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## Demographic Trends and Water Demand: New Mexico, El Paso, and Ciudad Juárez

Most of the issues addressed at this conference would either disappear completely or be much easier to solve if the populations of New Mexico, El Paso, and Ciudad Juárez were declining rapidly rather than growing rapidly. Many variables (including the structure of industry, general economic conditions, and housing characteristics) affect the demand for water, but the size, growth, and other characteristics of the population set the context in which nearly all discussions of water demand (water problems, if you like) take place. This brief presentation will focus mainly on regional population trends and projections. The place to begin is with some demographic fundamentals and a review of some world and national demographic issues.

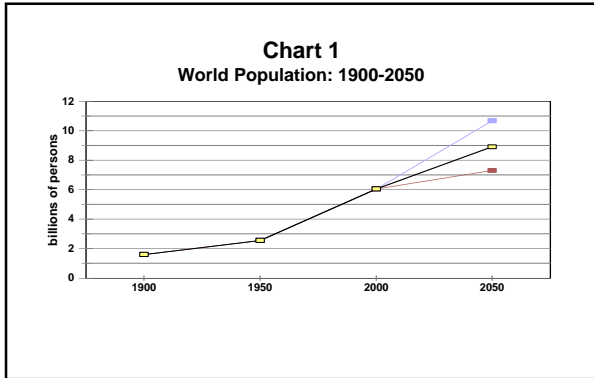
For the last fifty years, most popular and many professional discussions of demographic trends have centered on the “explosive” growth of the world’s population. We are all familiar with the story. Rapidly declining mortality in much of the world was not immediately accompanied by

corresponding declines in fertility. Under these conditions, the powerful force of compound annual growth rates suggests a world population size that would inevitably collide with the planet’s allegedly finite resource base. This basic population scenario, widely believed by many people, is at least as old as Malthus’ (1798) rather gloomy predictions of economic stagnation brought about by rapid population growth and a finite resource base.

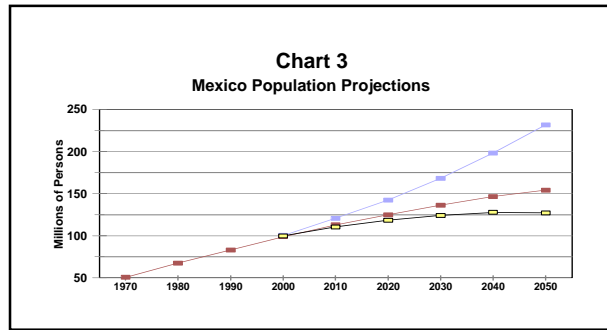
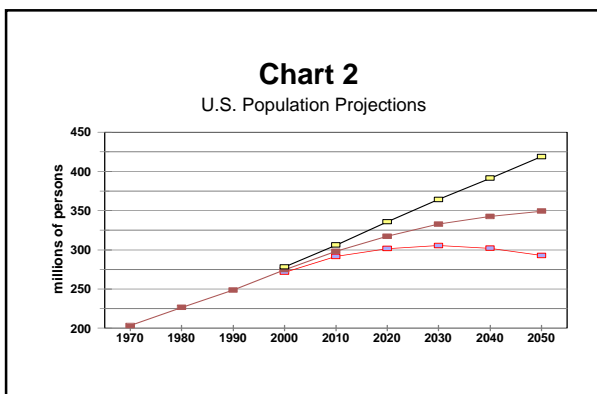
But a funny thing happened on the way to the Malthusian disaster. In the last few years, a great deal of interest has been expressed in academic and non-academic circles alike concerning the implications of an absolutely declining world population within the next few decades. Much of this discussion has been prompted by the aging of the world population and the population projections of the United Nations.

Beginning in 1996, the UN projections include a scenario in which the world’s population would begin to decline in absolute terms within the next few decades. The latest (1998) UN projections (Chart 1) show a range of world population in the year 2050 of 7.3 billion to 10.7 billion persons. Both the low and high UN scenarios are plausible given historical trends in mortality and fertility. Nearly half of the world’s population now lives in nations in which the total fertility rate is below the replacement level. Unlike population projections of smaller geographic areas such as nations or states, the UN projections

do not suffer from highly uncertain migration assumptions. Given current technology, net world population migration is zero. Yet, even without the volatility of migration assumptions, the UN projections exhibit a range of 3.4 billion persons—roughly half of the low-scenario population in 2050 and somewhat more than half of the world's current population.



