

# **Bioregional Demographic Trends and Implications for Biodiversity**

**Report to the California Biodiversity Council**

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Over the past 50 years, California has always been a major magnet for people looking for new opportunities. Consequently, it has had one of the fastest rates of population growth in United States. Population growth will continue to present a major challenge to the protection of California's unique and varied biodiversity.

## **Executive Summary**

California is a magnet for people looking for new opportunities and has experienced one of the fastest rates of population growth and land use change in the United States. The scale and pattern of population growth will continue to present a major challenge to the protection of California's unique and varied biodiversity. To assess the potential impacts of future population, FRAP reviewed existing regional and local population patterns and used some simple rules to allocate new residents across the landscape.

County population patterns and future estimates from the Demographic Research Unit of the California State Department of Finance are aggregated into 10 different regions to illustrate recent trends and the potential long-term population changes. The economic recession during the mid-1990s and the subsequent rebound demonstrates the close relationship between employment prospects and migration.

Regional growth rates vary widely across the state. The San Joaquin Valley and other inland regions with relatively good transportation access to major metropolitan areas are growing faster than the state as a whole. The Sacramento Valley is the only bioregion following the projected path for the whole state. The population growth for the four coastal regions was slower than the state during the mid-1990s, and these regions are projected to continue to grow at a slower rate for a number of different reasons. The San Francisco Bay Area and Southern California, the two most densely populated regions in the state, have relatively little land left in which to expand. The Central Coast and the North Coast have considerable potentially developable land but have few existing urban

centers or strong transportation networks to support rapid regional economic growth compared to the total size of the regions.

The land use impacts of these increases in population will be accommodated by the expansion of existing residential areas according to what is allowed by zoning and what is economically feasible. Without any major changes in land use economics or policies, a reasonable hypothesis is that the distribution of the new population will closely follow existing patterns. In terms of land use, 14 million acres in the state is occupied with widely scattered residences on 1 to 10 acre parcels while only 4 million acres are covered with subdivisions or urban areas. The remaining 82 million acres has little to no residential land use on it. At the county level, California counties can be grouped into four distinct development patterns.

- Orange County represents the 'suburban' type where most land is either in subdivisions or in unpopulated or very lightly populated wildlands.
- Sacramento County illustrates the 'agricultural/metro' pattern of a major metropolitan area expanding onto an agriculturally based economy and landscape.
- Sonoma, Santa Cruz, and El Dorado counties represent a third pattern where a large fraction of the total landscape already has many homes scattered among wildlands and in the intermix area between urban areas and the wildlands.
- Finally, land use in many counties in California, especially those with a large fraction of federal ownership, remains overwhelmingly wildland or agriculture.

Land use impacts related to future population growth will probably follow these distinct patterns.

### **Population Related Questions**

- How many people will be added to the overall population?
- Where will they live (by bioregion, urban areas, suburban areas, intermix, scattered in wildland and agricultural areas)?
- What other resource impacts will they have on California's biodiversity (increased water transfers, air emissions, new transportation systems, industrial pollution, etc.)?
- Will mechanisms be developed that convert increased population into increased investment in mitigation and restoration activities?

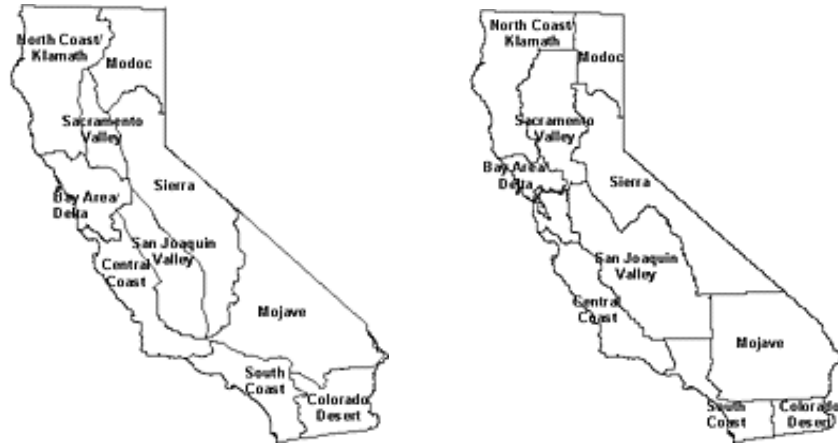
The following information focuses on what we know about the first two questions – how many people are projected to move into California by bioregion and what are some of the patterns of residential land use that we can expect. One of the main conclusions is that there is not a "California pattern" for population impacts. We should not expect that there will be a "California solution" to this issue. Each bioregion exhibits its own set of population related changes that most probably will have a strong influence on future biodiversity related policies.

## Population Forecasts

Population forecasts are developed and updated by the Demographic Research Unit of the California State Department of Finance. A single estimate for the state, counties, and major cities is developed based on an extrapolation of the most recent available data and a specific package of methodologies and assumptions. The economic recession during the mid 1990s produced a number of unexpected changes in the domestic migration that required a significant lowering in future population projections in the most recent estimates. Since counties are the smallest unit for standard population projections, county boundaries rather than the bioregional boundaries are used to define populations of the bioregions. The following table compares population of bioregions defined by county boundaries and the smaller census blocks. The most significant difference is the shift in residents out of the true South Coast bioregion to the Mojave (San Bernadino and Riverside counties) and the Central Coast (Ventura). The San Joaquin Valley population also increases with the inclusion of portions of the Delta and the Sierra Nevada.

Bioregion	By County	By Census Block	Difference	County over / under estimation %
California	29,363,156	29,428,496	-65,340	0
South Coast	13,647,766	16,092,094	-2,444,328	-15
Bay Area - Delta	5,891,240	6,593,315	-702,075	-11
San Joaquin Valley	2,700,652	2,009,534	+691,118	+34
Mojave	2,561,101	595,015	+1,966,086	+330
Central Coast	1,856,648	1,203,879	+652,769	+54
Sacramento Valley	1,700,429	1,496,266	+204,163	+14
Sierra	541,159	614,038	-72,879	-12
North Coast/Klamath	321,223	388,294	-67,071	-17
Colorado Desert	106,784	362,112	-255,328	-71
Modoc	36,154	73,949	-37,795	-51

Source: FRAP analysis of 1990 Census data. 1990 Census and 1990 DOF populations are slightly different due to different base month.

