# The Environmental Impact of Immigration into the United States

**by Philip Cafaro, Ph.D.**

ABSTRACT

Immigration into the United States has a large environmental impact for two interconnected reasons. First, immigration has a large impact on total U.S. population numbers. Second, overall population size is a key factor in determining a wide variety of environmental impacts. This report documents the importance of immigration-driven population growth in increasing environmental impacts on the lands, air and water of the United States—and the potential to decrease these environmental impacts through federal policies and actions that decrease immigration into the U.S. It focuses primarily on sprawl, loss of farmland, habitat and biodiversity loss, greenhouse gas emissions, and water demand and withdrawals from natural systems. In every case, immigration-driven population growth is shown to be an important and quantifiable factor in increasing total environmental impacts.

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## Introduction

Immigration into the United States has a large environmental impact for two interconnected reasons. First, immigration has a large impact on total U.S. population numbers. Second, overall population size is a key factor in determining a wide variety of environmental impacts. The following report documents some of the most important of these environmental impacts on the lands, air and waters of the U.S.

The National Environmental Protection Act (NEPA), the foundational environmental law of the U.S., established a national policy to use all practicable means and measures "to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans." NEPA highlighted the importance of population growth in its originating legislation of 1969, stating at the outset that Congress recognizes "the profound influences of population growth" on the natural environment. Among NEPA's primary goals is to achieve a "balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities" (NEPA Sec. 101a and 101b).

A long line of environmental advocates and scientists have also emphasized the important role population growth plays in increasing environmental problems in the U.S. President Clinton's Council on Sustainable Development put it bluntly twenty years ago, in their report *Toward a Sustainable America*: "The sum of all human activity, and thus the sum of all environmental, economic and social impacts from human activity, is captured by considering population together with consumption" (PCSD 1996). One of their ten proposed national sustainable development goals was "move toward stabilization of [the] U.S. population"(PCSD 1999). Senator Gaylord Nelson, the founder of Earth Day, asked in a speech in Madison, Wisconsin in March, 2000: "With twice the population, will there be any wilderness left? Any quiet place? Any habitat for song birds? Waterfalls? Other wild creatures? Not much" (Kolankiewicz 2011).

In a general sense, it should be obvious that the U.S. population must stabilize—must cease to grow—sooner or later, if Americans hope to create an ecologically sustainable society. This follows from the basic facts that all human beings make physical demands on their environment and that per capita environmental impacts cannot be reduced to zero. This report, however, focuses not on this general point but on the specific impacts that particular policy-driven increases in immigration may lead to in the foreseeable future. As we will see, these impacts are potentially large and occur across the full spectrum of environmental issues facing the U.S.

**Immigration's Impact on Past U.S. Population Growth**

The first official U.S. census, in 1790, returned a national population of a little under four million (USCB 2013a). The most recently completed census, in 2010, totaled America's population at 309 million (USCB 2013b). This represents an increase of 7,725%. Up-to-date estimates of the current population of the United States are available at the population counter on the homepage of the Census Bureau website. When accessed on September 28, 2016 at 12:59 p.m. Eastern

Standard Time, the U.S. population stood at 324, 588,626. That makes the United States the third most populous nation in the world, behind China and India.

Figure 1 graphs U.S. population growth from 1790 to 2010. The largest decadal increases in absolute terms were also the most recent: from 1990 to 2000 the U.S. population grew by 33 million people, while from 2000 to 2010 population grew by 28 million.

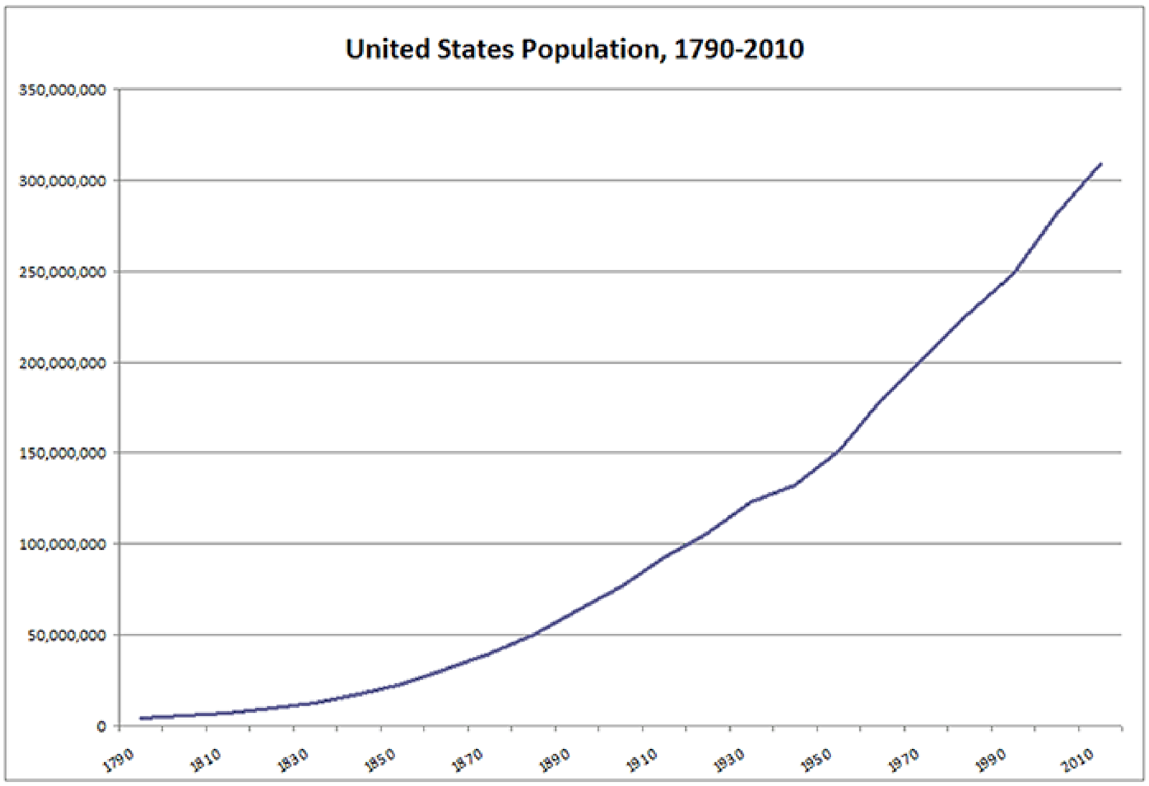


**Figure 1. Historic U.S. population growth, 1790-2010.**
Source: Census Bureau data.

In contrast to the steady rise in total U.S. population size, immigration numbers have fluctuated sharply throughout American history. The chart in Figure 2, also based on Census Bureau figures, shows decadal immigration numbers since 1820 (USDHS 2011).

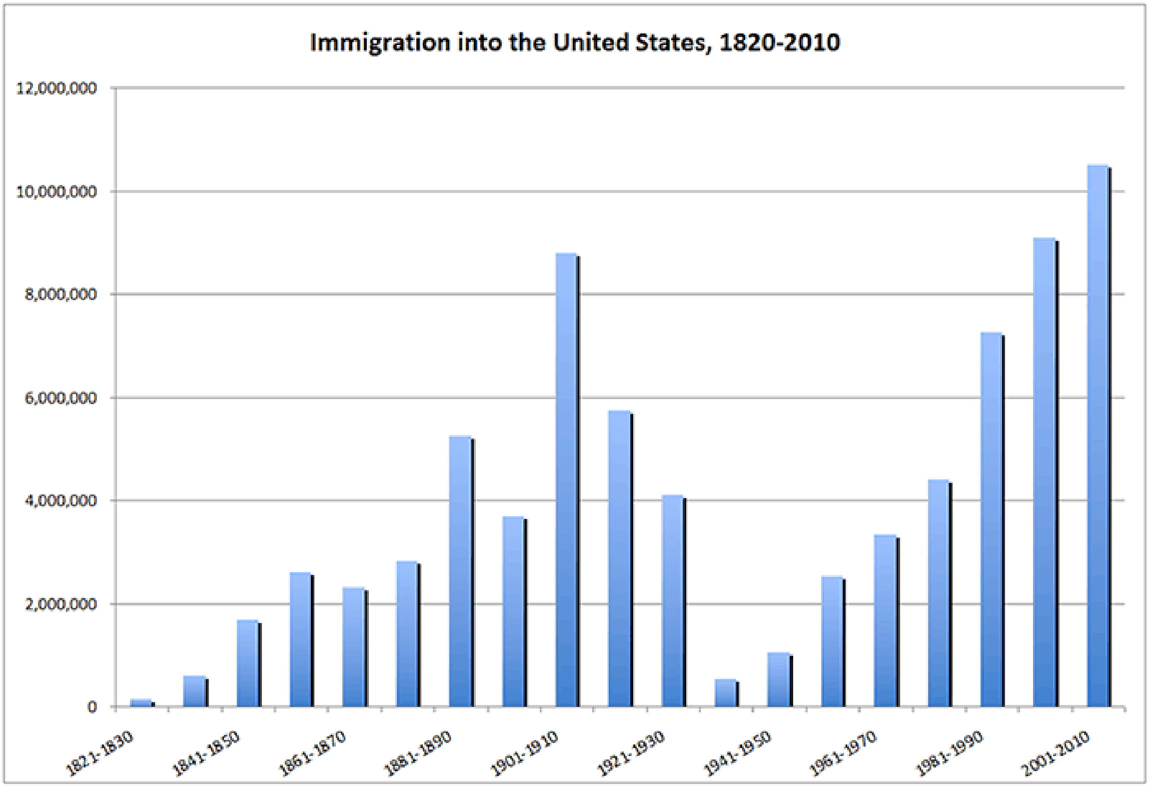


**Figure 2. Immigration to the United States by decade, 1820 to 2010.**
Source: Census Bureau data.

As can be seen, U.S. immigration levels have varied greatly over the years, primarily due to changes in federal immigration policies. For example, between 1900 and 1910, net immigration (total immigration into the U.S. minus emigration from the U.S.) averaged about 900,000 annually. Between 1950 and 1960, net annual immigration was much lower, at around 250,000. And between 2000 and 2010, expansive immigration policies and lax enforcement of immigration laws pushed immigration numbers to their highest levels ever: net legal migration averaged more than one million annually, while net illegal migration fluctuated between zero and half a million, depending on the state of the economy.

Comparing the previous figures showing population growth and immigration numbers might cause some confusion. How is it that the U.S. population has climbed steadily, while immigration has varied so greatly over the past hundred years? The answer is that population growth is a function of both immigration rates and birth rates (among both native-born citizens and immigrants). More precisely, demographers see four primary factors determining the overall growth rate for any population: birth rates, death rates, immigration into a population, and emigration out of it. All four factors help determine whether a population grows or declines, and by how much (Yaukey et al. 2007, Poston and Bouvier 2010).

During the first "Great Wave" of immigration from 1880 to the mid-1920s, America's population grew rapidly owing to a combination of high birthrates and high levels of immigration. The U.S. population increased from 50 million in 1880 to 116 million in 1925. During the immigration slowdown that followed, the U.S. population continued to grow substantially—from 116 million people in 1925 to 194 million people in 1965—but now primarily owing to high rates of natural increase. During the 1950s for example, American women had an average of 3.5 children each: far above the 2.1 total fertility rate necessary to maintain a stable population for a nation with modern health care and sanitation. So the United States' population grew—but by tens of millions less than would have been the case if pre-1925 immigration levels had continued.

By the 1970s, American families were raising fewer children—in 1976 the total fertility rate stood at a lowest-ever 1.7 and it has remained below replacement level since then—and the United States was well positioned to transition from a growing to a stable population. One study found that without post-1970 immigration the U.S. population would have leveled off below 250 million around 2030 (Lytwak 1999). At steady pre-1965 immigration levels, America's population would have taken longer to stabilize and would have stabilized at a higher number, but broadly speaking the trajectory would have been the same. If we had taken such a stabilization path the United States would not have been alone; most countries in the developed world made this "demographic transition" in the decades after World War II (USCB 2012).

However, the United States did not take this path. Instead, as shown in Figure 3, we increased immigration just as native birthrates fell below replacement level, bringing in tens of millions of new residents.

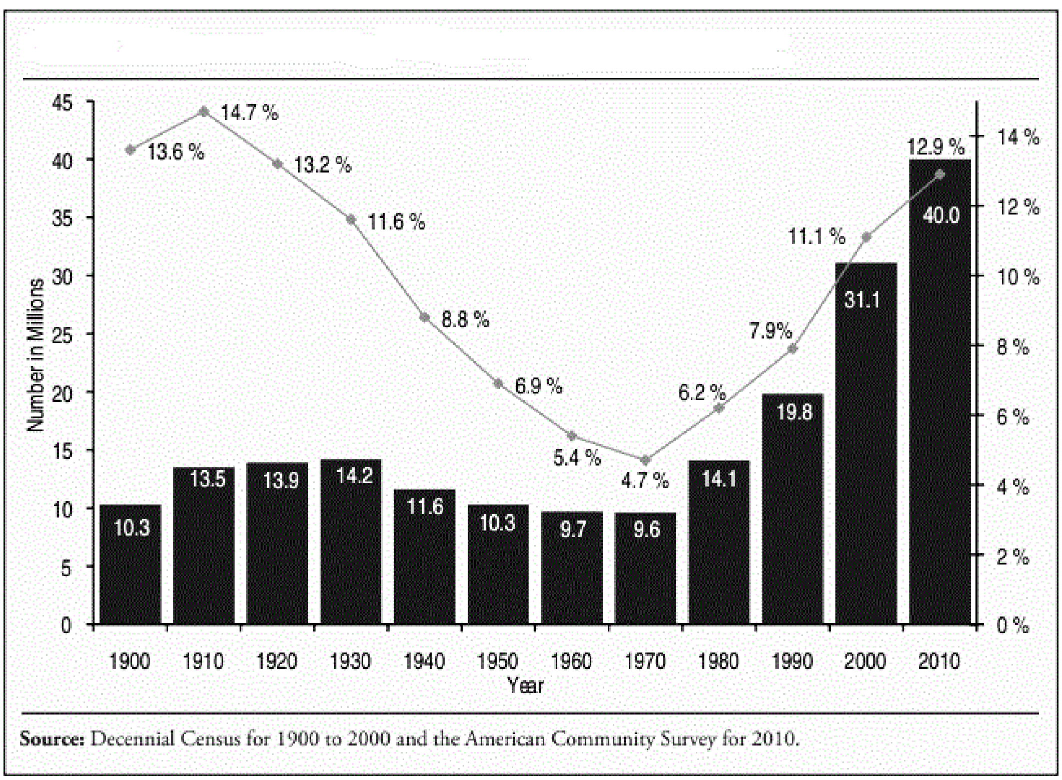


**Figure 3. Number of immigrants & their percentage of U.S. population, 1970-2010** Source: Camarota 2011.

Many of these new immigrants were women and men in their childbearing and child-raising years, coming from countries where large families remained the norm. This helped to raise U.S. fertility rates back near replacement level. The number of births to immigrant mothers has increased rapidly in recent decades, from 228,000 in 1970 to 916,000 in 2002, according to data from the National Center for Health Statistics (Camarota 2005). One demographer concludes, "At the very time that the great majority of native-born Americans were voluntarily choosing to limit their family sizes to levels which could have led to the end of U.S. population growth, Congress was making changes in immigration policy which have ensured ever more growth. The result of these changes was the highest sustained immigration and greatest population growth in U.S. history" (Lytwak 1999).

As a result, since 1965 the U.S. population has climbed from 194 million to 318 million. That's an increase of 124 million people—equal to the total population of the United States in 1928. Just as important, our population continues to grow rapidly, by approximately 3 million people annually. Indeed, the U.S. annual growth rate (0.96%) is much closer to that of developing countries such as Morocco, Vietnam, or Indonesia (all at 1.07%) than to other developed nations such as Denmark (0.25%), Taiwan (0.19%), or Belgium (0.07%) (CIA 2011). The main difference is that population growth in the developing world is driven by high fertility rates, while population growth in the United States and the rest of the developed world is mostly a function of mass immigration.

**Immigration's Impact on Future U.S. Population Growth**

Such is our demographic past. What of immigration's impact on America's demographic future?

In 2008, the Census Bureau projected U.S. population numbers out to 2050 based on current trends regarding fertility rates, average lifespans, and immigration numbers. They came up with a medium (or "most likely") projection of 439 million—a 158 million-person (56%) increase over 2000 (USCB 2008). The following year the Bureau delivered a further series of projections, which held fertility rates and longevity constant and varied immigration levels (Ortman and Guarneri 2009). These came out as shown in table 1 below.

Table 1 U.S. population projections to 2050 under different immigration scenarios

| Average annual net immigration | Population in 2050 |
|---|---|
| Zero | 323 million |
| 1 million | 399 million |
| 1.5 million | 423 million |
| 2 million | 458 million |

Obviously, according to the Census Bureau, immigration makes an immense difference to future U.S. population numbers. The difference between zero net immigration and the Bureau's most likely scenario is 116 million people—equal to the total U.S. population in 1925. Other studies have confirmed the impact immigration is likely to have on America's future population; one study published by the Pew Research Center estimated that 82% of population growth between 2000 and 2050 will be due to post-2000 immigrants and their descendants (Passel and Cohn 2008). More recently, the Center has stated that immigration will drive almost all future population growth in the U.S. (Pew Research Center 2015).

Immigration's impact on total population becomes even clearer when we take longer views. This is because population growth tends to cumulate and because, in the case of the United States, mass immigration prevents the nation from ever taking advantage of its replacement-level fertility rate and stabilizing its population. Consider several population projections out to 2100.

Researchers at Decision Demographics, Inc., in consultation with the Center for Immigration Studies, recreated the U.S. Census Bureau's 2008 population projections, using data provided by the Census Bureau (Tordella et al. 2012). They created a population projection tool that replicated the model created by the Census Bureau for its 2008 and 2009 projections, while allowing users to vary fertility and immigration levels and to run projections out to the year 2100 (Camarota 2012). Holding fertility rates steady at the levels predicted by the Census Bureau and varying immigration in half million person annual increments generates the projections graphed in Figure 4 below (Cafaro 2015). The results are striking.

