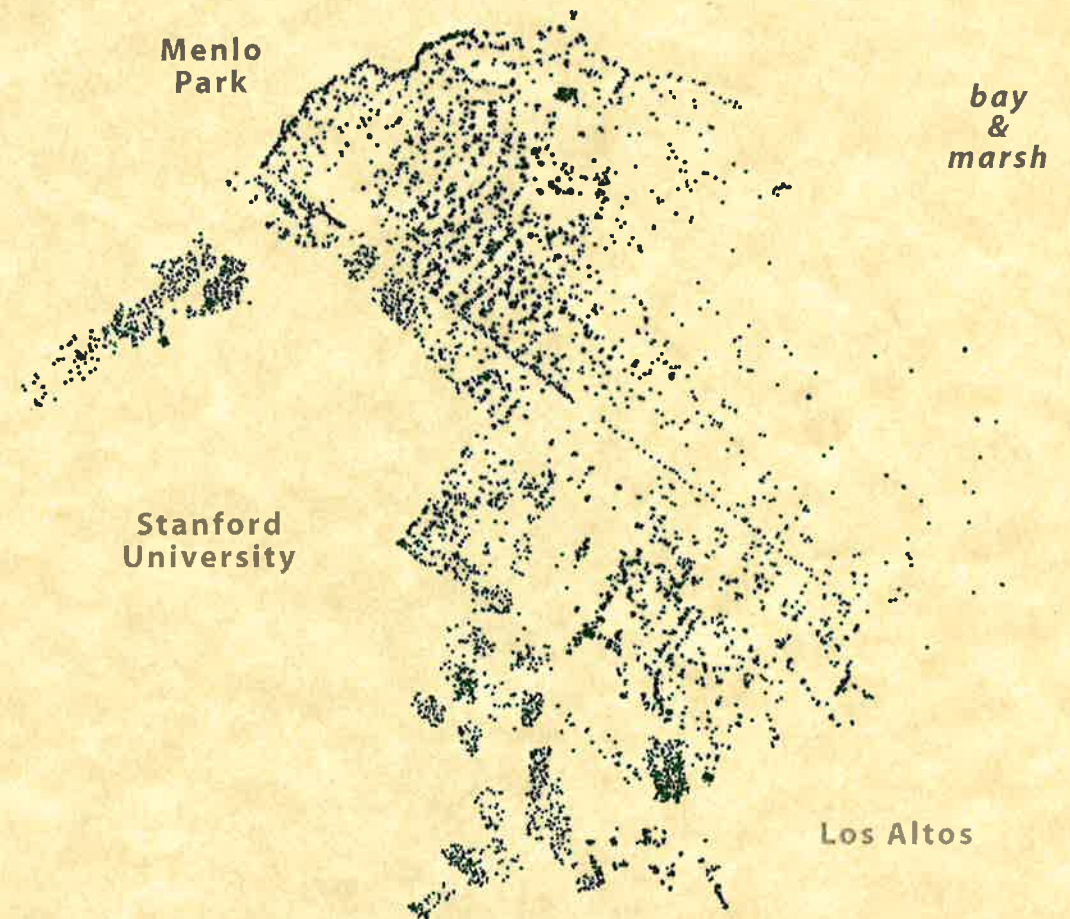


THE OAKWELL SURVEY

Palo Alto's
native oaks



CANOPY

TREES FOR PALO ALTO

OAKWELL:

A Definitive
Survey Of the
Native Oaks of
Palo Alto



CANOPY
TREES FOR PALO ALTO

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Palo Alto's Native Oaks
Results of the Canopy OakWell Survey
1997-2001

Bill Courington and the OakWell Volunteers:

Joan van Gelder, Ann Turner, Susan Rosenberg, Sue Thiemann, Mike Alexander,
Ted Wassam, Maija McDonald, Alice Fasbender, Barry Fasbender, Susan Wilson,
Dave Matson, Lu Bingham, Jean Gillett, Nina Bell, Nancy Heubach, Nancy Rogers,
Francis Nitzberg, Carlin Otto, Terry Andre, Kate Feinstein, Roberta Yee,
Diana Bebbington, Mimi Wolf, Ann Knopf, Kay Hays, Jean Olsen, Alison Fleming,
Maureen Decombe, Karla Kummer, Michele Shorin, Tony Angioletta, Inge Angioletta,
Dan Bergen, Jane Bergen, Gene Jacobson, Lucinda Pisano, Lynn Stewart, Ruth
Troetschler, Lee Schink, Glenda Jones, Dana St. George, David Levy, Mark Pratt,
David Kohler, Delphine Kohler