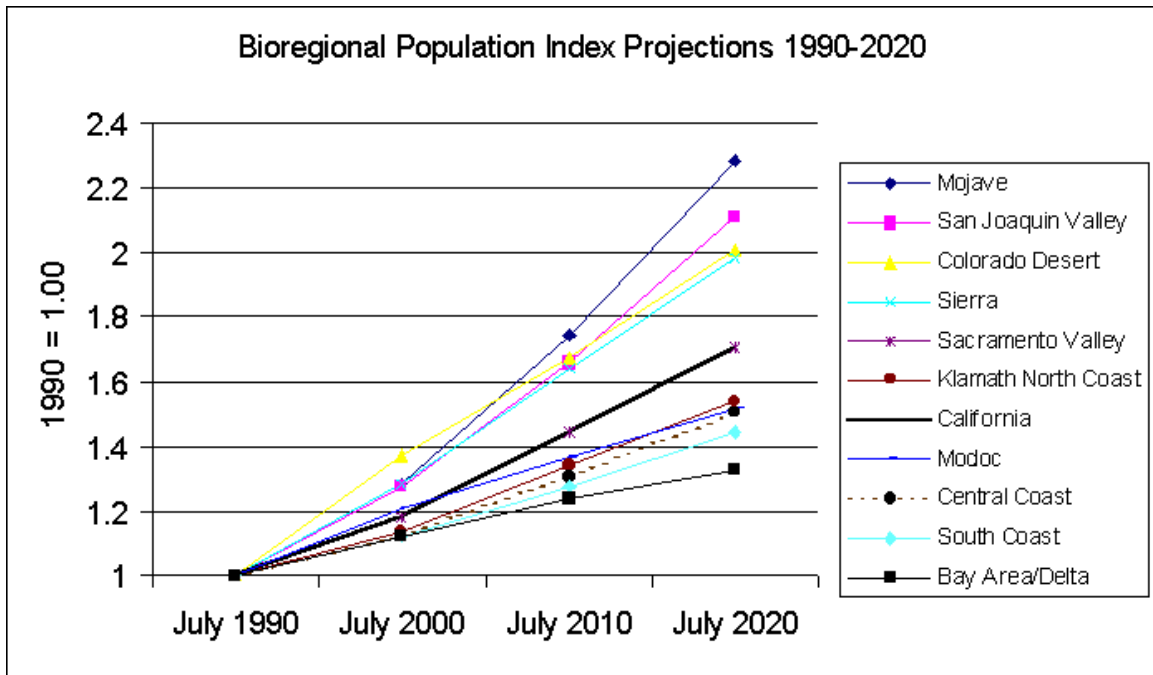


### Population Patterns by County Based Bioregions

Bioregions	July 1990	July 1996	July 2000	July 2010	July 2020
California	29,944,045	32,383,000	34,704,000	40,939,000	47,507,000
South Coast	13,831,000	14,741,100	15,540,600	17,682,800	19,928,500
Bay Area/Delta	6,052,000	6,502,800	6,809,500	7,488,900	8,031,100
San Joaquin Valley	2,768,200	3,123,500	3,526,300	4,607,800	5,838,400
Mojave	2,631,300	2,985,900	3,371,400	4,597,400	6,010,500
Central Coast	1,883,900	1,987,000	2,110,900	2,459,900	2,829,000
Sacramento Valley	1,737,200	1,877,250	2,054,500	2,502,400	2,967,800
Sierra	559,920	631,960	717,400	918,400	1,110,200
Klamath North Coast	332,300	349,650	376,500	445,400	512,600
Colorado Desert	110,800	141,200	152,300	185,200	222,600
Modoc	37,425	42,650	45,000	51,100	56,700

Source: Department of Finance, April 1997

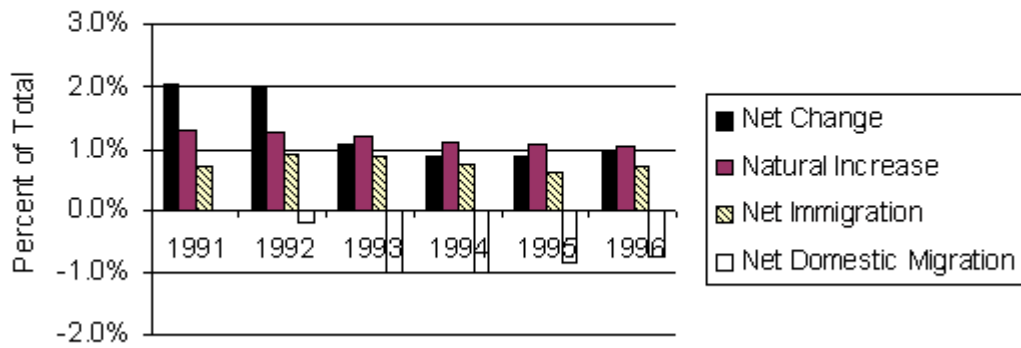
There is a wide range of growth rates across the different regions. The following figure illustrates the projected populations indexed to 1990 populations. Diversity is the key. The Sacramento Valley is the only bioregion following the projected path for the state as a whole. Areas with large irrigated agriculture are projected to experience the greatest rates of growth and the coastal areas are projected to have considerably lower rates of growth.