Similar uncertainty is apparent in national population projections for the U.S. and Mexico. UN (1998) projections of the U.S. population to the year 2050 (Chart 2) range from a low of 292 million persons to a high of 419 million persons. The difference between the high and low projections of 127 million persons is nearly half (46 percent) of the current U.S. population. Although there are differences in fertility and mortality assumptions between the high and low projections, the critical assumption leading to these very different projections is net international migration. The UN projections of Mexico's population (Chart 3) exhibit a similarly wide range with a high population of 223 million persons to a low population estimate of approximately 119 million persons in the year 2050. The difference between the high and low projections of 104 million persons is greater than Mexico's current population.



What do these trends have to do with the dynamics of population growth in New Mexico, El Paso and Juárez? First, the global and national level projections illustrate the inherent difficulties of projecting the future size of any population. Reasonable demographic assumptions lead to widely varying future scenarios of growth or decline. Second, it is in general a much easier and safer proposition to project large populations than small ones. Migration, for example, tends to be much more volatile at the state and local level than at the national level. To the extent that migration is associated with economic conditions in the sending and receiving areas, an accurate migration forecast must depend on forecasts of local economic conditions well into the future. Third, the national level projections of population in the U.S. and Mexico suggest that population growth rates in the two nations are not independent. Large numbers of out-migrants from Mexico, for example, could reduce population growth rates in Mexico while increasing population growth rates in the U.S. In turn, population growth rates in the region under consideration are powerfully influenced by national trends. In short, if there is great uncertainty about population growth at the national level, there is even greater uncertainty at the state and local level.

## THE REGIONAL POPULATION

Recent population data for the region are presented in Table 1. By comparison, the U.S. population grew by 8.5 percent during the 1990 to 1998 time period. The 1990s are not a particularly unusual time period for the region when examining population growth rates, which are typically higher in the region than at the national level.

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**Table 1**

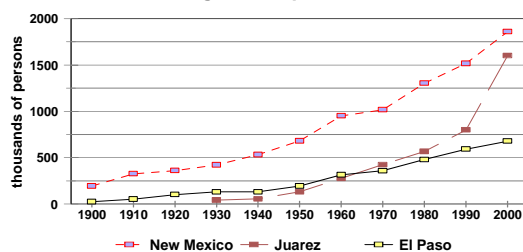
**Regional Population in 1990 and 1998**

Area	1998 Population (millions of persons)	Percent Change 1990 to 1998
New Mexico	1.737	14.6
El Paso	0.703	18.8
Ciudad Juárez	1.167	42.7
Total	3.607	24.2

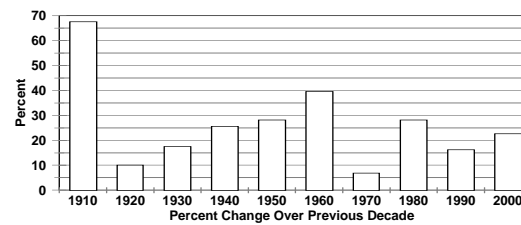
Source: New Mexico and El Paso data are U.S. Bureau of the Census estimates available on the internet at: [www.census.gov](http://www.census.gov). The figure for Juárez is interpolated from Mexican census data and projections in Peach and Williams, 1999.

A longer term perspective on regional population growth may be obtained by examining Chart 4 which displays total population in the three areas during the 20<sup>th</sup> century except for Juárez for which consistent data extend back only to 1930. As indicated in the chart, the population of New Mexico increased about eight-fold over the century from about 200,000 persons in 1900 to 1.7 million (estimate) in 2000. This is about the same rate of growth as the population of Mexico during the century and more than double the U.S. growth rate. Nevertheless, New Mexico's population growth rate has been highly variable from decade to decade as indicated in Chart 5. Despite a relatively rapid growth in population for the state as a whole, population growth rates by county within the state vary considerably. Indeed, five New Mexico counties lost population in every decade since the 1930s.

