

Overview of Hardwoods in California

Report to the Board of Forestry

June 3, 1998

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The assessment and monitoring of hardwoods are conducted within two comprehensive planning approaches used by CDF and FRAP – fire planning and watershed planning. There is not a separate hardwood program within CDF. The Board of Forestry's (BOF) California Fire Plan will be rolled out to all counties in the state where wildland fire protection is provided by CDF or contract counties. Our efforts in watershed planning are in the development phase with the advanced activities in the American River and along the North Coast. Fire and watersheds are used, rather than a specific group of trees, as organizing principles because nearly every acre in the state can burn and every acre fits within defined and nested watersheds.

Yesterday in the Ecosystem Management Committee, Cathy Bleier presented a more thorough and detailed review of the technical information than what will be described today. This much shorter presentation will do three things:

- Analyze some of the major trends in natural, social, and economic systems that certainly, or at least with a high probability, will affect hardwoods
- Present examples of what can and can not be gleaned from existing monitoring and assessment results
- Present lessons we have learned from a number of alternative analysis and responses towards hardwood change around the state

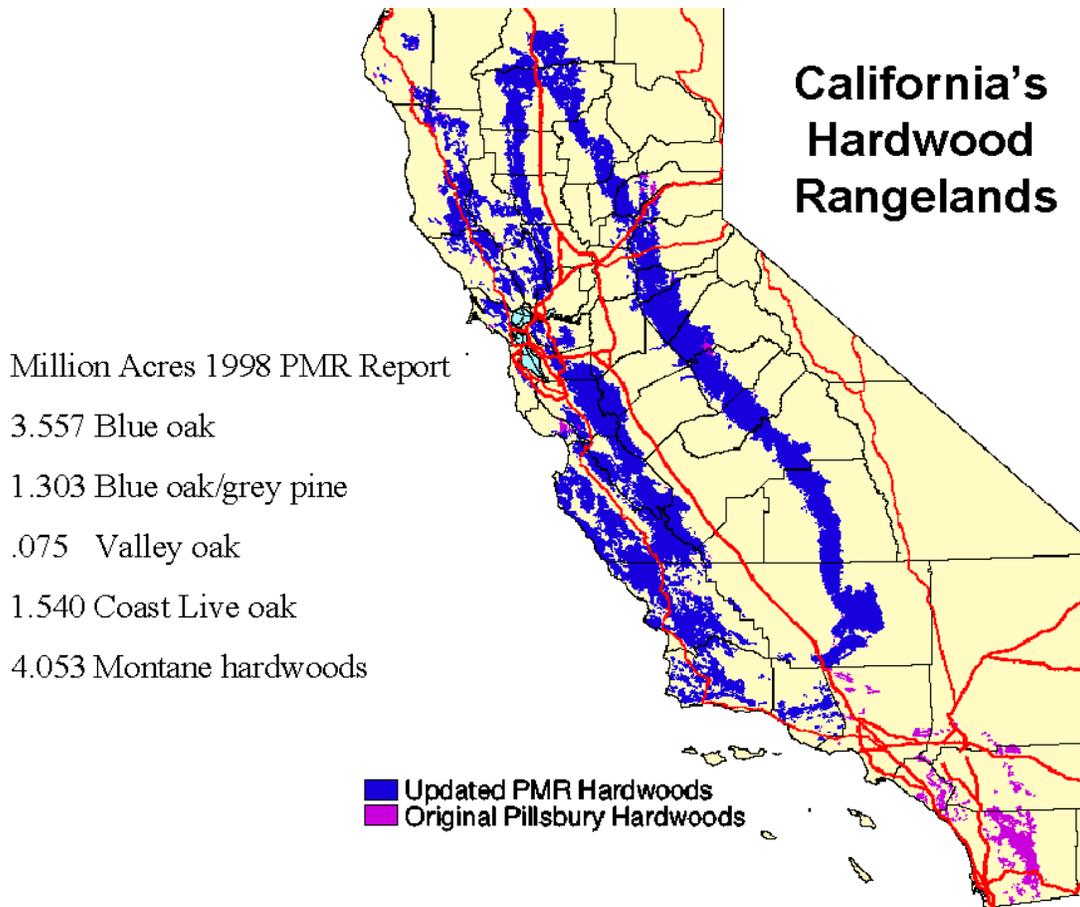


Figure 1– This map shows the major areas of hardwoods based on updates of the Pillsbury aerial photo analysis (1981 photos) updated with pixel (25 meter) data of the most recent remote sensing assessment conducted by Pacific Meridian Resources as well as a summary of the estimated acreage of some of the major hardwood types in California. It is important to note the assessment did not include tanoak (*Lithocarpus densiflora*) or valley oaks and other riparian hardwoods in the Sacramento and San Joaquin River Valleys. Pixel type analysis will undercount valley oak savannahs with relative low tree densities. The acreage numbers are from the new pixel coverage for some of the major oaks within the measured area. The estimate for valley oaks is substantially lower than many previous estimates – in large part due to the methods of measurement that counts savannahs mainly as grass rather than as a woodland with few trees per acre.