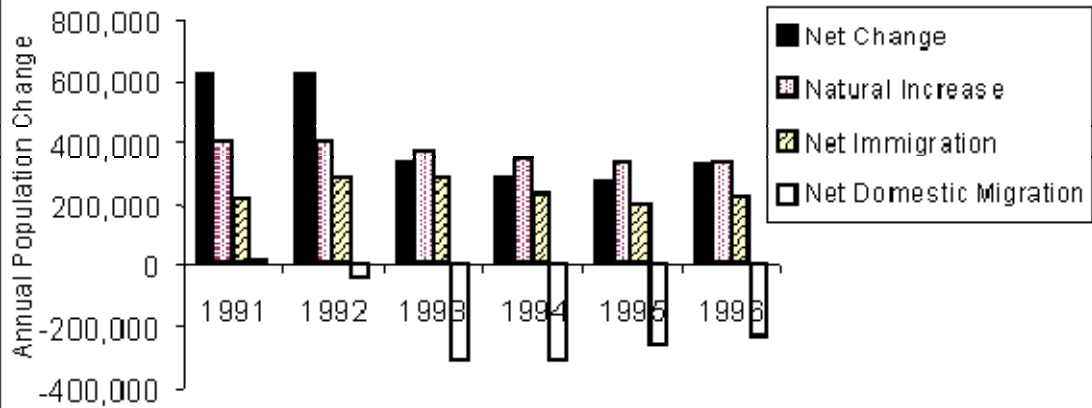
### Components of Population Change by Bioregion

Of the four main components of population change (births, deaths, foreign immigration, and domestic migration), the sudden reversal of domestic migration of people moving in and out of the coastal counties explains why overall population forecasts were revised. As the following figures for California illustrate, there are no significant changes in terms of the birth and death rates (the two components of natural increase) or any significant changes in international immigration. The major change was the significant movement of people out of the coastal counties to Sierra Nevada counties or other states. Research at the Federal Reserve (Gabriel, S.A., Matthey, J.P. and Wascher, W.L. *The demise of California reconsidered: interstate migration over the economic cycle*. Economic Review No. 2. Federal Reserve Bank of San Francisco, 1995. p.30-48) analyzed trends in domestic migration from California and concluded that nearly all the variation was driven by the loss of jobs in those counties during the recession. They predicted that resurgent economies would reverse the trend and lead once again to significant rates of overall population growth in areas that had experienced net domestic out migration during the mid 1990s. The figures for the nine other bioregions (on pages 5-7) illustrate many bioregion-specific patterns for the components that make up overall population change. All regions experienced significant drops in the rate of domestic in-migration but the Sierra Nevada was the only region that experienced a positive flow of domestic migration throughout the 1990 to 1996 period.