**Chart 4**  
**Regional Population**



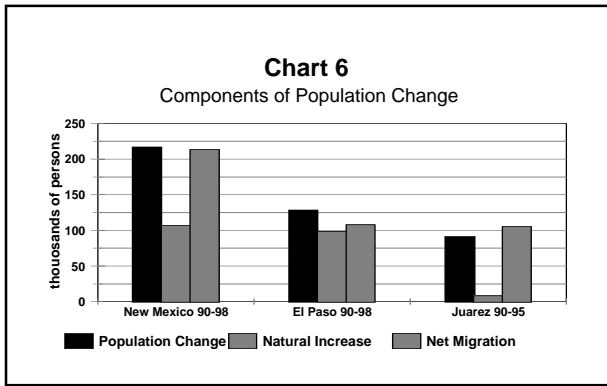
**Chart 5**  
**New Mexico Population**



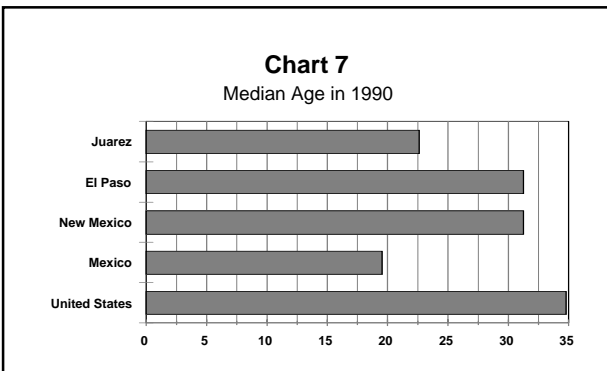
El Paso county's population has grown from only a few thousand in 1900 to more than 600,000 in 1998. Most of El Paso's population growth occurred in the last fifty years. And, as with New Mexico, El Paso county population growth rates varied considerably by decade.

The population of Cd. Juárez grew from 43 thousand in 1930 to just over 1.0 million in the 1995 Mexican Census and may reach 1.5 million by the time the 2000 census figures are available. There has been a noticeable acceleration of growth rates along the Mexican border—including Juárez—during the 1990s. Some of this acceleration in growth rates may be due to an undercount in the 1990 Mexican Census. Yet, migration to Juárez probably has accelerated in the 1990s, especially after the 1994-96 economic crisis in Mexico. Juárez population growth rates, like those in many other Mexican border cities, have been high for more than fifty years. At current growth rates (1990-95), the population of Juárez will be larger than New Mexico's total population early in the 21<sup>st</sup> century. Whether or not Juárez's population continues to grow at current rates is an open question.

To better understand the future population dynamics of the region, it is necessary to examine the components of population change: births, deaths and net migration. Chart 6 displays the components of population change for New Mexico and El Paso from 1990 to 1998 and Juárez for 1990-1995. In all three areas, the importance of natural increase (the excess of births over deaths) should not be underestimated. Between 1990 and 1998, natural increase accounted for 59.3 percent of New Mexico's population increase and 91.8 percent of El Paso's population increase. In Juárez, natural increase accounted for 50.6 percent of population change between 1990 and 1995.

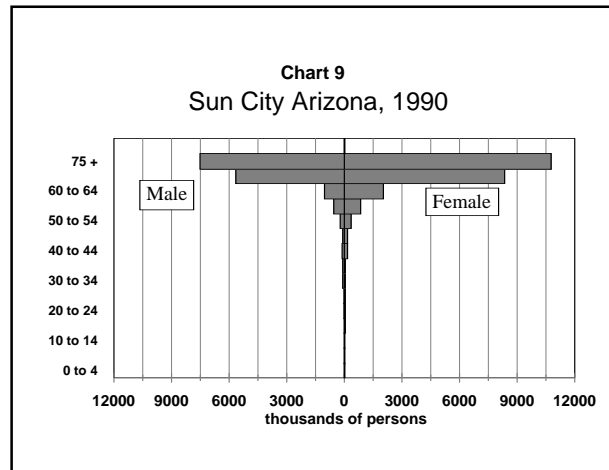
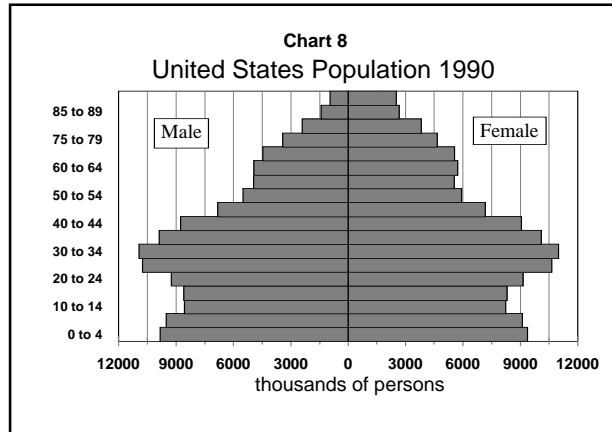


The natural increase data cited above point to the importance of what demographers refer to as demographic momentum, the tendency of a population to increase due to its age and sex distribution, even when fertility rates might be stable or declining. In other words, a population with a large portion of its population in the child-bearing years can expect to see a lot of births even if birth rates are stable or falling. Conversely, a population with a high proportion of older people is likely to have fewer births. In general, the regional population is younger than the U.S. population, but older than the population of Mexico. Selected median ages of the regional population in 1990 are displayed in Chart 7. The relatively young regional age distributions suggest continued population growth, even if fertility rates were to decline.



