

THREE HUNDRED MILLION AND COUNTING
QUESTIONS THAT NEED DISCUSSION

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Introduction

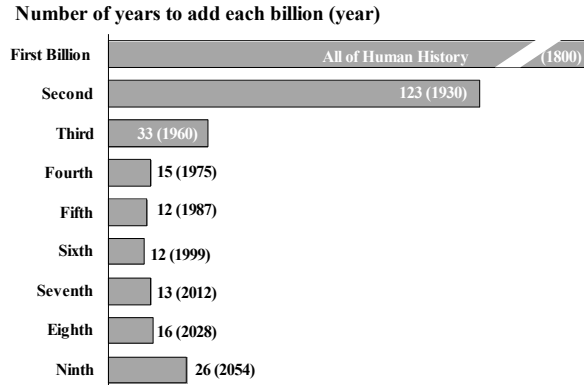
On October 17, 2006 U.S. population numbers officially reached the 300 million mark. Images from that day include a group of people clustered around a population clock in the nation's capitol, applauding as the number surpass 300 million; a New York Times editorial stating that the 300 millionth person should receive a bouquet and a thank-you card; a statement from the Secretary of Commerce to the effect that America's growing population is good for the economy and necessary to enable the support of aging populations; and an Associated Press article noting that the 400 million party is likely less than four decades away. Overall the press coverage presented a celebration of a milestone reached.

In all the celebration, the potential negative aspects of growing population numbers were given virtually no attention in the popular media. Yet, as memory of recent events fades, and as numbers continue to quietly advance toward 400 million and beyond, it is worth thinking a bit about what these population numbers imply. There are some tough questions about population that need to be answered in the United States, and now is as good a time as any to start asking them.

The Past as Prologue to the Future

The history of the world population is a story of very slow growth up until the 1800's, followed by rapid increases in growth rates over the past 150 years. A very rapid rise occurred in the mid-20th century, when the growth rate rose from about 1.5 percent per year in 1950 to a peak of over 2 percent in the early 1960s, primarily due to reductions in mortality. Rising growth rates were manifested in the form of rapidly rising numbers of individuals and ever shorter intervals between the addition of successive billions to the population (Figure 1). About 45 years ago (around 1963) the rate of growth began falling. This resulted, after a lag of several decades in a stabilization of the pace of increase. The growth rate is expected to continue falling, with the result that the time period required to add successive billions will lengthen. Today there are more than 6.5 billion people in the world. At predicted growth rates, human numbers will reach 7 billion in 2012.

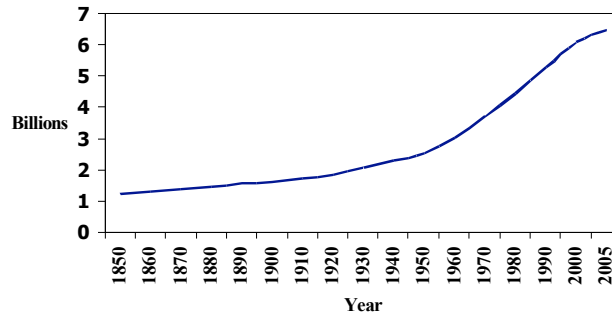
Figure 1
Growth in Global Population



Sources: First and second billion: Population Reference Bureau. Third through ninth billion: United Nations, *World Population in 2300* (medium scenario), 2003.

The change in world population growth rates show up clearly in a plot of population over time (Figure 2). The sigmoid, or “S” shaped curve indicates a slowing of growth in recent decades, and the potential for stabilization of population within several hundred years.

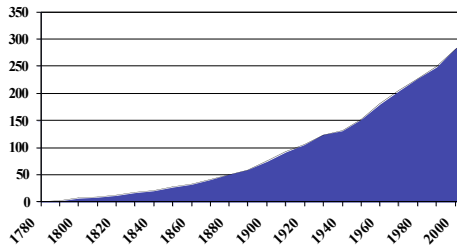
Figure 2
World Population 1850 -2005



Source: U.S. Census Bureau, International Programs Center, 2006

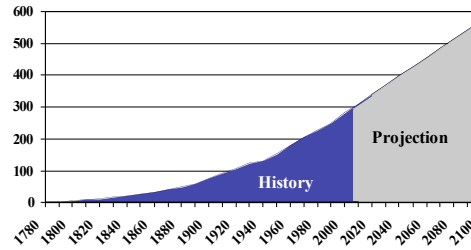
Examination of a plot of U.S. population growth reveals a significantly different shape than the global growth curve. No evidence of a downturn in growth is seen in either the historical record (Figure 3) or in projections through the end of the century, when the U.S. population size is expected to be approximately double that of today (Figure 4).

