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Pamela Case

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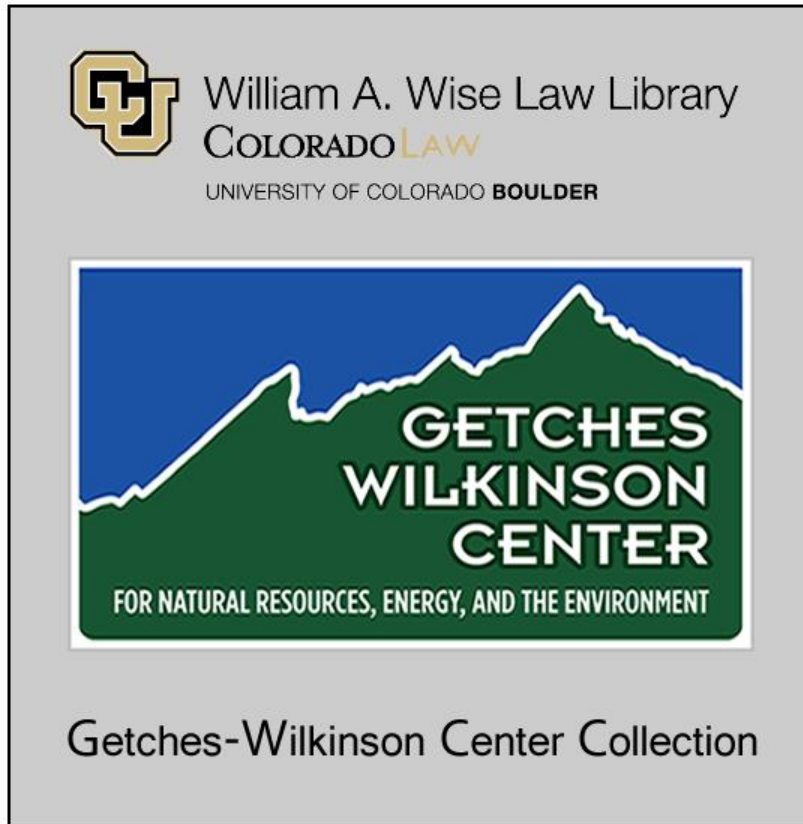


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**PATTERNS OF DEMOGRAPHIC
AND ECONOMIC CHANGE
IN THE WESTERN UNITED STATES**

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DAMS: WATER AND POWER IN THE NEW WEST

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Patterns Of Demographic And Economic Change In The Western United States

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For more than one hundred and fifty years, people have migrated to the West in successive waves, developing its wealth of natural resources, farming its lands and building up its cities and towns. The expansion of the Western population and economy is closely tied to development of water, that most renewable of all resources, and to federal and state policies for development and management of that resource .

Population growth and industrialization are key features of the Western region. In fact, they may now be the most salient features of the West. Because demographic patterns and change in these patterns are "macro" or "superscaler" phenomena (that is, they occur at scales larger than can be seen by individual observation), accurate views of these can only be built up by assembling thousands of pieces of data into coherent pictures. These "pictures" need to be looked at and interpreted in the context of relatively long-term time sequences.

Current Patterns Of Change

The Western states have been undergoing a period of significant change during the last twenty-five years. Some of the most significant demographic changes have occurred in just the last fifteen years. The economy has been changing in important ways, although this has been at a slower rate than has been occurring with respect to the population.

The population of the Western states has been growing more quickly than predicted, both as a result of natural increase¹ and due to the movement of people into the West from other states and abroad. During the last twenty-five years, the population of the seventeen states grew by about 32 percent as a whole, in comparison with a growth rate of 19 percent for the rest of the Nation. During the last fifteen years, the population of the West has grown by about 18 percent, in comparison to 11 percent for the rest of the Nation.

The overall growth of the Western population and the individual sources of that growth are impressive, but the most substantial and significant feature of demographic change in the West has to do with the way in which people have begun to rearrange themselves on the Western landscape.

In the 1970's, a fairly dramatic demographic picture took form. Large numbers of people moved to the interior West from the Western coastal cities. At the same time, the interior West also received immigrants from the Northern Great Plains states, the Lake States, the Eastern coastal states and the South. West Coast cities continued to grow, but their populations were of such magnitude that continued growth here did not constitute significant change. This was not true for the interior states. Arizona, New Mexico and southern Nevada received particularly large influxes of people from the Eastern seaboard, the Lake States and the Midwest. All the interior states, almost every county, received new people in numbers that for them, represented substantial increases over their historical populations. For a time, even the emptying out of the Northern Great Plains was arrested on its western-most marches.

