DEMOGRAPHIC CHANGE AND ITS IMPACT ON FOREST RESOURCE REQUIREMENTS[1]

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ABSTRACT. - Demographic forces are a major factor underlying long-term trends in forest resource requirements and forest use. This paper describes demographic changes in the United States and in the world as well as the impact of these changes on forest requirements. The aging of both the U.S. and world populations is a crucial demographic trend, and it is without historical precedent. The passage of the socially and economically influential Baby Boom generation is particularly important in the United States. World population will continue to grow in the developing countries and will probably double to over 10 billion in the next century. By contrast, population growth is slowing in the developed countries and may eventually cease. Forest conservation and future markets for forest products will increasingly depend upon sustainable development and technological advancement in developing countries.

INTRODUCTION

Major demographic changes are now occurring that will profoundly affect the demand for forest products and the use of our forests. An understanding of how changing demographic trends affect markets for goods and services and societal attitudes is particularly important for the long-term analysis of forest resource requirements. First, we will look at the major demographic changes taking place in the United States and their possible impacts on forest resource use. Second, we will look briefly at some broader world population trends and their implications for forest products markets and world forestry.

[1] Paper presented to the General Session at the SAF National Convention held at Spokane, WA, on September 24–27,1989.

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DEMOGRAPHIC CHANGE IN THE UNITED STATES

The United States is in the midst of a dramatic demographic evolution: from rapid population growth and a society oriented toward youth to a stable population and an aging society. Particularly noteworthy is the passage of the socially and economically influential Baby Boom generation from youth to middle age. The aging of society is important in determining the demands for goods and services. In addition to the decline in population size and age, differences in racial and ethnic birth rates and in immigration rates will lead to a more diverse society. Ways to incorporate all members of society into productive economic pursuits will become increasingly important as population growth declines.

Population Projections

The total population of the United States has increased from 181 million in 1960 to 248 million in 1989. However, the average annual growth rate has fallen from about 1.7 percent in the 1950s to slightly less than 1 percent in the 1980s. If present demographic trends continue, the United

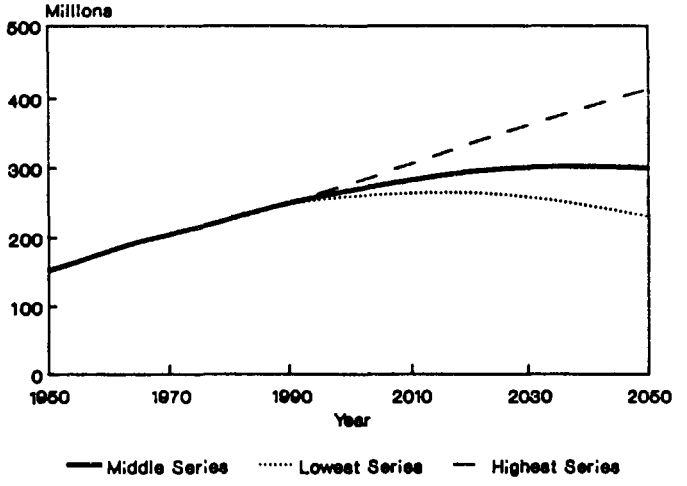

Figure 1.–U.S. population, 1950-1988, with projections to 2050.

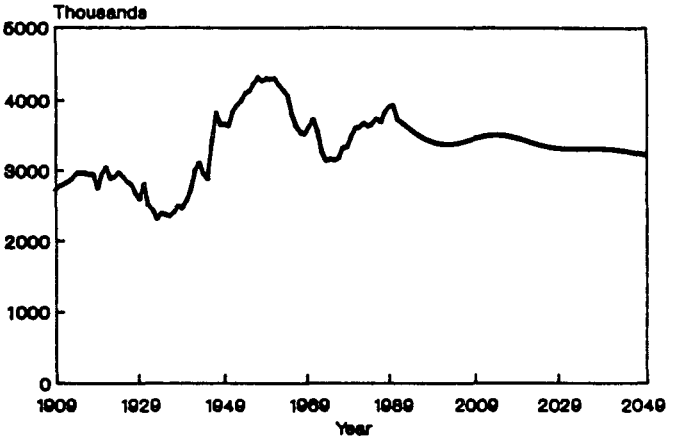

Figure 2.—Births in the United States 1909-1988, with projections to 2050.