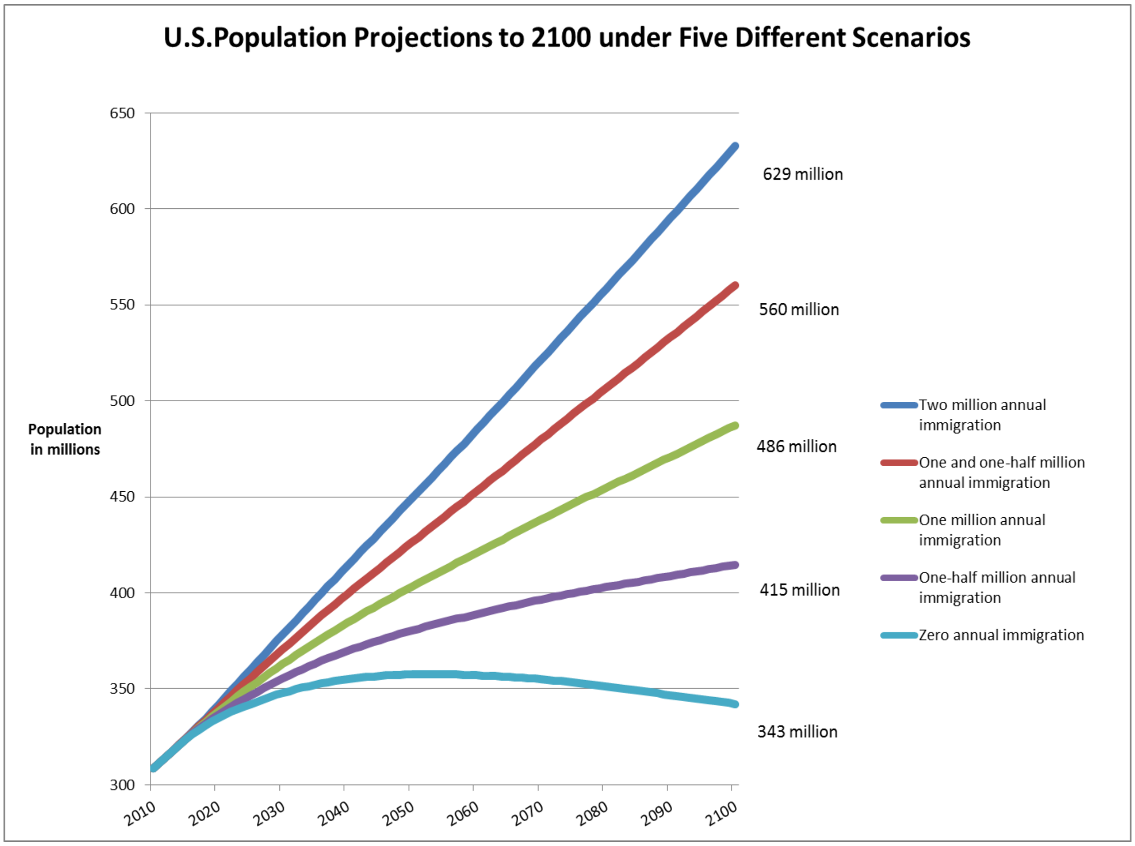


**Figure 4. U.S. Population Projections to 2100 Under Five Different Immigration Scenarios.** Source: Cafaro 2015.

At zero annual net immigration (immigration set equal to emigration), America's population continues to increase for about forty years and then slowly decreases to 343 million total, for an overall increase of 33 million people over 2010. Under this scenario the U.S. essentially stabilizes its population near where it is today.

If the federal government broadly followed the 1997 recommendations of the Jordan Commission on Immigration Reform, cutting net immigration to 500,000 annually, the U.S. population would grow significantly, to 415 million by 2100. That would represent an increase of 105 million people. Population stabilization might be in sight by then, albeit at a much higher level—provided future leaders chose to cut immigration even further.

In a third scenario, we can imagine the federal government holding legal immigration steady near current levels, at one million annually, while succeeding presidential administrations reined in illegal immigration. In that case America's population would instead increase by 176 million to 486 million total. Just as important, in 2100 the U.S. would be still be confronting an upward trajectory with no population stabilization in sight.

In a fourth "no action" scenario, total immigration could continue near its recent heights of 1.5 million annually, through some combination of high legal immigration and continued tolerance for illegal immigration (perhaps regularized through occasional amnesties, as in recent decades). In this scenario America's population would reach 560 million by 2100, increasing by 250 million people, and its growth curve would angle even more steeply upward.

Finally, immigration could be increased to 2 million annually, the highest rate in history, but still less than the increase proposed in an immigration reform bill that passed the U.S. Senate in 2013. Under this scenario the U.S. population would nearly double to 629 million people. As in the previous two scenarios, the population in 2100 would be set to increase by tens of millions more for many years to come.

To reiterate and at the risk of stating the obvious: small changes in the annual immigration rate could make a huge difference to U.S. population numbers in the coming years. A good rule of thumb is that every half million immigrants admitted annually increases America's population at the end of this century by 72 million people. Another is that under all mass immigration scenarios with more than a few hundred thousand net immigrants per year, the U.S. population cannot stabilize and instead continues to grow.

Both of these points are of grave environmental concern. Given Americans' failure to create a sustainable society of 325 million people, creating one with hundreds of millions more inhabitants is even more unlikely (Pimentel et al., 2010). And even if Americans manage to stumble to the year 2100 with 500 million or 600 million inhabitants, the unpromising trajectory with continued mass immigration would be for further immense population growth in the following century.

Note, however, that such growth is not inevitable. The American people have voluntarily chosen to stabilize their population, through their choices to have fewer children than their parents and grandparents. They can build on this by choosing to reduce immigration rates as well and stabilize their population. This can be shown clearly by using Decision Demographics' projection tool to graph population projections under three alternative immigration scenarios: 250,000 annually, 1.25 million annually, and 2.25 million annually. These three scenarios, graphed in Figure 5 below, correspond roughly to the U.S. immigration rate during the four decades around the middle of the previous century; to the current annual U.S. immigration rate; and to the annual immigration levels likely under the immigration reform bill passed by the U.S. Senate in 2013, respectively.

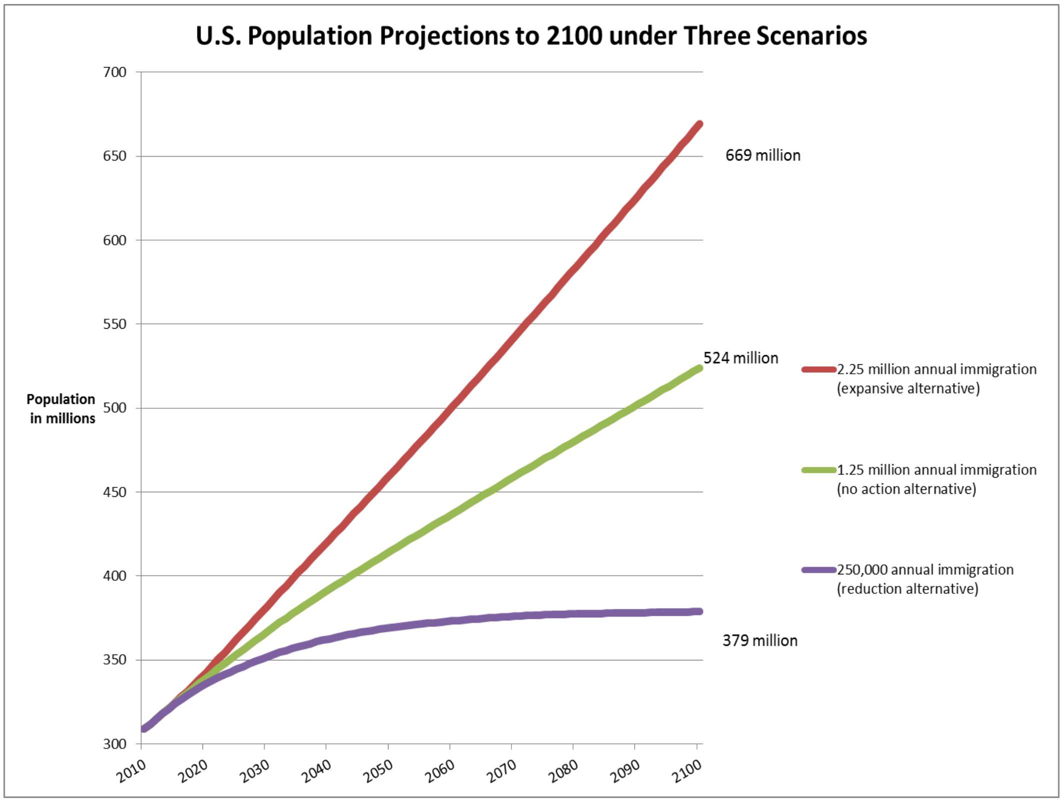


**Figure 5. U.S. Population Projections to 2100**
**Under Three Different Immigration Scenarios.** Source: Cafaro 2015.

These projections show that the United States has a clear path to population stabilization. They also show that the nation's current path is likely to lead to massive population growth: over 200 million more Americans by 2100 at current immigration levels. Finally, they show that recent "comprehensive immigration reform" proposals have the potential to drive U.S. population growth even higher, potentially more than doubling the U.S. population by the end of this century. Again, each half-million more annual immigrants means 72 million more Americans in 2100.

It remains true that major changes to any of four key demographic factors could significantly change the trajectory of U.S. population growth in the twenty-first century. If death rates increase that will slow growth; conversely, medical advances that extend life spans could cause our population to grow even more quickly. A mass exodus of American citizens (increased emigration) or a widespread trend to refrain from childbearing (decreased fertility rates) could slow growth and in extreme scenarios even lead to population decreases, despite continued mass immigration.

Realistically however, in the short- to mid-term these other possibilities for curbing growth seem unlikely and/or unpalatable. They also seem relatively impervious to policy interventions: we are not likely to offer incentives for U.S. citizens to emigrate, or to have fewer children, or to die more quickly. In contrast, immigration levels can be changed quickly and substantially via both Congressional legislation and executive action. This means that for the foreseeable future immigration policy will remain the primary means to regulate U.S. population growth. In the United States, federal immigration policies essentially constitute a de facto national population policy.

## Examples from Environmental Impact Statements Noting Population Growth's Environmental Impacts

Common sense suggests that population growth is an underlying cause of many new environmentally harmful projects around the U.S. This may be confirmed by a survey of the "purpose and needs" sections of several recent Environmental Impact Statements (EIS's).

Transportation is one major area in which anticipated or planned population growth is used to justify new developments that have significant environmental impacts. For example, the *Los Angeles Mid-City/Exposition LRT Project, Final EIS/EIR*, a light rail mass transit project, has a 17-page "needs and purposes" section that uses the term "growth" several times to demonstrate the need for the proposed action. It states: "This level of service is not expected to improve and may significantly worsen as a result of population growth and increased trip making in coming years" (Metro 2005). This EIS also contains specific mention of how the populations of certain areas adjacent to the proposed line are projected to grow in the future.

Similarly, the EIS for the Lake Oswego to Portland transit project states: "The need for the project results from historic and projected increases in the traffic congestion in the Lake Oswego to Portland Corridor due to increases in regional and corridor population and employment" (Metro 2010).

Another category of transportation-related development is reflected by the *Final Environmental Impact Statement, Tier 1: FAA Site Approval and Land Acquisition by the State of Illinois, Proposed South Suburban Airport*. This EIS alleges that land acquisition is needed now, because of a consistent increase in aviation demand in recent years, and growth of population in the area. According to the EIS, the city of Chicago's forecasts "predict 1.4 million aircraft operations by the year 2015 and an annual growth rate of 0.9 percent from 2000 to 2015" (FAA 2002). This continuing growth will make the purchase of land more expensive and cause much disruption of displaced businesses, unless the land is purchased soon before it can be developed for non-aviation purposes. Supporting evidence is offered that the local Will County population increased 40% from 1990 to 2000.

Many of transportation's environmental impacts come from tailpipe or engine emissions due to use of vehicles, and to highway, road and airport construction, which continue to consume land and generate pollution across the country. Such development alters or eliminates wildlife habitat, farmland and open space, by covering it with blacktop and concrete, and degrades further large areas through water runoff of pollutants associated with vehicle exhaust, tire rubber residue, leaked crankcase oil and other toxic outflows. Such developments are represented by the *U.S. 36 Corridor Final Environmental Impact Statement, Boulder Colorado*. This EIS states: "in 2005, the population was estimated to be 506,900 and is expected to grow to 649,100 in 2035—a 28 percent increase." This growth provides the main "purpose and need" for the project's "improvements," that include road widening and other associated construction (CDOT 2009). Countless similar projects, not all of which are subject to federal EIS's, are in process or in the planning stages throughout the U.S.

Energy projects also are often justified based on population-growth-driven demand projections. Energy-related EIS's include the *Kangley-Echo Lake Transmission Line Project, Supplemental Draft Environmental Impact Statement*. The "Purposes and Need for Action" section includes the forthright statement: "As population grows . . . the need for electrical energy increases" (BPA 2003). There exists an extensive literature on the negative ecological impacts of transmission line clear cuts, access roads and other linear developments that fragment and degrade wild lands and wildlife habitat.

The massive development rush associated with the natural gas fracking boom, that threatens to degrade water resources and many relatively undeveloped wildlife habitats around the nation, may be represented by the *Final EIS Atlantic Rim Natural Gas Field, Development Project, Carbon County, Wyoming*. The purpose and needs statement includes the phrase, "to meet the growing need for energy," and goes on to emphasize an increased need to use natural gas in power production in the U.S. (BLM 2006). Population growth is not explicitly mentioned, but the need for more electricity and more household heating for an average of 1.5 million new homes built a year nationwide in recent decades is largely a function of continued population growth.

The *Alton Coal Tract LBA Draft EIS*, chapter 1, section 1.3, "Purposes and Need," is more explicit about the underlying cause of the need for ever more energy in the United States. It states: "Given known technology and demographic trends overall, the United States demand for coal is expected to increase by approximately 0.4% per year through 2035" (BLM 2011). The Alton Coal EIS cites a publication of the Energy Information Administration of the U.S. Department of Energy, the *Annual Energy Outlook with projections to 2035* (EIA 2010). This document is even more forthcoming about the "demographic trends" that cause ever more energy to be needed in the U.S., stating: "Growth in U.S. energy use is linked to population growth through increases in demand for housing, commercial floorspace, transportation, manufacturing, and services." This report notes that energy consumption per person in the U.S. is currently decreasing due to efficiency improvements; however, in spite of these reductions in energy use per capita, the *Outlook* confirms the Alton need claim, stating: "Coal consumption increases by 0.4 percent per year in the Reference case" (EIA 2010).

Similarly, the section entitled, "Purpose, Need for, and Benefit of the Action" in Chapter 1 of a 2006 EIS prepared jointly by the U.S. Department of Agriculture's Rural Utilities Service and the Montana Department of Environmental Quality on a proposed coal-fired 500-megawatt (MW) power plant near Great Falls and the Missouri River in Montana, stated: "The demand for electricity for residential customers is expected to increase for two reasons: increasing population and increasing use of electricity per household" (RUS/MDEQ 2006).

More natural gas supply and demand predictably leads to a need for more pipeline capacity, so the *Final Environmental Impact Statement on Ruby Pipeline Project*, issued January 8, 2010 was examined. Section 1 of the EIS states: "According to Ruby, the need for the project arises from a growing demand for natural gas in Nevada and on the West Coast" (FERC 2010). As in other EIS need statements reviewed, evidence that energy demand will keep growing is based in part on Census Bureau population projections, which extrapolate from present demographic trends and immigration rates.

New water supply proposals also typically involve an appeal to current and future population growth. The *Draft* and *Final EIS's for the Jackson County Lake Project* on the Daniel Boone National Forest, in eastern Kentucky's Appalachian highlands, examined the effects of constructing a water supply dam and reservoir on publicly owned and managed forest lands (RUS 2000, RUS 2001). These effects included the permanent elimination of hundreds of acres of rich bottomland hardwood forest and wildlife habitat on a national forest, and possible impacts on endangered bat species, among others. Chapter 1 of the draft EIS addresses the purpose and need for the proposed action, under sections titled "Projected Demands" and "Population Projections," the former relying directly on the latter. The DEIS notes that: "To quantify water needs from now until the year 2050, two types of data are needed. The first type is water consumption rates per customer; the second is population projections" (RUS 2000).

Chapter 1 of the *Draft EIS for the Lower Bois d'Arc Creek Reservoir* identified the purpose and need for this proposed new 16,641-acre (26-square mile) water supply reservoir on a tributary of the Red River in northeast Texas: "State population projections show the . . . service area population increasing from 1.6 million to 3.3 million by 2060." The draft EIS specifies that although state-of-the-art water conservation, efficiency, reuse, and recycling measures can offset a large portion of the increase in municipal and residential water demand associated with more than doubling the service area population, they are insufficient to negate it entirely (USACE 2015).

An EIS for a large American dam project, a kind of development that has inflicted immense environmental damage on rivers and their associated fish and wildlife communities throughout the U.S., is the *Narrows Project Final Environmental Impact Statement*, Sanpete County, Utah. This EIS states the project is needed to "reduce the average annual shortages to irrigators in Sanpete County" and to supply "an additional supply of municipal water to offset current shortages and accommodate anticipated population growth in Sanpete County" (USBR 2012).

Housing and Schooling. New housing projects are an important cause of farm, forest and open space losses, and it makes intuitive sense that continual housing construction is necessitated by the need for ever more shelter for a U.S. population that has increased by almost 3 million a year in recent decades. EIS's regarding such developments are relatively rare, because they usually do not affect public lands and are undertaken by private businesses rather than governmental agencies. In NEPA parlance, they lack a "federal nexus": no federal agency is proposing them, permitting them, or funding them. For these projects (as for most private developments), society is denied a full public environmental accounting of direct, indirect and cumulative impacts of population-growth-driven development.