Then, in the 80's (actually in the just the last part of the 70's and extending into the 90's), the pattern of relatively even dispersal into the interior changed direction. Very slowly at first, and then at an increasing rate during the 80's, migrants began to collect in a small

¹ "Natural increase" is considered to be the difference between births and deaths in the existing population.

nucleus of inland cities and metropolitan areas. The emptying out of the Northern Great Plains resumed its long historical trajectory. It now began to reach down into Oklahoma and northern Texas. Small towns and rural areas throughout the interior West lost people to these new cities. A small number of nuclear cities in the interior West started to acquire a velocity of growth substantially different than that of the rural areas or the older metropolitan areas of the coast.

In Western areas outside of Southern California, a series of urban archipelagos began to take form. These were, and are, today, areas of very high population density, surrounded by large rural areas whose populations are sparse and declining. Each of these areas consists of a number of central cities typical of a metropolitan area, and a ring of suburbs. Some of the suburbs are extensive and exist on land formerly considered to be uninhabitable by large numbers of people. These include marsh lands and deltas in the coastal states, and foothills and steep mountainous areas in the interior states.

We now know that this pattern of concentration of most of the West's people into what appears to be a relatively small number of metropolitan areas began in the latter 70's. But its outlines did not become clear until the mid-1990's.

All the new cities are located on nodes of the interstate highway system, but the structure of the transportation network does not appear to explain their creation or continued growth. The structure of large-scale water developments created in the West during the last twenty-five years also provides little explanation. Half the new cities lie at the stems of large water storage and delivery projects, but the other half do not. Demographers and social scientists now agree that the reorganization of people on the Western landscape is largely due to economic forces.

Beginning in the early 1980's, the Southern California economy took a downturn for a variety of reasons, and remained essentially at a standstill for fourteen years. Meanwhile,

the Denver and Salt Lake City economies began to shift toward telecommunications, computing and advanced technologies. These are the new sources of wealth in the West. These metropolitan economies then led the Nation in terms of earnings and employment for five to seven years. Similar events, all characterized by technological shifting, took place in other interior Western cities. Drawn by the prospects of higher-paying jobs or the opportunities of co-locating with allied industries, and driven by the standstill in Southern California, people began to move.

At the same time, and for many of the same reasons, people began to migrate from rural areas, particularly those of the Northern Great Plains. These people also were drawn by the prospect of jobs, and driven by the dwindling livelihood to be made on small family farms.

Southern California continued to grow tremendously, but an increasingly large fraction of its growth took its source in immigration. For people emigrating from the Far East and from Latin America, the Southern California economy was, and still is rich in opportunity. But for people having sufficient income to acquire discretionary funds, the Southern California economy was proving to be a relatively poor place in which to invest those funds. This was true not only for those who would normally invest funds in conventional ways, but for millions of ordinary people who wished to purchase real property, such as homes, or for those seeking to invest in such things as higher education for their children. Between 1994 and 1995, California acquired 370,000 immigrants, but exported 480,460 people to coastal cities further North or to the interior West. Colorado, the state with the highest rate of economic growth in the nation in that year, received approximately one-third of its new citizens from California.

Economic Change

Changes in demography and the economy are closely intertwined. By 1977, the Western economy, with the possible exception of mining, was more urban and industrial than was commonly supposed. Service and trade industries were the dominant Western economic sectors in 1977, as they were for the United States as a whole. The next largest industrial sectors (in terms of economic activity) were consumer services, construction and all the industries which fabricate materials (metal, glass, plastic, woven fabrics, rubber and so forth). Agriculture, the largest water-using industry, ranked ninth in terms of earning capacity in the Western economy.

Not surprisingly, the locations of the economically dominant industries are distributed among the Western counties in much the same fashion as is the population. Agriculture, mining, livestock ranching, and the other extractive industries tend to be located in places where these resources occur in the landscape, of course.

To some extent, these tend to be rural locations, but not exclusively. Some of the centers of supposedly rural activities such as agriculture actually tend to be located in counties very near the most densely populated counties, particularly those along the coast and those situated at the nodes of the interstate highway system in the Western interior. In fact, agricultural activity nearest the metropolitan centers of the West tends to generate the highest earnings. But this is less true for mining, livestock ranching, fishing and forestry.

Over the last twenty-five years, the proportional distribution of economic activity across sectors remains relatively stable. All sectors of the economy have grown in terms of earnings and employment.