States faces the serious possibility of eventual zero population growth in the next 50 years. According to the middle projection series of the Bureau of the Census, the population will increase by 54 million to 302 million in 2038 (Spencer 1988). By 2050, the population is projected to range from 230 to 414 million (Fig. 1).

Historically, fertility has been the most important cause of population growth in the United States. The total fertility rate–the life-time total of births per woman–declined fairly steadily from the early 19th century to the 1930s. However, in the 1940s and 1950s, birth rates rose rapidly, reaching a peak of 3.7 children per woman in 1957. The total fertility rate began to fall sharply in 1961, reaching a low of 1.8 children per woman in 1976. Fertility rates in the 1980s have remained near the rate of 1.8 children per woman. In projecting future population, the Census Bureau makes three assumptions about future fertility: these are a low, middle, and high series assumption of total fertility of 1.5, 1.8, and 2.2 children per woman, respectively. The middle series assumption of 1,800 births per thousand women is consistent with the recent level of fertility, womens' expectations of future births, and social and economic trends among women that support low fertility such as increased labor force participation, higher educational attainment, and older age at first marriage.

Age-specific mortality rates are projected to continue to decline because of advances in medical technology and preventive health care and wellness programs. In 1986, overall life expectancy at birth was 75 years, in contrast to 47 years in 1900 and 70 years in 1970. The Census Bureau's middle series projection of life expectancy will reach 81.2 years by 2080, with low and high assumptions of 77.9 and 88.0 years, respectively.

Immigration had been an important part of population growth until the Immigration Control Act of 1924. In recent years, immigration has again become an important factor. The Census Bureau estimated net immigration as 450,000 people in 1975, 845,000 in 1980 and 648,000 in 1985. People are also leaving the United States for various reasons–current emigration is estimated at 150,000 persons annually. The Census Bureau middle series assumes net immigration of 575,000 in 1990 and a decline to 500,000 in 2000 and beyond (with low and high assumptions of 300,000 and 800,000, respectively).

The U.S. population has become more racially and ethnically diverse in recent decades, and it is projected to become even more diverse in the next century. In 1988, Blacks made up 12.2 percent of the total population, Hispanics about 8 percent, and Asian, Native Americans, and other nonwhite people, about 3.3 percent. By 2050, these shares of total population could increase to 16 percent for Blacks, 15 percent for Hispanics, and 9 percent for Asians, Native Americans, and other nonwhite people. This projected increase in racial and ethnic diversity makes it important that these groups become an integral part of the nation's workforce (Dertouzos and others 1989).

Population Age Composition

The wide swings in the number of births in the last 60 years have lead to an unbalanced population age structure in the United States. First, a sharp decline in births occurred in the late 1920% and 1930s–from 3.1 million to 2.3 million. This was followed by the Baby Boom, with births rising to 4.3 million in 1957. The number of births stayed near this level until 1961, when births slowly declined (Fig. 2). The number of births fell to 3.1 million in 1975, and by 1976, the total fertility rate fell to a historic low of 1.8 children per woman. The large cohorts of the Baby Boom generation reaching child-bearing age led to an increase in birth to 3.9 million by 1988, even though fertility rates remained near record-low levels.