State laws and local regulations, proximity to public lands, and potential to affect the interests of indigenous peoples, however, may require some EIS's to be done for non-federal agency construction projects. One example is the *Draft EIS for the Maybrook Glen Subdivision*. Volume 1, section D, "Project Purpose, Need and Benefits," describes a need to "provide premium single-family detached housing" in the area. This suggests that additional housing units will be needed due to an increase in the local population, or the desire of local business to increase the area's population (Village of Maybrook 2012).

Another example comes from the new Kihei High School on Maui, Hawaii for which a Final EIS was released on September 10, 2012. In the *Kihei High School Environmental Impact Statement Preparation Notice*, the sub-paragraph on

“Population Growth” details that population growth from 1990-2000 in the county was 50.8%, reaching a total of 16,749. It further states that: “Population projections for the Kihei-Makena Community Plan region anticipate that the year 2020 resident population will be approximately 33,227, while the 2030 population for the region is 38,757” (State of Hawai’i 2009). Pretty clearly, population growth is the major cause for the need for this new high school, as it probably is for many schools, community centers, sports clubs and other new public and private facilities across the U.S. In the case of this school, its construction would entail the permanent conversion of 77 acres of open space adjacent to an existing residential community to a high school campus, i.e., built-up land (State of Hawai’i 2012).

Many other kinds of development also involve a population multiplier. The *Tappan Zee Hudson River Crossing Project (bridge replacement), Environmental Impact Statement* states, regarding areas near the bridge: “Between 2010 and 2047, the populations *of* Rockland and Westchester Counties are expected to increase by 50,000 and 134,000 residents respectively. . . . This growth in population and employment will increase daily volumes across the Tappan Zee Bridge for the next thirty years” (FHWA 2012). Projected population growth thus justifies (indeed, necessitates) the bridge’s quicker replacement and upgrading.

Public lands generally considered safe from degradation may still be subject to development pressure to accommodate ever more visitors. The *Final Environmental Impact Statement for the Middle Kyle Complex*, for a proposed visitor recreation complex in the Spring Mountains in Nevada, was prepared by the U.S. Forest Service. It states that the project is necessary because: “The rapid population growth of Clark County, Nevada, is exerting pressure on existing recreational facilities in the SMNRA . . . in 2008 [the population was] 1,986,146 . . . by 2035, the population of Clark County is expected to increase to 3.6 million" (USFS 2009).

In summary, this short review of the "purpose and needs" sections of a range of EIS's suggests that population growth plays an important role in generating a variety of important environmental impacts across the United States. The following sections of this report quantify the role of immigration-driven population growth regarding several key environmental problems.

**Immigration's Environmental Impacts: Urban Sprawl & Loss of Farmland**

During recent decades, sprawl, defined as new development on the fringes of existing urban and suburban areas, has been recognized as a leading environmental problem across the United States. Sprawl is an environmental problem for numerous reasons, including increasing overall energy and water consumption, increasing air and water pollution, and decreasing open space and wildlife habitat. Since habitat loss is a leading cause of species endangerment, it is no surprise that some of the nation's worst sprawl centers, such as southern Florida and the Los Angeles basin, also contain large numbers of endangered species.

From 1982 to 2010, 41.4 million acres (approximately 65,000 square miles) of previously undeveloped rural land was built on to accommodate America's growing cities and towns. That is an area approximately equivalent to the state of Florida. Of these 41 million acres lost–or "converted" as land managers and planners generally say–over 17 million acres were forestland, 11 million acres cropland, and 12 million acres pasture and rangeland.

As the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) stated it in a summary report reviewing the 1982-2007 quarter-century:

> The net change of rural land into developed land has averaged 1.6 million acres per year over the last 25 years, resulting in reduced agricultural land, rangeland, and forest land. Loss of prime farmland, which may consist of agriculture land or forest land, is of particular concern due to its potential effect on crop production and wildlife. (NRCS 2013a)

Figure 6 shows the increase in developed land from 1982 to 2010, as estimated by the NRCS. The total area of developed land grew from 71.9 million acres (112,356 square miles) in 1982 to 113.3 million acres (177,096 square miles) in 2010. All of this land was originally developed from either agricultural land or natural habitat. As the NRCS observes: "more than one-third of all land that has ever been developed in the lower 48 states was developed during the last quarter-century" (NRCS 2013a). The annual increase in developed land over this 28-year period varied from 760,000 acres to 2,159,000 acres, and averaged 1.5 million acres/year.

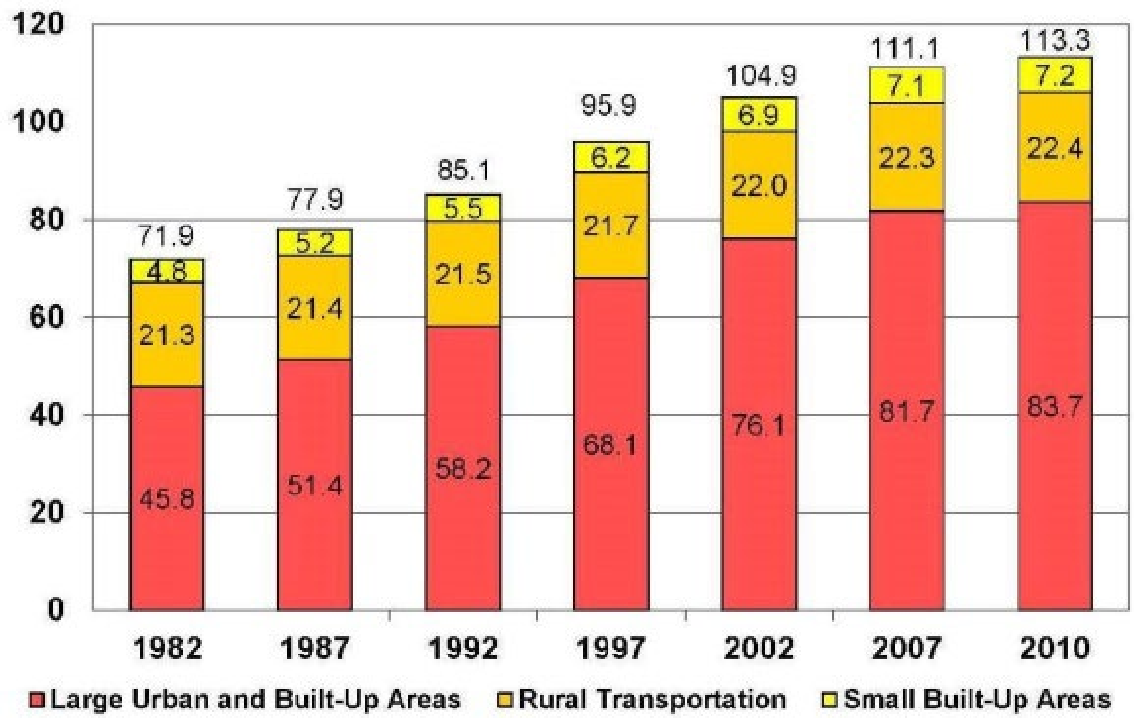


**Figure 6. Growth in Developed Land, 1982-2010 (millions of acres).**
Source: NRCS 2013b.

What causes sprawl? Transportation policies that favor building roads over mass transit appear to be important sprawl generators. So are zoning laws that encourage “leapfrog” developments far out into the country, and tax policies that allow builders to pass many of the costs of new development on to current taxpayers rather than new home buyers. Between 1970 and 1990, these and other factors caused Americans’ per capita land use in the hundred largest metropolitan areas to increase 22.6 percent. In these same areas during this same period, however, the amount of developed land increased 51.5 percent (Beck et al., 2003).

What accounts for this discrepancy? The answer is population growth, which is by far the single most important cause of sprawl. New houses, new shopping centers, and new roads are being built for new residents. As Figure 7 illustrates, in recent decades cities and states with the highest population growth rates have also sprawled the most. For example, states whose populations increased between 0% and 10% during a fifteen-year period saw a 26% increase in developed land, while states whose populations increased between 20% and 30% saw a 41% increase in developed land. Cities whose populations increased between 0% and 10% during a twenty-year period averaged a 38% increase in developed land, while cities whose populations increased between 30% and 50% averaged a 72% increase in developed land during that same time.

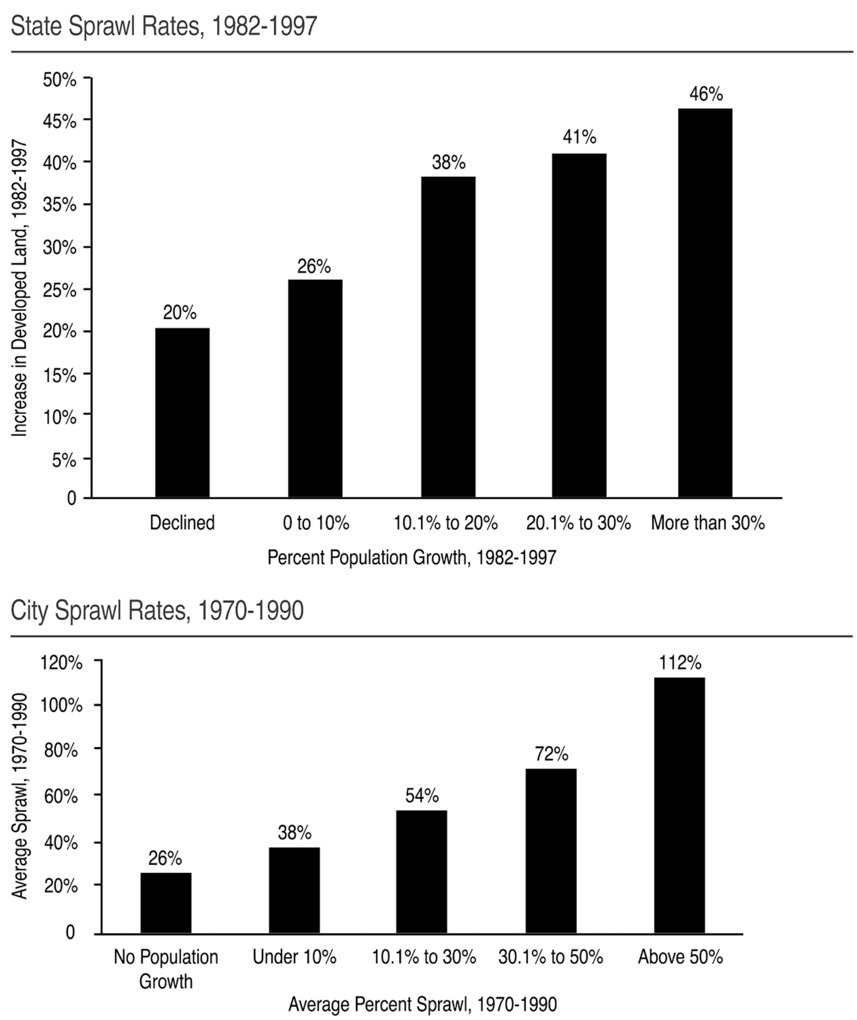


**Figure 7. U.S. state sprawl rates, 1982—1997, and U.S. city sprawl rates, 1970–1990.** Source: Kolankiewicz and Beck 2001.

The two most thorough studies on the causes of sprawl in the U.S. during the last two decades of the twentieth century analyzed several dozen possible factors. Grouping together all those factors that can increase per capita land use and comparing these with the single factor of more "capitas," it found that between 1982 and 1997, 52 percent of sprawl in the U.S. was attributable to population increase while 48 percent was attributable to misguided policies that increased land use per person (Kolankiewicz and Beck 2001. Beck et al. 2003). A follow-up study on the more recent 2000-2010 period found that population growth was now causing approximately 70-90% of suburban sprawl nationwide (Kolankiewicz et al. 2014).

Figure 8 shows the average amount of open space that was developed to accommodate each extra person added to the U.S. population from 1983 to 2010, according to the NRCS. The land developed for each additional U.S. resident ranged from a low of 0.3 acre to a high of 0.85 acre; the average was 0.53 acre for the entire period of the study. This suggests that every additional person added to the United States population entails the development of about half an acre of farmland or natural habitat.

| Period | Period Growth in Developed Land (thousand acres) | Annual Growth in Developed Land (thousand acres) | Additional Developed Acreage for Each Person Added to Population During Period Shown | |
|---|---|---|---|---|
| 1982-1987 | 6,025 | 1,205 | 1982-1987: 0.58 | 1982-1992: 0.58 |
| 1987-1992 | 7,205 | 1,441 | 1987-1992: 0.57 | |
| 1992-1997 | 10,796 | 2,159 | 1992-1997: 0.85 | 1992-2002: 0.65 |
| 1997-2002 | 9,007 | 1,801 | 1997-2002: 0.45 | |
| 2002-2007 | 6,121 | 1,224 | 2002-2007: 0.45 | 2002-2010: 0.39 |
| 2007-2010 | 2,281 | 760 | 2007-2010: 0.30 | |

**Figure 8. Increase in Developed Land and Developed Land Per Capita, 1982-2010** Source: Kolankiewicz 2015.

We can understand the potential impact of future immigration-driven population growth on sprawl in the U.S. by comparing predicted amounts of sprawl under the three demographic scenarios presented earlier in figure 5: immigration at 250,000 annually, 1.25 million annually, and 2.25 million annually. These three scenarios correlate with populations of 379 million, 524 million, and 669 million U.S. residents in 2100, respectively.

Continuing annual immigration at its current level of 1.25 million annually generates a U.S. population of 524 million in 2100. This is an increase of 215 million from the 2010 population of 309 million. Cumulatively, today, there are about 0.37 acres of developed land per American. Assuming, conservatively, that the same correlation holds throughout this century, the addition of 215 million new Americans would entail the development of 79 million additional acres of formerly rural land. That is an area larger than New Mexico, our fifth largest state.

About 90 percent of this sprawl would be due directly to population growth, while about 10 percent would be generated by increasing per capita land consumption. In 2010 there were 113 million acres of developed land in the United States. Increasing this by 79 million acres would push the total amount of developed land to 192 million acres, or 300,000 square miles, in 2100. That is substantially larger than our second largest state, Texas. Urbanized or developed land in the U.S. would increase from 7.6% of all non-federal lands in 2010 to 13.3% in 2100.

What would this sprawl mean in practice? Large swaths of America would lose their rural character. The average American would be more isolated from the wild nature and the rural countryside than ever before, and such areas would take longer to reach. Once accessed for sightseeing, hiking, camping, or picnicking, open spaces such as state or national parks and forests would be more crowded with fellow “urban refugees” seeking a green reprieve from artificial settings. Wild flora and fauna would decrease, and the number of threatened and endangered species would increase.

Figure 9 shows predicted development in the Southeast region to 2060 given current demographic trends. They give some sense of how this region, once dominated by rural countryside consisting of woodlands, fields and farms, will have been overtaken by sprawling development. However, the extent of sprawl will be much greater by 2100.

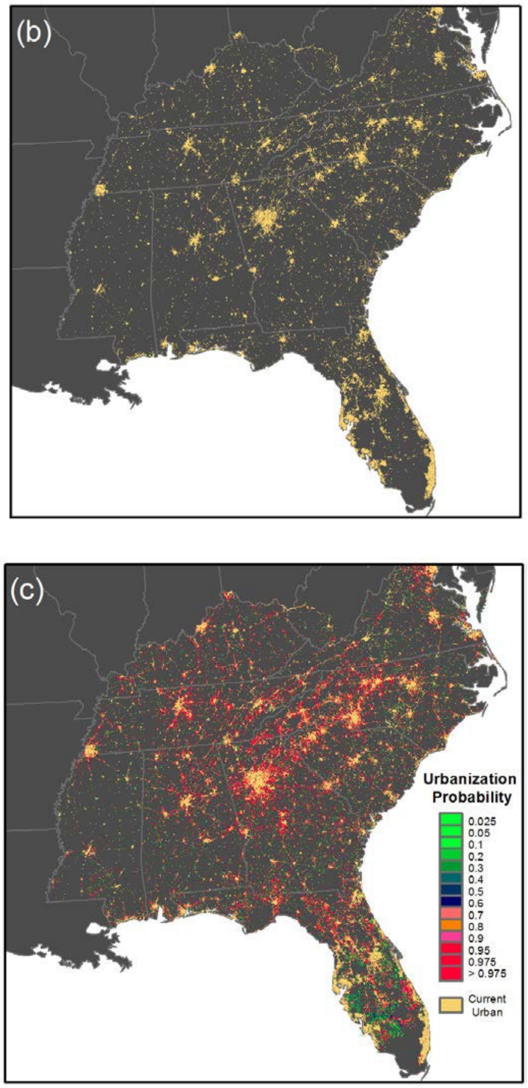


**Figure 9. Southeastern urban land cover in 2009 and projected Southeastern urban land cover in 2060.** Source: Terrando et al. 2014.

Under the more expansive immigration alternative, 2.25 million annual immigration into the United States would lead to a U.S. population of 669 million in 2100. This is an increase of 360 million from the 2010 population of 309 million. Under this alternative, the 2100 U.S. population of 669 million would exceed the previous immigration alternative's population projection of 524 million by 145 million. In other words, the population would be 28 percent larger and thus, all else being equal, under this alternative the total urbanized land area in the United States would be 28 percent greater than under the previous alternative.

Under the expansion alternative, 113 million acres of developed land in 2010 are projected to increase to 245 million acres, or 383,000 square miles, by 2100. This would be about equal in area to Texas and New Mexico combined; that is, our second and fifth largest states. Still larger swaths of rural America would be permanently converted to urbanized areas. In addition, extensive areas of the country that would still be officially designated "rural" under the classification systems of the NRCS and the U.S. Census Bureau would nonetheless be influenced by adjacent developed areas and would lose some of their rural feel. The delineated acreage of developed land *per se* actually underrates its pervasiveness on the American landscape, because built-up land affects environmental quality on adjacent rural lands and waters by means of water withdrawals, noise, views, odors, air and water pollution, transportation infrastructure, traffic levels, and crowding of parks and open space (Beck et al. 2003).

