

The Economic Drivers Behind Residential Conversion in the Oak Woodlands¹

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Abstract

Acre for acre, oak woodlands provide habitats for a greater range of wildlife species than grasslands and irrigated agricultural lands. Oak woodlands also are highly valued as open space around residential development. The rich habitat diversity and the physical attractiveness drives residential interest in living in or adjacent to oak woodlands as well as preservation interest in maintaining oak woodlands without an overlay of residential land uses. Numerous state and local regulations are being implemented to balance these competing goals. California's growing metropolitan population will continue to drive both the demand for new housing sites as well as more permanent open space near metropolitan areas. This paper analyses the spatial patterns of residential conversions to identify the key economic drivers behind residential conversion in the oak woodlands at the regional level. Using spatially explicit Census and land cover data, we mapped current residential densities within oak woodlands and other vegetation types for 1990 and 2000. We combined these data with real estate sales data to map regional patterns of high- and low-cost residential areas, grazing land, and public open space. Land surrounding San Francisco Bay, while highly desirable to potential residents, will not absorb much additional residential development as most is protected as public or privately owned open space. It is more probable that the growth pressures will be realized in areas further away from the San Francisco Bay in areas currently characterized by low-density residential development or smaller ranches.

Keywords: Demographics, economics, oak woodlands, real estate, residential land use.

Introduction

If historical land use trends continue, development is expected to impact around 500,000 acres of hardwood woodlands over the next 40 years (FRAP 2003a). Each county in California has taken a different approach towards balancing the demand for new residential development and preserving the values that open space provides to existing residents (Giusti and Merenlender 2002; Saving and Greenwood 2002; Thompson, Noel, and Cross 2002). Given that the demand for new residential parcels in the hardwood woodlands comes from both existing residents who will trade longer commutes for a woodland-dominated neighborhood and people relocating to new areas, it is important to understand the larger regional patterns of development pressures and open space values across Northern California (Mayer and Somerville 2000; Merenlender et al. 2005). The extent and the pattern of conversion from current uses to more residential uses will affect wildlife populations, open space values to

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local residents, and other environmental attributes. The challenge is to improve our understanding of the regional trends driving residential conversion pressures, as well as the opportunities to ensure socially desired outcomes.

Methods

Developing a standard regional framework requires the use of standardized data sets. Three different data sets are used in the analysis. The first is the FRAP's (Fire and Resource Assessment Program) statewide analysis of population densities across all land cover types (FRAP 2003a). The second is the household income data from the 2000 Census, as it provides a measure of the location of households with the high incomes necessary to buy homes on large lots in California. The final data set is the ZIP code based real estate data on home sizes and prices in the major metropolitan areas of Northern California.

A simple and fairly accurate spatial projection of future urban and exurban residential land use can be developed by projecting historic trends out over the next few decades. Housing density within existing Census blocks can be determined by analyzing the "Year House Built" answers in the 2000 Census (U.S. Census Summary File 3, 2003). This approach was used by Duane in the Sierra Nevada Ecosystem Project (Duane 1996) and more recently applied statewide (FRAP 2003a). FRAP's "share of growth" model allocates countywide population projections to a finer spatial scale (i.e., census block group parts) by distributing California Department of Finance county population projections to census block group parts as a linear function of the share of growth in the preceding decade. Using current Census blocks as the consistent geographical unit allows for an accurate presentation of historical trends as well as a solid basis for making forward looking projections of land use changes.

The FRAP Assessment uses the census data model, referred to as the "Projection of Development," to estimate the extent of future development on all current vegetation types that were published in the FRAP Assessment. "Development" is defined as housing density of one or more houses per 20 acres. FRAP uses the one house per 20 acre threshold as it signifies the point where the existence of houses changes our fire suppression strategies and where there may be a significant level of watershed or habitat impact.

Above this threshold, 'rural residential' refers to areas with average lot sizes ranging from 5 to 20 acres, 'interface' refers to areas with average lot sizes ranging from 1 to 5 acres, and 'urban' refers to areas with average lot sizes of less than one acre. This methodology was first developed to explore development and fire trends on 1945-era Oak Woodlands of the Northwestern Sierra Nevada Foothills (Spero 2001). The primary purpose was to produce estimates with a low level of error in the acreage that is projected to attain at least a dispersed level of residential land use. It is important to note that this fairly low density for 'developed' refers to far fewer houses per acre than the common view of developed, referring to subdivision densities in which average lot size is one acre or less. (e.g., Landis and Reilly 2003).