Bioregional Population Index Projections 1990-2020

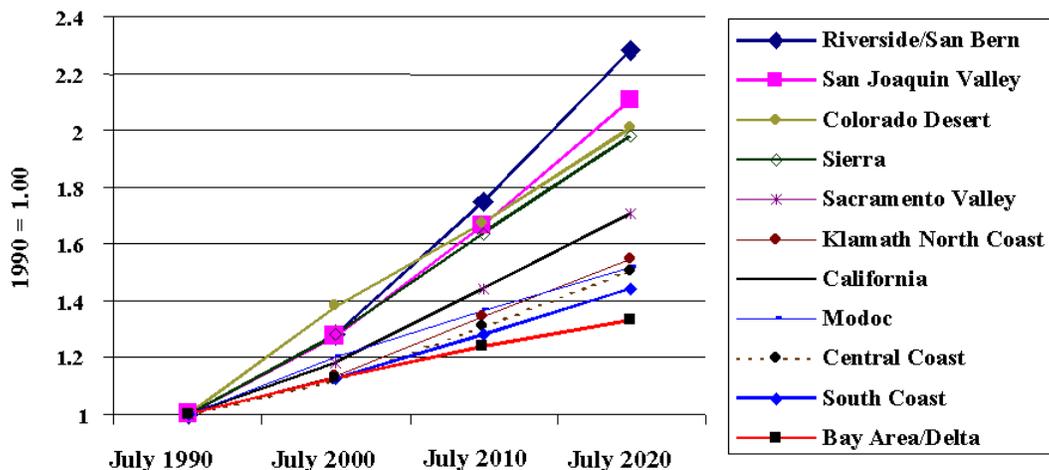


Figure 2– The history of California over the past 150 years has always been marked by large and rapid changes in the landscape driven by changes in the economy and our population. The most recent Department of Finance (DOF) population projections suggest that we should be prepared for more change. By the year 2020, DOF estimates that California will have 14 million more residents. The following figure illustrates the relative population change for all the bioregions in the state. Some areas in the state with the greatest existing extent of hardwood rangelands (such as the Sierra Nevada counties) are projected to double in population by 2020. Unquestionably, large influxes of people into a region that does not have an existing pattern of Southern California style subdivisions will lead to large changes in the hardwood rangelands we see now. The same Department of Finance projections foresee 120,000 new residents for Santa Barbara County by 2020. While this is a slower rate of population change than the Sierra Nevada, it is nonetheless significant.