Examples abound of the widespread penetration of adverse urban influences into rural hinterlands. For example:

- Prevailing winds transport smog originating in Southern California eastward toward the sparsely populated Joshua Tree National Park in the Mojave Desert and beyond to the Grand Canyon National Park in northern Arizona. Smog from California's rapidly growing Central Valley often blights the beautiful blue-sky vistas in the Sierra Nevada mountain range just to the east. The largest trees in the world, the 2,500 year-old giant sequoias growing on the flanks of the Sierra Nevada in Sequoia-Kings Canyon National Park, are exposed to smog and elevated ozone concentrations. (Wheelwright 2014, Miller et al. 1994)

- Water quality in the East Coast's most important estuary, the Chesapeake Bay, is impaired by the sheer spread of pavement and other impervious surfaces within its 64,000-square-mile watershed. Already by 1990 some 11,480 square miles within the watershed had been developed, and analysis of satellite imagery and other ground-based data indicates that in the 1990s an additional acre was being developed every six to 10 minutes. Residential and related land development and other "non-point sources" degrade local streams and sends nutrients (primarily nitrogen and phosphorus compounds) and toxic pollutants into the bay, which threaten to overwhelm hard-won, costly reductions in these pollutants. (Blankenship 2000, EPA 2014)

• Urban growth demands water that must be diverted from farmers and natural ecosystems, especially in the arid West. Suburban neighborhoods with lawns and pools are particularly water intensive. Of California's 350 water basins, 40 are seriously overdrafted. Recent droughts and climate change predictions of a drier future for the state paint a dire picture. Rising urban demands for water along over-allocated rivers such as the Platte River in Nebraska, the Rio Grande in New Mexico, and the Colorado River in Arizona have adversely impacted water quality and flows and terrestrial and aquatic wildlife habitat literally hundreds of river miles downstream from those urban areas withdrawing water for municipal use.

• Ever more frequently across the country, sightseers at local overlooks and viewpoints must gaze out across manmade clutter where once there had been mostly open landscapes. Hikers in California and Colorado reach summits only to be rewarded with vistas of new subdivisions under construction. Sprawl threatens the ambience of such national historic treasures as Mt. Vernon and the hallowed Civil War battlefields of Bull Run, Antietam, Fredericksburg and Gettysburg, among others. (NPS 1997)

All these environmental impacts, and countless more, will increase across the U.S. if federal policy decisions increase immigration-driven population growth. Conversely, federal policy decisions to decrease immigration and its attendant population growth can help reduce negative environmental impacts.

Consider our third immigration scenario. Under the immigration reduction alternative, 250,000 annual net immigration into the United States would lead to a U.S. population of 379 million in 2100. This is an increase of 70 million from the 2010 population of 309 million. However, it is 145 million less than the 524 million projection for 2100 under the status quo scenario, and 290 million less than the 669 million projection under the immigration expansion alternative.

Under this alternative, the 2100 U.S. population of 379 million would exceed the 2010 population of 309 million by 70 million, for a 23 percent increase. It would be 145 million – or 38 percent – less than the 524 million of the middle immigration projection. It would be 290 million – or 77 percent – less than the 669 million of the immigration expansion projection. Assuming that average per capita urban land consumption would remain the same under all three alternatives—and there is no reason to assume otherwise—the total urbanized developed land area in the United States would be 38 percent less under the immigration reduction scenario than under the status quo immigration scenario, and 77 percent less under the reduction scenario than under the expansion scenario.

As of 2010, there were 113.3 million acres (177,031 square miles) of developed land in the United States. With population growth of 70 million by 2100 under the immigration reduction alternative, this built-up area would expand by 25.7 million acres to 139 million acres. The table below (from Kolankiewicz 2015) compares the total area of all development acreage for all three alternatives in 2050 and 2100.

**Table 3-5. Projected area of total developed land in 2050 and 2100 under the three immigration scenarios (alternatives) used in this EIS**

| Alternative | Average annual net migration | Developed land in 2010 (millions of acres) | Developed land in 2050 (millions of acres) | Developed land in 2100 (millions of acres) |
|---|---|---|---|---|
| Reduction | 250,000 | 113.3 | 135.3 | 139.0 |
| No Action | 1.25 million | 113.3 | 152.2 | 192.1 |
| Expansion | 2.25 million | 113.3 | 168.7 | 245.3 |

In comparing these figures, it is evident that urban sprawl will consume far less land in the U.S. in the 21st century if immigration levels are reduced. The difference in total developed land in 2100 between the immigration reduction and immigration expansion scenarios is 106.3 million acres. That almost equals the total amount of developed land in the U.S. in 2010 (113.3 million acres).

Figure 10 charts the growth of developed land in the United States under all three immigration scenarios. Once again, it is plain that immigration levels will be a key factor in determining the amount of urban sprawl allowed to occur in the U.S. during the coming century.

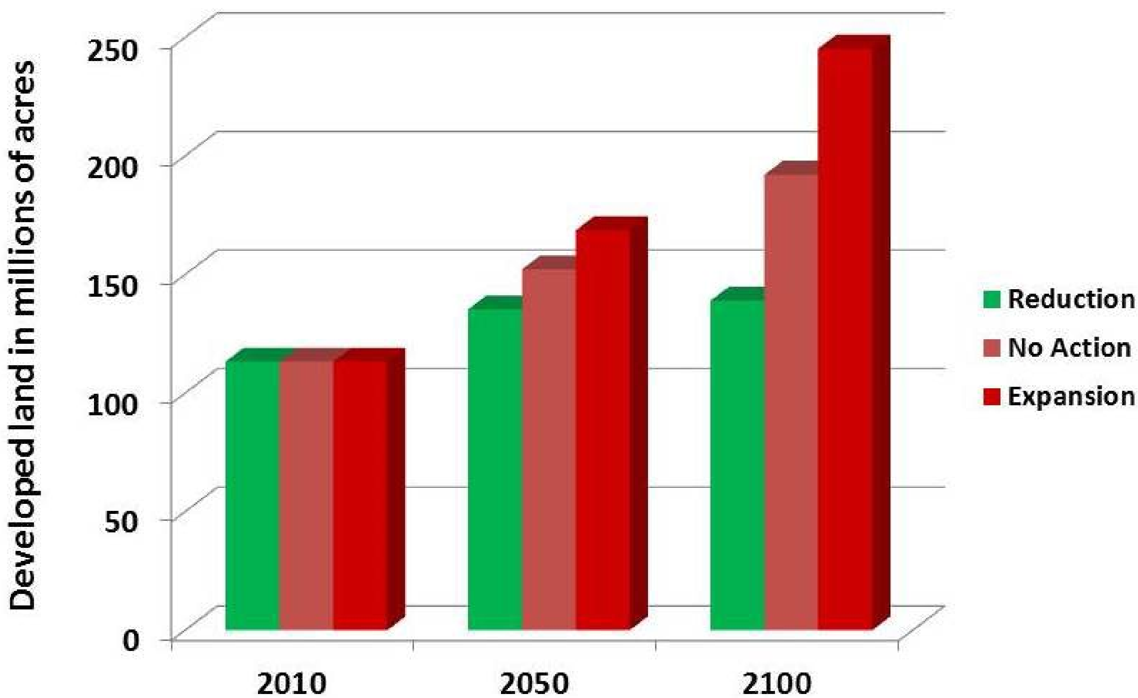


**Figure 10. Estimated growth in amount of developed land in U.S. under three different immigration scenarios**. Source: Kolankiewicz 2015.

In considering sprawl, special notice should be taken of the impacts of sprawl on farmlands, and the implications of this for food security. The juxtaposition of relentless development pressures, on the one hand, and land degradation from soil erosion, salinization and other factors, on the other, is reducing the productive agricultural land base of the United States—even as the pressures on that same land base from a growing population are intensifying (Kolankiewicz et al. 2014). The NRCS's *National Resource Inventories* estimate that the acreage of cropland in the U.S. decreased from 420 million acres in 1982 to 361 million acres in 2010, a decline of nearly 60 million acres (14 percent) in less than three decades. Some of this represents cropland withheld from active farming with federal government subsidies and placed into the Conservation Reserve Program, but these lands tend to be fragile or environmentally sensitive sites not suitable for sustainable cultivation.

If the 1982-2010 rate of cropland conversion and loss continues to the year 2100, the U.S. will lose an additional 193 million acres of its remaining 361 million acres of cropland. Only 168 million acres would then remain—about 40 percent of the 1982 area —and none of this acreage would be in pristine condition after two centuries of intensive exploitation. Its soils and nutrients, while perhaps not depleted, would require even greater inputs of costly fertilizers. At the same time, this land would be counted on to feed many more people, both in the U.S. and abroad (Kolankiewicz et al. 2014).

The table below (from Kolankiewicz 2015) shows the area of cropland per capita in the United States in 1982 and in 2010, and projected out to 2050 and 2100. It assumes the same rate of cropland loss as during 1982 to 2010 (2.1 million acres annually) and uses the most recent Census Bureau population projections.

| Year | Cropland in 48 contiguous states (millions of acres) | U.S. Population in Millions (48 states) | Acres of cropland per capita |
|---|---|---|---|
| 1982 | 420 | 225 | 1.9 |
| 2010 | 361 | 306 | 1.2 |
| 2050 | 276[1] | 400[2] | 0.7 |
| 2100 | 168[1] | 571[2] | 0.3 |

Under this scenario, available cropland will decrease from 1.9 acres per person in 1982 to 0.3 acre per person in 2100, an 84 percent drop. Figure 11 graphically depicts this decrease.

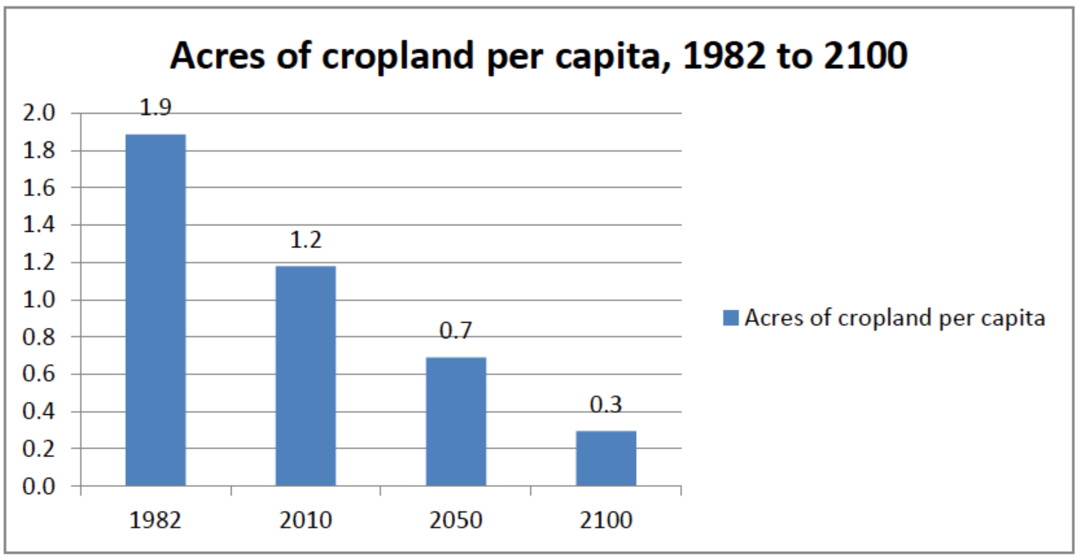


**Figure 11. Projected long-term decline in cropland per person.**
Source: Kolankiewicz et al. 2014.

No matter how optimistic one's views about potential improvements in agricultural productivity, the implications of this trend for national food security are worrisome. Immigration-driven population growth helps drive the problem from both ends: increasing the number of people depending on the agricultural production of the nation's croplands, pastures and range lands, while generating sprawling development which paves over these lands, decreasing the amount of agricultural land available to support this growing population.

Once again, we can get a sense of how important immigration-driven population growth is to this problem by comparing contrasting immigration scenarios. An annual immigration rate of 1.25 million into the United States would result in a U.S. population of 524 million in 2100, an increase of 215 million (70 percent) from the 2010 population of 309 million. Accommodating 215 million new Americans would require substantial space and land area. Because farmland tends to be flat and flatlands are easier and cheaper to build on than hillsides, and because of the proximity of much farmland to urban areas, where it lies directly in the path of development, much of the acreage for the new development necessitated by 215 million more residents will likely come from the nation's agricultural land base.

A conservative approach to predicting likely aggregate cropland loss from 2010 to 2100 that may be attributable to population growth under this scenario uses the average rate of cropland lost to development between 1982 and 2007, according to the NRCS's National Resources Inventory data. On average 405,520 acres of cropland were developed annually during the 25-year period from 1982 to 2007 (NRCS 2013a). During that same time period, America's population grew by an average of 2.8 million per year. Dividing 405,520 acres by 2.8 million yields a rate of cropland loss of 0.145 acre per added resident: every seven people added to the population resulted in the development of one acre of cropland.

If we assume this ratio between population growth and cropland conversion and if the U.S. population were to grow by 215 million by 2100, that would entail the direct loss of 31.2 million acres of the nation's cropland to population-growth-related development. This scenario also would likely be associated with the permanent disappearance of many tens of millions of acres of pastureland and rangeland. While the sustainability of many current agricultural practices is questionable, agricultural lands remaining in cultivation or in grazing regimes under this scenario would be subjected to even more intensive practices in order to maintain productivity at all costs. In itself, this is unlikely to be ecologically sustainable over the long run.

Under a more expansive immigration regime, an annual immigration rate of 2.25 million into the United States would result in a U.S. population of 669 million in 2100, an increase of 360 million (117 percent) from the 2010 population of 309 million. Accommodating 360 million new Americans would generate even greater sprawl and hence even greater pressures on farmlands and ranchlands than under the previous scenario. Assuming 0.145 acres of cropland developed to accommodate each additional person, a 360 million population increase would lead to the direct loss of 52.2 million acres of the nation's cropland to development.

Conversely, under a more restricted immigration regime, an annual immigration rate of 0.25 million (250,000) would result in a U.S. population of 379 million in 2100, an increase of 70 million (23 percent) from the 2010 population of 309 million. Accommodating 70 million new Americans would still generate sprawl and the loss of agricultural lands and wildlands, but much less than under the immigration status quo. Given a ratio of one acre of cropland lost per seven new residents, this alternative would directly cause the urban development of 10.2

million acres of cropland by 2100, and the loss of additional millions of acres of pastureland and rangeland.

The table below shows the projected croplands lost between 2010 and 2100 due to population-related development alone under our three immigration and population growth scenarios. These range from 10.2 million acres of cropland lost by 2100 under the low immigration scenario to 52.2 million acres lost under the high immigration scenario:

| Alternative | Average annual net migration | U.S. cropland in 2010 (acres) | Cropland lost to development by 2050 (acres) | Cropland lost to development by 2100 (acres) |
|---|---|---|---|---|
| Reduction | 250,000 | 361 million | 8.7 million | 10.2 million |
| No Action | 1.25 million | 361 million | 15.4 million | 31.2 million |
| Expansion | 2.25 million | 361 million | 21.9 million | 52.2 million |

All three scenarios predict significant croplands losses, because all three scenarios include significant population growth. However, the difference in the amount of loss is striking. The results suggest that each increase of 100,000 in annual immigration between 2010 and 2100 will result in an additional 2 million acres of cropland lost over the same period.

It is worth noting that cropland is only one of the three categories of agricultural land designated and inventoried by the NRCS. Pastureland and rangeland are the other two major categories of farmlands and these have also seen declines in recent decades because of development, though not as dramatically as cropland. The NRCS estimates that between 1982 and 2007, the nation's pastureland was paved over at the rate of about 280,000 acres/year (compared to 400,000 + acres/year for cropland). Meanwhile, rangeland—which is more concentrated in the sparsely populated High Plains and Rocky Mountain West—was converted to developed land at the rate of 212,000 acres/year.

Immigration-driven population growth results in sprawl. Some of this sprawl takes place on farmland, permanently eliminating it from the inventory of productive agricultural land in the U.S. Cropland, pasture and rangeland all decline as development spreads across farm lands to make way for subdivisions, streets and highways, shopping centers, playgrounds, schools, government office buildings, wastewater treatment plants, electrical substations, and so forth—all of the structures and facilities needed to accommodate more residents. The threat posed to America's farmland by policies that significantly increase immigration can hardly be overstated. The environmental implications of these policies for U.S. food security and for maintaining a healthy and prosperous population deserve much greater scrutiny than they have hitherto received, particularly in the context of global climate change (IPCC 2018) and the ongoing transgression of global planetary boundaries for safe human utilization of the biosphere (Steffen et al. 2015b).

**Immigration's Environmental Impacts: Habitat & Biodiversity Loss**

By all accounts, biodiversity (the variety of living things, comprehensively understood in terms of genetic diversity, species diversity and diversity of natural communities) is rapidly diminishing across the globe. The United Nation's Secretariat of the Convention on Biological Diversity estimates that humanity could extinguish one out of every three species on Earth within the next one to two hundred years (SCBD 2010), while according to Raven et al. (2011): "biodiversity is diminishing at a rate even faster than the last mass extinction at the end of the Cretaceous Period, 65 million years ago, with possibly two-thirds of existing terrestrial species likely to become extinct by the end of this century."

While paleontologists debate the causes of previous mass extinctions, the primary causes of the current one are clear: ever more people to consuming, degrading and appropriating ever more resources. The consensus among conservation biologists is that the five most important "direct drivers" of biodiversity loss are habitat loss, the impacts of alien species, over-exploitation, pollution, and global climate change (Primack 2014). All five direct drivers are themselves mainly caused by the "primary drivers" of increased human populations (Brashares et al. 2001, McKee et al. 2003) and increased human economic activity (Wood et al. 2000). According to the *Millennium Ecosystem Assessment*, the force of these extinction drivers increased immensely over the past century as human populations and human economies exploded in size (Reid et al. 2005). Subsequent research (Butchart et al. 2010, Steffen et al. 2015a) bears out the *MEA*'s further conclusion that the forces driving extinction are increasing in power, as societies become more populous and wealthy.

Conservation scientists agree that habitat loss is by far the number one threat to nonhuman species. For example, over 1400 species currently are listed as threatened or endangered in the U.S. under the Endangered Species Act (ESA). In a thorough study of ESA information published in the *U.S. Federal Register*, D. S. Wilcove and colleagues found habitat degradation or loss implicated as a cause for

85% of threatened and endangered species in the United States, making habitat loss by far the number one cause of species endangerment (Wilcove et al. 1998).