A map of these projections is available in the online version of the FRAP Assessment (FRAP 2003b). Table 1 summarizes the acres of potential conversion by different types of hardwood vegetation types. Blue oak woodlands constitute about half of the projected change.

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Table 1—Projected area* and percentage of current private, undeveloped hardwood potentially impacted by new development, by decade to 2040 (thousand acres).

Land cover type	2000 undeveloped land base	Area developed at density of at least one housing unit per 20 acres				Total	Percentage loss 2000 to 2040
		2000-2010	2010-2020	2020-2030	2030-2040		
Aspen	3	L				L	1
Montane Hardwood	2,339	92	52	73	77	294	13
Montane Riparian	75	3	2	1	1	6	8
Blue Oak Woodland	2,196	89	58	54	70	271	12
Blue Oak-Foothill Pine	685	40	21	25	17	102	15
Coastal Oak Woodland	651	12	18	15	19	63	10
Eucalyptus	4	L	L	L	L	L	23
Valley Foothill Riparian	78	4	4	3	4	15	19
Valley Oak Woodland	109	3	1	4	3	11	10

*housing density of one or more units per 20 acres; L – less than 500 acres
Source: FRAP, 2003; FRAP 2002c

Figure 1 shows the distribution of total new ‘developed acres’ by average lot size across the whole Census split block (around 400 households) and 1990 vegetation type. For all woodlands, 84 percent of the acreage is accounted for in areas where the average lot size in the census block is between 5 and 20 acres. Only 16 percent of the acreage is within what most observers would consider development to typical subdivision level densities. This fairly sparse density class is also the best predictor for where future residential development in future decades will occur. For many ecological outcomes, it will be the private management of this mosaic rather than ‘yes/no’ decisions on new subdivisions that will be the main determinant of future ecological functionality.

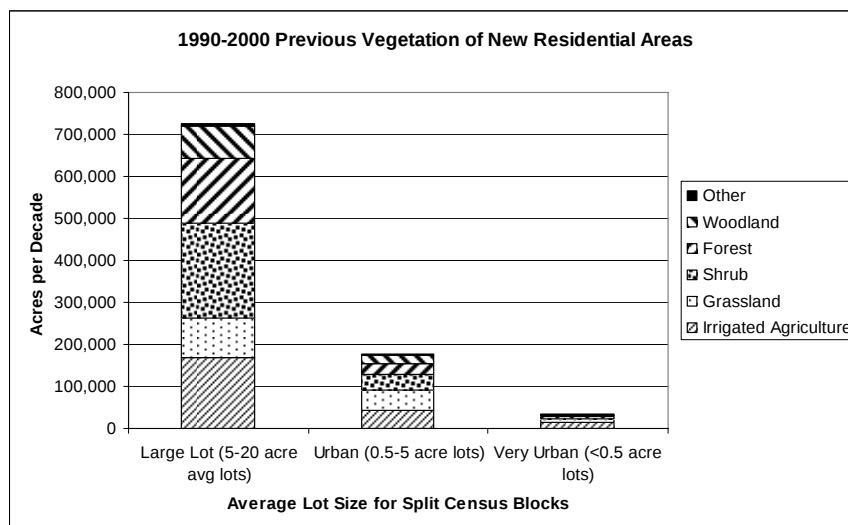


Figure 1—Size of parcels in new developed areas.

Example of Growth in the Oak Woodlands of El Dorado and Placer Counties

An analysis of the spatial pattern of residential growth in the adjacent counties in El Dorado and Placer counties just east of the rapidly growing Sacramento metropolitan region illustrates how residential conversion patterns can differ due to local policies, historical parcelization, and transportation routes.

All of the newer areas developed in 2000 are immediately adjacent to 1989 developed areas. In terms of the number of new houses (and associated tree, stand, and wildlife habitat disturbance), around two-thirds of the new houses were infill into existing developed areas and one-third was newly developed areas. Since CEQA and planning reviews may not always be used for infill projects, this suggests that much of the impact (and potential management mitigations) may not surface in formal environmental review procedures.