[October] 2001

"Every lot or homesite which boasts an oak tree is worth more than one without trees. Property owners need to be educated to ... realize that it pays to care for the health of their trees as they would for their own well-being."

Fredrick Law Olmstead, designer of Central Park and Stanford landscaping.
Palo Alto Times, June 22, 1922

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Thanks to Cachuma Press for permission to reproduce images of oak leaves from *The Oaks of California*, the definitive introduction to native oaks.

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Summary

In 1997, Canopy, the non-profit educational advocate for Palo Alto trees, launched a program called OakWell to serve as an information source for native oaks in Palo Alto. The first Oakwell project, described in this report, inventoried all native oaks east of Deer Creek Road, and left oak care instructions at each residence that had an oak. The project did not count the area west of Deer Creek—mainly Foothills Park and Palo Alto Hills—because much of the terrain is difficult and thickly wooded, and most of the trees are growing in native conditions.

Here are the survey's main conclusions:

- Palo Alto has about 9,000 native oak trees. The number rises to 13,000 if the trunks in stands (clusters, groves) are counted as individual trees. In this report, stands are counted as single trees except where otherwise noted.
- Coast live oak (*quercus agrifolia*) is the predominant species, constituting 84% of oaks in Palo Alto. Valley oak (*quercus lobata*) follows with 15%. Less than one percent of Palo Alto's oaks are blue (*quercus douglasii*), or black (*quercus kelloggii*). There are so few blacks that this species might not be native to Palo Alto, though it grows naturally as near as Woodside.
- Large oaks (greater than 48 inches in diameter) are uncommon: only 85 coast live oaks and 73 valley oaks fall in this group. Palo Alto's largest oak is an 80-inch coast live.
- The farther a neighborhood is from the bay, the more oaks it is likely to have. Of the nine neighborhoods with more than 300 oaks, only one is east of Middlefield.
- Only one of Palo Alto's 47 neighborhoods, Garland, has no native oaks. Barron Park has the most oaks, 1,239, or 14% of the city total.
- 341 oaks are street trees, meaning they are in the City right-of-way in front of residences or businesses. By contrast, a City inventory conducted in 1989 found 616 street oaks; this difference should be investigated.
- 2,846 Palo Alto parcels—about 13% of all parcels—have at least one oak.
- Over half of Palo Alto's oaks are on single family residence properties; another 18% are on commercial properties. The rest are distributed among multi-family residences, parks and parklets (such as medians), schools, government, nonbusiness organizations, the railroad, and vacant lots.

The OakWell survey project created a baseline for future evaluation of changes in Palo Alto's native oak population. The project took four years to complete, engaging

47 volunteers for about 3,000 hours. 1,163 of those hours were spent in the field collecting data; the rest were consumed by project planning, preparation, administration, and data entry. The survey cost less than \$2,000 in direct expenses, mostly for supplies.

What We Did and Why

In 1996, the City of Palo Alto adopted its first tree protection ordinance. It applied to coast live and valley oaks. Although Palo Alto has long been well-known for its abundance of mature trees, this was the City's first tree protection ordinance. During ordinance discussions and debates, it became clear that no one knew how many oaks were in Palo Alto, whether the number was shrinking or growing, how many trees were on private versus public property, and so on. All evidence for and against the ordinance was anecdotal. The need for the ordinance could have been made plainer if there had been data showing that large numbers of native oaks in fact were being lost to practices that the ordinance would attenuate.

Bill Courington, a member of the Canopy Steering Committee, proposed OakWell - a program which would be an educational resource for oaks in Palo Alto. OakWell's first project would be an inventory that would establish a baseline for judging how the city's oaks were faring in future years. Because "surveyors", as the inventory volunteers were called, would visit every site with an oak, they could leave a doorhanger describing essential native oak care practices. Thus, the project would both acquire and distribute oak information.