Importantly, habitat loss is directly tied to overall human numbers. Figure 12 shows that the area of developed land—from which natural wildlife habitats have been permanently erased—in U.S. states is closely correlated with the population sizes of those states. The larger a state's population, the larger the area of developed land in that state.

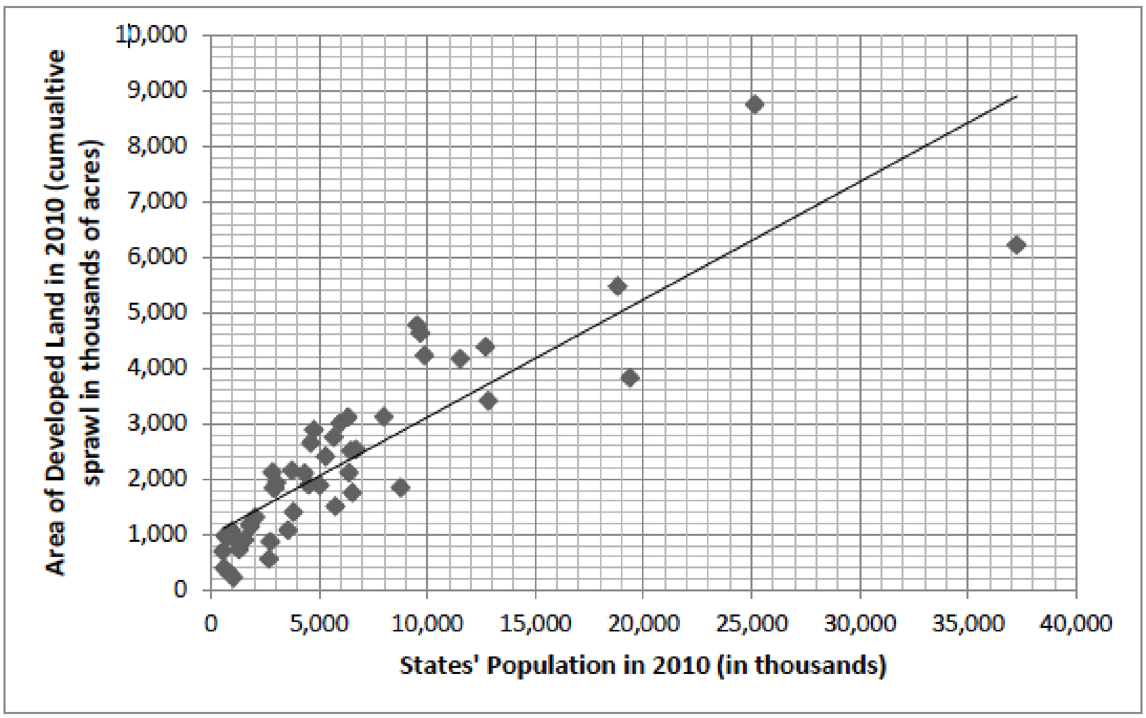


**Figure 12. Cumulative developed land area (sprawl) is a function of population size.** Sources: Census Bureau data, NRCS 2013b.

Another study of the leading causes of endangerment for American species classified as threatened or endangered by the U.S. Fish and Wildlife Service was carried out by Brian Czech and associates. Its results are summarized in the table below (Czech et al. 2000):

| Cause of Endangerment | Number of Species Harmed |
|---|---|
| Interactions with non-native species | 305 |
| Urbanization | 275 |
| Row-crop agriculture | 224 |
| Outdoor recreation and tourism development | 186 |
| Domestic livestock and ranching activities | 182 |
| Reservoirs and other running water diversions | 161 |
| Modified fire regimes and silviculture | 144 |
| Pollution of water, air, or soil | 144 |
| Mineral, gas, oil and geothermal extraction or exploration | 140 |
| Industrial, institutional and military activities | 131 |
| Harvest (hunting, collecting) | 120 |
| Logging | 109 |
| Road presence, construction and maintenance | 94 |
| Loss of genetic variability, inbreeding depression, or hybridization | 92 |
| Aquifer depletion, wetland draining or filling | 77 |
| Native species interactions, plant succession | 77 |

We see that a wide variety of human activities contribute to the displacement of other species, but few of them appear objectionable in themselves. They are simply the economic pursuits that sustain human wellbeing, whether that means growing food, providing people with water or energy, or allowing them to recreate in enjoyable places. In other words, these are activities that to some degree are part and parcel of people existing at all. Bring in more people and you will need to work the landscape harder, or use more of it, in order to provide these things for them.

Anthropologist Jeffrey McKee has been studying the links between population growth and biodiversity loss for two decades. He states: “There is now a growing body of academic literature . . . establishing a scientific link between human population density and growth and increased extinction threats for plants and animals” (McKee 2012). In his study of a wide range of countries, McKee found that increasing human population density accounted for 90 percent or more of increasing numbers of threatened species. Increased per capita consumption accounted for under 10 percent, and all other variables, such as agricultural land use practices, amounted to little more than “statistical noise.” Figure 13 depicts parallel curves, representing human population and anthropogenic extinctions, growing in tandem for the past two centuries.

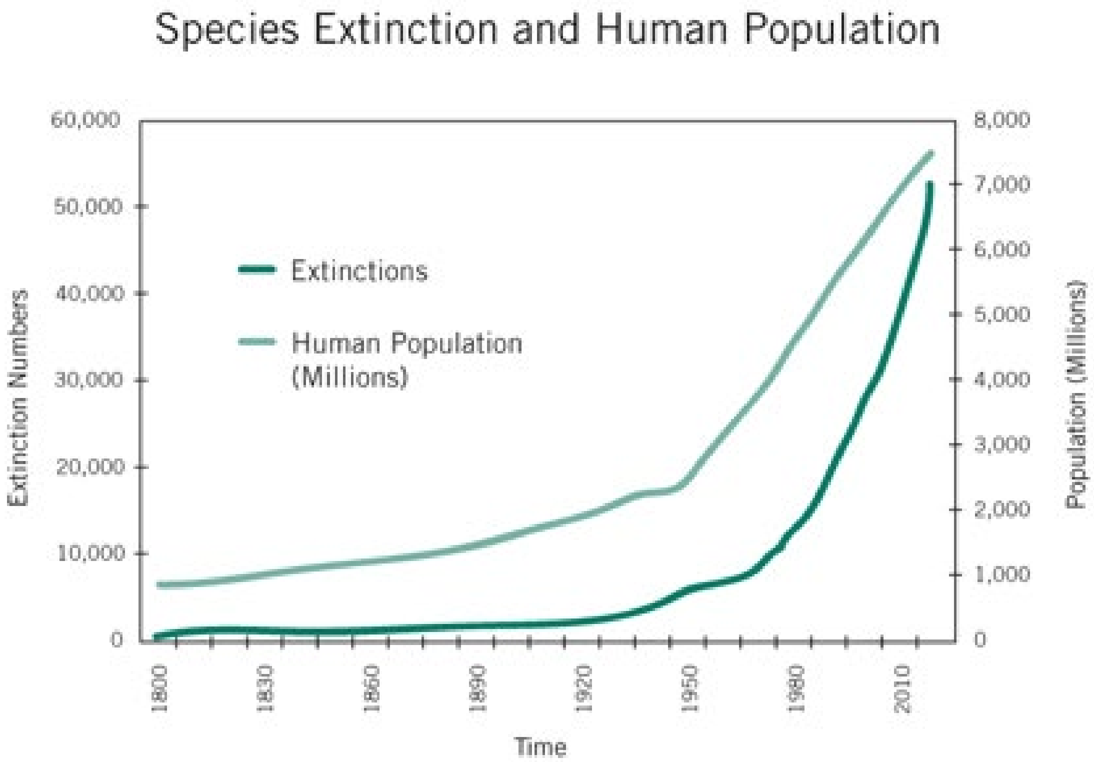


**Figure 13. Increasing human population and increasing extinctions.**
Sources: Scott 2008, Center for Biological Diversity no date.

Prominent biologists concur that human population growth is devastating biodiversity. Jared Diamond cites an "evil quartet" of habitat destruction, fragmentation, overharvesting and introduced species (Sanderson and Moulton 1998). E.O. Wilson, the founder of the discipline of conservation biology, touts the acronym HIPPO: habitat destruction, invasive species, pollution, population, and overharvesting. He estimates that globally at least 12,000 wild species are going extinct annually (Biello 2008). Niles Eldredge, curator-in-chief of the permanent Hall of Biodiversity exhibition at the American Museum of Natural History in New York City, has written that "the explosion of human population, especially in the past two centuries, coupled with the unequal distribution and consumption of wealth on the planet, is the underlying cause of the Sixth Extinction (Eldredge 2001).

Conservation organizations are beginning to take a harder look at the need to rein in population growth if they hope to prevent mass species extinction. In 2010, one of the largest Australian environmental advocacy organizations, the Australian Conservation Foundation (ACF), formally proposed that the Australian Government recognize "human population growth in Australia" as a "key threatening process" under the Environment Protection and Biodiversity Conservation Act of 1999. ACF asserted that, "Population growth is best viewed as an underlying process, which intensifies and exacerbates numerous other proximate threats to biodiversity" (ACF 2010). The group continued:

> Population growth is the first driver in a complex chain of direct and indirect effects on Australia's biodiversity. It underpins and exacerbates nearly every other threat to our ecological life support systems . . . Population increase is, in turn, a driver of a numerous consequential biological and non-biological processes, including but not limited to the following:
>
> • Construction and operation of human infrastructure, such as roads, housing and other buildings, dams, transmission lines, and so forth;
>
> • Alteration of natural landscapes, such as clearance of habitat for agriculture and other purposes, dredging of marine environments for shipping access, and changed fire regimes to protect human infrastructure;
>
> • Increased intensity of use of natural resources, such as harvesting of forests for timber and extraction of water from rivers and aquifers;
>
> • Altered flow regimes for waterways and tidal zones;

> • Introduction of pollutants into natural systems, including nutrients, waste materials, oil spills, and other pollutants into riverine and coastal ecosystems;
>
> • Use of natural areas for recreational purposes, which may be accompanied by disturbance of organisms (such as nesting sea birds) and incidental destruction (as by boat propellers or trampling of sensitive areas);
>
> • Generation of greenhouse gases, with consequent alteration of climatic processes and sea levels; and
>
> • Introduction of non-indigenous organisms, both intentionally (as for agricultural purposes) and unintentionally (as for a wide range of exotic pests). (ACF 2010)

Similarly, recent research found that immigration-driven population increases in Europe could undermine EU efforts to preserve biodiversity on the continent, while cutting back on immigration would facilitate such conservation efforts (Cafaro and Götmark. 2019).

In the United States, as in Australia and Europe, immigration-driven population growth is a direct cause of habitat loss and all these other adverse impacts on biodiversity. Human population increase directly contributes to loss and degradation of natural habitats because all human activities consume resources and create waste. Every person necessarily uses land, water, energy and other resources in ways that displace, modify, or degrade natural habitat features and functions.

As the size of the U.S. population increases, there is a concomitant increase in the magnitude of aggregate impacts on the environment and a concomitant decrease in the quantity and quality of resources left for other species. Recently great strides have been made in quantifying such impacts.

In the last two decades, researchers affiliated with the Global Footprint Network have developed the Ecological Footprint (EF) measurement. EF has emerged as the world's leading measure of aggregate human demands on nature. Ecological footprint accounting addresses the ability of the biosphere to meet the growing demands of humanity (GFN 2014) (Figure 14).

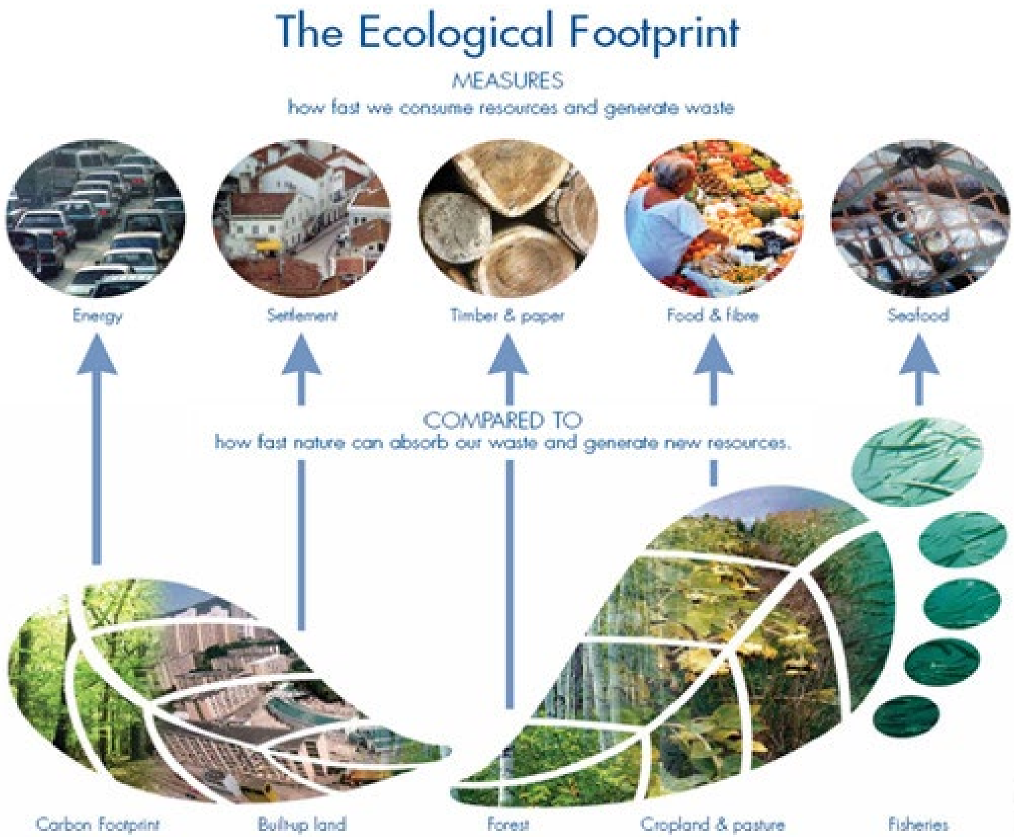


**Figure 14. The Ecological Footprint showing biocapacity at the bottom of the diagram.** Source: WWF 2014.

EF accounting represents both sides of a balance sheet. On the asset side, biocapacity stands for the area of Earth's biologically productive land, including forests, grasslands, rangelands, and pasture, cropland and fisheries. Particularly if they are left unharvested, these productive regions can absorb a portion of the carbon dioxide emissions we release. In EF analysis, biocapacity is compared with humanity's demands on nature: our Ecological Footprint. The EF represents the productive area required to supply the renewable resources humanity is using and to absorb our wastes.

According to recent calculations, the per capita footprint of the average American is approximately seven hectares per capita (GFN 2012). That is, on average, in order to provide for his or her resource and energy consumption, each American uses and impacts about 17 acres of ecologically productive land. This amount is far greater than the aggregate amounts of residential or urbanized land directly squatted on by each American consumer. The United States' collective EF extends well beyond urban boundaries deep into the countryside and wild lands, adversely impacting habitats and biodiversity in the U.S. and abroad. Crucially, Americans' *collective* EF is a product of two things: the size of our *average* EF and the total number of our "feet."

To get a better handle on the potential impact of immigration-induced U.S. population growth on biodiversity loss, let's consider once again our three reference immigration scenarios: status quo immigration, immigration expansion, and immigration reduction. Under the status quo alternative, 1.25 million annual immigration into the United States would lead to a U.S. population of 524 million in 2100. This is an increase of 215 million (70 percent) from the 2010 population of 309 million.

Under this scenario and assuming a per capita ecological footprint of 17 acres, the U.S. will increase its total ecological footprint by 3,655,000,000 acres. That is over three and a half billion more acres of Earth's finite resources, on land and sea, that will be devoted primarily to human demands, rather than to meeting the needs of other species. That represents an immense loss of biodiversity.

*Ceteris paribus*, a human population that is 70 percent larger will have a 70 percent greater impact on biodiversity. As with other environmental impacts, with commitment and intelligent policies it is possible to reduce the per capita impact on habitat and wildlife by means of greater efficiency and conservation—but not infinitely so. People can live in well-insulated homes in higher-density, less-sprawling settlements, drive more fuel-efficient cars instead of gas guzzlers, and so forth. But there are still limits to what is technically and politically feasible. Just as important, capitalist economies tend to take efficiency improvements and put them to use in furthering economic growth and human consumption—not in setting resources aside for the benefits of *nature's* economies. For these reasons, it is possible that Americans will demand more land and resources per capita for their "pursuit of happiness" in the future, not less. In that case, each individual added to the U.S. population will have an even greater negative impact on biodiversity than is currently the case. In any event, what we can say with certainty is that *ceteris paribus*, more people means greater harms and less resources available to other species.

It should be stressed that even if the U.S. population were to remain constant over the rest of this century and not increase at all, existing levels and patterns of land use and current rates of resource consumption and pollution would still negatively impact habitats and biodiversity. Populations of many species of birds, for example, are in decline in the United States (Figure 15), and some of these declines would likely continue even without further habitat loss/degradation and other adverse effects from a growing human population. Population growth simply exacerbates these losses.