Table 2—*Summary table for El Dorado and Placer counties.*

Infill of	existing developed areas		new residential areas	
	El Dorado	Placer	El Dorado	Placer
Houses	3,318	7,019	1,274	5,953
Acres	112,579	110,973	48,304	43,027

A Heuristic Model of Economic Drivers of Residential Conversion

The Census-based modeling exercises of historic patterns of residential expansion provide a non-economic perspective of the probable patterns of residential development. At a regional real estate market level, however, the rate of infill will be strongly influenced by the relative real estate purchasing power of potential residents as well as market value of houses that typically have private open space values (large lots), adjacent public and private open space values, and a negative value associated with distance from major employment centers (the long commute penalty).

Many of the other papers presented at this conference focused on the habitat conservation values of public and private oak woodlands with varying levels of resource management and residential land uses. The aesthetic value of oak woodlands is also proportional to how many people can enjoy them as private or public ‘open space.’ Logically, the value will go up nearer to residential areas, even though the ecological quality may be altered with increasing residential land use and associated road and other infrastructure.

As Sunding (2005), Sunding, Swoboda, and Zilberman (2004), Wu and Plantinga (2003) have all noted, there are many overlapping and poorly understood economic policy implications between housing development and habitat conservation around metropolitan areas. The rest of this paper explores the economic drivers behind the demand for residences in the oak woodlands in the San Francisco Bay Area and the metropolitan Sacramento region.

Who Has Money to Spend on a Home in the Woodlands?

Rapid economic growth in the San Francisco Bay Area region has increased the percentage of households with high incomes compared to other parts of the state. Figure 2, based on the 2000 Census, illustrates that a larger percentage of Bay Area households have sufficient disposable income to purchase expensive homes on the periphery where most of the hardwood woodlands are. They can also relocate to areas farther from the metropolitan fringe if they want their housing investment to purchase a larger home and larger lots.

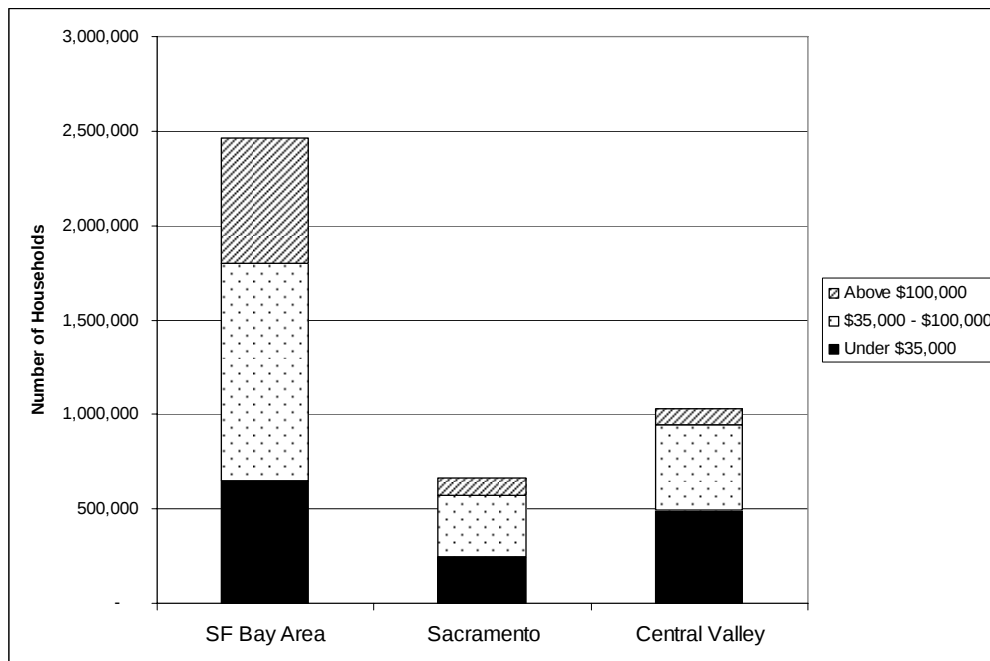


Figure 2—Number of households by 2000 incomes in three California regions.

Given the high cost of housing, households with relatively high incomes are the ones that can purchase new homes that are both larger and are on large lots or expensive houses in affluent neighborhoods nearer the desirable metropolitan centers. To look at where houses are being bought, and how much they are selling for, we used the median cost per square foot of houses sold data that is compiled by dataquick.com and published weekly in the *San Francisco Chronicle* and the *Sacramento Bee*. We chose the median cost per square foot rather than median house value to adjust for the fact that the newer houses on the periphery are typically larger. Unfortunately, Yolo County could not be included in the analysis, due a lack of house price data. Many of these growing residential areas are oak woodland landscapes.