Canopy's essentials of

Native Oak Tree Care



- **Keep the Critical Zone native,** which means...
 - Don't water: water + warmth = oak root fungus, which will eventually kill your tree.
 - Remove paving and competing plants—especially ivy.
 - Keep cars out—compacted soil is bad for all trees.
 - Don't raise the soil level.
- **Extend the native area farther** if you possibly can.
- **Prune conservatively** and professionally: it can't be undone.
- **Have your tree inspected** by an ISA-Certified arborist.

CANOPY
TREES FOR PALO ALTO

OakWell Doorhanger

Earlier Studies

Earlier efforts to inventory Palo Alto native oaks have been partial. Unfortunately, in most cases the results have apparently been lost.

- According to the booklet *The Trees of Palo Alto*, published by the Chamber of Commerce in 1959, Garden Club volunteers counted 205 coast live oaks between Addison and San Francisquito Creek. We could not discover what the East-West boundaries of the study were or any further data, such as tree size and location.
- According to the same book, Girl Scouts “subsequently” counted 1,042 live oaks and redwoods from Addison to California Avenue. We failed to find more specific data from this study.
- In 1980, Sheila Daar, a Berkeley landscape designer and horticultural consultant, sampled oaks for the City of Palo Alto. She found 75% coast live, 10% valley, 7% holly (non-native) and 4% cork (non-native); she did not look for blue or black oaks. She estimated that there were about 2,000 native oaks with crowns greater than 32.5’ in diameter, which number suggested a tree at least 100 years old. She estimated that about 500 of these were maintained by the City. Our attempts to contact Sheila Daar failed.
- The City of Palo Alto inventoried street and park trees, including oaks, in 1989, and created a valuable database that includes tree condition data. The inventory did not cover oaks on private property or school sites.

What We Found

Palo Alto’s native oaks are unevenly distributed among species and neighborhoods. The patterns are fairly consistent, suggesting that the unevenness reflects natural factors rather than distortions introduced by development. However, there is no way to tell for sure.

Species and Size

Counting stands (clusters) as single trees, Palo Alto has about 9,000 native oaks. We undoubtedly missed some trees, for example, those in the interiors of large blocks, or small trees obscured by buildings or larger trees.

The great majority of native oaks are coast live (84%). Nearly all the rest (15%) are valley oaks. Blue oaks are rare in Palo Alto and are mainly concentrated in the hills west of Foothill Expressway. Black oaks are so rare that their classification as “native” is questionable. (All three black oaks we found are in fact recently planted street trees.) It is also likely, however,

that we undercounted black oaks. They are less distinctive in appearance than coast live or valley oaks, and the area we trained in had no black oaks.

Diameter Species	1–11”	12–24”	25–36”	37–48”	48”+	Total
Coast Live	2995	2901	1131	346	85	7458
Valley	667	276	214	169	73	1399
Blue	9	14	11	4	0	38
Black	3	0	0	0	0	3
Total	3674	3191	1356	519	158	8898

Native Oaks by Species and Diameter (Stands Counted as Single Trees)

Based on informal observations, coast live oak volunteers (very young spontaneously “planted” trees) were common , but valley oak volunteers were rare except in neighborhoods such as Barron Park and College Terrace where mature trees are comparatively dense. We do not know why there is such a discrepancy in volunteers; perhaps there are not enough nearby trees to pollinate; perhaps animals prefer valley oak acorns to coast live oak acorns.

In general, valley oaks grow larger than coast live oaks; 50% of large (48” or greater diameter) oaks are valley oaks though valley oaks constitute only 15% of the oak population. However, Palo Alto’s largest oak is a coast live oak; its diameter is 80 inches.

We used the arborist standard for measuring diameter: 54” above grade level. For multi-leader trees (those that have branches at or below 54”) we measured all leaders and computed the diameter by the standard arborist formula of 100% of the largest leader plus 50% of the other leaders.