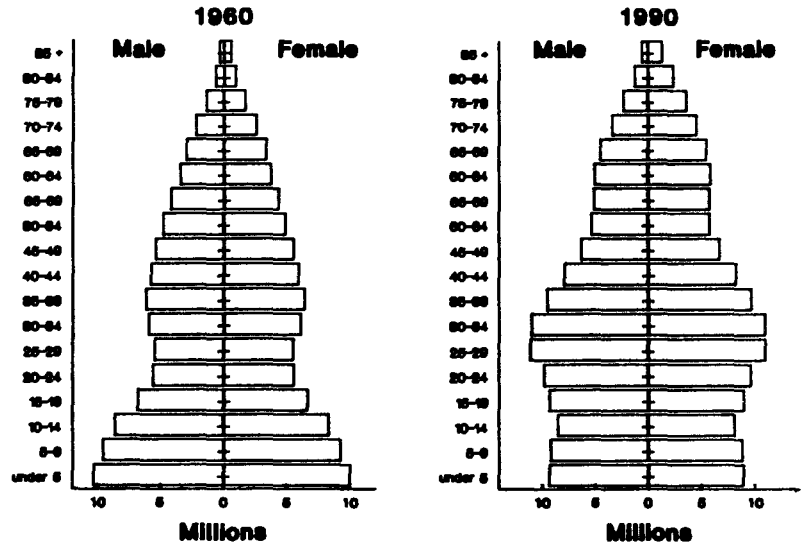

Figure 3.-U.S. population by age and sex, 1960 and 1990.

In the post-World War II Baby Boom years of 1946 to 1964, 75 million children were born in just 18 years. The peak Baby Boom years were characterized by the birth of 80 percent more children per year than were born in the years of the Depression. The skewed age structure of our current population has been caused by not only the disproportionately large Baby Boom generation, but also the relatively small cohorts of those born in the 1930s and 1970s that bracket this generation. To put these age cohorts in perspective, look at their relative ages in 1990 (Fig. 3). The smaller population cohorts of 1925 to 1940 will be 50 to 65 years of age in 1990. The Baby Boom generation will be 26 to 44 years old, and the "Baby Bust" generation of the 1970s will be 10 to 19 years old.

The passage of the relatively smaller cohorts into retirement age in the next 20 years will ease the burden on the retirement and social security system until 2010, when the the Baby Boomers begin to reach 65. Until 2010, the number of 40- to 60–year-oldpersons will rapidly increase because of the large Baby Boom cohorts and the decline in the number of persons reaching retirement age (the smaller cohorts of the 1930s). There will also be relatively fewer young workers (age 18 to 29). Thus, the demographic background is becoming estremely favorable for the economy because of the relatively large number of savers and of primary working-age people and the relative decline in the number of entry-level workers and retirees (Merrick and Tordella 1988). This situation is just the opposite of that of the 1970s and early 1980s, which was characterized by a large number of adolescents and relatively fewer people in the prime working-age groups. The improvement in the economic conditions of the 1980s has been aided by the favorable change in the demographic background, and these conditions are likely to continue for the next two decades. By 2020, the Baby Boom generation will approach retirement age, and the number of persons over 65 years old will begin to grow rapidly (Fig. 4). The increase in the number of elderly will be dramatic: the number of persons over age 85 is projected to increase from 3 million in 1988 to over 15 million in 2050. Health-related issues and saving for retirement will be major concerns in the next century.

The aging of our population is without historical precedent. The most striking feature of the aging population is the rise in the median age. Until now, the United States has been a nation with a youthful and growing population. However, the median age rose from 28 years in 1970 to 30 years in 1980, and it is expected to be about 33 years in 1990. The Census Bureau projects that the median age will rise to 36.4 years by the turn of the century, 40 years in 2020, 43 years in 2040, and 44 years in 2080, according to the medium projection series. Even the highest series projects the median age to 38 years by 2020 and 40 years by 2080.

Spatial Distribution of Population

Regional shifts in population are important demographic trends in the United States. Most population growth in recent decades has occurred in the South and West. For example, from 1960 to 1986, the South increased its share of population from 29.7 to 34.4 percent, and the West from 15.6 to 20.2 percent. For the same period, the Northeast's share of the population declined from 26 to 20.7 percent and the Midwest's from 28.7 to 24.6 percent. These trends are projected to continue (Wetrogan 1988). By 2010, the South's share of the total population is projected to increase to 37.2 percent and the West's to 23.3 percent. The Northeast's share is projected to decline to 18.6 percent and the Midwest's to 20.9 percent.