The service sector has continued to dominate the economy. It is not only is the largest sector, but it has expanded more rapidly than all the others. The advanced technology products sector often grew almost as fast, climbing from 18th place (out of 20 industrial sectors) to eight place by 1990. Today it remains just behind the computing and telecommunications industrial sector. A 1993 study of firms using advanced technologies indicates that the diffusion of advanced technologies to other industrial sectors also increased the earnings (and wages) generated by firms adopting these technologies.² If the advanced technology products firms and the computing and telecommunications sectors are taken together (given the merging evolution of these two industrial sectors), their combined rate of growth would exceed the growth rate of the services industry.

The locations of the leading industries are coincident with the most densely populated places, as they were in 1977. These locations, particularly for agriculture shifted in the seventeen years between 1977 and 1993.

Economic activity in the western US, as measured by the contribution to US gross domestic product, is strongly concentrated in nodal metropolitan economies. These include Los Angeles, San Francisco, Sacramento, Phoenix, Tucson, Albuquerque, El Paso, Dallas, Houston, Denver, Salt Lake City, Eugene, Portland, Seattle, Boise, Spokane and Missoula. This strong nodal pattern has characterized the western landscape throughout its development, but has become even more pronounced during the past two decades. Over time, these nodal economies have gained prominence, dominating the economic growth throughout the region.

An added indication of this pattern is displayed by the pattern of economic diversity. The areas of highest economic diversity are predominately the nodal metropolitan economies.

²"Higher Wages Accompany Advanced Technology" by Timothy Dunne, University of Oklahoma and Kathy V. Friedman, Economic Statistical Briefs, US Department Of Commerce, Economics and Statistics Administration, Bureau Of The Census, August 1993.

Rural areas show lower levels of economic diversity or, stated conversely, are more specialized and depend on a narrower spectrum of economic activities (often agricultural or extractive uses).

This strongly nodal pattern of economic activity in the West closely follows the population distribution: large amounts of economic activity are coincident with the highest concentrations of people. Our data indicate that economic patterns change more slowly than do demographic patterns and population change, but the economic patterns still appear to follow, and in some cases, to shape the patterns of demographic change. (Both "cause" and "effect" processes seem to be taking place between economy and demography. These data sets do not allow us to isolate or trace these interactions clearly, but we can see that they do occur.)

In contrast, water use follows a very different pattern, quite unlike the patterns of economic activity. Even if only the economic uses of water are considered (total water use less domestic and power generation uses), the dissimilarity between the two patterns increases. In other words, the pattern of economic activity in the West is very different from the pattern of water use in the Region. The obvious reason is that, in general, agriculture utilizes the most water. Since agriculture is typically located outside of the metropolitan economic nodes (with the great exception of Los Angeles County), the pattern of water use is strikingly different than the economic pattern. While total economic activity is strongly concentrated in metropolitan nodes, the economic uses of water are far more dispersed. In fact, the pattern of economic uses of water shows clear associations with large scale water supply and delivery systems such as the Columbia/Snake, Missouri/Platte, Rio Grande, Arkansas, Colorado river systems, the Ogalla aquifer and the Central Valley of California.

Interesting patterns appear when segments of the economy and their associated water uses are examined. For example, the pattern of the economic value of production from

irrigated agriculture compared with the pattern of water use for irrigated agriculture provides some interesting contrasts. The economic value of irrigated agricultural products is highest in central and southern California (where water use is high), while similarly high irrigation water use areas such as the Snake River produce agricultural products of lower economic value. Stated differently, the pattern of irrigation is not a good predictor of the economic value of irrigated agricultural products in the West.

In contrast, the economic value of livestock production and the use of water for livestock, and the value of mining production and the use of water for mining both show strong coincidence: economic production values are highly correlated with associated water uses. The patterns of water use for and economic value of production from industrial and commercial activities are also highly coincident and are also strongly “nodal,” much like the pattern of total economic activity.

Projected Population Growth

In 2050, the Nation’s population will be about 50 percent larger than it is today. It will have grown by about 4.5 percent between 1995 and the year 2000, and then grow even more slowly after that. Only during the 1930’s has the Nation’s population ever grown more slowly than this.

The primary source of change in the national population over this long time period is natural increase. The number of births in the US are projected to decrease slightly as the century ends, then increase progressively throughout the projection period. The number of births remains relatively low (or declines slightly) until 2000 as the Baby Boomers finish passing through their childbearing years. Then an increasing number of women are expected to bear children. (These will be the grandchildren of the Baby Boomers.) The number of births are expected to increase throughout the projection period, in 2012,

topping the highest birth rate recorded in the Twentieth Century. By 2050, there may be as many as 5.7 million births a year

Between 1995 and 2050, the total number of deaths each year are expected to increase by 70 percent. There were 2.3 million deaths in 1995: there are expected to be 4 million deaths in 2050. This is true even though life expectancy is assumed to increase over time. But throughout the time period, there are an increasing number of people in older ages where mortality is highest.