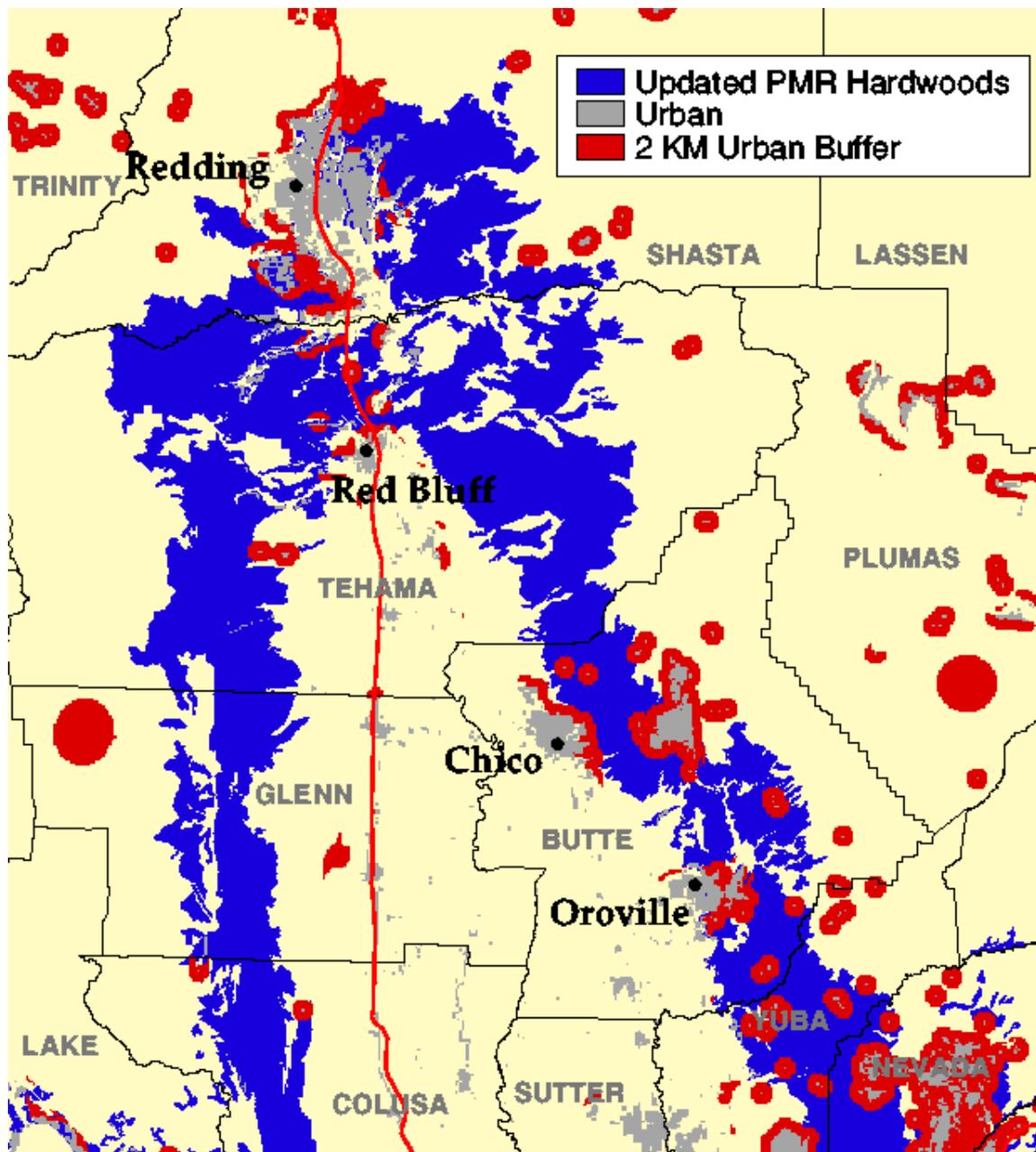


Figure 3– This map is one simple projection of what could happen with population growth in the hardwood rangelands of the Northern Sacramento Valley. Since we do not know where people will actually be living, one plausible estimation technique is to assume that most residents will be within a 2-kilometer buffer surrounding existing urban areas. For the Northern Sacramento Valley, the only areas that we would project to have major changes would be around Chico, Paradise, and Redding. No whole county is projected to undergo great change.