Figure 3
Growth of U.S. Population, 1776 - 2005



Source: U.S. Census Bureau, 2006.

Figure 4
Growth of U.S. Population, 1776 - 2100



Source: U.S. Census Bureau, 2006.

Today, growth of the U.S. population is driven by a birth rate that exceeds the death rate, and immigration. Each two minutes the nation's population increases by 9, with growth defined by 15 births and 10 deaths (for a net gain of 5), and the arrival of 4 new immigrants. The growth rate is currently just under 1.0 percent annually. This rate of growth may not sound very dramatic, until the power of compounding is applied and the figure it is applied to is 300 million.

Compounding – A Powerful Mechanism for Investors, an Awesome Driver of Growth

As increasingly sophisticated investors we are well aware that compounding of interest can lead to significant growth of assets over time. But as often pointed out by Dr. Albert Bartlett, professor emeritus of physics at the University of Colorado, we tend to give little thought to the power of compounding when considering growth of populations.

Today, few would be attracted to a bank offering an interest rate of only 1 percent. Nonetheless, earning 1.0% with annual compounding would double an investment in about 70 years; doubling would occur in only about 35 years at a 2 percent rate. Populations respond in precisely the same ways and in the same time frames at various rates of growth. There is, however, a difference between growth of bank accounts and growth of population in that whereas 35 and 70 years are long time periods to an individual, these same time periods represent scarcely a blip in the long sweep of history. This difference helps to explain why people tend to view a 1 percent rate of growth as insignificant. But a population growth rate of 1 percent is far from insignificant over your lifetime and that of your children and grandchildren.

To understand the dynamics of growing numbers, consider for a moment the impact of repeated doubling. Starting with any number, doubling that number just ten times results in a total that is 1,024 times the original number (i.e. 1-2-4-8-16-32-64-128-256-512-1024). With that reality in mind, let's examine population growth in the context of compounded annual rates of growth. In view of the fact that a 1.0 percent compounded rate of growth translates to a doubling time of 70 years, what would be the population of the United States if a growth of 1.0 percent were to be maintained for, say, 210 years? Since 210 years is three doubling times at a 1.0 percent rate of growth, the same kinds of calculations as above yield a U.S. population of eight times the current population, or over 2.4 billion in

210 years (or more than one-third the current world population). And if growth at a 1.0 percent rate were to continue for 700 years? Again, since 700 years is ten doubling times at a 1.0 percent rate of growth, the population of the United States at that point would be 1,024 times greater than the current population, or over **307 billion . . . over 47 times the current population of the entire world!** Even a growth rate of 0.5 percent would yield a population of almost 33 billion, a number over 5 times greater than the current world population.

The impact of a sustained 1.0 percent growth rate on the populations of selected states is shown in Table 1. Note that at this rate of growth, a rate viewed by many people as insignificant, the populations of California, New York, Pennsylvania, and Texas would each exceed, by two to six times, the current *world* population! Twenty eight states would each have populations greater than one-half the current world population (i.e. more than *3.25 billion*).

It is important to point out that these are not hypothetical calculations but rather the mathematical realities of continued growth! These kinds of realities are what cause Dr. Bartlett to raise the question whether the oft’ used term “sustainable growth” isn’t really an oxymoron.

Table 1
 Future Population of Selected States at a Sustained
 1.0 Percent Annual Growth Rate

State	Population July 1, 2000 (millions)	Future Population (millions)	Future Population (billions)
		2210	2700
California	33.9	273.7	35.9
Colorado	4.3	34.8	4.6
Florida	16.0	129.1	16.9
Hawaii	1.2	9.8	1.3
Massachusetts	6.4	51.3	6.7
Minnesota	4.9	39.8	5.2
New York	19.0	153.3	20.1
Oregon	3.4	27.6	3.6
Pennsylvania	12.3	99.2	13.0
Texas	20.9	168.5	22.1
Virginia	7.1	57.2	7.5
Washington	5.9	47.6	6.2
Wisconsin	5.4	43.3	5.7
Wyoming	0.5	4.0	0.5
Total U.S.	281.4	2,273.9	298.1

The inescapable conclusion is that rational discussion is needed regarding both U.S. and global population growth and what might be done to bring about a stable population. This topic is currently missing from the mass mailings and publications of the mainstream U.S. environmental organizations, despite the obvious environmental implications of rapid population growth. Population growth is missing as well from discussion agendas of the White House and Congress, and legislative bodies and religious and civic groups across the nation.