Because we did not enter back yards unless invited, or areas posted No Trespassing, we could not get close enough to many trees to measure them. We estimated the diameter of an inaccessible tree if we could see its trunk at 54”. If we could not see a trunk, we guessed the diameter based on the size of the visible part of the tree. In the database, each tree has a code indicating whether its diameter was measured, estimated, or guessed. We coded all stands as estimated. The numbers of measured, estimated, and guessed diameters are:

- Measured: 3,802
- Estimated: 3,96
- Guessed: 1,114

Stands

A *stand* is a cluster of same-species oaks. (We treated mixed stands, which occur infrequently, as distinct stands whose extents overlap.) We invented stands to reduce the work of measuring individual trees that grow in clusters or groves, often along creeks. (There is also a biological basis for a stand; in some stands, roots grow together to form what amounts to a single tree with multiple trunks.) Although a stand has multiple trunks, the stand as a whole is coded with a single diameter, that of the “typical” tree in the stand. Unfortunately, the trees in some stands have a wide range of diameters, making the typical diameter a serious oversimplification.

Over a third of Palo Alto's native oaks grow in stands; there are 745 stands totaling 4,951 trunks. Small coast live oaks make up most stands, as the following table shows. The numbers in parentheses give the number of trees in the selected stands. For example, there are 15 coast live oak stands whose typical diameter is 25–36"; these stands have a total of 67 trunks.

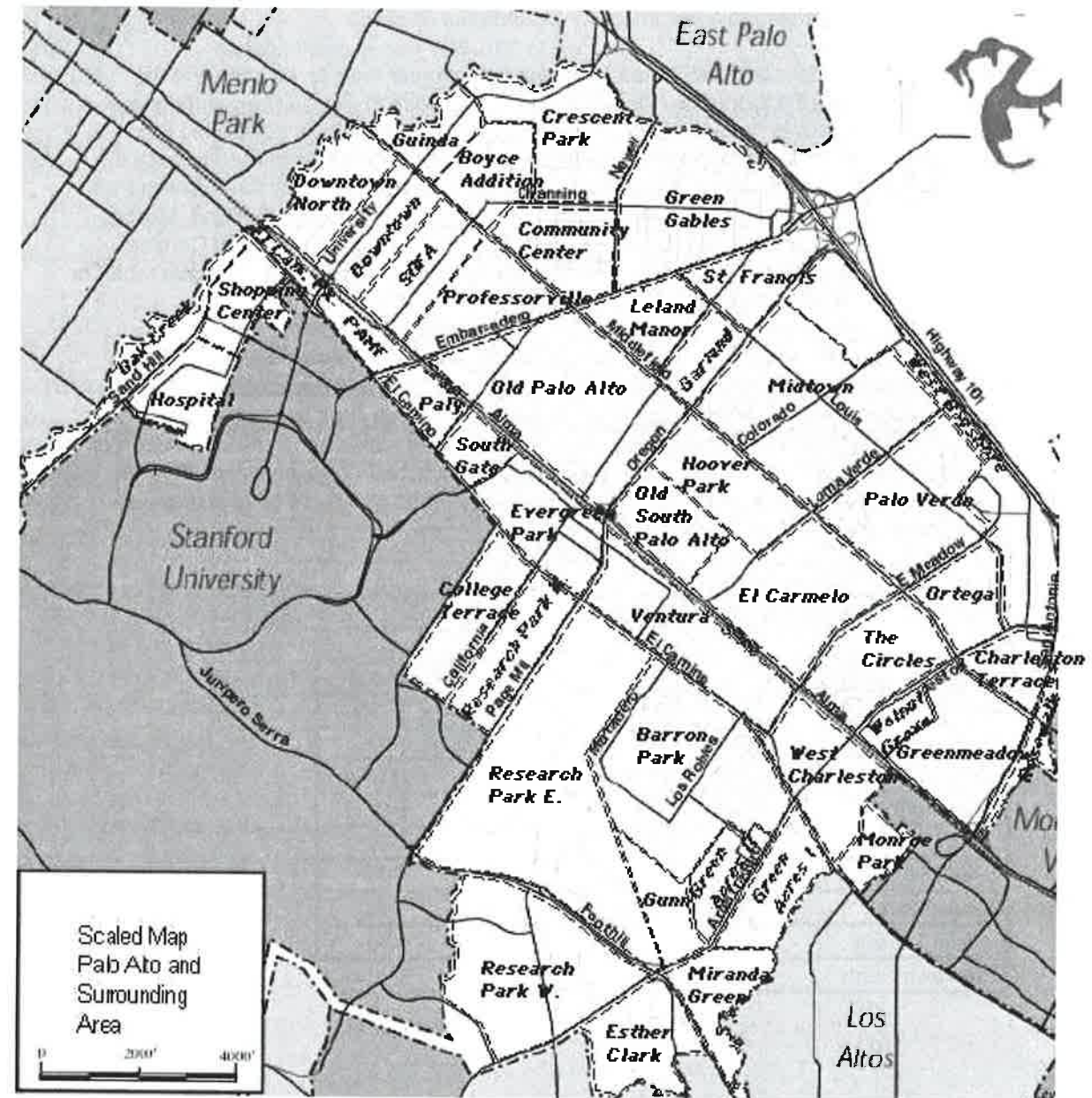
Typical Diameter						
Species	1–11"	12–24"	25–36"	37–48"	48"+	Total
Coast Live	503 (3416)	124 (896)	15 (67)	0	0	642 (4379)
Valley	86 (411)	6 (30)	6 (118)	0	0	98 (459)
Blue	1 (2)	2 (104)	2 (7)	0	0	5 (113)
Black	0	0	0	0	0	0
Total	590 (3829)	132 (1030)	23 (192)	0	0	745 (4951)