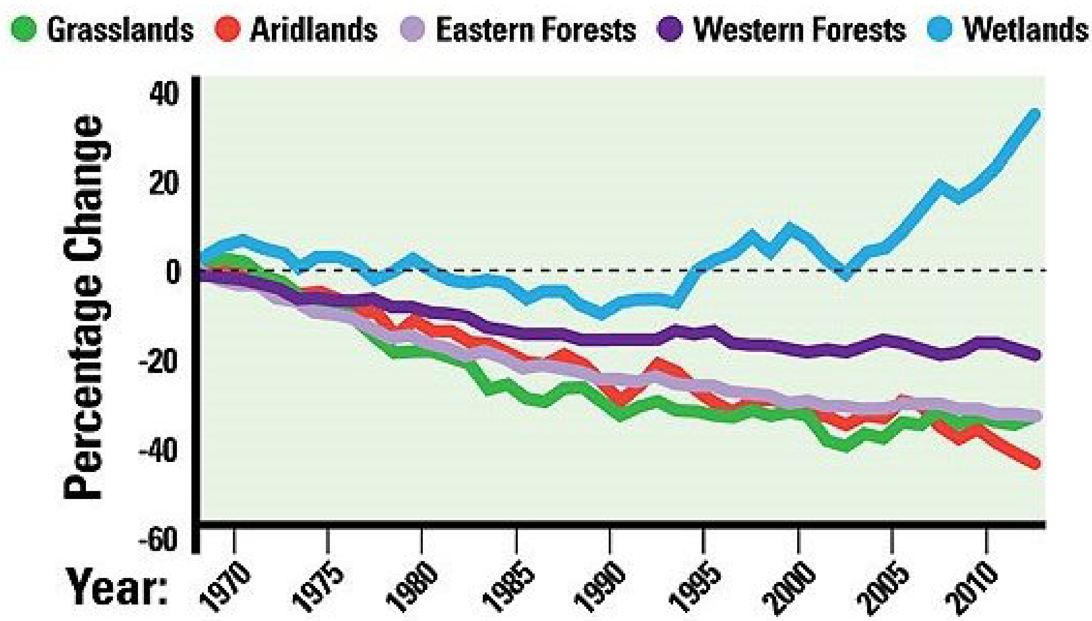


**Figure 15. Bird population indicators in five inland U.S. habitats.**
Source: NABCI 2014.

Under our more expansive immigration scenario, 2.25 million annual immigration into the United States would result in a U.S. population of 669 million in 2100. This is an increase of 360 million (117 percent) from the 2010 population of 309 million. Under this scenario and assuming a per capita ecological footprint of 17 acres, the U.S. will increase its total ecological footprint by 6,120,000,000 acres. That is over six billion more acres of Earth's finite resources, on land and sea, that will be devoted primarily to human demands, rather than to meeting the needs of other species. That represents an even greater loss of biodiversity than under the status quo immigration scenario.

Overall, the effect on habitats and biodiversity of either a 215 million population increase (under the status quo immigration alternative) or a 360 million population increase (under the immigration expansion alternative) would be adverse and severe. It would likely be associated with the permanent loss of several billion acres of wildlife habitat directly to development (sprawl and urbanization). A much larger area of habitat—forestland, wetlands, desert, shrub-scrub, tundra, alpine, riparian, grasslands—would be vulnerable to degradation from increased environmental pressures and stresses associated with a human population that is 70 or 117 percent larger. These increasing pressures would stem from such stressors as:

- Air pollution including smog and ozone that damages leaves and growth of trees;

- Heavy metal contamination from toxic elements such as lead and mercury;

- Exposure of ecosystems and wild plants and animals to acute and chronic toxicity from pesticides;

- Acid precipitation damage of soils, plants, and aquatic ecosystems;

- Point and non-point sources of water pollution that damage aquatic environments;

- Noise pollution and other disturbances affecting wildlife in areas adjacent to developed zones;

- Increased demand for water for agriculture, municipalities, industry and recreation would place greater stress on aquatic habitats and biota;

- Habitat fragmentation due to road construction and right-of-ways for new pipelines and power lines (habitat fragmentation reduces the viability of wildlife species needing large areas of uninterrupted habitat to survive and thrive);

- Large-scale development of renewable energy (wind farms and concentrated solar facilities) in rural areas which both fragment and eliminate habitat and cause bird and bat mortality from collisions with spinning blades;

• Large-scale hydraulic fracturing for shale gas and tight oil, which entails an extensive network of roads, pipelines, and drilling pads that fragment, damage, and destroy wooded habitats;

• Spreading exotic invasive species of plants, animals, and microbes that aggressively outcompete and displace or infect native flora and fauna (e.g., kudzu, zebra mussel, red imported fire ant, emerald ash borer, West Nile virus, chestnut blight);

• Damaging logging practices that compromise forest composition and structure;

• The increasing area of wildland-urban interface around the country from suburban sprawl and exurban and vacation home development, which interferes with the use of prescribed fire and other fire management practices needed to maintain healthy habitats and control fuel loads;

• The myriad effects associated with global warming and climate change, including increasing soil moisture stress, extreme weather events (downpours, derecho winds, tornados, hurricanes, ice storms, heat waves, droughts), perturbed phenology (disrupted timing of natural events that have traditionally coincided, such as the blooming of plants and the migration of birds), the drying out of much of the western U.S., exposing forests over vast areas to moisture stress, mortality, and insect infestations.

Parks, wildlife preserves and roadless areas—zones of great value for habitat and biodiversity—that are already protected or officially designated might remain so for the duration of this century, although they would be subjected to greater levels of many of the stressors cited above. However, the U.S. has a greater area of unprotected natural areas than formally protected ones, and with the multiple demands exerted by an American population that is 70 or 117 percent larger, there is likely to be less political support for officially protecting these areas from resource exploitation (e.g., logging, mining, drilling, road-building) or development.

Increasingly, with much higher populations, the more acute needs and demands of human beings are likely to be pitted against those of wildlife. In these instances, when push comes to shove, wilderness, wildlife and biodiversity tend to lose out, because they have no votes and no political or economic clout of their own. An example of this is currently occurring in California, where the survival of the endangered delta smelt (Hypomesus transpacificus) (Figure 16) is in doubt, as a result of the state's severe drought and waning political support for the freshwater flows in the Sacramento-San Joaquin Delta needed for this small fish to avoid extinction (Platte 2015).

**Figure 16. Endangered Delta Smelt (*Hypomesus transpacificus*) of California.**
Source: Kolankiewicz 2015.

When thousands of farmers cannot grow crops and tens of millions of city dwellers watch lawns turn brown because of insufficient water, support for an inconspicuous fish tends to dry up. Note that under the expansive immigration scenario, California might have not twice but three times as many people in 2100—with no end in sight to further population growth.

Finally, let us consider our third scenario, under which immigration is significantly reduced from current rates. Under the immigration reduction scenario considered earlier in this report, 250,000 annual immigration into the United States would lead to a U.S. population of 379 million in 2100. This is an increase of 70 million (23 percent) from the 2010 population of 309 million. It is 145 million less than the 524 million projection for 2100 under the status quo alternative and 290 million less than the 669 million projection under the expansion alternative.

A U.S. population that is more than 23 percent larger than our present population generally would be expected to exert greater pressure on natural resources and further displace wild nature. However, these impacts likely would be much less than under either of the other alternatives. Under the immigration reduction scenario and assuming a per capita ecological footprint of 17 acres, the U.S. will increase its total ecological footprint by 1,190,000,000 acres. The table below compares the likely increase in total U.S. ecological footprint under the three immigration policy scenarios:

| Annual immigration 2010-2100, in millions | Population increase in millions of people | Ecological footprint increase, millions of acres |
|---|---|---|
| 0.25 | 70 | 1,190 |
| 1.25 | 215 | 3,655 |
| 2.25 | 669 | 6,120 |

These results indicate that the immigration reduction scenario would lead to only one-fifth to one-third of the increased pressure on biodiversity generated by the other two scenarios. *Ceteris paribus*, the reduction scenario allows for much more habitat and many more resources to remain devoted to preserving biodiversity.

Here is a final, crucial point. Under the immigration reduction alternative, by 2100, the U.S. population is projected to have stopped growing and stabilized. Under the other two alternatives, it would still be growing rapidly with no end in sight. Thus, under the status quo and expansion alternatives, increasing anthropogenic stresses on wildlands and biodiversity would almost certainly still be growing with no end in sight.

In contrast, under the immigration reduction alternative, a stable U.S. population could begin to devote conservation and efficiency improvements to *improving* conditions for other species—not just to slowing their decline. Because a stable overall population likely would mean population declines in some parts of the country, this scenario would open up significant opportunities for the ecological restoration of former wildlife habitat. Of all three scenarios, only the immigration reduction scenario opens up the possibility of Americans sharing the landscape more generously with other species in the future than we do today. In this way, immigration reduction could constitute a significant contribution toward creating an ecologically sustainable society.

Whatever immigration policies the U.S. pursues in coming decades, this analysis suggests that they will play a crucial role in setting the parameters for biodiversity preservation in the future. Whether Americans preserve the great biodiversity legacy bequeathed to us by our predecessors for our children and grandchildren will depend, in part, on whether we can reduce immigration and stabilize our population.

## Immigration's Environmental Impacts: Greenhouse Gas Emissions & Resultant Climate Change

After decades of research, the facts regarding global climate change have come into clear focus. According to the Intergovernmental Panel on Climate Change's (IPCC's) *Fifth Assessment Report*, published in 2013 and 2014, we now know the following:

> • The Earth grew roughly 1.35°F hotter on average over the past century, with greater warming at the poles, and this warming trend is accelerating.
>
> • Recent global warming has been caused primarily by human activities—not natural climate cycles, sunspots, or anything else. About 75% of human contributions have come through increased greenhouse gas emissions and about 25% have come through land use changes, primarily deforestation and soil erosion. Atmospheric concentrations of the three most important greenhouse gases (carbon dioxide, methane and nitrous oxide) are higher than they have been for the past 800,000 years or more.
>
> • If emissions continue to increase we can expect even higher temperatures and more chaotic weather in the years ahead. The greater the emissions, the greater the likely temperature increases and the more extreme and unpredictable the weather. If instead we drastically cut greenhouse gas emissions and leave the world's remaining primary forests standing, we can avoid much of the climate change that would occur under "business as usual."
>
> • "Global warming" involves a lot more than higher average worldwide temperatures. Climate change is also leading to rising sea levels, more frequent and severe storms in many parts of the world, the mass extinction of many species of plants and animals, increased ocean acidification, and numerous other problems. And climate change will likely provide significant surprises in coming centuries, many of them unpleasant. For all these reasons, a better term than global climate change might be global climate degradation. (IPCC 2013, IPCC 2014)

According to the IPCC, we should be very worried about all this. Climate change threatens the wellbeing and even the survival of hundreds of millions of people around the world, through increased risk of malnutrition and starvation, and increased frequency of deadly weather events. Those most threatened by climate change tend to be among the Earth's poorest people, whose poverty leaves them with insufficient protection against potential climate ills and who bear little responsibility for causing the problem. Grave as the threats are to people, the dangers to other species from climate change are even greater, since beyond harms to individual organisms they threaten to extinguish whole species on a mass scale, accelerating the sixth mass extinction (IPCC 2014).

As the world's wealthiest and most powerful nation—and a nation that has generated more greenhouse gas emissions over the past two and a half centuries than any other—the United States arguably has a moral responsibility address this issue and help limit future climate change. Even if we do not care about the wellbeing of poor people in Africa or Asia, current and future impacts on the U.S. itself still provide ample reason to work to decrease U.S. greenhouse gas emissions, according to the recent *U.S. National Climate Assessment* of the U.S. Global Change Research Program (Melillo et al. 2014).

The *National Climate Assessment* was prepared by a team of more than 300 experts, who drew on a large body of peer-reviewed scientific publications and technical reports, and it was reviewed and approved by the National Academy of Sciences. The *Assessment* emphasizes that climate change is not just some vague future threat, but is already affecting Americans in numerous tangible ways.

Extreme weather events related to climate change have become more frequent and intense; this "weird weather" includes prolonged heat waves, heavy downpours, floods and droughts. In addition, global warming is causing sea level to rise on the U.S. coastline; it is causing Arctic sea ice to melt, as well as glaciers in the Northern Rockies, the Cascades, and in Alaska. Oceans along our shores are becoming more acidic as they absorb CO2. These and other results of climate change are disturbing Americans' livelihoods, damaging some sectors of our economy, and stressing our natural environment. Figure 17 depicts documented U.S. temperature change over the past century; note that the period from 2001 to 2012 was warmer than any previous decade.

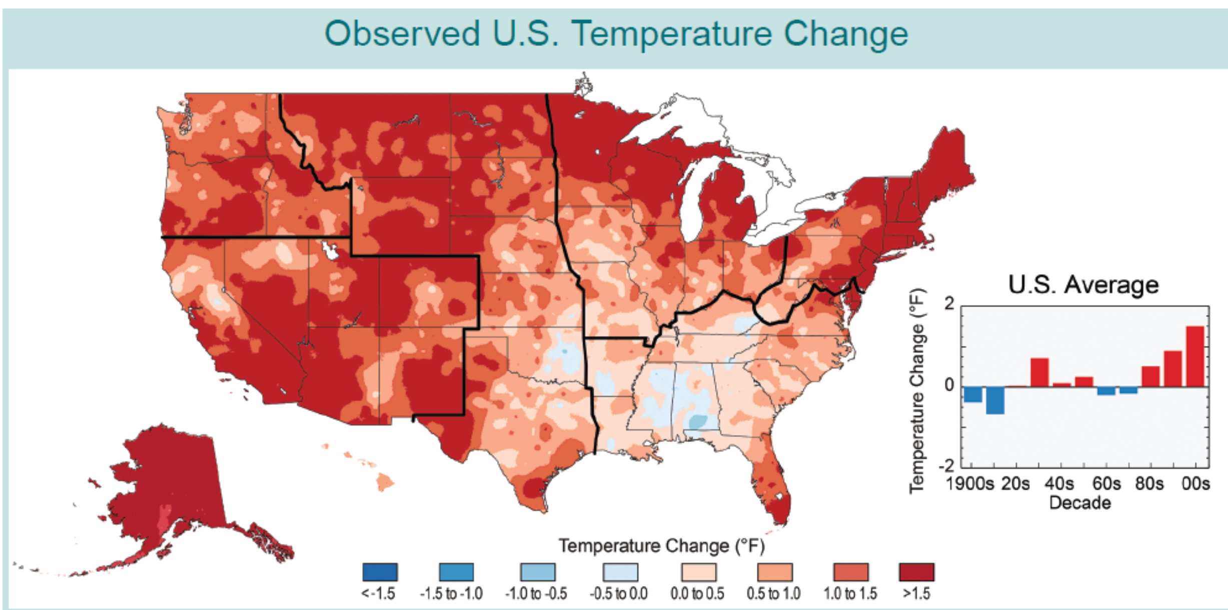


**Figure 17. Observed U.S. temperature change: 1991-2012 average vs. 1901-1960 average.** Source: Melillo et al. 2014.

The *National Climate Assessment's* other key findings include the following:

> * Heat-trapping gases already in the atmosphere have committed the U.S. to a hotter future with more climate-related impacts in the U.S. over the next few decades.
>
> * Impacts related to climate change are already evident in many economic sectors and are expected to become increasingly disruptive across the nation throughout this century and beyond.
>
> * Climate change threatens human health and well-being in many ways, including through more extreme weather events and wildfire, decreased air quality, and diseases transmitted by insects, food, and water.
>
> * Infrastructure is being damaged by sea level rise, heavy downpours, and extreme heat; damages are projected to increase with continued climate change.
>
> * Water quality and water supply reliability are jeopardized by climate change in a variety of ways that affect ecosystems and livelihoods.
>
> * Climate disruptions to agriculture have been increasing and are projected to become more severe over this century.
>
> * Ecosystems and the benefits they provide to society are being affected by climate change.
>
> * Ocean waters are becoming warmer and more acidic, broadly affecting ocean circulation, chemistry, ecosystems, and marine life. (Melillo et al. 2014)

Overall, the *National Climate Assessment* paints a grim portrait of the potential harms climate change could visit on the U.S. over the next century.

How does population growth relate to this matter? *Human population growth is not just an important cause of global climate change: it is one of its two primary causes.* As the IPCC's *4th Assessment Report* succinctly put the matter: "GDP/per capita and population growth were the main drivers of the increase in global emissions during the last three decades of the 20th century . . . At the global scale, declining carbon and energy intensities have been unable to offset income effects and population growth and, consequently, carbon emissions have risen" (IPCC 2007).

Climate scientists speak of the "Kaya Identity": the four primary factors that determine overall greenhouse gas emissions. They are economic output/per capita, overall population, energy used to generate each unit of GDP, and greenhouse gases emitted per unit of energy. Over the past three and a half decades, improvements in energy and carbon efficiency have been overwhelmed by increases in population and economic output. Again according to the IPCC (2007): "The global average growth rate of $CO_2$ emissions between 1970 and 2004 of 1.9% per year is the result of the following annual growth rates:

population + 1.6 %,

GDP/per capita + 1.8 %,

energy-intensity (total primary energy supply per unit of GDP) **−**1.2 %,

and carbon-intensity ($CO_2$ emissions per unit of energy) **−**0.2 %."

Greenhouse gas emissions account for about three-quarters of anthropogenic climate forcing; the other quarter primarily comes from deforestation and the conversion of wild lands to agriculture. Here, too, population growth is a key factor driving the problem, as governments encourage new settlements and the conversion of forests to agriculture, in order to feed and accommodate burgeoning human numbers. Crucially, the IPCC's projections for the next several decades see a continuation of these trends.

*Just as population growth is an important cause of global climate change, ending population growth could play a big part in solving the problem.* Recent evidence suggests that merely providing modern, inexpensive contraception to the hundreds of millions of women and couples around the world could shift future population numbers significantly downward (Moreland et al. 2010). One recent study concluded that "reduced population growth could make a significant contribution to global emissions reductions." It continued:

> Several analyses have estimated how much emissions would have to be reduced by 2050 to meet long-term policy goals such as avoiding warming of more than 2◦ C or preventing a doubling of CO2 concentrations . . . Our estimate that following a lower population path could reduce emissions 1.4–2.5 GtC/y by 2050 is equivalent to 16–29 percent of the emission reductions necessary to achieve these goals . . . By the end of the century, the effect of slower population growth would be even more significant, reducing total emissions from fossil fuel use by 37–41 percent across the two scenarios. (O'Neill et al. 2010)

Another way to state this last point is that about 40% of the excessive greenhouse gas emissions projected over the rest of this century under "business as usual" would come from population growth. Note that population control's contributions to climate change mitigation increase over time, as smaller global populations in one generation lead to smaller populations in the next generation, and the next, and the emissions reductions continue to cumulate (Murtaugh and Schlax 2009, Engelman 2010).