**Components of Population Change as a Percentage of Total California Population**

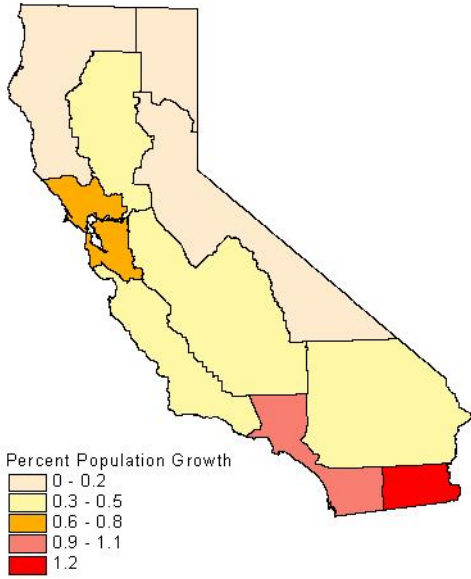


**California**

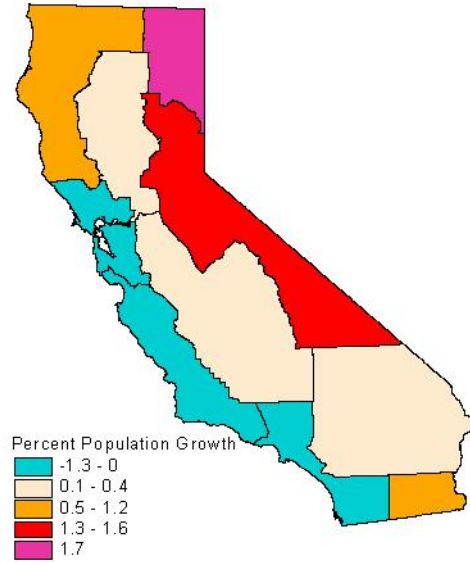


## Average Annual Population Change 1990-1996

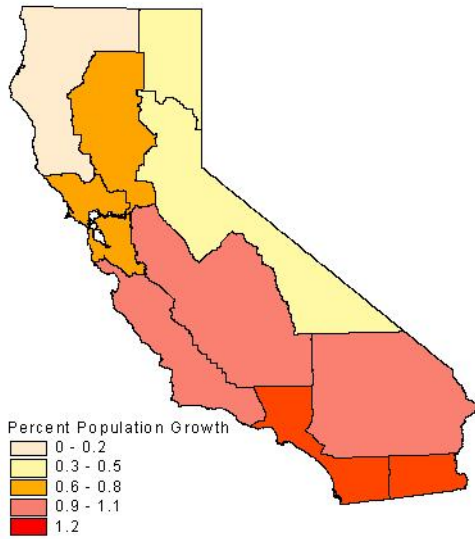
### International Immigration



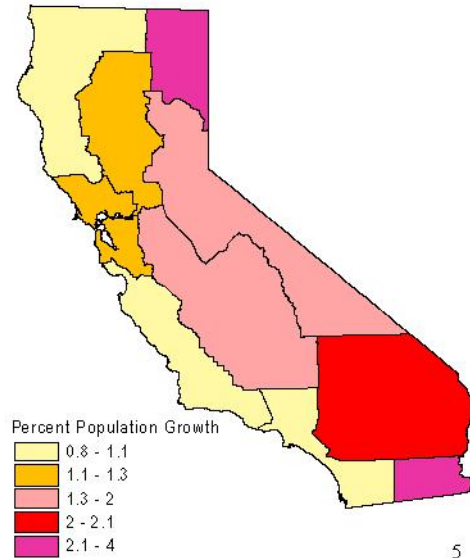
### Domestic Migration



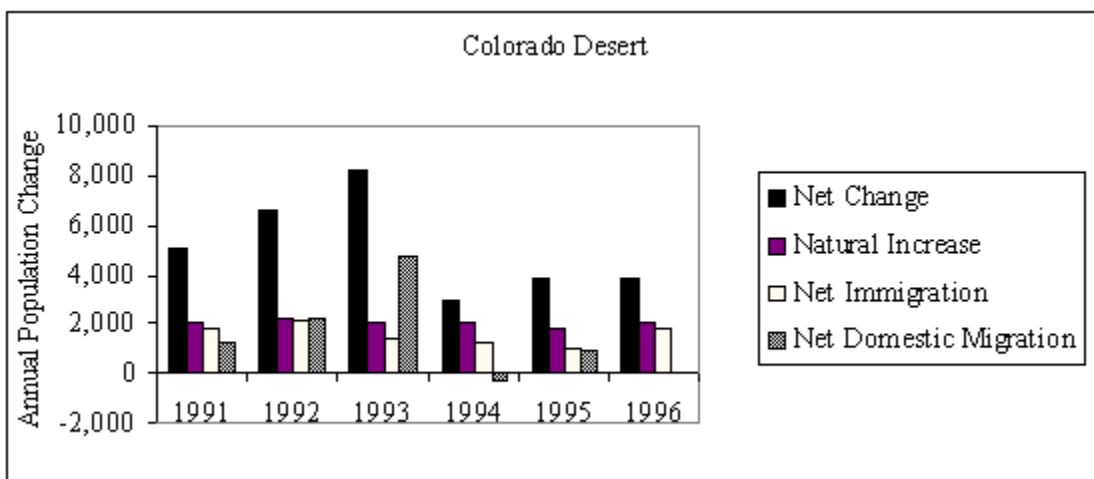
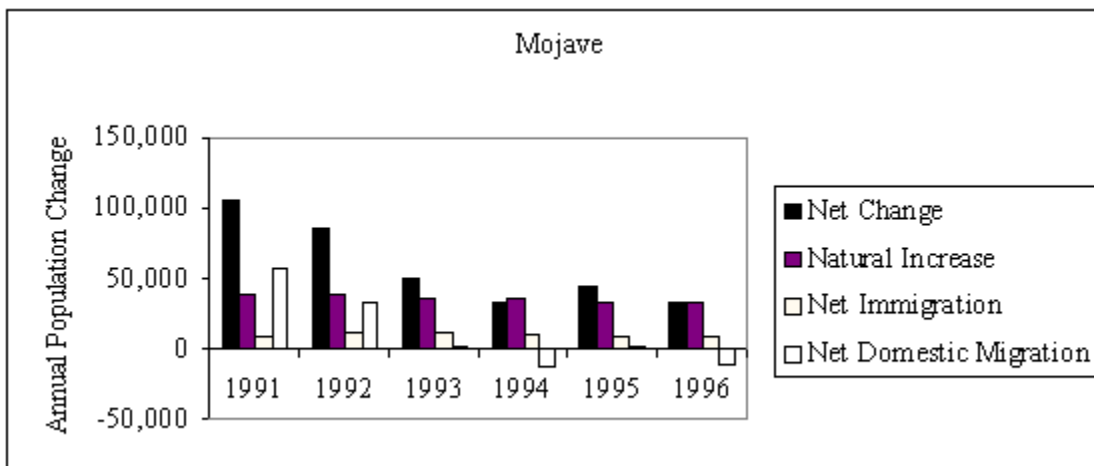
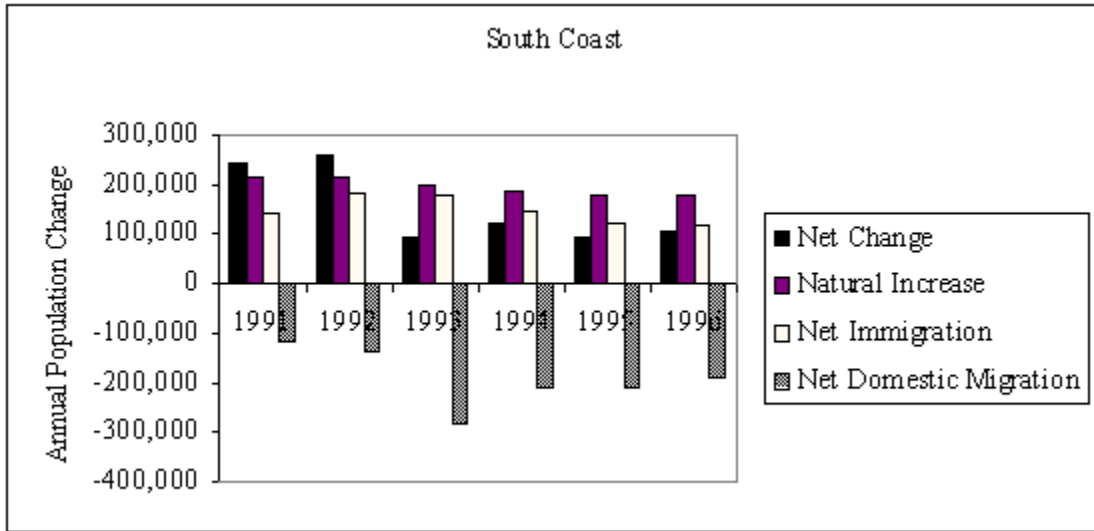
### Natural Increase