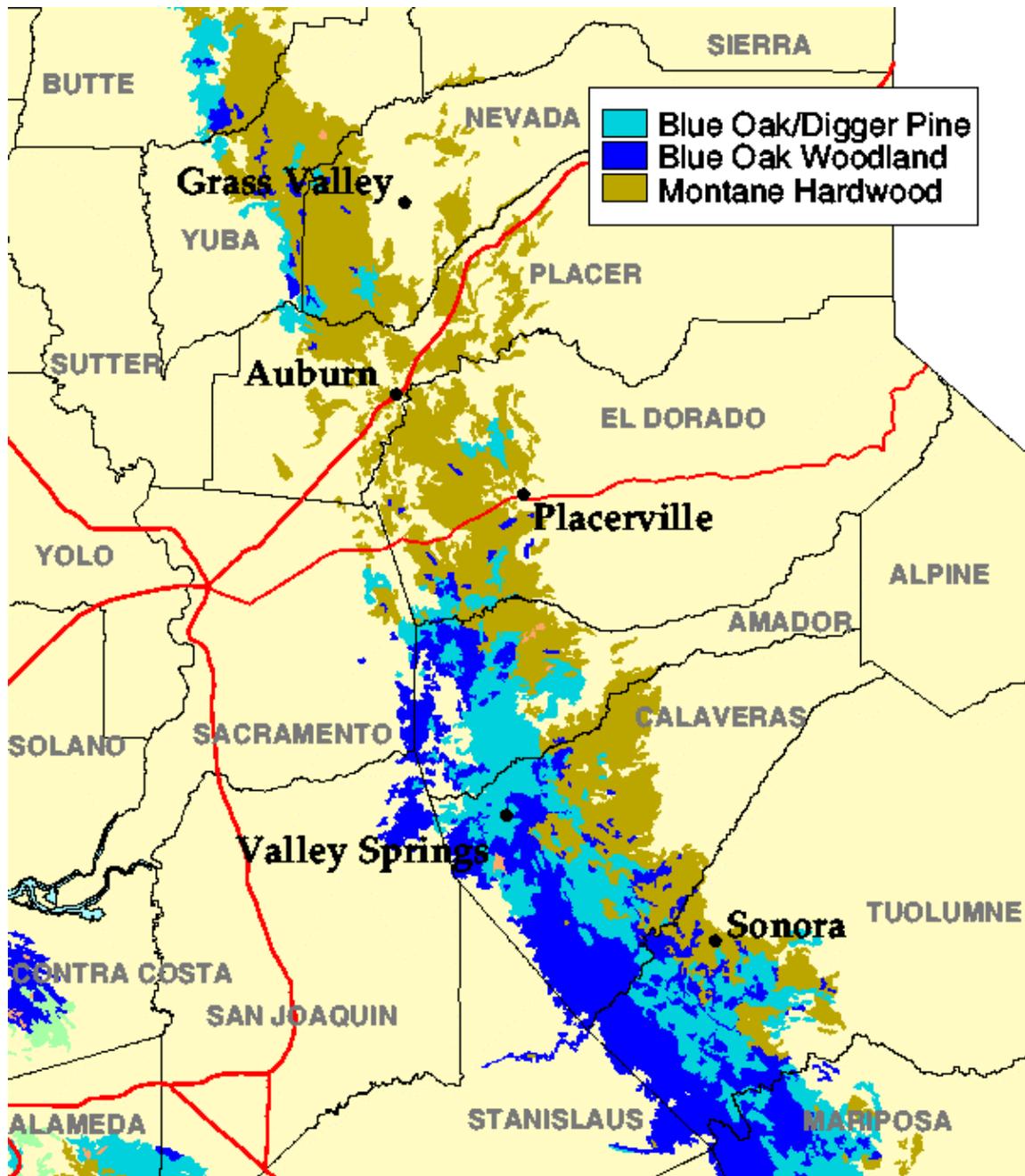


Figure 4– This map shows the three main types of hardwoods in the Central Sierra Nevada that varies both by elevation and latitude.

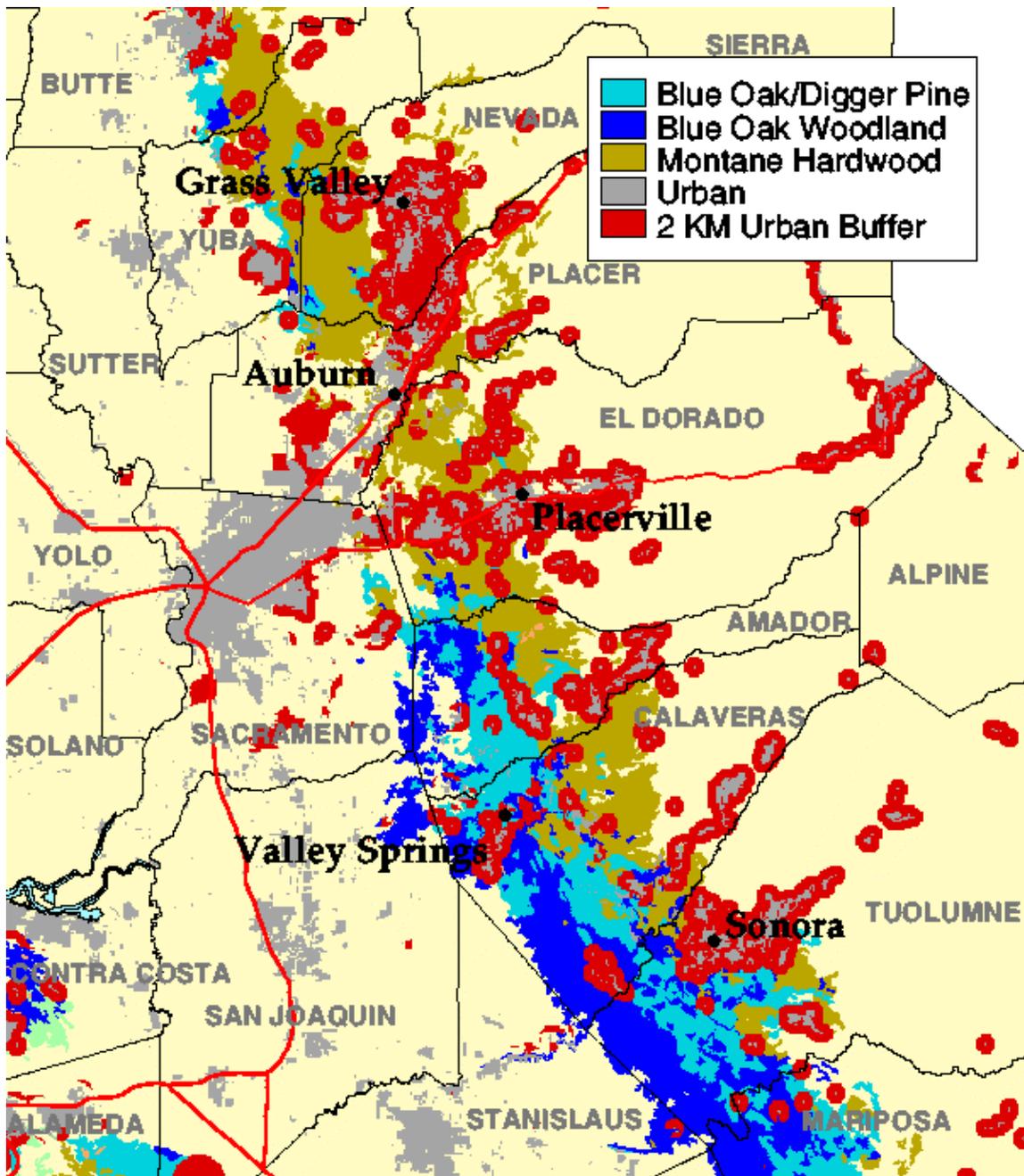


Figure 5– This overlay shows existing urban areas (gray) and our simple projection (red) into the hardwoods. The impact will clearly be dramatic. It is important to remember that the red overlay does not mean that the hardwoods will all disappear. It does suggest that the landscape will be fragmented with new driveways and homesites and traversed by many more people, children, and family pets. It is unquestionable that many of these acres be managed as backyards rather than rangelands or hunting areas – with significant changes to associated wildlife impacts.