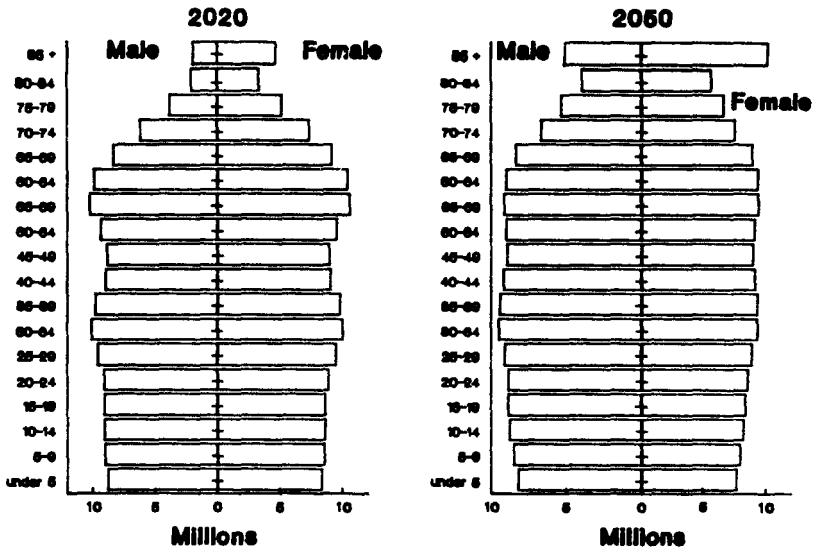

Figure 4.—U.S population by age and sex, 2020 and 2050.

An important aspect of demographic change is migration of people to small cities and counties near metropolitan areas. This dispersal of population is aided by technological changes in transportation and telecommunication systems. According to Lessinger (1987), there will be a major movement of the population away from suburbia to nearby open spaces. These trends, if realized, will make conservation and land planning in rural and forested areas particularly important. For example, concern has arisen about rural subdivision of forestland in New England.

Another aspect of rural population distribution is the decline in the agricultural farm population. Since 1920, this population has fallen from 30 percent of the total population to about 2 percent in 1988 (U.S. Bureau of the Census 1989). Labor productivity has soared in agriculture as capital-intensive technologies have displaced labor-intensive ones, thus greatly reducing the marginal cost of production of agricultural products and freeing labor supply for more productive use in other sectors of the economy.

Socioeconomic Characteristics

Demographic change is also related to social and emnomic forces. Household formations are determined by both population and socioeconomic factors. Increased affluence and higher educational attainment also affect societal attitudes and customs.

Several demographic characteristics of the population are related to social change and economic forces. One important characteristic is the number and type of households, which is related to marital status and living arrangement. The average household size declined from about 3.7 persons in 1940 to 2.6 in 1988. The number of households headed by individuals has risen sharply in recent years. In 1988, individuals headed 24 percent of all households, an increase from 17 percent in 1970. Other nonfamily households comprised 4 percent of all households (an increase from 2 percent in 1970), married-couple families about 57 percent (from 71 percent), and other one-parent families 15 percent (from 11 percent). The number of elderly persons living alone has increased sharply.

The level of education attainment has risen to an historically high level, and it is expected to continue to increase. In addition, labor force participation is at an all-time high because of the increased participation of women. The general level of affluence has risen with the rise in average income (about 2 percent annually, after accounting for inflation). Even among traditional husband–and–wife households, most are two-income families. Moreover, less than half these families have children under 18 living at home (U.S. Bureau of the Census 1989).