The following figure summarizes the main patterns for the San Francisco – Sacramento double-metropolitan region. The expensive residential label refers to areas in the upper quintile of regional housing values and the inexpensive residential label refers to areas in the lowest quintile.

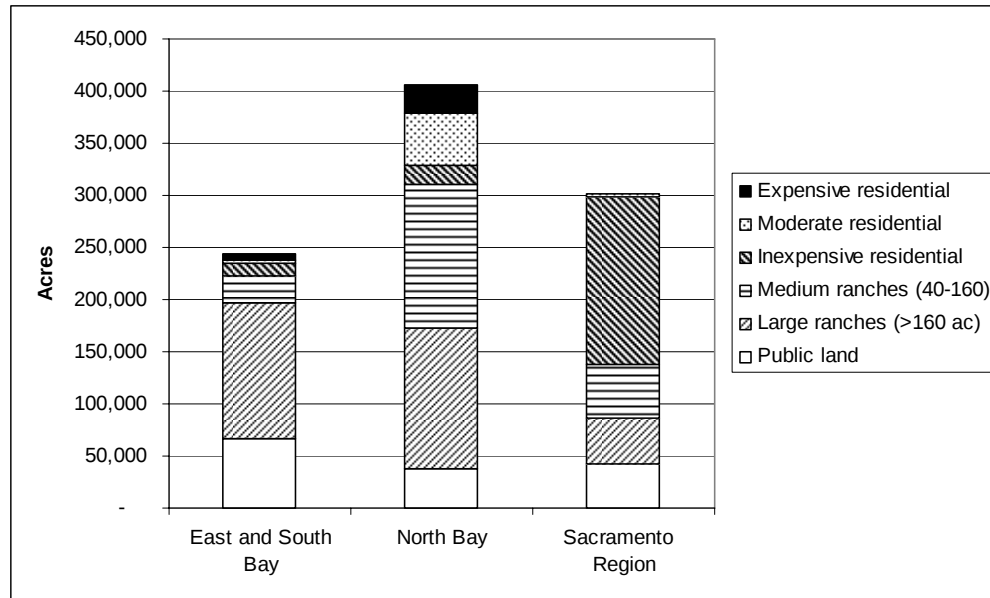


Figure 3—Hardwood land use in metropolitan Northern California.

Although the counties in the South and East Bay have the highest household incomes in the state and the region, there are relatively few acres available within a typical commute range within the hardwood areas. Compared to the two other sub-regions, a much higher percentage of hardwood lands are in public ownership or are still dominated by large ranch operations with few interspersed residences. The combination of historic public lands, locally funded land acquisitions, and private philanthropic acquisitions have combined to create one of the few areas of the state in which public open space is very large component of the hardwood lands.

The North Bay counties have slightly lower household incomes than the South and East Bay, but have considerably more acres of residential use with higher value homes in the hardwood zones. The high value of housing suggests a strong demand for open space amenities, even if the location involves a longer commute to major employment and cultural zones.

The Sacramento metropolitan region has the most area (in terms of acres and as a percentage of the total hardwood vegetation) in the current or probable residential land use zones. In addition, the housing costs are far below those registered in the greater San Francisco Bay region. One of the key inferences to be drawn from comparing the patterns among these three sub-regions on the periphery of the metropolitan areas in Northern California is that the Sacramento region will most probably capture an increasing share of the relocation, long distance commuter, Internet commuter and retiree component of residential growth.

Conclusion

The dynamics of residential expansion into the oak woodlands and other related hardwood vegetation types suggests that low density, or large lot, residential growth will dominate the acres impacted, even if it provides a relatively small portion of regional housing. More detailed analysis highlights two key insights. First, most new development within hardwood regions occurs via infill of already existing developed

areas rather than via new projects. Much of this infill will still be at a relatively low density and will leave a partially altered ecological mosaic that will be quite different than either subdivisions or unfragmented lands. And second, the high cost of housing in some areas of oak woodlands will limit development only to the very affluent, but it will probably shift development pressures to other oak woodland areas in which lower housing costs make up for the greater distance from the more affluent metropolitan areas.

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