Pillsbury polygons vs PMR polygons over pixels

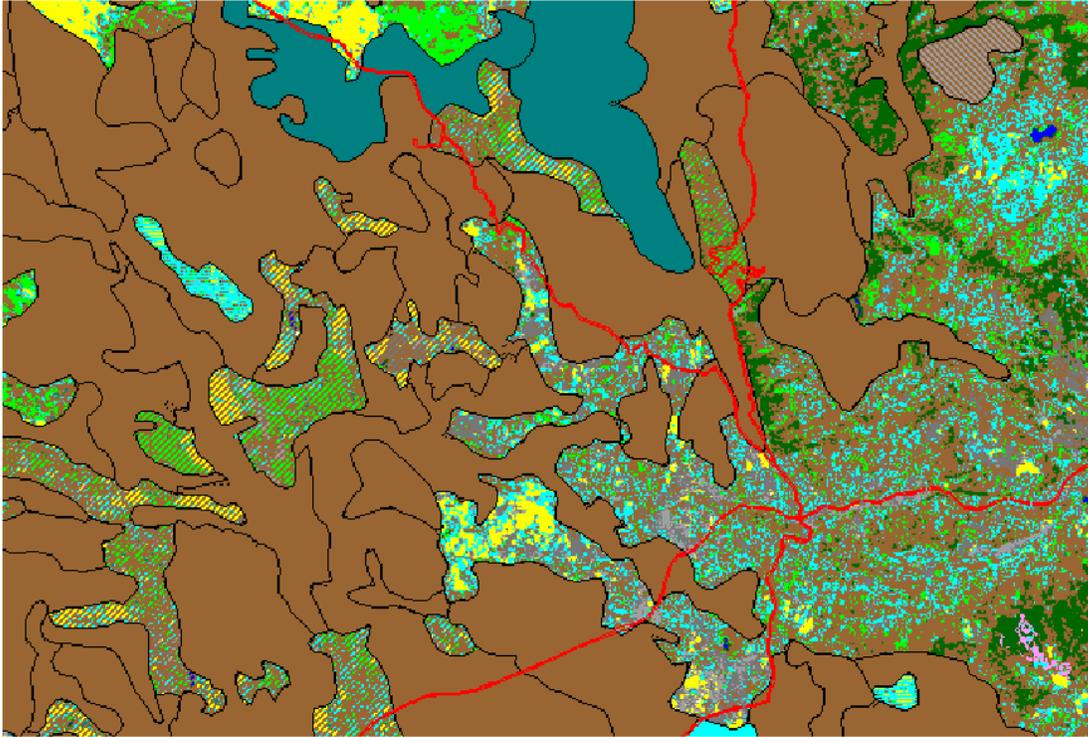


Figure 6– Getting back to a more detailed view of the hardwoods, this slide of the area just west of Placerville illustrates two different methods of hardwood identification and aggregation. The large units are referred to as polygons – or units of the landscape where the differences inside the polygon are far less than differences between adjacent polygons. The finer grained colors are referred to as pixels, 25-meter-by-25-meter units for which the spectral reflectance is captured by the satellite and translated to a specific vegetation type based on field validations. As you can see, each polygon that was coded as a hardwood includes a fair number of pixels that represent non-hardwood types (the greens and yellows are shrubs and grasses). Conversely, there will be hardwood pixels in polygons that are coded as non-hardwood polygons. Due to heterogeneous nature of hardwood rangelands, woodlands, shrubland, and mixed conifer forest types, pixel and polygon acreage counts of hardwoods will always produce different summaries for the same landscape.