Policy analysts around the world are beginning to wake up to the importance of slowing population growth in order to deal successfully with climate change. A study several years ago from the London School of Economics entitled "Fewer Emitters, Lower Emissions, Less Cost" found that reducing global population growth, through improving women's educational opportunities and providing inexpensive contraception, was cheaper than most other climate mitigation alternatives currently under consideration (Wires 2009). Another study found that non-coercive population measures could reduce greenhouse gas emissions by 5.1 billion tons per year by 2100 (O'Neill et al. 2010). For comparison, *total* current emissions are approximately 8 billion tons per year. The potential emissions reductions from population stabilization or reduction are immense.

How does *immigration-driven* population growth *in the U.S.* relate to this matter? Arguably, U.S. population policies have played an important role in the U.S. failure to swiftly cut greenhouse gas emissions. In recent decades, as we saw earlier in this report, Federal administration's led by both parties have repeatedly increased annual immigration levels, through specific policy decisions, committing the United States to continued rapid population growth. This in turn has pushed U.S. carbon emissions higher.

For example, between 1990 and 2003, U.S. per capita CO2 emissions increased 3.2% while total U.S. CO2 emissions increased 20.2% (CDIAC 2007). Why the discrepancy? Simple. During this same period, America's population increased 16.1%, primarily due to immigration (USCB 2013c). More people drove more cars, built more houses, took more vacations, and did more of the many things that emit carbon. Population growth accounted for about four-fifths of increased CO2 emissions during this period, while individual consumption growth accounted for only one-fifth.

For the first several decades after World War II, aggregate U.S. energy consumption climbed steeply as a result of both a rapidly increasing population and rapidly increasing per capita energy consumption (Holdren 1991). Roughly 85 percent of primary energy consumption was furnished by fossil fuels, so that total national CO2 emissions were rising rapidly as well. However, for the past four decades, three of the four factors in the Kaya identify have not been increasing as rapidly as before, or have actually fallen. GDP per capita, in real dollars, roughly doubled over the past four decades. Energy expended per dollar of GDP produced actually decreased substantially, falling almost by half from 1980 to 2010. And CO2 emissions per unit of energy used remained about the same. The upshot is that *per capita* emissions of CO2 have been roughly flat or falling for the last four decades.

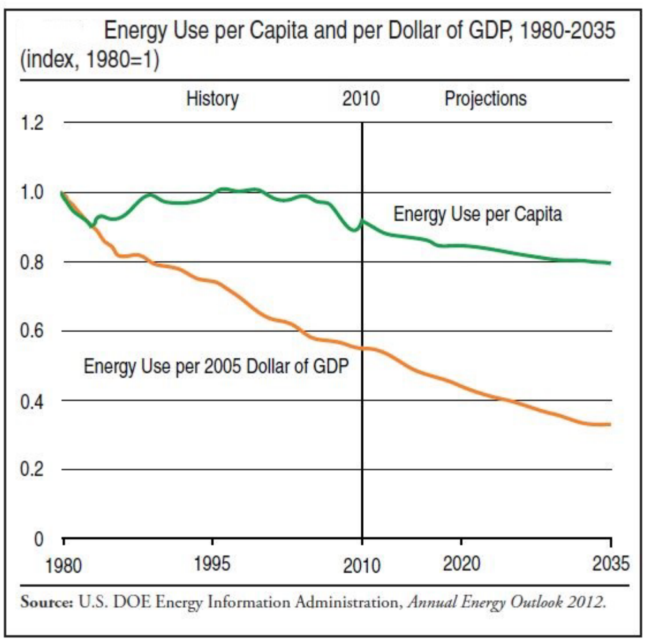


**Figure 18. U.S. energy intensity – energy use per capita and energy use per dollar of GDP, 1980-2010 and project to 2035.** Source: Kolankiewicz 2015.

If the U.S. population had stabilized during this time, total U.S. CO2 emissions would have been flat or falling, too. But that is not what happened, because the U.S. population continued to climb steeply, growing by about 110 million people from the early 1970s to the present. Figure 19 depicts U.S. population growth and total $CO_2$ emissions from 1975 to 2010.

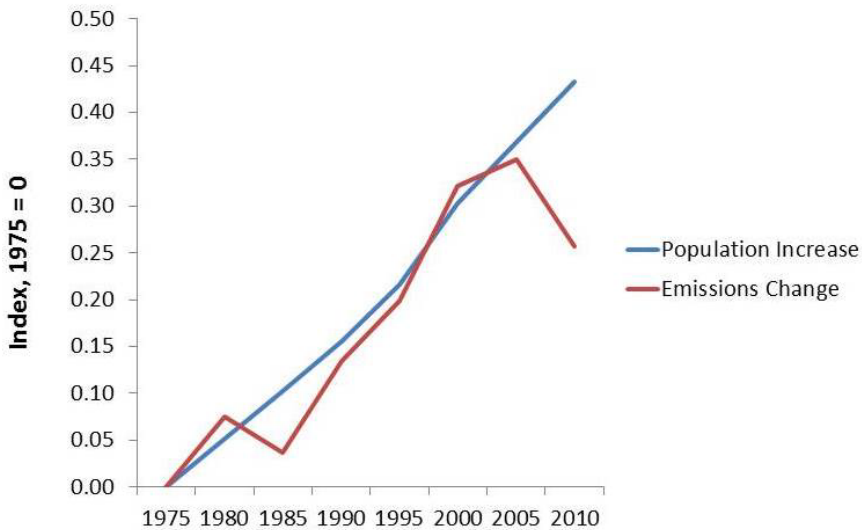


**Figure 19. U.S. population growth and change in total $CO_2$ emissions, 1975 to 2010.** Sources: Census Bureau data, Department of Energy data.

The U.S. population increased steadily from 1975 to 2010, and aggregate $CO_2$ emissions, while jumpier, increased in tandem for most of this time. Over the last several years emissions have fallen, primarily as a result of the 2008 recession and its lingering effects. This recent decrease in $CO_2$ emissions may be an anomaly. Eric Larson, research scientist at Princeton University's Energy Systems Analysis Group, believes that "the decline is unlikely to continue, " because "as the economy rebounds the fall in emissions is likely to be neutralized or overtaken by growing population and incomes that will drive increased demand for energy-using appliances, air conditioners, TVs, personal electronic devices, cars, and other amenities (Larson 2012). The real issue, however, is not whether *some* decrease in emissions is possible in the context of a rapidly growing population, but whether *sufficient* decrease is possible. Larson continues: "In the face of such [economic and demographic] growth and the 80 percent reliance of the U.S. on fossil fuels for energy today, modest improvements in energy efficiencies and expansions of lower carbon energy alternatives will not provide the level of change in the energy economy needed for carbon emissions to fall by 2050 to a level that most climate scientists believe is needed to avoid severe impacts of climate change." (Larson 2012)

A tight historical correlation between U.S. population growth and greenhouse gas emissions has been born out by numerous studies, including Kolankiewicz (2002). The impact of immigration levels on U.S. CO2 emissions was analyzed in a paper by Kolankiewicz and Camarota published in 2008. Among this paper's findings were the following:

> • Immigrants in the United States produce an estimated four times more CO2 in the United States than they would have in their countries of origin.
>
> • U.S. immigrants produce an estimated 637 million metric tons of CO2 emissions annually–equal to the combined emissions of Great Britain and Sweden.
>
> • The estimated 637 tons of CO2 U.S. immigrants produce annually is 482 million tons more than they would have produced had they remained in their home countries.
>
> • If the 482 million ton increase in global CO2 emissions caused by immigration to the United States were a separate country, it would rank 10th in the world in emissions.
>
> • The impact of immigration to the United States on global emissions is equal to approximately 5 percent of the increase in annual world-wide CO2 emissions since 1980. That is 5 percent of total *global* CO2 emissions, not 5 percent of U.S. emissions. (Kolankiewicz and Camarota 2008)

The above figures do not include the impact of children born to immigrants in the United States; if they were included, immigration's contribution would be much higher. Kolankiewicz and Camarota (2008) conclude that in recent years, increases in U.S. $CO_2$ emissions have been driven entirely by population increases, since per capita U.S. emissions have stabilized. As a contributing and quantifiable factor to climate change, American population growth is on a par with deforestation in the Brazilian Amazon and first car purchases in China.

In order to avoid the worst harms threatened by climate change, in 2013 participants in the United Nations Framework Convention on Climate Change, including the United States, formally committed to work to prevent average global temperatures from rising more than 2°C above twentieth century baseline temperatures. In order for the United States to do our part to achieve this goal, plausible analyses suggest that we will need to reduce annual greenhouse gas emissions to approximately one-fifth of current levels over the next five decades (Pacala and Socolow 2004). That is a huge decrease, although credible pathways for reaching it have been sketched out using existing technologies. Meeting such an ambitious goal or even more modest ones, however, will prove more difficult the more America's population continues to grow. Perhaps the main question to ask about whether the U.S. can reduce our emissions sufficiently while doubling or tripling our population is whether this is impossible, or just extremely unlikely.

Consider the numbers. United States' greenhouse gas emissions were approximately 6700 million metric tons ($CO_2$-equivalent) in 2011 (EPA 2013). With a population of 315 million people in 2011, that averages out to 21.3 tons of emissions per person per year. By hypothesis the United States needs to decrease our annual emissions by four-fifths by 2063, to 1340 million metric tons. How much of a per capita decrease would that involve?

At a population of 315 million people we would have to decrease annual emissions to 4.3 tons per person per year. But even with no further immigration, the U.S. population is set to increase to 357 million people by 2063. So we would have to decrease per capita annual emissions to 3.75 tons to bring overall U.S. emissions down to that acceptable total of 1340 million metric tons. Instead of an 80% decrease in per capita emissions we will need an 82.5% per capita decrease.

That would be with no further immigration. Now recall that year in and year out, the United States takes in far more immigrants than any other country in the world. At current levels of immigration our population would increase much more, to 444 million people by 2063. Factoring in current immigration, we would have to decrease per capita annual emissions to 3.0 tons to bring overall U.S. emissions down to our acceptable total: an 86% decrease in per capita emissions.

That would be at current immigration levels. But recent “comprehensive immigration reform” legislation, which passed the Senate in 2013 and has been reintroduced into succeeding Congresses, could increase immigration to about 2.25 million immigrants per year. In that case, the U.S. population would be projected to increase to 513 million people by 2063 and we would have to decrease per capita annual emissions to 2.6 tons. Rather than the 80% reductions needed with a stable population, we would be faced with achieving an 88% decrease in per capita emissions in order to bring annual U.S. emissions down to our target of 1340 million metric tons.

Now let us ask: how much harder might immigration-driven population growth make reducing total U.S. greenhouse gas emissions the necessary four-fifths over the next fifty years? Our current immigration path would necessitate 20% lower per capita emissions than under zero net immigration (3.0 tons per capita versus 3.75 tons), while increasing immigration along the lines of the Senate's 2013 bill would require 31% lower per capita emissions (2.6 tons versus 3.75 tons). As a first approximation, then, we might say that at current immigration levels population growth will make it 20% more difficult for Americans to do our part to sufficiently mitigate global climate change, while a more expansive immigration regime could make it 31% more difficult to do so. However, this probably significantly understates the impediments to success caused by immigration-driven population growth, for several reasons.

The problem of achieving sufficient emissions reductions is compounded by the fact that at any particular time, each successive "slice" of reductions is more costly, assuming that we rank-order our important emissions reduction choices and implement the cheapest ones first. Measures to decrease current greenhouse gas emissions 10% would likely save American consumers and businesses money, due to efficiency gains and pollution reduction benefits. But the next 10% would likely cost a significant amount, the next 10% reduction would cost much more, the following 10% much, much more, etc. At some point, further reductions may be technically impossible. Before that point is reached they would likely have become prohibitively expensive.

Similarly, each succeeding slice of reductions is likely to demand more in the way of behavioral changes from Americans. The first 10% or 20% in emissions reductions might require little change beyond a willingness to pay a small amount for various efficiency improvements. But at some point, if we want to reduce emissions far enough, we will have to demand real sacrifices from people: either forcing them to spend big money for the efficiency improvements they need to continue behaving as they have, or forcing them to behave differently (drive smaller cars or take public transportation, eat less meat, forgo unnecessary plane flights, etc.). Again, at some point further behavioral-based reductions may not be possible, and long before then they would probably have become impossible to achieve politically.

The key point is that beyond some relatively easy initial steps, the deeper the emissions cuts, the more sacrifice they will entail. So the figures of 20% and 31% probably significantly underestimate how much more demanding immigration-driven population growth will make the emissions reductions need for the U.S. to do our part to limit climate change. Such population growth could easily make it two or three times more difficult to achieve our emissions reduction goals, in terms of the monetary costs or lifestyle changes demanded. Immigration-driven population growth thus makes it much less likely that Americans will achieve those goals. After all, we already have ample evidence of many of our fellow citizens' unwillingness to make significant behavioral changes or sacrifice financially in order to address climate change.

It is even possible that continued population growth could make it physically impossible to adequately reduce U.S. greenhouse gas emissions, even if all Americans wanted to do so. The maximum number of people that can be sustained over the long term in modern, industrialized societies requiring high levels of energy use to sustain a high standard of living for their members is simply unknown. There is considerable evidence that even the current U.S. population is much too high, if we hope to sustain ourselves in safety and comfort without resorting to levels and kinds of energy use that are toxic to the environment (Pimentel et al. 2010).

At this point, it would be helpful if we could make robust, exact predictions about how different immigration/population scenarios are likely to affect future U.S. greenhouse gas emissions. However, predicting population's influence more than a few decades in the future is bedeviled by the large uncertainties involved in predicting numbers for the other three principal factors in the Kaya identity (per capita GDP; energy used per unit of GDP; and greenhouse gas emissions per unit of energy). What we can quantify with confidence, however, is the magnitude of upward pressure on greenhouse gas emissions exerted by the population growth that would occur under each of our three reference scenarios.

Under the status quo immigration scenario, annual immigration of 1.25 million into the United States would result in a U.S. population of 524 million in 2100, an increase of 215 million or 70 percent above the 2010 population of 309 million. *Thus, there would be 70 percent greater upward pressure on greenhouse emissions under this alternative.* In other words, if there were no change at all in any of the other three factors, or changes in these factors cancelled each other out, U.S. greenhouse gas emissions would be 70 percent larger in 2100—solely due to population increase. This should be compared with the call of climate scientists for an 80 percent or more *reduction* in CO2 emissions by 2050 if our climate is to be stabilized at a temperature no more than 2◦ C above preindustrial levels.

Under the immigration expansion alternative, 2.25 million annual immigration into the United States would result in a U.S. population of 669 million in 2100. This is an increase of 360 million (117 percent) above the 2010 population of 309 million. Again, predicting the exact level, or even a reasonable range, of U.S. greenhouse gas emissions far into the future is all but impossible. However, it can be stated with certainty that *under the expansion alternative, upward pressure on greenhouse gas emissions would be substantially higher than under the status quo alternative, to wit, 117 percent greater versus 70 percent greater*. If each of the other three factors in the Kaya identity were to remain unchanged, U.S. greenhouse gas emissions in 2100 would be 117 percent higher than they are today—solely due to population increase.

Finally, under the immigration reduction alternative, 250,000 annual immigration into the United States would lead to a U.S. population of 379 million in 2100. This is an increase of 70 million (23 percent) above the 2010 population of 309 million. It is 145 million less than the 524 million projection for 2100 under the status quo alternative and 290 million less than the 669 million projection under the expansion alternative. *Under the reduction alternative, upward pressure on U.S. greenhouse emissions would be substantially lower than under either the status quo alternative or the expansion alternative, to wit: 23 percent greater for the reduction alternative, versus 70 percent greater for the status quo alternative and 117 percent greater for the expansion alternative.* While the lower immigration rates under this scenario would lead to a substantial slowdown in the rate of U.S. population growth, population size would still increase by 70 million, or 23 percent, between 2010 and 2100, because of current demographic momentum. However, this upward demographic pressure would be much less than under the other alternatives. Thus this alternative would leave more room for efficiency improvements to result in substantial, actual cuts in *total* U.S. greenhouse gas emissions (rather than just feel-good *per capita* reductions).

A crucial distinction needs to be noted between the magnitude of U.S. greenhouse emissions and the magnitude of the impact of climate change in 2100 on the American environment and economy. Annual greenhouse gas emissions from the United States do not cause a direct environmental impact in the U.S.; rather, they contribute indirectly and cumulatively in a tangible, non-trivial manner to what is the greatest long-term, cumulative environmental problem on Earth: global climate change. If U.S. greenhouse gas emissions somehow miraculously could be eliminated entirely by 2100, but the growth in emissions from the rest of the world continued unchecked, the effects on the climate of the United States would still be disastrous. Limiting climate change to a safe amount will take substantial international commitments and coordination.

Nevertheless, both self-interest and justice demand that the U.S. do its part to meet this challenge. U.S. population size is *and will remain* one key, underlying factor in determining the magnitude of U.S. greenhouse gas emissions, and U.S. national emissions are a significant part of the international problem. With the population of more than half a billion that would result under the status quo immigration alternative, it would be much more difficult for the U.S. to sharply reduce its greenhouse gas emissions and thereby do its part to address the climate predicament. It would be even more difficult, and perhaps impossible, to make a sufficient commitment with the population of more than two-thirds of a billion that would result under the immigration expansion alternative.

Conversely, slowing U.S. population growth, as would occur under the immigration reduction alternative, would itself make a significant contribution toward the U.S. living up to its responsibilities in this area. Stabilizing the U.S. population during the second half of the 21$^{st}$ century, which would occur under this scenario, would turn one of the four Kaya factors from an emissions magnifier to a neutral factor. This would open up space for efficiency improvements to lead to actual, deep emissions reductions. Under the immigration reduction alternative, it would be far more feasible for the United States to make a constructive contribution to the global partnership urgently needed to address global climate change.

## Immigration's Environmental Impacts: Water Demands & Withdrawals from Natural Systems

As we saw earlier, immigration has had and will have a large impact on U.S. population size. Because population size helps determine a society's environmental footprint, immigration has a major environmental impact on the country as a whole. This section documents some of immigration's environmental impacts on the waters of the U.S., focusing on its role in increasing withdrawals from natural systems (particularly rivers and streams) and diminishing the per capita water resources available for people.