### Net Change

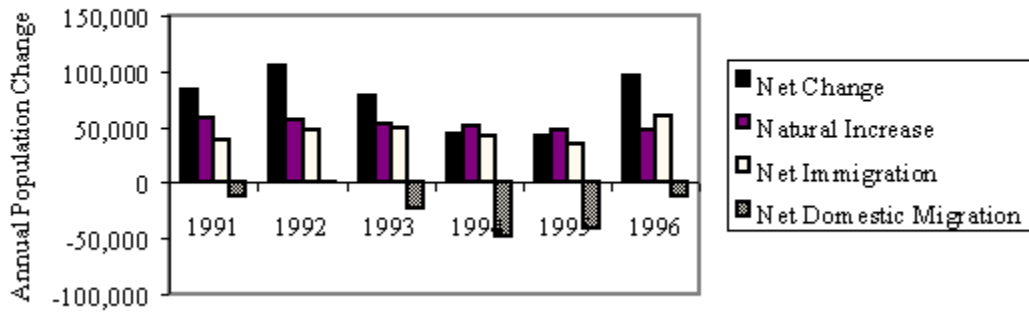


## Population Change Graphs

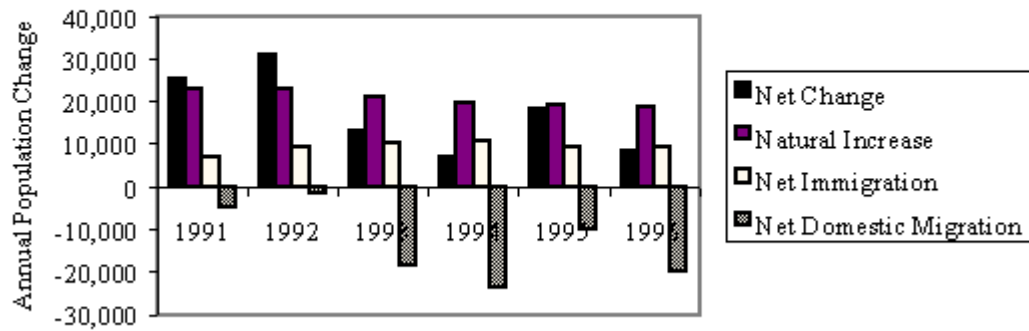




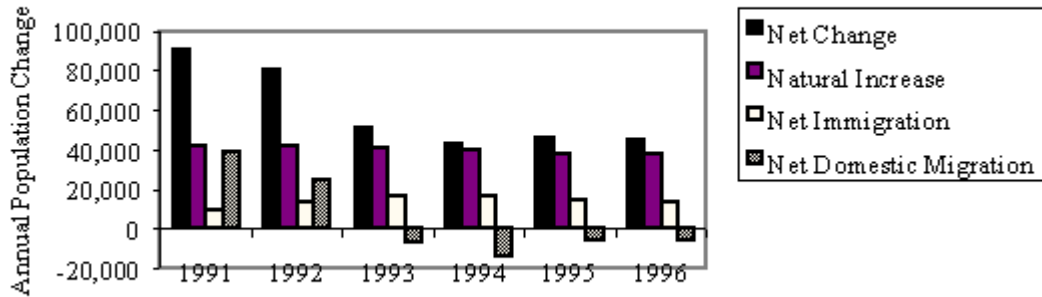
Bay Area/Delta

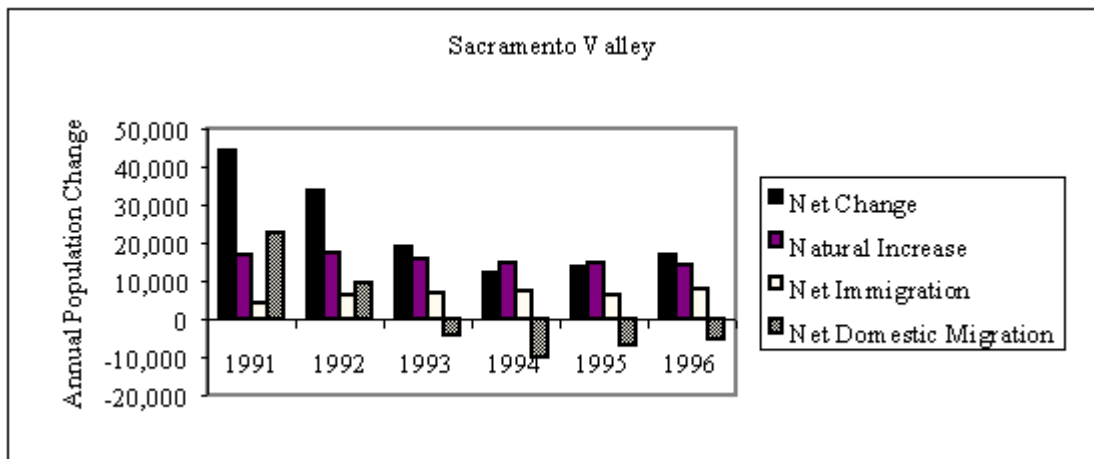
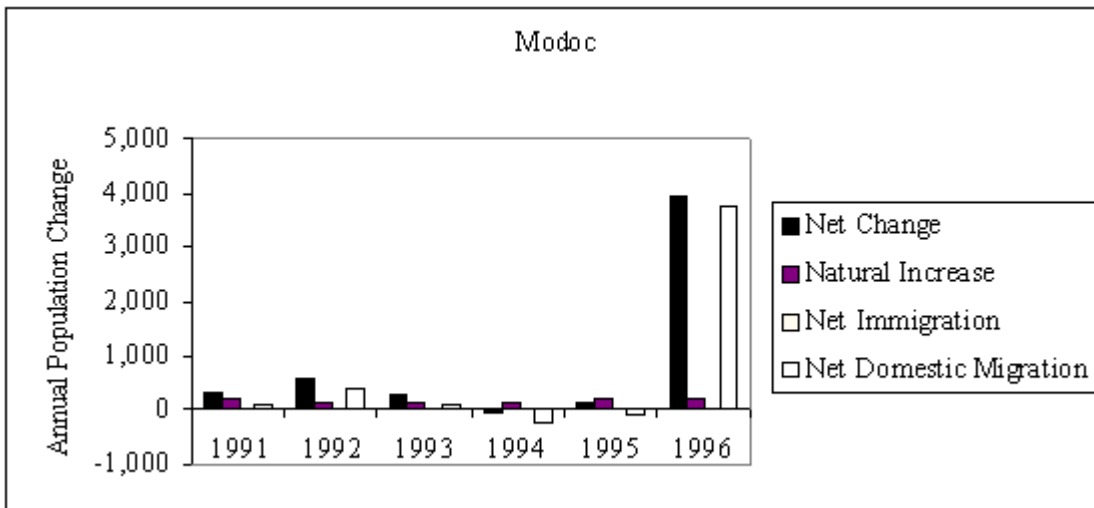
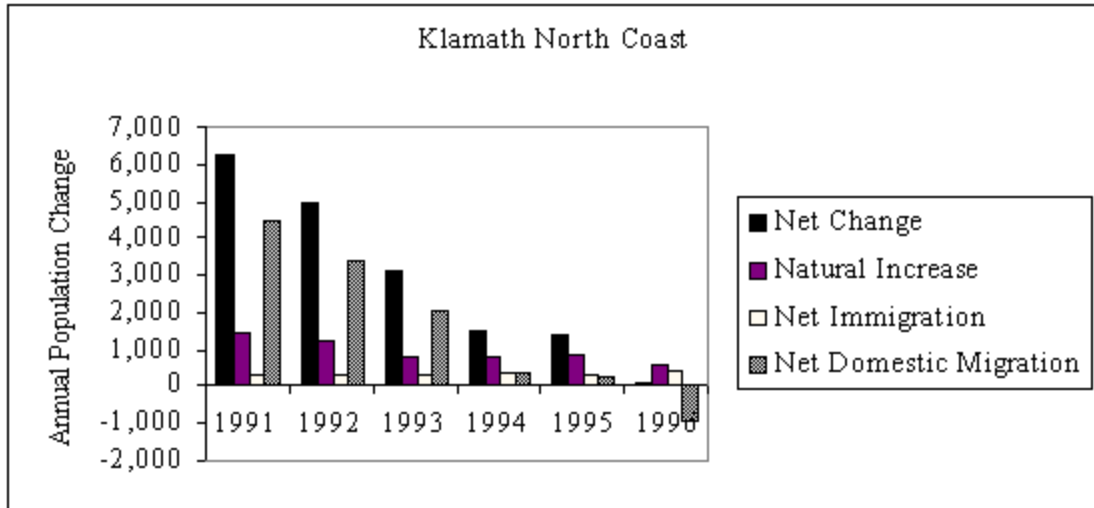