Stands by Species and Diameter with Number of Trunks in Parentheses

Note: Except where noted, in this report, a stand is counted as a single tree.

Neighborhoods

The OakWell project divided Palo Alto into the 47 neighborhoods shown on the following map. (There are no standard neighborhood boundaries, so the project created its own.)



OakWell Neighborhoods (Names in Italics, Boundaries Dashed)

Palo Alto's native oaks are distributed very unevenly around the city, as shown in the following tables. At the extremes, there are over 1,200 oaks in Barron Park and none in Garland. In part, that is because Barron Park is much larger and less developed than Garland. In addition, oaks in general, and valley and blue oaks in particular, increase in abundance with distance from the bay, and Garland is closer to the bay than Barron Park. Oaks close to the bay are often near creeks but there is no creek near Garland. Most of the high-oak neighborhoods are west of Middlefield, and many are west of El Camino. Whether the uneven distribution is due to soil type, salinity, the height of the water table, or some other factor, is a topic for further research.

The mix of species within neighborhoods also varies widely; at Gunn High, for example, 57% of oaks are valleys; whereas St. Francis, West Bayshore, Rosewalk, (and Garland) have no valley oaks. Blue oaks are concentrated in Research Park West and nearby Esther Clark, with a few "strays" elsewhere. The following tables show the distribution of species by neighborhood. Classifying neighborhoods by whether they have <100, 100–300, or >300 oaks is a convenient way to break what would otherwise be one unwieldy table; the numbers have no other significance.

Neighborhoods with more than 300 Oaks

Neighborhood	Coast	Valley	Blue	Black	Total
Barron Park	932	305	2	0	1239
Old Palo Alto	841	60	0	2	903
Research Park East	395	142	0	0	537
Professorville	426	59	0	0	485
Esther Clark	250	137	12	0	399
Research Park West	274	84	18	0	376
Crescent Park	343	13	0	0	356
College Terrace	246	100	0	0	346
Downtown North	311	11	0	0	322

Neighborhoods with 100–300 Oaks

Neighborhood	Coast	Valley	Blue	Black	Total
Oak Creek	230	25	0	0	255
Community Center	228	21	0	0	249
Gunn	108	141	0	0	249
Boyce Addition	221	19	0	0	240
Shopping Center	184	23	1	0	208
West Charleston	193	13	2	0	208
Guinda	206	1	0	0	207
South of Forest	176	10	0	0	186
Evergreen Park	165	10	0	0	175
SPRR	149	23	0	0	172
Miranda Green	155	7	0	0	162
Paly	139	2	0	0	141
Ventura	108	32	0	0	140
Hospital	120	14	0	0	134
Green Acres II	96	24	2	0	122
Green Gables	112	10	0	0	122
Research Park North	107	13	0	0	120
El Camino Park	110	4	0	0	114