Net immigration is projected to be an important factor in future population growth, even though it is not as important as natural increase, and it has been assumed by the Census Bureau to remain essentially static at about 820,000 immigrants per year. Immigration is considered to be important because in the year 2000, the total population of the Nation would be about million people larger (2 percent) than if no immigration took place. By the year 2050, the total US population might include 80 million post-1994 immigrants and their descendants. People in these two generations may constitute 25 percent of the population.

In terms of the States, the South and Far West combined are projected to account for slightly more than 84 percent of the 72 million persons added to the Nation's population over the next thirty years. That is, during the 1995 to 2025 period, the South and Far West are each expected to increase by more than 29 million persons. In contrast, during this same period, the Midwest is projected to add 7 million persons during the period 1995 to 2025, while the Northeast adds approximately 6 million persons.

California, the most populous state, contained 12 percent of the Nation's population in 1995. By 2025, California is expected to have 15 percent of the Nation's population. From 1995 to 2025, California adds 17.7 million people (equivalent to nearly the current population of New York State).

In the year 2025, eight percent of the Nation's population are projected to reside in Texas, compared to six percent in New York. Wyoming, now with the smallest share of the Nation's inhabitants (0.2 percent), will be replaced by the District of Columbia shortly before the year 2000.

The rate of population change among the 50 states and the District of Columbia varies significantly now, and will continue to do so in the future. Nine of the ten fastest growing states are expected to be in the West. Nevada is expected to have the most rapid growth between now and the year 2000 (22 percent). The District of Columbia currently shows a six percent decline. It is expected to increase in population in the interim period (2000 to 2020), and then began to decline again, relative to the rest of the states. The most rapid rate of change for the next several years is projected for the Mountain States: this rate of population change is expected to range from 9 to 22 percent during the 1995 to 2000 period. Georgia is the only other state with a projected rate of population change of nine percent or greater during this period.

The Western region will rank first in terms of having the highest rate of births, but will have the smallest number of deaths. During the 1995 to 2025 period, five states (California, Texas, New York, Florida and Illinois) are projected to have five million or more births. Four of these states, California, Florida, Texas and New York will have five million or more deaths. Among the five states, California and Texas are expected to have twice as many births as deaths. Furthermore, California and Texas alone are projected to account for 46 percent of the Nation's growth from natural increase.

Migration is projected to play an important role in regional differences in growth during the twenty-five year period. California is projected to add the largest number of international migrants (more than 8 million). This would be more than one-third of the immigrants added to the Nation's population over the twenty-five year period. Other states projected to have major gains of a million or more persons from immigration are New York, Florida, New Jersey, Illinois and Texas.

Overall projected rates of growth for the Western states tend to mask the amount of internal change expected to take place, and the sources of change for each state or sub-region of the West.

In general, internal migration (that is, migration among all the states in the Nation) accounts for the largest portion of the changes expected to take place in all the Western states. This is true for each of the years in the twenty-five-year time period.

Based on the recent past, Nevada and Wyoming are expected to experience much more turnover than the other states. In fact, these data suggest that these states will have more than 12 percent of their people coming and going every year. In real numbers, Nevada experiences net internal movement of 60,591 people in 1995 (according to these projections), 44,708 people in the year 2000, and 1,943 people in 2025. For purposes of comparison, its population is expected to range between 1,530,000 and 2,312,000 people in those years.

California receives proportionately little in-migration, but continues to export people to other states until about the year 2000. That is, it is projected to export 879,380 people in 1995 (while acquiring only 398,912 from other states), 834,054 people in the year 2000 (while acquiring only 450,181 people), and 911,385 people in 2025 (while acquiring 826,211 people from other states). For purposes of comparison, California is exporting numbers of people every year equivalent to the entire population of Montana in those same years.

Texas also experiences some in-migration until about 2015, while it exports relatively few people. For purposes of comparison, Texas is importing people in numbers roughly equivalent to the population of Wyoming in these years.

The second most important source of change is natural increase. For all Western states, there are more births than deaths. But unlike the case of internal migration described above, the relative impact of this source of change on the individual states is much more varied. The seventeen Western states differ considerably in the age and sex structures of their current populations. As a result, some states will experience a substantial impact from births or from deaths in a given time period: either because a relatively large portion of their population is in fertile, childbearing years, or else because a large portion is elderly. Other states will have a closer relationship between births and deaths because their populations are relatively evenly divided between all age and sex structures.

