013**	**μ 2022**	**σ 2022**	**μ Δ DSH (%)**	**σ Δ DSH**
Q. affinis	15.1	3.9	30.8	6.6	15.7 (103.9)	4.1
Q. crassifolia	8.9	-	20.3	-	11.4 (128.1)	-
Q. polymorpha	16.3	1.7	31.8	4.0	16.0 (98.2)	2.1
Q. resinosa	-	-	28.2	-	-	-
Q. rysophylla	18.1	6.8	29.2	23.0	21.9 (121.0)	12.0
Q. sartorii	19.9	0.7	36.8	7.7	16.9 (84.9)	7.0
All Oaks	16.4	3.9	30.7	9.8	16.6 (101.2)	5.4

Table 4. Mean annual height and trunk DSH increase from 2005 to 2022, 2005 to 2013, and 2013 to 2022 and mean annual canopy spread increase from 2005 to 2022 of six species of Mexican oaks at the at the Los Angeles County Arboretum and Botanic Garden, Arcadia, California.

	Mean Annual Height and Trunk DSH[z]						
Species	2005-2013 Ht. m/yr	2005-2013 DSH cm/yr	2013-2022 Ht. m/yr	2013-2022 DSH cm/yr	2005-2022 Ht. m/yr	2005-2022 DSH cm/yr	2005-2022 Spread m/yr
Q. affinis	1.1	1.8	0.4	1.7	0.8	1.8	0.4
Q. crassifolia	0.9	1.0	0.5	1.2	0.7	1.1	0.3
Q. polymorpha	1.2	1.9	0.4	1.7	0.8	1.8	0.5
Q. resinosa	-	-	-	-	0.5	1.1	0.3
Q. rysophylla	1.4	2.2	0.4	2.3	0.7	1.7	0.5
Q. sartorii	1.4	2.4	0.2	1.8	0.8	2.1	0.6
All Oaks	1.3	2.0	0.4	1.8	0.7	1.8	0.5

The mean height of *Quercus rysophylla* decreased in 2022 compared to 2013 because when we measured this species in 2013, we had overlooked a scraggly runt that was overgrown with ivy and overtopped by adjacent trees. Although still substantially smaller in height than the other two specimens, we included it in our 2022 measurements; hence, the smaller mean height increase for 2022 that results in a decrease in height compared to 2013.

The species leader in trunk DSH increase from 2013 to 2022 was *Quercus rysophylla* with a mean increase of 21.9 cm while the lowest was *Q. crassifolia* (only one tree) with an increase of 11.4 cm although this tree had the greatest percentage increase of all species at 128.1%. The other three species all showed a doubling or nearly so of trunk DSH since 2013.

Across the six species measured from 2005 to 2022, mean annual height increase was 0.7 m (range 0.5-0.8 m), mean annual trunk DSH increase was 1.8 cm (range 1.1-2.1 cm), and mean annual canopy spread increase was 0.5 m (**Table 4**). From 2005 to 2022, all species had mean annual height increases from 0.7 to 0.8 m except *Quercus resinosa*, which had 0.5 m. *Quercus sartorii* had the highest mean annual trunk DSH increase of 2.1 cm followed by *Q. affinis* and *Q. polymorpha* at 1.8 cm and Q. *rysophylla* at 1.7 cm. *Quercus crassifolia* and *Q. resinosa* had the lowest mean annual trunk DSH increase at 1.1 cm each.

Literature Cited

Coombes, A. 2012. *Quercus crassifolia*. Curtis's Bot. Mag. 26(2): 162–169.

FNA. 2022. Flora of North America. *Quercus polymorpha*. On–line: http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=233501074 Accessed 17 March 2022.

Hodel, D. R., K. A. Morris, K. Greby, and J. E. Henrich. 2013. The outstanding growth of some unusual Mexican oaks and other trees at the Los Angeles County Arboretum and Botanic Garden in Arcadia. West. Arbor. 39(2): 34–40.

Lane. 1988. Sunset Western Garden Book. Lane Publishing, Menlo Park, CA.

McVaugh, R. 1974. Fagaceae. Flora Novo–Galiciana. Cont. U. Michigan Herb. 12(Pt. 1, No. 3): 1–93.

OW. 2013. Oaks of the world. On–line: http://oaks.of.the.world.free.fr Accessed: 17 March 2022.

Valencia A. S. 2004. Diversidad del genero *Quercus* (Fagaceae) en Mexico. Bol. Soc. Bot. Mexico 75:33–53.

Donald R. Hodel is the Emeritus Landscape Horticulture Advisor for the University of California Cooperative Extension in Los Angeles County and specializes in the taxonomy, selection, and management of palms and trees. drhodel@ucanr.edu

James E. Henrich is Curator of Living Collections at The Los Angeles County Arboretum and Botanic Garden, Arcadia, California. jim.henrich@arboretum.org

Emily Vicioso is a former Arboretum Gardener at The Los Angeles County Arboretum and Botanic Garden, Arcadia, California. vicioso.emily@gmail.com

James Komen is a Consulting Arborist in California specializing in risk assessment and tree appraisal. jameskomen@gmail.com

---

Publication Date: 26 April 2025.
PalmArbor: https://ucanr.edu/site/hodel-palms-and-trees/palmarbor
ISSN 2690-3245
Editor-In-Chief: Donald R. Hodel.
Hodel Palms and Trees: https://ucanr.edu/site/hodel-palms-and-trees