Neighborhoods with fewer than 100 Oaks

Neighborhood	Coast	Valley	Blue	Black	Total
Green Acres I	94	2	0	0	96
Downtown	80	4	0	0	84
Hoover Park	60	22	0	0	82
PAMF	72	7	1	0	80
Monroe Park	68	1	0	0	69
Southgate	60	4	0	1	65
Leland Manor	40	12	0	0	52
El Carmelo	30	17	0	0	47
Old South Palo Alto	31	6	0	0	37
Midtown	15	6	0	0	21
The Circles	16	5	0	0	21
Greenmeadow	16	3	0	0	19
West Bayshore	17	0	0	0	17
Walnut Grove	12	1	0	0	13
St. Francis	10	0	0	0	10
Ortega	5	4	0	0	9
Palo Verde	4	1	0	0	5
Charleston Terrace	2	1	0	0	3
Rosewalk	2	0	0	0	2
Garland	0	0	0	0	0

Stands are also most common in western Palo Alto. The following table shows the distribution of stands by neighborhood. 14 neighborhoods, mostly east of Middlefield, have no stands.

Neighborhood	Coast	Valley	Blue	Black	Total
Research Park West	114	22	4	0	140
Research Park East	64	21	0	0	85
Barron Park	56	7	0	0	63
Esther Clark	36	13	1	0	50
Oak Creek	43	5	0	0	48
Hospital	37	3	0	0	40
Old Palo Alto	34	0	0	0	34
Gunn	17	12	0	0	29
Crescent Park	25	0	0	0	25
Professorville	23	1	0	0	24
Guinda	23	0	0	0	23
Research Park North	19	2	0	0	21
Miranda Green	19	1	0	0	20
SPRR	19	0	0	0	19
Green Acres I	17	0	0	0	17
Shopping Center	11	6	0	0	17
Downtown North	15	0	0	0	15
PAMF	13	0	0	0	13
Green Acres II	8	2	0	0	10
Boyce Addition	8	0	0	0	8
College Terrace	7	1	0	0	8
South of Forest	8	0	0	0	8
West Charleston	6	0	0	0	6
Community Center	5	0	0	0	5
Green Gables	5	0	0	0	5
Evergreen Park	3	0	0	0	3
El Carmelo	1	1	0	0	2
Old South Palo Alto	2	0	0	0	2
El Camino Park	1	0	0	0	1
Hoover Park	1	0	0	0	1
Monroe Park	1	0	0	0	1
Paly	1	0	0	0	1
Ventura	0	1	0	0	1

Stands by Neighborhood Property Types

Half of Palo Alto oaks are on single family residence properties, as the following table shows:

Parcel Type	Oaks
Single Family	4645
Commercial	1636
Park	740
Multi-family	590
School	480
Organization	315
Government	307
Parklet (median, island)	273
Railroad	133
Vacant Lot	107
Other	46

Native Oaks and Parcel Types

The dispersal of oaks among thousands of property owners means that efforts to improve oak habitats or to contact oak owners in case of drought or pestilence, will have to cast a wide net, or focus on a subset of trees (large ones or valleys, for example).

Street Trees

We found 340 street oaks (trees located in the street, in the planting strip, or, in neighborhoods with rolled curbs, in the four-foot zone inboard of the sidewalk). Street trees are the property of the City of Palo Alto.

Species	Number
Coast Live	259
Valley	78
Blue	1
Black	3
Total	341

Street Tree Oaks

By comparison, the City 's 1989 street tree inventory lists 616 coast live and valley oak street trees. We have not attempted to resolve the difference, but we should. Possibly some street oaks died in the 1990s. Possibly the OakWell teams failed to code many trees as street trees because the teams did not understand how far behind the sidewalk City property extends—it varies by neighborhood.

