A California County Oak Index

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California is developing everywhere, and will endure a continuing population explosion for decades to come. According to the 2000 Census data 50.6% of California's oak woodlands are now in Metropolitan Areas. Yet the fate of heritage oak woodlands is completely up to counties and other local jurisdictions. Some of these places will be nice places to live 50 years from now, and in many others, the oaks will be gone. How are the oaks in your county doing?

I created an oak index, shown at right, to assess relative need for an oak conservation agenda in California's oak woodland counties.

This article is intended to provide oak activists with some details about the oak woodlands in those California counties where most of them grow. For detailed information you can download tables, charts and maps, which include base oak data, for 46 counties at www.forestdata.com/oaks.htm.

The Data

I did some GIS analysis using geographic data downloadable from the internet. The oak layer was developed by Dr. Norman Pillsbury of CalPoly, by state consultants Pacific Meridian Resources, and by the CDF (California Dept. of Forestry and Fire Protection) from 1991-1994. They used satellite imagery, aerial photography and field inspections to classify 10.5 million acres of California lands as "hardwood types". Unfortunately, the South Coast region is not included in this assessment and so the oak woodlands that still do exist in San Diego, Riverside, San Bernardino, Los Angeles counties are not included. Specifically oak woodlands over 40 acres in extent were mapped in the Central Coast, San Joaquin/East Side Sierra, Sacramento/North Interior, Central Sierra and North Coast regions of California. The mapping was the first such effort for California oak woodlands. It was mostly based on black and white 30-meter imagery (that

15.3	Monterey
10.8	San Luis Obispo
10.8	San Benito
7.6	Calaveras
7.0	Santa Clara
6.5	Tehama
4.0	Mariposa
3.4	Kern
3.2	Amador
2.9	Mendocino
2.7	Tulare
2.2	Santa Barbara
2.1	Fresno
2.1	Madera
2.0	Sonoma
1.8	Napa
1.7	Butte
1.5	Alameda
1.4	Tuolumne
1.4	El Dorado
1.3	Shasta
1.1	Stanislaus
1.0	Nevada
1.0	Colusa
0.8	Marin
0.7	Yuba
0.7	Glenn
0.6	Lake
0.5	Yolo
0.4	Contra Costa
0.4	Placer
0.3	Ventura
0.2	Merced
0.2	Santa Cruz
0.1	Solano
0.1	San Joaquin
0.1	Humboldt
0.0	Trinity
0.0	Sierra

means each pixel covered 900 square meters) supplemented with aerial photography. Looking at the dataset with the new 1-meter digital orthoquads in the background (where you can readily see each tree) one realizes that the hardwoods layer needs updating, but also cannot help to be impressed by the quality of the work that was done. In any event the CDF hardwoods dataset, while it has many known deficiencies, is the best available for region-wide assessments and we are lucky to have it. A detailed statewide vegetation map is currently being developed, and so we can expect to have more accurate information in the future.

I obtained County GIS layers and population data from the library provided by ESRI, the maker of Arc/Info GIS software. Some data is also becoming available from the Census 2000. I used their Metropolitan Areas coverage and their Census Tract coverage during my analysis. The US Forest Service provided a land ownership layer digitized at 1:24000 scale resolution.

Oak Counties

About 30% of Oak Woodlands in the 53 million acre study area are found in just four counties: Monterey, San Luis Obispo, Kern and Tehama. Other counties with vast areas of oak woodlands are Tulare, Fresno, San Benito, Santa Clara, Mendocino, Calaveras, Mariposa and Santa Barbara. Fifty-eight percent of the land area of Calavaras County is classified as "oak woodland" or "hardwood" by CDF, followed closely by San Benito, Santa Clara and Amador – all over 50%. Monterey, San Luis Obispo, Tehama, Napa and Alameda Counties are all over 30% oak woodland.