Economic Considerations

The general aging of the population and the decline in population growth will mean a general slowing in overall economic growth as the supply of labor decreases. The aging of the Baby Boom generation will impact cyclically on the demands for many age-related goods and services. In addition, the emphasis of advertizing on the primary age groups of the Baby Boom generation will tend to magnify the impact of this group. For example, the main cohorts of this generation are now from 25 to 40 years old. Thus, advertizing emphasizes family, child care, career opportunities, and housing.

In the future, the concerns of middle-aged persons, such as saving and investment, will be more important; after

2010, the concerns of the retired population will predominate. Commodity demands may level off with a lack of demand for new housing, and economic growth will slow down because of the declining labor supply. The demand for housing that has occurred in the last 20 years has been manifested in the repair and remodeling of existing structures because supply of new housing has been restricted by land-use controls and the high costs of new housing (Marcin 1976).

The net addition of new households will eventually slow down as population growth declines. However, the demand for second homes and vacation homes may increase because such homes are most prevalent among persons aged 40 to 65. Thus, as Baby Boomers reach middle age, the second-home demand should increase. The demand for vacation and second homes in forest areas will probably increase, thus creating the potential for more residential interface with forest management issues such as fire protection and timber cutting.

Recreational Use of Forests

Recreational use of forestlands will be particularly influenced by the aging of society. Other important variables that determine the recreational use of forests are educational attainment and general affluence, which are related to the age of the user. Trends in recreational activities are illustrated by the 1982 National Recreation Survey (NRS). These surveys, which are conducted by the Census Bureau, asked the same questions about recreational participation that were asked in 1965. Thus, we can compare participation for the two periods (Robinson 1987). The overall results indicate that the older, better-educated age groups have increased recreational activities, although participation in traditional activities like picnicking, pleasure driving, and sightseeing has declined dramatically. This indicates a shift from less active to more active forms of recreation. College-educated people have increased their participation in activities like tennis, canoeing, sailing, waterskiing, camping, and hiking. In general, except for bicycling, skiing, and camping, participation in other recreational activities have declined for noncollege-graduates (Robinson 1987). By contrast, young people have decreased their participation in recreational activities.

Future recreational needs for and uses of our forests will be greatly influenced by the aging of our population and the trend toward a more educated population. This suggests that future recreation may be oriented toward environmentally appreciative activities. Although members of the Baby Boom generation have significantly increased their participation in outdoor recreational activities, participation in such activities still tends to decline as the people age. For persons in the 25 to 44 and 45 to 64 age groups, participation in such activities as camping and bicycling declines by 50 percent. Participation in strenuous activities, like skiing, horseback riding, and ice skating, declines even more. Only less strenuous, appreciative activities like walking for pleasure, sightseeing, and bird watching are not strongly age-related.

Implications For Forest Management

The Baby Boom generation has grown up with higher educational attainment and greater environmental awareness than that of their parents. This should support increased interest in forest management. In 1982, the median age of small forest landowners was estimated at 56 years (Birch and others 1982). This age may decrease somewhat as the Baby Boom generation reaches middle age and seeks to buy forestland, either for investment or recreation. Smaller families and more diverse households without children mean that people will have more freedom to live in rural and remote areas.

As the Baby Boomers buy or inherit more forestland, knowledge about their attitudes will be increasingly important for determining forestland management practices. In 1983, Cordell and Stevens reported most landowners were middle-aged or older; less than 18 percent were under 40 years old. Landowners also had a high degree of educational attainment—53 percent had attended college. Today, Baby Boomers are likely to become the major owners of private, nonindustrial forestlands. If they acquire land at a relatively young age, then perhaps they may be more interested in timber management.

The attitudes of the Baby Boom generation toward forests, combined with a demonstrated interest in local involvement in forestland management decisions, may heighten interest in certain types of forest development. For example, the current emphasis on family activities may encourage interest in family camping and resorts on public lands. Local citizens and governments may lobby for these types of developments. Needs for housing and other economic development will support the need for timber harvesting and other commodities.