Boundary Trees

Boundary trees are those that apparently straddle two properties and are therefore jointly owned. We noted boundary trees to obtain the addresses of both owners and to see if there is anything different about trees that might be neglected by both owners. The surveyors could not judge property lines accurately, so a tree's boundary designation should not be considered definitive.

The following table shows that few oaks—nearly all of them coast live—appear to lie on property line boundaries.

Boundary Oaks

Species	Number
Coast Live	360
Valley	24
Blue	0
Black	0
Total	384

Surveyors were asked to consider a tree that straddled the private-street tree boundary as a boundary tree because the City and property owner are jointly responsible for the tree. However, this was a fine distinction, occurred infrequently, and probably was not consistently observed.

Using the Data

The OakWell database has already seen use:

- A group developing a plan for the South of Forest Avenue neighborhood after the Palo Alto Medical Foundation moved away wanted a catalog of the native oaks in the neighborhood. We supplied a map and the attributes of the individual trees.

- The team that surveyed Gunn High School discovered many fine specimens, several of which were surrounded by irrigated lawn or ivy. This discovery led to the creation of the Canopy Fungus Fighters project funded by the Palo Alto Education Fund. In its pilot phase, this project has enlisted Gunn students to remove ivy from four trees and replace the sprinklers that were irrigating five others.

In the Future

Canopy hopes to do many things with the OakWell survey data in the coming years. The most prominent idea is to re-survey a sampling of blocks, say, in five years, to see what has changed. Another potentially illuminating project would be to reconcile the OakWell count of 340 street trees with the City's 1989 count of 600+. We would also like to continue distributing doorhangers by matching the addresses of property sales with the database - delivering an oak care doorhanger to new oak owners.

In the short run, volunteers are needed for the following projects to preserve the data and improve its utility:

- Scan the block maps that show tree locations. The paper maps are subject to decay and destruction, and they provide the only location data we have that is at a finer level than address (which is of little use for large parcels).
- Digitize the tree locations. Adding tree coordinates (latitude/longitude) to the database would enable us to produce tree maps. Maps would help us see concentrations of trees and would enable us to compare tree density to soil maps, water table maps, creek locations, and so on.

Conclusion

The OakWell inventory project had one immediate benefit—the transfer of oak care instructions to owners. Its long-term benefits remain to be revealed, but it is clear that any effort to manage a resource, such as Palo Alto's native oaks, must begin with an understanding of the extent and characteristics of the resource. The OakWell survey produced the foundation for future oak management and education programs.

The project is also a good example of what dedicated volunteers engaged in a well-organized effort can do. For less than \$2,000:

- Over 2,200 oak owners in Palo Alto have received hand-delivered instructions for taking care of oaks.

- The present and future citizens of Palo Alto have acquired a digital snapshot of the oak tree legacy they inherited from nature and their ancestors.
- Researchers of native oaks in urban settings can begin with the OakWell database.
- Canopy has received community visibility from the oak care doorhangers and from the T-shirts the survey teams wore.
- Canopy obtained the mailing addresses of a specialized group of potential donors and members.

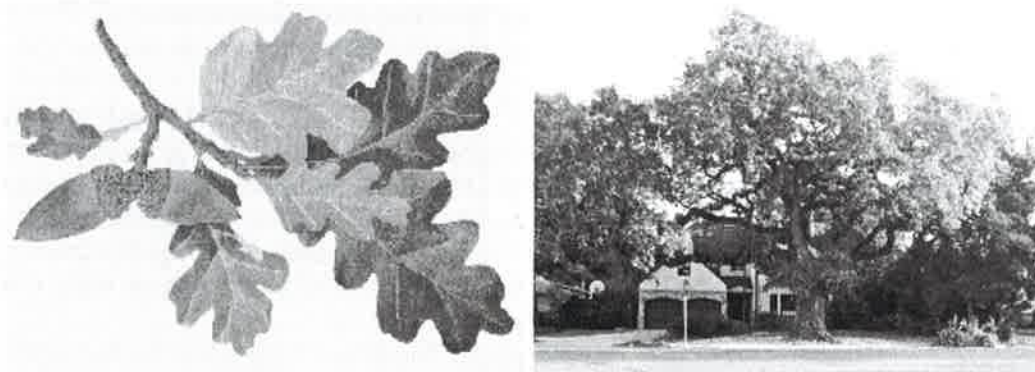
Other communities can indirectly benefit from the survey. By using the OakWell techniques and materials as the basis for their own tree inventories, they can save hundreds of work-hours and months of calendar time.