Implications of Population Growth

The impact of population growth on the availability of fixed assets such as land, water, and forests on a per capita basis is both relentless and subtle. Shown in Table 2 is the area of forest land in the United States at different points in history. Note that 220 years ago there were about 350 acres of forest for each man, woman, and child. This declined dramatically over a period of only 65 years due to a combination of conversion of forest lands to agriculture (resulting in a loss of more than 11% of forest land) and a more than 7-fold (or more than a 676%) growth in population; by 1850 the area of forest was 40 acres per capita. Similar developments occurred over the next 60 years, reducing the forest land area per capita to 9.5 acres – only 1/35th of what it had been 125 years earlier. Over the succeeding 95 years the area of forest land in the U.S. actually increased. However, the area of forest land on a per capita basis continued to drop as the population grew from 77 to 296 million. Assuming a stable forest land base going forward, forest area will continue to fall on a per capita basis, with 1.3 acres the most likely value by the end of this century.

Table 2
Forests Then, Now, and Future – U.S.

Year	Population	Forest area (million ac.)	Forest area/capita (acres)
1785	3,000,000	1,044	348
1850	23,300,000	926	40
1910	77,000,000	730	9.5
2005	296,410,000	749	2.5
2100	571,000,000	749	1.3

Source: Population figures from U.S. Census Bureau (2006), forest area from U.S. Forest Service.

The same per capita trends as shown in Table 2 can be seen in the volume of fresh water, the extent of lake shore, the area of tillable land, and so on. As the population continues to grow the numbers become incrementally smaller, and the margin for error for meeting human needs narrows steadily.

Questions to Consider

Substantive discussion of population growth has become politically incorrect in the United States as Americans have decided either consciously or unconsciously to simply

ignore the topic. To the extent that there is discussion, we have allowed debate to be defined by the shrill voices. In effect, domestic policy regarding growth appears to be “whatever happens, happens.”

Given the pervasive effect of population on a wide array of issues, the total disregard of this phenomenon in public discourse needs to be reversed. A few of the topics/questions that need informed and rational discussion are the following:

1. It is interesting to note that the United States and China bear great similarity in one respect: the geographic areas of the two countries are almost precisely the same. China, however, is noted for its immense population (approximately 1.3 billion people), for incredibly crowded cities, and for a highly visible mass of humanity across the landscape. By the end of this century, the U.S. will have a population of nearly 600 million and be slightly more than one doubling time (approximately 87 years at the current rate of growth) from achieving the current population of China. Using China as a model, is this the future we wish to leave for our children's children?
2. If the U.S. population does become as large as present-day China, and per-capita consumption remains at or close to current levels, what are the implications for future generations of Americans? For the wild places within U.S. borders and beyond? For global citizens?
3. If population growth is, in fact, essential for the health of the U.S. economy, what will happen when the population stops growing, something that must occur in the not-too-distant future (see discussion of compounding above)? Shouldn't thought be given now to how our economic model might be changed such that the economy could remain healthy in the absence of growth?
4. Isn't it time for a rational debate on immigration that includes examination of implications for future population levels? As things now stand, any questioning of current immigration policy is labeled as an attack on immigrants and the contributions that immigrants have made since the founding of the nation. Without a doubt this country and its greatness was built on immigrants. To recognize that fact, however, should not mean that further discussion and planning is stifled. A key component of addressing immigration will be to examine it and the factors influencing it on a global scale.
5. If society were to decide that a slowing of the population growth rate would be desirable, does that mean that the only options are to either employ the oppressive tactics used in conjunction with China's one-child policy, or to encourage widespread abortion? Current debate on this topic, to the extent that there is any, quickly points to these extremes; end of discussion. That there are other options is obvious, and these are worth discussing.

The Bottom Line

Although our society is loath to discuss population growth, it is unquestionably the single-most important factor driving environmental concerns domestically and globally, and the factor that will likely largely define the future of our descendants. It is important to understand where current trends are leading, to consider whether the likely future meshes with what most would view as acceptable for generations to come, and to explore options for changing the course of events if trends are judged to be outside the bounds of acceptability. It would seem there is no time like the present to begin these discussions.

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