Concern for the environment and the aesthetic value of forestland may increase. The continued migration to the West and the South and to smaller cities and rural areas will bring more people into closer contact with forests. This will lead to greater concern about timber management practices and issues related to the interface between forests and residences. Because the Baby Boom generation was educated during a period of environmental awareness, they may be against many timber management practices such as clear-cutting, road-building, or aerial spraying of herbicides. They may also favor recreational or wilderness use of forestland over timber cutting. As timber demand remains high, conflicts over the use of forestlands will continue or increase (Hendee 1983).

WORLD DEMOGRAPHIC TRENDS

Noteworthy world population trends are the continued population growth in the developing countries, especially in Africa and Latin America, and the declining population growth in the developed countries. Even though fertility rates are declining in the developing countries, population growth will continue because of the momentum of their relatively youthful populations. By 2050, world population is

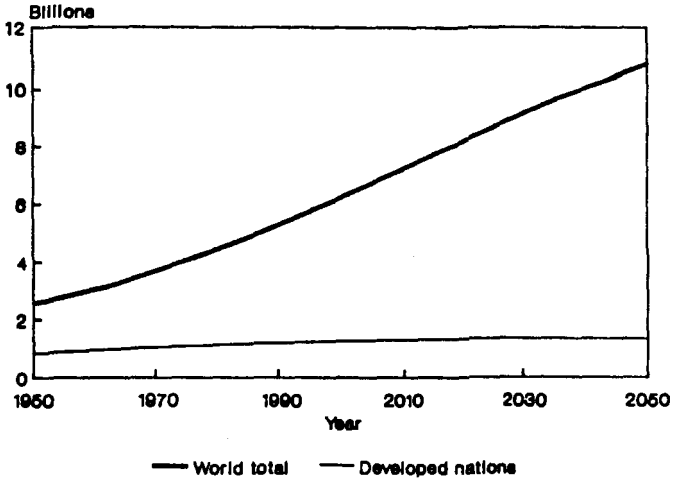

Figure 5.- World population 1950 - 1985, with projections to 2050.

projected to double from about 5 million to 10 million, even assuming eventual declines in fertility to replacement rates in developing countries (Fig. 5). The world population is generally aging as advances in medical technology improve life expectancy.

Developed Countries

Developed countries have high levels of economic activity and enjoy good health, educational, and social services as well as a great variety of economic opportunities for employment or business. Developed countries include United States, Canada, Europe, U.S.S.R., Japan, Australia, and New Zealand. Fertility rates have declined in these countries, and if present trends continue, population growth will cease. According to recent United Nations projections, the combined population of the developed countries is projected to rise from about 1.2 billion in 1990 to 1.35 billion in 2025 (United Nations 1989). The annual growth rate for these countries has declined from about 1.3 percent annually in the 1950s to a current level of 0.5 percent, and it is projected to stop growing by 2030. Other recent consolidated projections based on Census Bureau projections prepared by the Urban and Rose (1988) show the North American population topping out at 331 million in 2035, Western Europe at 365 million in 2005, Eastern Europe at 151 million in 2025, and Japan at 131 million in 2010.

Developing Countries

Recent United Nations projections indicate that the population of developing countries may increase from about 4 billion in 1990 to 7 billion in 2025 (United Nations 1989). This population could grow to 9 billion by 2050, even with a decline in fertility. A population of this size will surely put tremendous pressure on the environment. Because the transition to lower fertility is related to rising income, the challenge is to develop programs of sustainable growth that preserve the environment and conserve resources. Sustainable economic growth in these areas could provide excellent market opportunities for forest industries. The need for improved housing in most developing countries could be meet with wood products if there is effective buying power.

Let us look at some countries (China, Mexico, and Brazil) to see the ramifications of these population trends. China's population has already undergone a radical decline in fertility; yet, the population is still projected to grow from 1.1 billion in 1990 to 1.6 billion in 2050. Mexico's population will grow from 85 million in 1990 to 169 million in 2050—an increase of 74 million. Brazil's population is projected to increase from 158 to 368 million, or more than the entire projected population of North America. If these projections are anywhere near correct, then major adjustments will need to be made in economic policies in regard to the environment.