Appendix: Coast Live, Valley, Blue, and Black Oaks

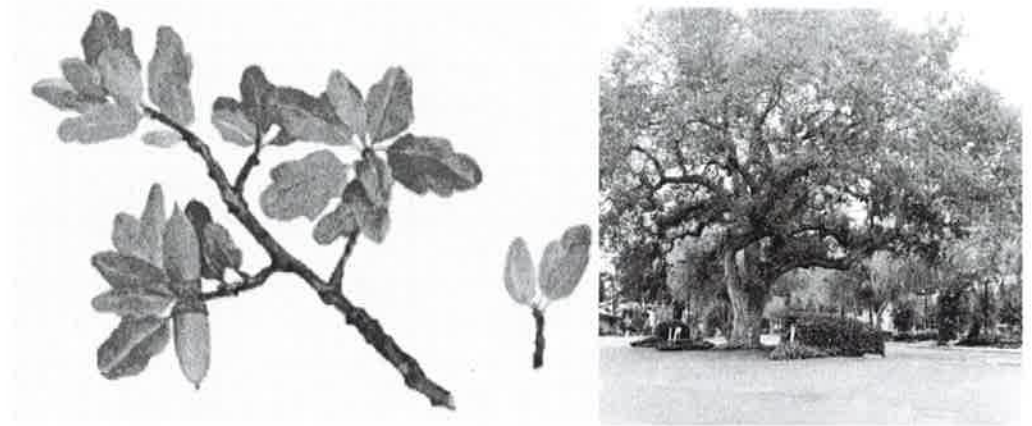
Four of the nine California native tree oaks grow in the Palo Alto area. The following images illustrate the leaves and acorns of these trees.



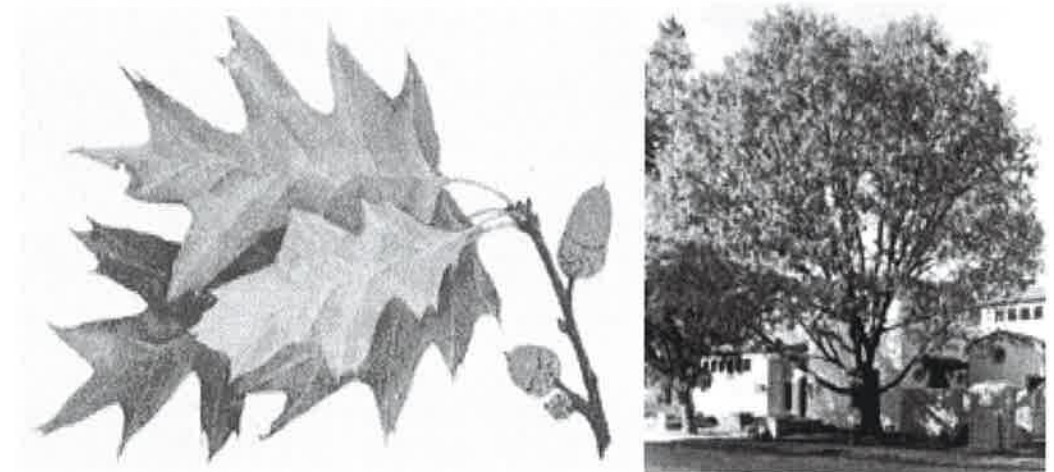
Coast Live Oak (Quercus Agrifolia) Leaves and Acorns (from The Oaks of California, Copyright Cachuma Press)



Valley Oak (Quercus Lobata) Leaves and Acorns (from The Oaks of California, Copyright Cachuma Press)



Blue Oak (Quercus Douglasii) Leaves and Acorns (from The Oaks of California, Copyright Cachuma Press)



Black Oak (Quercus Kelloggi) Leaves and Acorns (from The Oaks of California, Copyright Cachuma Press)