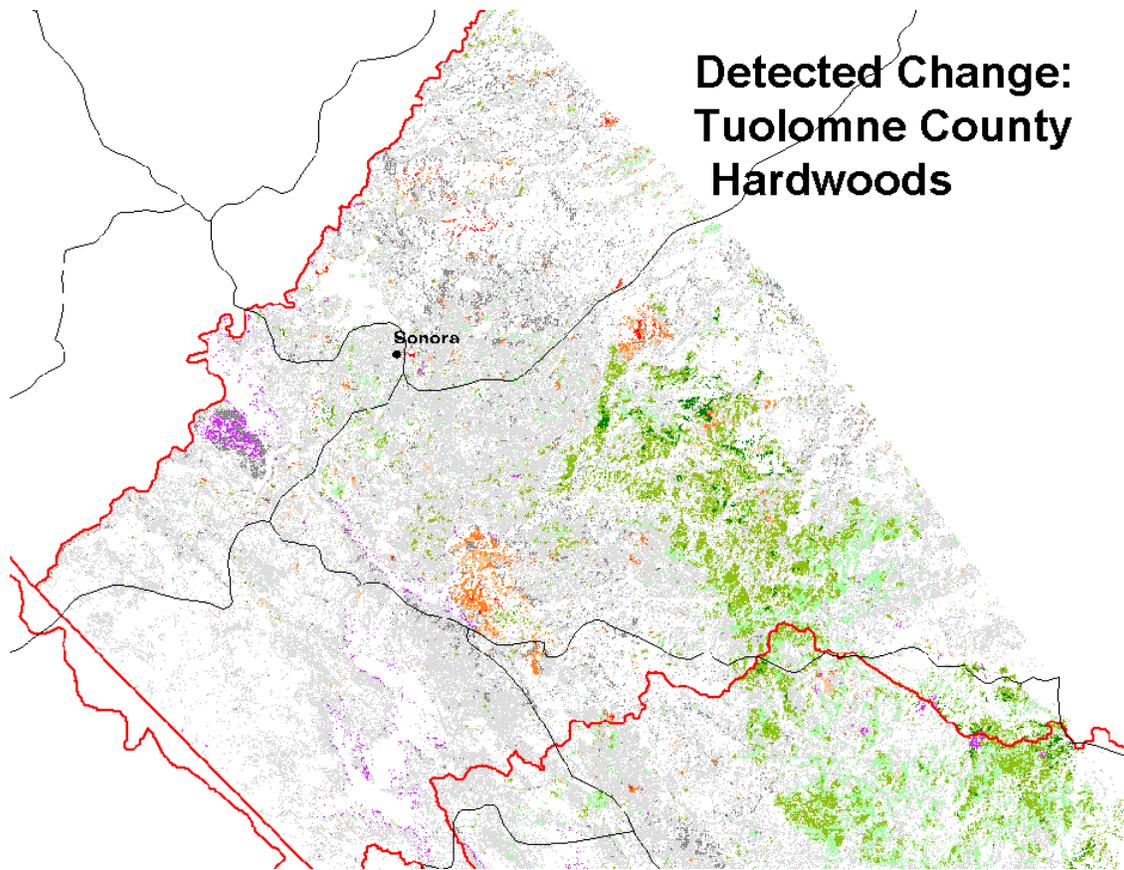


Figure 7– Another approach we have used to measure the change in hardwoods is to compare pixel by pixel, in the total reflectance that is correlated with changes in canopy. The USDA Forest Service is using this ‘change detection’ method to track changes in National Forests. CDF is adapting the technique to cover private lands around the state. The following unverified map shows hardwood areas in green that had more canopy cover in 1995 than in 1990 and areas in red that had less. It is important to point out that these changes detected by satellite imagery have not all been verified with field plot accuracy assessments. While some of the changes may be due to changes in the shrub and grass layers, the key pattern is the handprint of wildfire. The large green area is re-growth after the Stanislaus Complex fires of 1989, and many of the larger red areas are fires that occurred between 1990 and 1995.

Change Detection Project

Detected Change in Southern Sierra Area

Decrease: 63.9 thousand acres 3% Hardwood area

Increase: 301.6 thousand acres 15% Hardwood area

Detected Change in Northern Sierra Area

Decrease: 63.9 thousand acres 3% Hardwood area

Increase: 72.1 thousand acres 3% Hardwood area

Figure 8– This is a summary of the increases and decreases measured for the Northern and Southern Sierra. This suggests that there is considerable change in the vegetative cover in the hardwoods.

Causes of Hardwood Change in Southern Sierra

	Acres (thousands)	% Validated Change
Wildfire/salvage	15.9	53%
Brushing, thinning, harvest	7.0	24%
Prescribed fire and fuel mgmt	3.6	12%
Development	2.3	8%
Mining/other mgmt	0.9	3%
<u>Mortality</u>	<u>0.0</u>	<u>0%</u>
Total	29.7	100%

Figure 9– This table summarizes the validated changes in the Southern Sierra Nevada that were both measured from the comparison of two satellite images and ground checked with local landowner and land managers familiar with the area. Again, we see that wildfire is the dominant agent of change, followed by thinning and prescribed fire.