A particular concern to the United States should be the continued rapid population growth of Mexico and other Latin American countries. As the Mexican population increases from about 80 to 120 million, its labor force is expected to grow nearly as fast as that of the United States in the next 20 years. Political stability and sustainable economic growth are needed to alleviate a serious problem of illegal immigration into the United States and to help provide the economic where–with–all to address environmental problems.

Aging of World Population

The most pervasive trend in world population today is the aging of populations in both developed and developing countries. The United Nations estimates that the median age of the world population has increased from 21.6 years in 1970 to 23.4 years in 1985 and will continue to increase to 31.1 years in 2025 (United Nations 1989). The median age in the developed countries is projected to increase from 32.5 years in 1985 to 40.7 years by 2025. In the developing countries, the medium age will rise from 21.0 years in 1985 to 29.7 years in 2025. The increased number of older persons is associated with the relatively high birth rates of the past combined with the worldwide improvement in health services, education, and economic development. The world's elderly population (aged 65 and older) is currently growing at a rate of 2.4 percent per year. This growth is projected to accelerate in the next century as the large number of people born after World War II age (Torrey and others 1987). Currently, there are about 300 million elderly persons worldwide, and at the turn of the century, there will be 410 million. By 2025, the elderly population could consist of over 800 million and will be rapidly approaching one billion.

The consequences of this rapid aging of the world population are not fully understood because of the lack of an historical precedent. The growth of older populations and the increased number of elderly combined with smaller and more fragmented families will provide major challenges for public policy. The growing burden of public expenditures

for health care and retirement benefits will lead to intense political and public policy debates. The need of the elderly for social services is surely going to be a consideration in the future development of the world economy.

CONCLUDING REMARKS

Demographic forces are a major factor underlying long-term trends in forest resource requirements and forest use. Because demographic influences are slow, it is easy to ignore them. Moreover, the long-term impact of demographic change is often obscured by short-term issues. Basic demographic trends in the United States are the declining population growth rate and the general aging of the population. The passage of the Baby Boom generation from middle age to retirement age is particularly significant. The general rise in educational attainment and affluence is also important. Moreover, the racial and ethnic diversity of the population will increase.

Trends in spatial dispersal of population are likely to further expand the residential population in forestlands with resulting conflicts with timber management activities, fire protection measures, and general environmental concerns. Stabilization of the size of the population may moderate future commodity demands. The aging of the population will also change the type of recreational use of forests to less strenuous activities, such as walking for pleasure and bird watching. Finally, because an older, better-educated, more fluent society will likely be more concerned about environmental and ecological issues, controversies over commodity uses of the forest may increase.

World population trends include continued growth in the developing countries, despite reductions in fertility rates, and the general aging of the population. The world population will probably double from the present 5.2 billion people to over 10 billion some time in the next century. Paradoxically, nearly all this growth will take place in the countries that can least afford it. The developed countries are now approaching or are already below replacement-rate fertility levels. Population in these countries is about 1.2 billion people and is projected to peak at about 1.4 billion in 2030. Resource commodity demands are likely to moderate in the mature markets of the developed countries. Therefore, future increases in markets for forest products will become increasingly dependent upon sustainable development in the developing regions. Markets in the developing countries will depend upon the ability of these countries to acquire effective buying power through international trade and internal growth. Technological developments that utilize energy and resources more efficiently are perhaps the most important factor for sustainable growth. Furthermore, the conservation of forests in the developing countries will be increasingly dependent upon the development of social and economic systems that support sustainable development and technological advancement. These demographic, social, economic, and technological issues must be addressed simultaneously to bring about sustainable development that will stabilize the population and provide for the burgeoning numbers of elderly in the next century. The alternative is an unimaginable disaster that will prove Malthus was right—his timing was just a little off.

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