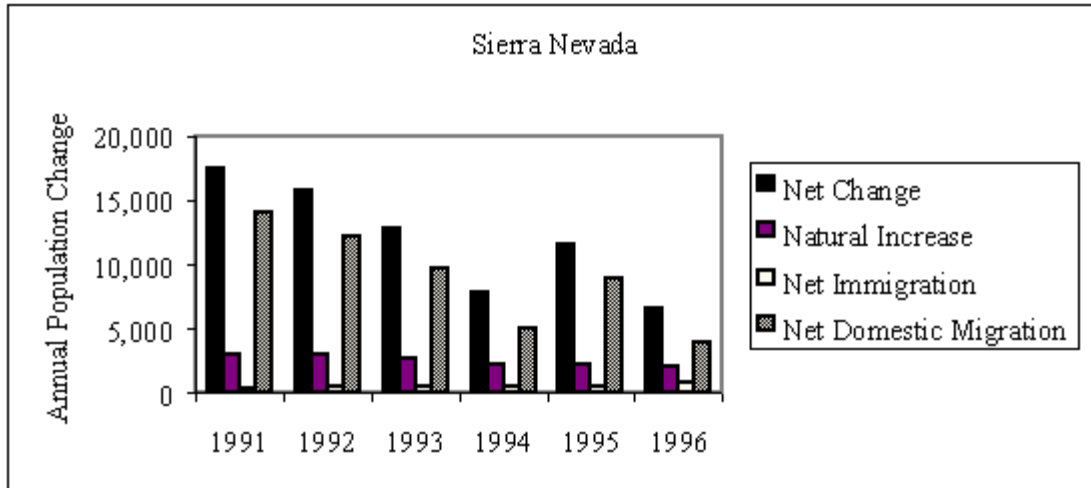
Central Coast



San Joaquin Valley







### Patterns of Settlement Density in Selected Counties

The preceding analysis suggests that population growth rates will vary considerably throughout the state and from year to year. The impacts of changing populations to land use and biodiversity can not be predicted simply from population projections. Increases in population will be accommodated by the expansion of existing residential areas according to what is allowed by zoning and what is economically feasible. Without any major changes in land use economics or policies, a reasonable hypothesis is that the distribution of the new population will closely follow existing patterns.

The following figures and tables (Patterns of Settlement Density) illustrate some of the prevalent patterns of residential land use across the state. Using housing data from the 1990 Census, land within each county is classified into eight density classes ranging from no permanent residents to high-density urban areas. The graphs show what proportion of land is in each density class and allows counties of different sizes to be compared on the same scale. The four figures use a number of counties to illustrate how increased population growth has been accommodated in different land use patterns.

Orange County represents a case where most land is either in subdivisions or in unpopulated or very lightly populated wildlands. Sacramento County illustrates the pattern of a major metropolitan area growing onto a residential landscape with many scattered residences that developed around an agriculturally based economy. Sonoma, Santa Cruz, and El Dorado counties represent a third pattern where a large fraction of the total landscape already has many homes scattered among wildlands and in the intermix area between urban areas and the wildlands. Each pattern has a very different implication about where biodiversity is now and who will own and manage the land in the future.

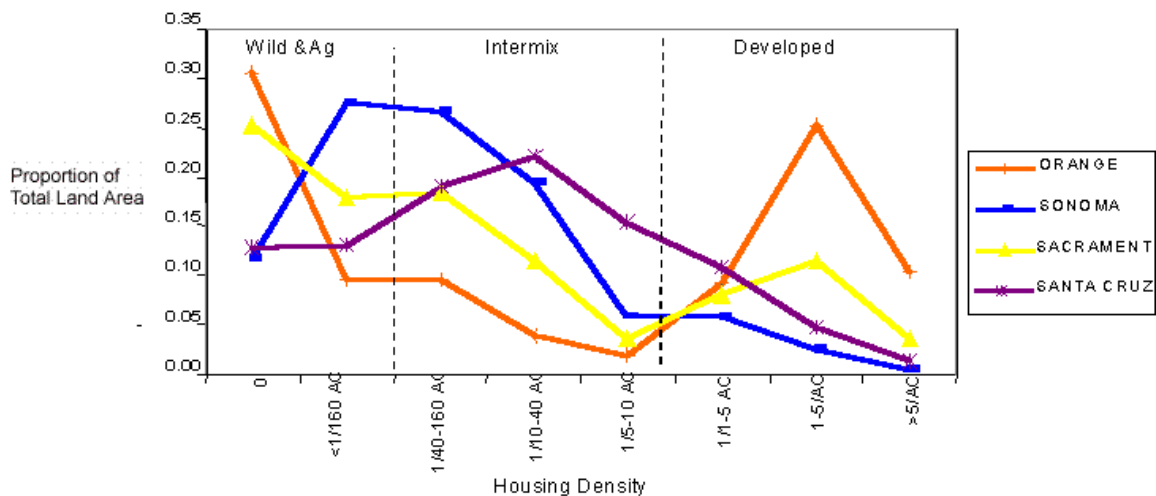
The final table classifies all counties in California into four land use types. The classification rules are:

- **Wildland and Agricultural** - over 70 percent wildland and agriculture AND less than 3 percent developed
- **Agricultural/Metro** - less than 30 percent AND more than 3 percent developed
- **Small Parcel** - more than 30 percent intermix and limited agricultural area
- **Suburban** - less than 30 percent intermix, limited agricultural acreage AND a high percentage of developed land

The combination of the population projections and settlement patterns suggests a wide range of challenges and takes us back to the final two population related questions raised at the beginning of this paper. Significant institutional challenges will need to be addressed in different ways across the state to ensure that demographic trends do not endanger the quality of life in California.

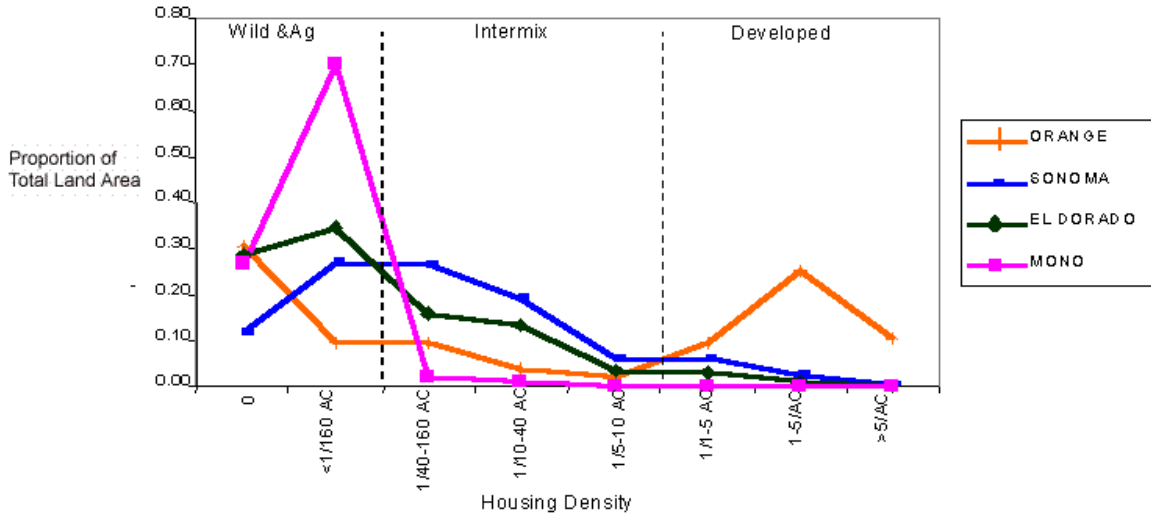
### Developing Counties Portray Different Patterns of Density

Counties show considerable variation in how they spread people across the landscape. Orange County has a u-shaped curve with large proportions of land in the Developed and Wild classes, but relatively little land in the Intermix class. Santa Cruz shows quite the reverse, with a larger proportion of land in the Intermix than in the Wild or Developed classes. Sonoma resembles Santa Cruz but has a greater proportion in Wild. Sacramento appears to move toward the Orange County case: a growing proportion of Developed and a declining proportion of Wild with both hinged by a low proportion in Intermix. Sacramento and Orange have created high-contrast, urban-wild landscapes while Sonoma and Santa Cruz have created landscapes with a large "homestead/estate" element between the urban and the wild. Each domain - Developed, Intermix and Wild - has impacts on ecological integrity and economic sustainability of the county.



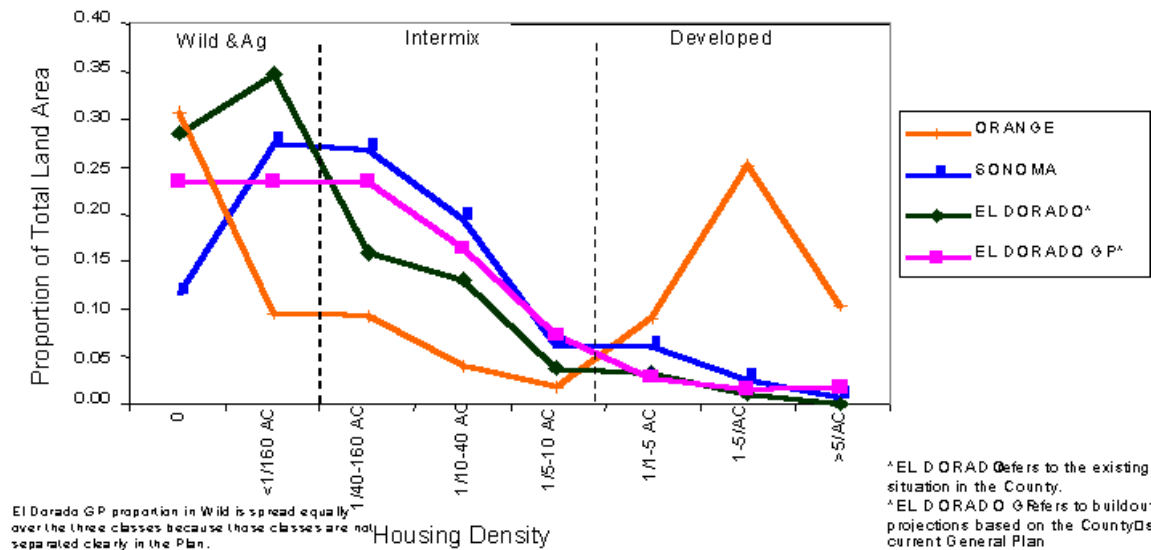
## The Pattern in Sierran Counties Shift as they Grow

Mono County shows what one would expect of a county dominated by wildland: nearly all Wild and very little Intermix or Developed. If El Dorado once had a population distribution similar to that of Mono County now, growth in El Dorado County has increased the proportion of Intermix much more than that of Developed and has lost considerable Wild land. Rather than concentrate growth in dense Developed areas, El Dorado has experienced lower density development with its creation of a rural residential landscape.