Western El Dorado

Grey - built up area

Red - projected

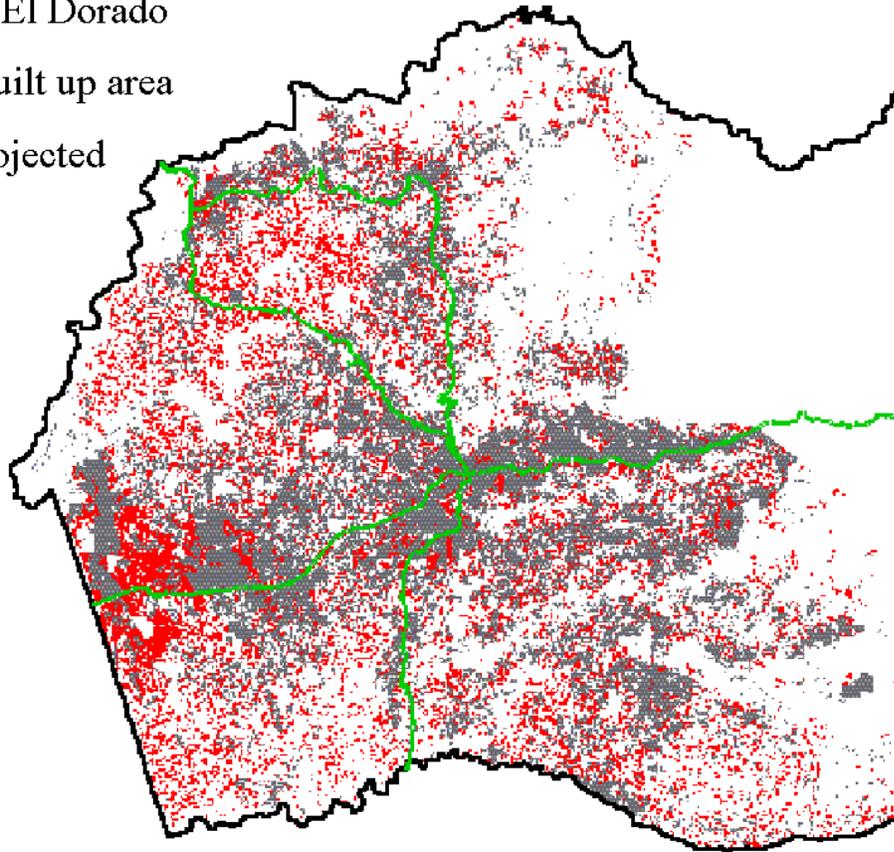


Figure 10– This image is a much more detailed view of present and projected residential land use in the western half of El Dorado County that has extensive hardwood coverage. This map was created by Greg Greenwood of FRAP by using a digital version of the County general plan and parcel-by-parcel estimates of development probability based on zoning maps. The gray area is the present residential ‘footprint’ now, and the red area is the estimated residential footprint at buildout. The green lines are roads, such as Highway 50 (running east west) and Highway 49 (running north south). The denser red areas are the large developments at the west end of Highway 50 nearest to Sacramento and infill around the Placerville urban area. Much of this development will trigger requirements for CEQA review and possible mitigation. Potentially more significant, however, is the red freckle pattern to the north and south of Highway 50. This dispersed rural residential development pattern will considerably fragment what are now relatively unpopulated areas. The County is not surprised or opposed to this proposed pattern, but the El Dorado County oak hardwood task force, in direct response to the BOF’s call for each county to develop their own explicit county level policy for hardwoods, has noted a number of potential problems.