Even so, we need to realize that the regional population, like that of the U.S. and much of the world is an aging population. Although median ages in the region are lower than in the U.S. as a whole, median ages in the area are increasing and will continue to do so. The implications of an aging population are profound and include direct effects on labor force participation, productivity

per worker, population growth, patterns of public expenditures, crime rates and yes, of course, water demand. Such implications can be illustrated very simply. Charts 8 and 9 are population pyramids of the U.S. and Sun City, Arizona in 1990. There is no need for graduate work in economics or demography to draw reasonable conclusions from these charts.



**SOME SIMPLE REGIONAL PROJECTS**

While a variety of more sophisticated and more intellectually satisfying population projection techniques are available, it is sometimes a useful exercise to simply extrapolate current trends. Despite some significant shortcomings, simple trend projections offer a number of advantages. Trend projections are computationally efficient. This means that simple trend projections can be done by almost anyone using a variety of different growth rate assumptions. Further, the number of underlying assumptions used in simple

trend projections is very small. Using simple trend projections does not require accurate assumptions concerning the future course of fertility, mortality, migration, or economic conditions. Finally, simple trend projections are easy to understand—an important consideration in many contexts.

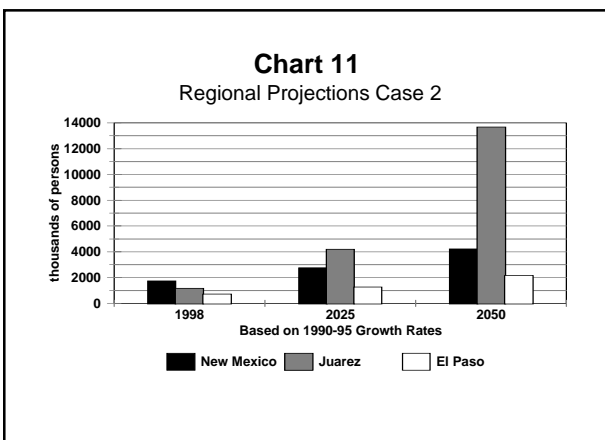
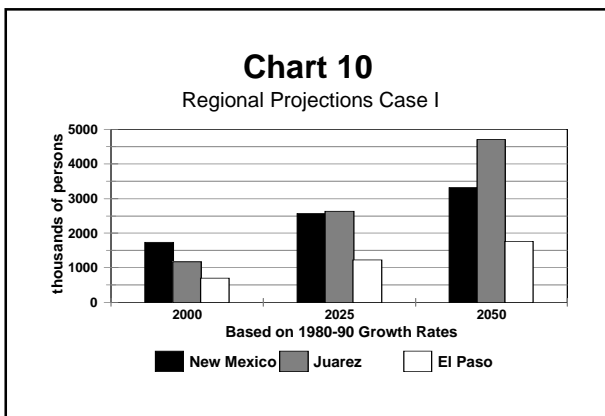
Simple trend projections of the regional population are presented in Charts 10 and 11. Two scenarios are presented here, but others can be easily computed using nothing more than a hand-held calculator. The first scenario uses compound annual growth rates from U.S. and Mexican decennial census data for 1980 and 1990. The second scenario is based on compound annual growth rates from 1990 to 1995 for Juárez and 1990 to 1998 for New Mexico and El Paso, Texas. The 1995 ending period for Juárez was selected because Mexico conducted a mid-decade census, but does not publish annual population estimates. On the U.S. side, the 1990 figures are from the decennial census while the 1998 figures are U.S. Census Bureau estimates ([www.census.gov](http://www.census.gov)). Projections are presented for both scenarios for the years 2025 and 2050.

Using the first scenario, the regional population more than doubles from a 1998 population of 3.7 million to 9.8 million in 2050. Under this scenario, the population of Juárez exceeds that of New Mexico by the year 2025 and is 43 percent larger than New Mexico's population by 2050. Still referring to the first scenario, the population of both New Mexico and El Paso increase by 65 percent by 2025 and more than double by 2050.

The second scenario, based on growth rates of the 1990s rather than the 1980s, implies even more dramatic changes in the regional population. Under this scenario, Juárez would be one of the world's larger metropolitan areas with a population approaching fourteen million people—or more than double the combined populations of New Mexico and El Paso. This scenario is not a likely one even given the historically high rates of population growth in Juárez.

## CONCLUSIONS

Even a brief tour of the population dynamics of the New Mexico, El Paso and Juárez region suggests that water experts and water users alike face some interesting issues in the coming decades. But that is not news to the participants at this conference. What we should all keep in mind as we plan for future water demands and debate water issues is that there is a great deal of uncertainty about regional population growth. Reasonable demographic assumptions lead to widely varying future population scenarios. Combining future demographic uncertainty with rapidly changing global, U.S. and regional economic conditions leads to a very simple conclusion: regional water demand in a decade or two will probably not be what we currently project it to be.



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