In all three time periods, California consistently experiences the most change due to births. Its birth rates for these selected years compare with its in-migration and international migration rates as shown in Table 1.

Table 1
Sources Of Projected Population Change In California

Year	Births	In-Migration	Immigration
1995	602,986	398,912	358,661
2000	582,648	450,181	368,528
2025	956,265	826,211	442,360

International immigration and emigration are the least important of the six sources of population change for the seventeen Western states, with the remarkable exception of California. However, for most of the projection period, California is expected to receive slightly more than one percent of its annual population growth from this immigration. Immigration to California is expected to be equivalent to approximately half its birth rate throughout the projection period, and equivalent to slightly less than its rate of intake of people from other states.

Implications For Water Use And Management

Recent years have brought a considerable amount of change to the West, much of it unanticipated. The West has grown in terms of overall population. Most of the growth has occurred in California and Texas: two states outsized with regard to the rest of the Nation, and poised by birth and immigration rates to become even more so in the future.

Much of the change in population patterns has been concentrated in the interior West, particularly in the Mountain States, and to a slightly lesser degree, in the Southwest.

As in earlier periods of the Twentieth Century, population growth in the West results from natural increase, from the influx of people from other states, and from a national concentration of immigration into California.

The most significant changes in the West in recent time are spatial; that is, the way people are grouping themselves on the landscape. In essence, people are concentrating in a relatively small number of urban archipelagos. This trend is likely to continue in the future. The metropolitan areas at the centers of these archipelagos have infrastructures and economies which are likely to cause coalescence of people in the Western landscape for a long time.

People also are drawn to these urban centers by factors having to do with the underlying age structure of the Western population and the Nation as a whole. Older people desire specialized support services for older and elderly people which found in these areas. Younger people need employment. Immigrants benefit from both the wider array of opportunities and social services characteristic of these areas.

The economy has not been experiencing as substantial a transformation as has the population. In overall character, it continues to expand along lines established earlier in

the 50's. But like the population, overall growth masks more substantial changes which have been taking place in the spatial organization of the economy on the Western landscape.

The pace of change is quickening in the West, in terms of its large-scale population and economic processes. The population of the West has grown tremendously in the West in the last thirty years, and is projected to keep expanding over the next twenty-five years. In fact, it will expand relative to all the rest of the Nation, and two Western states, California and Texas, will come to dominate the United States in terms of sheer population size.

It is likely that the largest share of future demand for water for all types of uses will be in California, Texas, Nevada and Utah. California and Texas have significantly larger populations now than almost all states in the Nation: and their populations are projected to grow even more outsized in the future. Both have significant concentrations of agricultural industries. Nevada and Utah, states with relatively moderately-sized populations now, are projected to change more substantially in the future than some of the other states. They are somewhat rural in character now, but probably will become significantly urban in the near future. Their needs for water have more to do with the fact that their population growths are relatively unexpected than with the fact that such growth may be large in absolute terms.

People in the West are coalescing into a relatively small number of metropolitan areas. These areas have infrastructures, a wide array of industries and high levels of economic activities to support their populations. Given that it is often less expansive to expand upon or rebuild existing infrastructures than it is to create new systems in new cities, it seems likely that these metropolitan areas will continue to be the nuclei of population growth and development in the West for the foreseeable future. It also may be that rural populations continue to decline, relative to the build-up of these metropolitan areas.

These observations have certain advantages for water planning and policy making in that the likely centers of Western population in the future can be known, and will be relatively "fixed" within the landscape. Working from the population projections for the states, it may be possible for water planners to estimate the likely shape of demand for water for municipal and industrial purposes for the individual metropolitan areas.

Agriculture around the metropolitan areas and in the coastal counties (which also are relatively heavily populated in comparison to the rest of the West) tends to have higher economic value than it does in the more rural settings of the West. Given the diversity of economies in and near these metropolitan areas, it is likely that a significant proportion of the crops being produced in these areas are exported to (i.e., used for trade and commerce with) other areas. Water used for agricultural purposes in these areas thus does not necessarily go for local consumption, but may have additional economic value as a basis for creation of export commodities. If this is the case, the most interesting changes in the long-standing balance between water use for agriculture, urban and industrial uses are likely to take place in the western-most of the large metropolitan areas.

In the interior areas of the West, the new cities are likely to have more need for local water infrastructure developments than most other regions. Water developments in these areas typically were constructed for agricultural purposes; but, these are rural areas suddenly becoming metropolitan within the space of thirty years. The long-term population projections suggest that these places will continue to grow at the same pace as they have in just the last fifteen years.