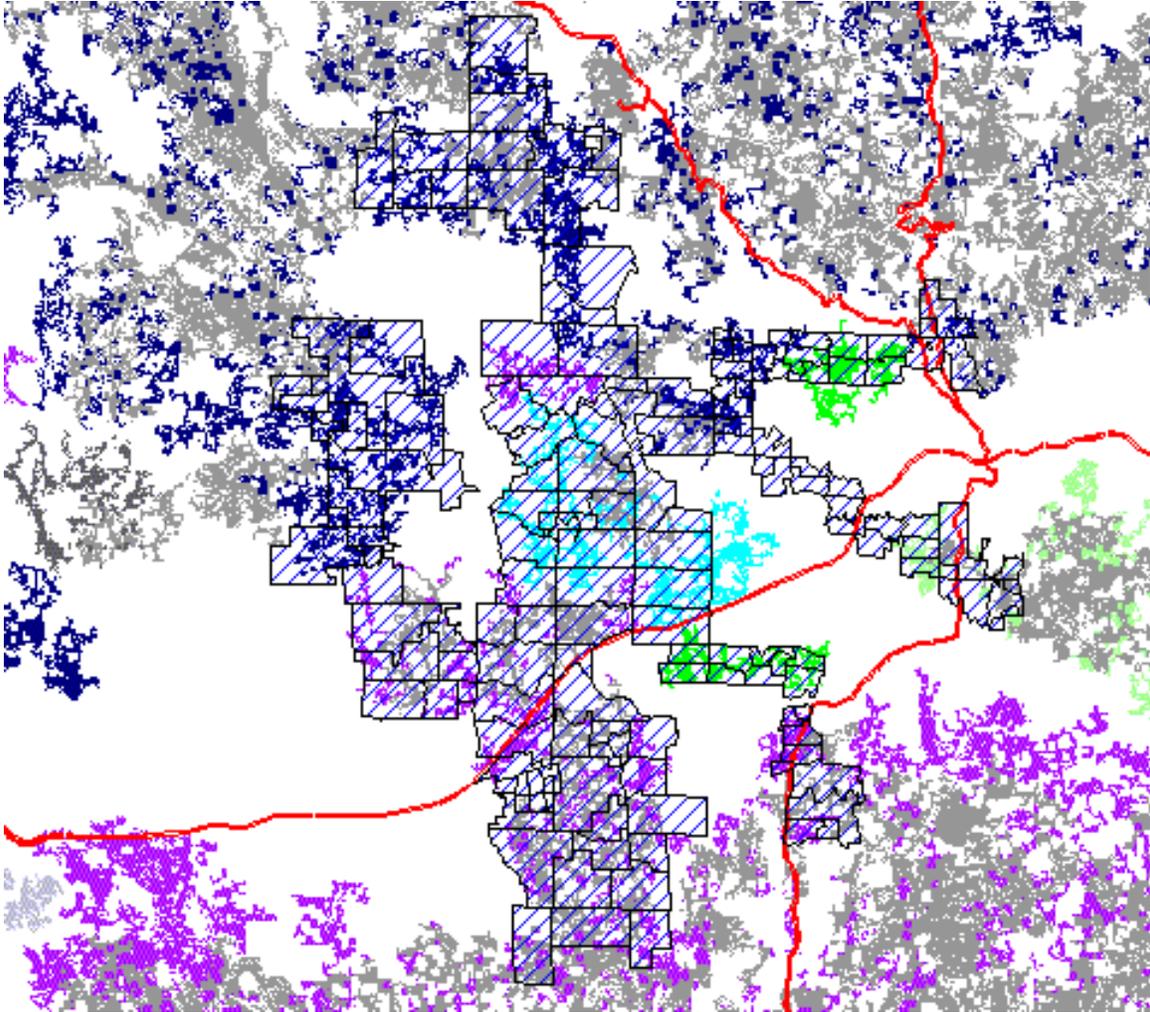


Figure 11– This slide again shows the area immediately to the west of Placerville. The gray areas show wildland oak woodland expected to persist after buildout. Colored areas show wildland oak woodland that will likely be converted toward non-wildland status (i.e. footprint of structure, urban oak or marginal oak status). Hatched areas are map book pages within which particular regulatory and educational efforts could be focussed in order to prevent the conversion to non-wildland status. Countywide regulations on the gray areas could possibly be an added expense to both landowners and government that would produce no significant improvements in landscape level patterns. The point here is that it is often possible to target a small subset of hardwood acres in the county with a higher probability of conversion if land use changes proceed as projected under the General Plan or other schemes. The corollary to that statement is that solutions to such focused problems will rarely be a single countywide formula. The hatched areas are actual parcels that include key areas of hardwoods that are required to maintain north-south connectivity at buildout over the Highway 50 corridor. If the residents of El Dorado County, or the state as a whole, want to invest in protecting portions of the natural heritage under pressure, the most equitable solution would be to purchase the land or specific easements from

willing sellers. What we can see is that even within a single county, there are often a few fairly specific areas of great concern. Countywide regulations could impose significant costs of the landowners and the regulating agencies but may be too weak and diffuse to focus on key parcels in certain parts of the county. It is a reasonable hypothesis that each county in California has a similar pattern where a cost-effective approach towards maintaining the socially valued characteristics of hardwood lands that occur on private lands would require actions and policies that will not be uniform across the county, much less the state.

Hardwoods in California

- Powerful drivers of land use change
- Spatial patterns matter
- Combination of 1 and 2 creates very different sub-county challenges - bigger than CEQA projects, smaller than county-wide policy

Figure 12– Three Major Ideas

As part of an overview for this discussion on hardwoods, there are three major ideas.

1. *Major drivers of land use change will affect California and its hardwood rangelands.*

Population growth will undoubtedly impact hardwoods. The Department of Finance projections are sobering. Some of the areas to experience the greatest proportional rate of growth will be those areas that are now rural. Economic growth is projected to be strong around areas that have strong

nuclei of high technology and high value financial services. The emergence of UC Santa Barbara as one of the top universities in the country in terms of the total value of National Science Foundation grants is a strong signal that this region will experience strong economic growth and associated land use changes.

Specialized agriculture has always been the growth component of California's agriculture and all indications are that this will continue. We are not Kansas dependent on a few crops like wheat and soybeans. California's strength in agriculture has been driven by its dominance in high value crops such as avocados, strawberries, and wine grapes. Economics clearly favor the expansion of vineyards compared to cattle ranching. How this will play out in Santa Barbara and other counties is unclear, but the pressure will be there.

2. *Spatial patterns matter*

County or statewide acreage counts of different hardwood types, no matter how accurate, will not capture the full range of hardwood values as habitat, vegetative ecosystems, or landscape units. The various patterns of hardwoods and land ownership developed from analysis of satellite data and county geographic information system data illustrated a wide range of spatial patterns.

3. *The combination of 1 and 2 creates very different sub-county challenges*

These challenges will be bigger than what will be addressed through CEQA projects (and associated mitigation measures) but often smaller than what could cost-effectively be addressed through countywide policies. It is doubtful that there will be easy answers to these challenges. Our experiences suggest that most communities of place around the state do value their hardwood landscapes and will work to sustain them.