Water is essential to all life—human and non-human, plant and animal, terrestrial and aquatic. Except for the American Southwest, the United States is comparatively well endowed with water resources and uses prodigious quantities of both surface water (withdrawn from human-built reservoirs, natural lakes and rivers) and groundwater (pumped from subterranean aquifers) to supply agriculture, industry and municipalities. In 2005, about 410,000 million gallons of water every day was withdrawn for use in the United States: more than a thousand gallons per person, or about 5,000 Rose Bowls filled to the brim. About 80 percent of our water supply is from surface water and the remaining 20 percent from groundwater (Barber 2009, USGS 2014a).

People use water to irrigate crops, to manufacture products ranging from steel to silicon chips to soft drinks, to water our lawns, fill our cooking pots, wash away our wastes, and even to cool our thermal (nuclear and coal) power plants. About 80 percent of water used in the U.S. is for agriculture (Pimentel et al. 2004), which is very water-intensive.

Figure 20 is a map of the United States showing total 2010 water use in each state. Notably, the two states with the largest withdrawals are California and Texas: the two most populous states in the country.

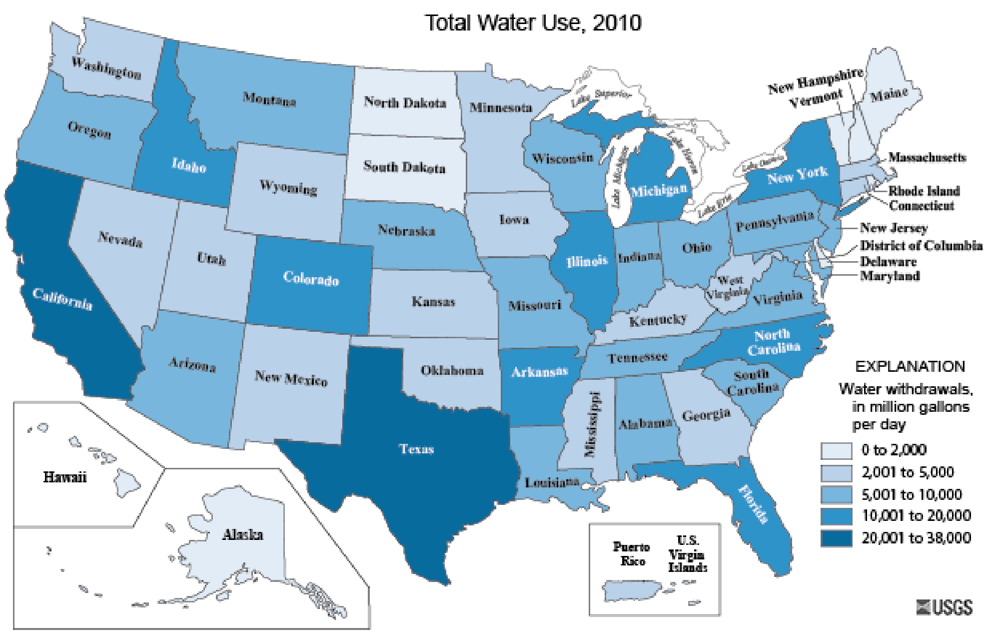


**Figure 20. Total water use in the United States, 2010, state by state.**
Source: USGS 2014b.

Figure 21 shows 2010 water withdrawals by sector, or type of use. The three largest categories were thermoelectric power, irrigation and public supply, cumulatively accounting for 90 percent of the national total (USGS 2014b).

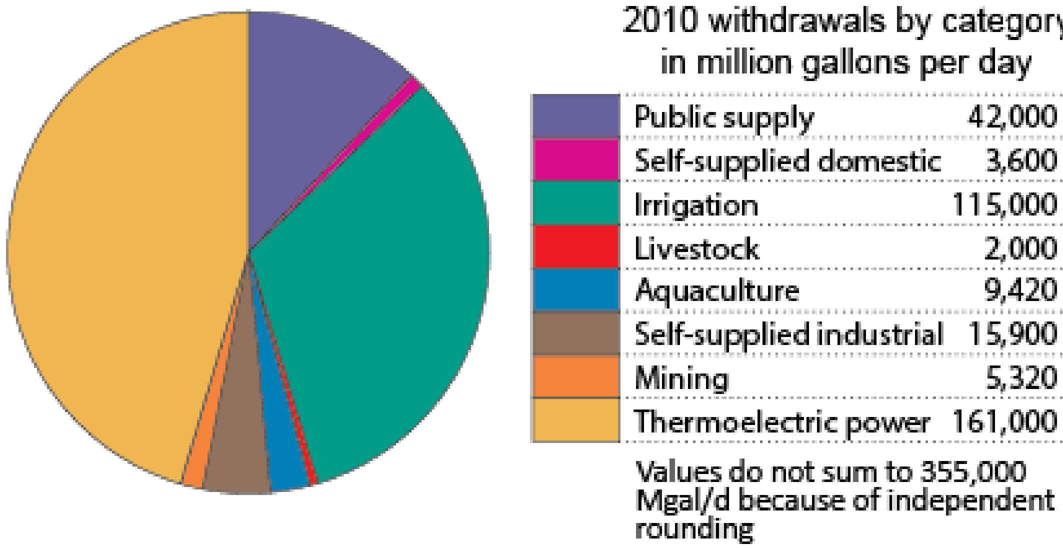


**Figure 21. Withdrawals by water use category or sector in 2010 (million gallons per day).** Source: Kolankiewicz 2015.

Aggregate water use (withdrawals) in the U.S. decreased 13 percent from 2005 to 2010, mostly due to the economic slowdown associated with the Great Recession of 2008. During this same period, the U.S. population increased by about 10 million inhabitants, or three percent. This demonstrates that the relationship between population size and aggregate water consumption is not a simple one; every added increment of population does not guarantee an added increment of water consumption. Besides the level of economic activity and population size, water conservation and efficiency measures also have a bearing in determining total water consumption. To a point, for a period of time, under special conditions and with strong public commitment and political support, total water use can be reduced—or at least held constant—even with a growing U.S. population, as it has been in recent years. However, it's worth remembering that if the U.S. population were stable, aggregate water use could be cut even more, given the same commitments made to water conservation, reuse and efficiency. That would allow more water to remain in streams, rivers and lakes.

In these natural settings, water performs valuable ecosystem services and functions. These not only include supporting aquatic biota, fisheries, and wildlife such as waterfowl, but also commercial navigation, hydroelectric power generation, recreation (e.g., boating, fishing, swimming), and even sightseeing and tourism. All these activities and human benefits depend on keeping a sufficiency of water in these ecosystems. So does the wellbeing of thousands of plant and animal species that live within them; indeed, they cannot continue to exist without a sufficiency of water. When too much water is taken from these ecosystems for consumptive use by human beings, there may not be enough water left behind to perform these critical ecosystem services and functions.

Aquatic ecosystems may be modified, and often damaged, by human activities other than the direct removal of water. This can occur from:

- flood control facilities (e.g., levees, channelization, dams);
- an increase in the number of developed areas and impervious surfaces within a watershed, which increase the volume and rate of runoff during storm events;
- land use practices within a watershed that cause erosion and lead to sedimentation within water bodies (e.g., crop cultivation, grazing, logging, deforestation);
- construction within floodplains that impedes the flow of water;
- navigation facilities within rivers, such as locks and dams on the Mississippi and Ohio rivers and many others;
- dredging of rivers and bays to maintain navigation channels;
- ports constructed and maintained in rivers, lakes, and bays;

• construction of dams for hydroelectricity or water diversion.

Note that increasing human populations increases the pressure to ratchet up all these activities. Dams, in particular, cause adverse changes downstream that can continue all the way to the river's mouth. The most important of these are reduction of spring flooding, which damages downstream wetlands and often interferes with fish reproduction; retention of sediment, which leads to increased bank and bed erosion downstream, loss of deltaic wetlands, and disappearance of sand on beaches along the seashore; and interference with the migration and reproduction of anadromous fish, such as wild salmon.

Protecting water *quality*, by avoiding and cleaning up water pollution, is just as important as preserving water quantity. Numerous human activities can adversely affect water quality, and these activities are often a reflection of high surrounding human population densities, or of damaging activities in rural areas that directly support high human populations elsewhere (e.g., mining, drilling for hydrocarbons, logging, grazing, crop cultivation). Excessive loadings of nitrogen and phosphorus fertilizers transported to streams, rivers, and lakes encourage explosive growth of "algal blooms," coating water surfaces and ultimately leading to low dissolved oxygen levels and fish kills (USGS 2014c). Bacteria such as fecal coliforms and pathogens such as giardia and cryptosporidium contaminate public-water supplies. Chemicals such as pharmaceuticals, dry-cleaning solvents, and gasoline that are used in urban settings are found in both surface water and groundwater. Endocrine disruptors, synthetic chemicals that interfere with the endocrine systems in both humans and wildlife, are a growing problem in many water supplies around the country.

In all these cases, the occurrence and severity of water pollution or impairment of water quality is directly related to human population size and/or density. There is very little natural pollution in the absence of human populations and their contaminant-generating activities. Even where pollution or impairment occurs in rural areas with low surrounding population density, it is because of nearby human activities such as mining, farming, ranching, logging, or hydrological modifications that produce raw materials or products consumed by human populations elsewhere. Both in terms of water quantity and water quality, a growing human population scales up the challenges of safeguarding the nation's water supply.

As a result of water withdrawals and water pollution, more than 123 freshwater animal species have been driven extinct in North America since 1900. Hundreds of additional species of fishes, mollusks, crayfishes and amphibians are considered imperiled today. Of North American freshwater species, nearly half of all mussel species, 23 percent of gastropods, 33 percent of crayfishes, 26 percent of amphibians and 21 percent of fishes are listed as either endangered or threatened because of anthropogenic impacts (USFWS 2016). Recent events like the multi-year drought in California and lead contamination in Flint, Michigan remind us that the U.S. also struggles at times to provide sufficient clean, uncontaminated water to its human population of 324 million people.

Let us consider the likely demands on U.S. water resources under our three reference immigration scenarios: reduction, status quo, and expansion. For purposes of comparison, we will assume that increased water efficiency and conservation measures can reduce aggregate per capita consumption of water by 25 percent by 2100. This will be assumed for each of the alternatives.

Under the status quo immigration alternative, 1.25 million annual immigration into the United States would lead to a U.S. population of 524 million in 2100. This is an increase of 215 million (70 percent) from the 2010 population of 309 million. Assuming an aggregate, across-the-country and across-the-board decline in per capita water demand of 25 percent due to implementation of improved water conservation and efficiency measures, total nationwide water demand would still increase by 27 percent between 2010 and 2100.

Effects on water resources from this growth would vary by region. The *2014 U.S. National Climate Assessment* divides the continental United States into six regions: Northeast, Southeast, Midwest, Great Plains, Southwest, and Northwest. Projected changes in precipitation due to anthropogenic climate change vary from region to region. So do population projections: the fastest growing regions in recent decades, also projected to grow the most rapidly in the foreseeable future, are the Southeast, Southwest and Northwest, although portions of the Great Plains states, especially Texas and Colorado, are also projected to add many millions of residents (Melillo et al. 2014).

Overall, according to the *Climate Assessment*, short-term (seasonal) droughts are expected to intensify in most U.S. regions. It states: "snowpack and streamflow amounts are projected to decline in parts of the Southwest, decreasing surface water supply reliability for cities, agriculture, and ecosystems" (Garfin et al. 2014). The Southeast region is also anticipated to experience water problems. One of the three key messages for the region in the *Climate Assessment* is: "Decreased water availability, exacerbated by population growth and land-use change, will continue to increase competition for water and affect the region's economy and unique ecosystems" (Melillo et al. 2014). While changes in projected precipitation for this region are highly uncertain, the reasonable expectation is that there will be reduced water availability due to the increased evaporative losses resulting from rising temperatures alone (Carter et al. 2014). Longer-term droughts also are expected to intensify in large areas of the Southwest, the southern Great Plains (Texas and Oklahoma), and the Southeast. Annual runoff and related river flows are projected to decline in the Southwest and the Southeast, and to increase in the Northeast, Alaska, the Northwest and the upper Midwest regions, generally reflecting projected precipitation patterns (Melillo et al. 2014).

Combining these precipitation and water availability projections with regional demographic projections and the assumptions of the status quo immigration alternative, it is apparent that under the status quo scenario, two rapidly growing regions in the country—the Southwest and the Southeast—will experience very grave problems with water availability that will have significant adverse effects on urban areas, agriculture and the already beleaguered aquatic ecosystems of these areas. Other regions of the country would face more manageable scenarios with regard to water resources. While demographic pressures on water quantity and quality would increase in most of these other regions, the potential for increased water efficiency and conservation, as well as more stringent pollution control measures and improved technologies, offer real prospects for meeting human water demands while maintaining or perhaps enhancing the integrity of aquatic ecosystems. Of course, if population were not growing so robustly, then savings from widespread implementation of water conservation and efficiency would allow more water to be retained in aquatic ecosystems rather than withdrawn from them. This in turn would benefit the flora and fauna of these natural systems, as well as restoring and enhancing the diminished levels of ecosystem services they currently furnish to society.

Under the immigration expansion scenario, 2.25 million annual immigration into the United States would result in a U.S. population of 669 million in 2100. This is an increase of 360 million (117 percent) from the 2010 population of 309 million. Assuming an average decline in per capita water demand of 25 percent due to implementation of improved water conservation and efficiency measures, total nationwide water demand would still increase by 62 percent between 2010 and 2100 under the immigration expansion alternative, due to rapid population growth.

Again taking into account projected changes in regional water availability according to the *2014 National Climate Assessment*, the situation under the immigration expansion alternative for the Southwest and Southeast would become even more precarious than under the status quo alternative. If immigration policy decisions move the U.S. toward a scenario like the expansion alternative and regional demographic trends of the past half-century persist for the remainder of this century, then *both the Southwest and Southeast would undergo a tripling or more of their current populations at the same time that each region has less water available*, and in the case of the Southwest, much less water available, than at present. Both of these regions are already experiencing severe water quantity and quality problems. These problems for the two most rapidly growing regions in the country would intensify enormously under the expansion alternative. Under this scenario, both regions may be forced to make politically unpalatable decisions.

Overall, the net effect of the immigration expansion alternative on water demands and withdrawals from natural systems would be highly adverse. The degree of severity of this effect would vary from region to region, with impacts in the Southwest and Southeast being the most severe. While water-saving practices and technologies could to some extent ameliorate the adverse effects on water resources of adding 360 million more Americans—more than a doubling the current population—they would come nowhere near to eliminating them.

In coastal areas, especially in Texas, California, and Florida—all of them experiencing population growth at much higher rates than the national average—pressure to build numerous desalination plants is likely to increase. The water emerging from these plants would likely be much costlier than current water supplies, and whether or not future Texans, Californians and Floridians could afford it is an open question. Removing salt from seawater is inherently energy-intensive, and if fossil fuels were to be burned to provide the needed energy, massive amounts of CO2 would be emitted into the atmosphere, worsening global warming. The rapid population growth under the immigration expansion alternative—to the end of the century and beyond—would likely force such hard choices and negative impacts, and perhaps others.

In stark contrast, under the immigration reduction scenario, 250,000 annual immigration into the United States would lead to a U.S. population of 379 million in 2100. This is an increase of 70 million (23 percent) from the 2010 population of 309 million. It is 145 million less than the 524 million projection for 2100 under the status quo alternative, and 290 million less than the 669 million projection under the expansion alternative.

Assuming, as in the other two alternatives, an average decline in per capita water demand of 25 percent due to implementation of improved water conservation and efficiency measures, total aggregate nationwide water demand would actually *decrease* by eight percent between 2010 and 2100. This is the only one of the three alternative scenarios considered that actually leads to a net reduction in the total nationwide water consumption by the year 2100.

While the net reduction in nationwide demand for water in the immigration reduction alternative would have a generally beneficial impact, two regions—the Southwest and the Southeast—might still encounter difficulties in meeting their water demands, because they would have faster population growth than the national average and because, according to climate modeling, they will have less water available than at present. However, these difficulties would be much more manageable than under either the status quo immigration alternative or the immigration expansion alternative.

Overall, the net effect of the immigration reduction alternative on water demands and withdrawals from natural systems would be modestly but significantly beneficial—provided that per capita water consumption were actually decreased by 25 percent, as assumed. This scenario, alone among the three, opens up the possibility of improving the environmental management of the waters of the U.S. With the notable exception of the Southwest and the Southeast, demands on water resources and withdrawals from aquatic ecosystems would remain relatively flat or decrease under the reduction alternative. This would allow more water to be retained "in-stream," increasing the flow not just of surface freshwater but also of ecosystems services provided to society. Rather than moving further into ecological overshoot, the immigration reduction alternative could facilitate environmental restoration of the nation's rivers, streams and estuaries, and thus the creation of an ecologically sustainable society.

**Conclusion**

This report has documented the importance of immigration-driven population growth in increasing environmental impacts on the lands, air and water of the United States—and the potential to decrease these environmental impacts through federal policies and actions that decrease immigration into the U.S. It has focused primarily on sprawl, loss of farmland, habitat and biodiversity loss, greenhouse gas emissions, and water demand and withdrawals from natural systems. In every case, we have seen that immigration-driven population growth is an important and *quantifiable* factor in increasing environmental impacts. If space permitted, similar results could be documented for increased air and water pollution, increased energy demands and resultant ecological degradation of lands and waters, and increased impacts on ecosystems outside the U.S. due to a rapidly growing U.S. population (Kolankiewicz 2015).

Creating an environmentally sustainable society is no mere amenity, but crucial to securing the resources necessary for the happiness and flourishing of future generations of Americans. That is why the U.S. Congress passed NEPA fifty years ago. But Americans cannot create a sustainable society within a context of endless population growth. It simply will not work. It is past time that the federal government recognized the immense role population growth plays in driving our environmental problems—and the plain words of NEPA—and subjected federal policies and actions with the potential to significantly influence U.S. population numbers to environmental analysis under the structure of NEPA.

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