The Index

To create an index I wanted to consider acreage, hardwood size, type and density, population growth, and whether oak woodlands occurred on public or private ownership. For a base I used the Pillsbury/PMR/CDF Hardwoods data discussed above. For each oak stand mapped I applied an acre-index value based on its simple acreage. For stands of valley oak, consisting of large trees, or of greater than 40% density by crown cover I doubled the acre-index value. If the stand was both high density and large trees I tripled that stand's simple acre-index value. I then calculated an acre-index value for each county in the study area.

To the county value I applied a variety of other factors to come up with an overall oak index. I multiplied each county's overall acre-index value by the decimal proportion of the county covered by oak woodlands (e.g. for Monterey County this was 49% or 0.49). Then I multiplied the result by the decimal proportion of the county total oak woodland area in private ownership (68% or 0.68 in Monterey County) and again by the population growth in that county from 1990 to 1999 (1.04 for Monterey County) to provide an index of pressure on the oaks. The final product was applied to a scale so that the total sum of values would equal 100. The result became the "oak index value" for that county as presented in the table above.

The resulting index provides results that show that Monterey, San Luis Obispo, San Benito, Calaveras and Santa Clara counties generate the highest levels of concern because of the magnitude of their oak woodland resources. Some interesting information is presented below.

Population

Virtually every county with significant oak woodland also is growing in population. Mariposa County has by far more oak woodland (23 acres) per person than any other county in California, but even there, acres per capita have declined from 26 acres per person as recently as 1990. Huge and populated counties like Kern County (772,000 acres of oak woodland) have 1.2 acres of oaks per person. Other populated counties such a Fresno, Yolo, Sonoma, Placer, Merced, Stanislaus and Marin have far less than an acre of oak woodland per inhabitant.

Ownership

Although not all public oaks are protected, it is fortunate that 17.5% of oak woodlands occur on public lands. These include local and state parks, US Forest Service and National Park Service lands and military bases. Fort Hunter-Liggett in Monterey County actually has one of the largest expanses of old growth valley oak in the state. Monterey, San Luis Obispo, Kern and Tulare Counties each have more than 150,000 acres of public oak woodland. However, only 10 of the 42 counties in the study area have more than 50,000 acres of public oak woodland.

Density and Size Class

It is easy to classify stand "density" using imagery or aerial photography. Density is simply the percentage of the land area, as seen from above, that is covered with live tree crowns. It is very important for determining habitat value of forest and woodland areas and so each stand observed was classified when possible. Most of these forests are in sparse to medium density stands. Of the 9.4 million acres of oak woodlands that were classified 32.8% were sparse (10-25% by area) crown cover, 30.4% were poor (25-39%) crown cover, 29.7% was normal (40-59%), and only 6.9% was "good" (60% crown cover or greater). As our trees die and do not regenerate, oak woodland densities can be expected to decrease across the board.

Similarly, tree size is important. Larger creatures require larger cavities and larger nesting cavities require larger trees. Where possible woodlands were classified as to consisting of "Large" or "Small" trees. Of the 10.4 million acres so classified 11.2 percent were "Large" trees while 88.2% percent were "Small" (as are most blue oaks).

Urbanization

Oak watchers are still waiting for updated and detailed census information. It is known however that California counties which support substantial oak woodlands grew in population by 9.2% between 1990 and 1999 alone! Among the counties with the greatest oak resources Calaveras, San Benito, Placer, Madera and El Dorado each grew by more than 25% during those nine years. I expect the census data will show that most of those new inhabitants live in houses in or very near oak woodlands.

To summarize, we still have lots of oaks but they are certainly threatened. They exist by and large on private lands, which are under great urbanization pressure. The millions of acres of blue oak woodlands are not regenerating. Several are relatively rare types. A dozen California county governments will determine the fate of our oak woodlands. For more information on the oaks in your county:

www.forestdata.com/oaks.htm

www.frap.cdf.ca.gov

www.census.gov

www.esri.com

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