## Which Way will Foothill Counties Grow?

Buildout of El Dorado County's General Plan shows elements of both the Orange and Sonoma trajectories. The Plan shows a considerable percentage increase in high density development when compared to the current pattern. (The scale of the graph renders this great percentage increase difficult to see, but it is there). Nevertheless, the Plan also projects increase proportions of land in the Intermix domain. The Current Plan appears to move El Dorado along the Sonoma trajectory. Biodiversity in the foothill counties will therefore depend more closely on how people manage their ranchettes and backyards than is now the case in Orange County.



## Wildland, Small Parcel, Agricultural/Metropolitan and Suburban Population Patterns

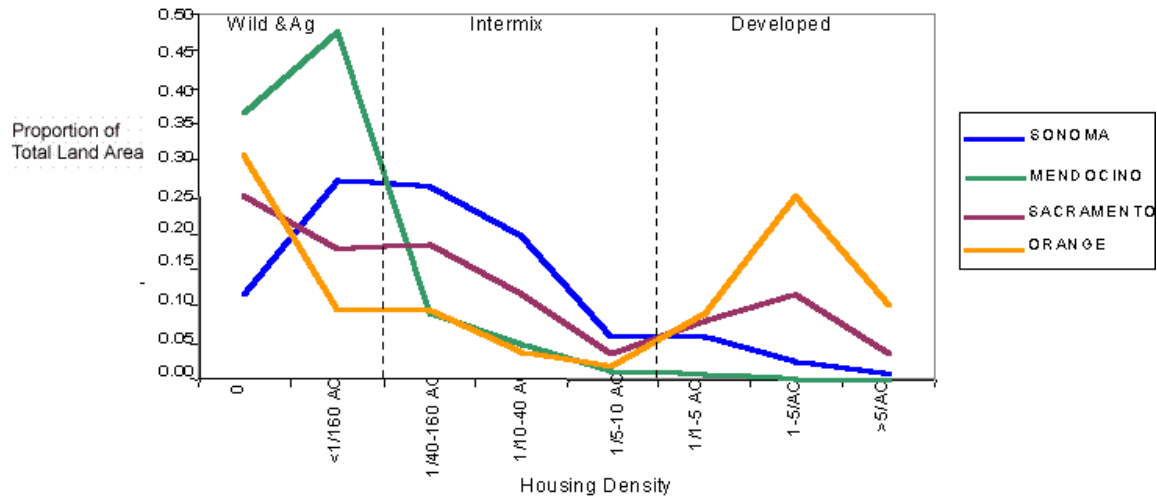
### - Different Challenges for Biodiversity

*Wildland County: Mendocino*- Population growth will have a relatively small impact on overall land use. The vast amount of land is forest or rangeland with only a small proportion in parks and reserves. Land stewardship practices across the "working landscape" and especially within river and stream corridors will have greater impacts than land conversion of residential uses.

*Small Parcel County: Sonoma*- Historic parcelization of larger forest, range and agricultural holdings has resulted in a pattern where more than half the county is characterized by an intermix of wildlands and homes. How people manage their ranchettes, non-industrial forest lands, large rural lots, small farms, and vineyards will have a significant impact on the functionality of wildlife habitat, vegetative communities and stream systems.

*Agricultural/Metropolitan County: Sacramento* - Most of the land is in agricultural holdings of various sizes. Flat land surround the major metropolis is increasingly being converted to residential, commercial and road uses. Biodiversity will depend on both that which coexists with agriculture and what resides on reserves or other areas required to mitigate the environmental impacts of new intensive development.

*Suburban County: Orange* - Full buildout is planned to consist of high density subdivisions and urban centers. High land costs per acre will limit the area of the county in the intermix densities. Reserve purchase, design and management will be the main trust of biodiversity planning.



### Land Use by Housing Density

County Type	Wildland and Agriculture	Intermix	Developed
Wildland/Agricultural	Rank Variable		
Inyo	99	0	0
Modoc	98	2	0
Mono	97	3	0
Alpine	96	3	0
Lassen	95	5	0
Imperial	94	5	1
Siskiyou	94	5	0
Trinity	93	7	0
Plumas	92	7	1
Colusa	91	9	0
Sierra	91	9<	0
Del Norte	90	8	1
San Benito	90	9	1
Kern	89	9	2
San Bernadino	89	8	2
Tuolumne	88	9	2
Glenn	87	12	1
Tehama	87	12	1
Mendocino	84	14	1
Humboldt	83	15	1
Monterey	83	13	3
San Luis Obispo	82	15	2

Mariposa	80	19	0
Shasta	80	16	2
Lake	79	18	2
Tulare	79	19	1
Kings	79	17	1
Fresno	77	20	2
Madera	75	22	1
Merced	71	26	2
Agricultural/Metro			Rank Variable
Sacramento	43	30	23
San Diego	61	23	13
Solano	64	25	8
Ventura	77	14	8
Placer	68	22	6
Riverside	81	12	6
Yolo	76	21	3
Small Parcel		Rank Variable	
Sonoma	39	46	9
San Joaquin	46	45	6
Calaveras	53	43	2
Santa Cruz	26	41	17
Santa Barbara	26	41	17
Napa	55	39	4
Yuba	58	36	4
Amador	58	35	3
Stanislaus	60	33	5
Butte	63	30	4
Sutter	65	30	3
El Dorado	63	29	4
Nevada	62	28	5
Suburban			Rank Variable
San Francisco	26	2	72
Orange	40	13	45
Contra Costa	47	21	29
Los Angeles	54	16	27
San Mateo	44	29	24
Alameda	61	17	22
Santa Clara	61	19	18
Marin	61	21	16

Source: CDF/FRAP Analysis of 1990 Census Data, November 19, 1997