

Residential Land Use in the U.S.

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In May 2006, two of the services operated by the U.S. Department of Agriculture (USDA) released land use studies. The Economic Research Service (ERS) released Major Uses of Land in the United States, 2002, a study that is published every five years. The Natural Resources Conservation Service (NRCS) released National Resources Inventory: 2003 Annual NRI, which used to be published on a five-year cycle but shifted to an annual schedule in 1997 with a reduction in the number of sample sites surveyed.

Although both studies contain useful information on the nation's 2.26 billion acres of land (1.89 billion acres in the contiguous 48 states), some of the information can be difficult to interpret; at the same time, the data sources used to generate the studies vary in quality. The ERS study combines information from a variety of sources, including several surveys, not all of which are compatible with one another. The NRCS study is based on a survey of conditions in several nonfederal sample sites, which, by definition, are subject to sampling error.

The ERS and NRCS studies employ terms such as urban, developed, built-up, and residential to describe land cover. Whichever term is used, it pertains to a relatively small percentage of the nation's total land area. Indeed, lack of precision in the estimates can make it difficult to identify nationwide trends based on changes affecting small acreages over a short period of time. Over a longer period, however, it is clear that the amount of land in urban or residential use has increased substantially, but whether that growth has coincided with a reduction in other important land uses, such as natural resource conservation or agriculture, is less clear. Answers often depend on the time frame of interest and the definitions used.

In addition, given that USDA studies understandably focus on agriculture, they do not explore all possible topics related to residential land cover. For

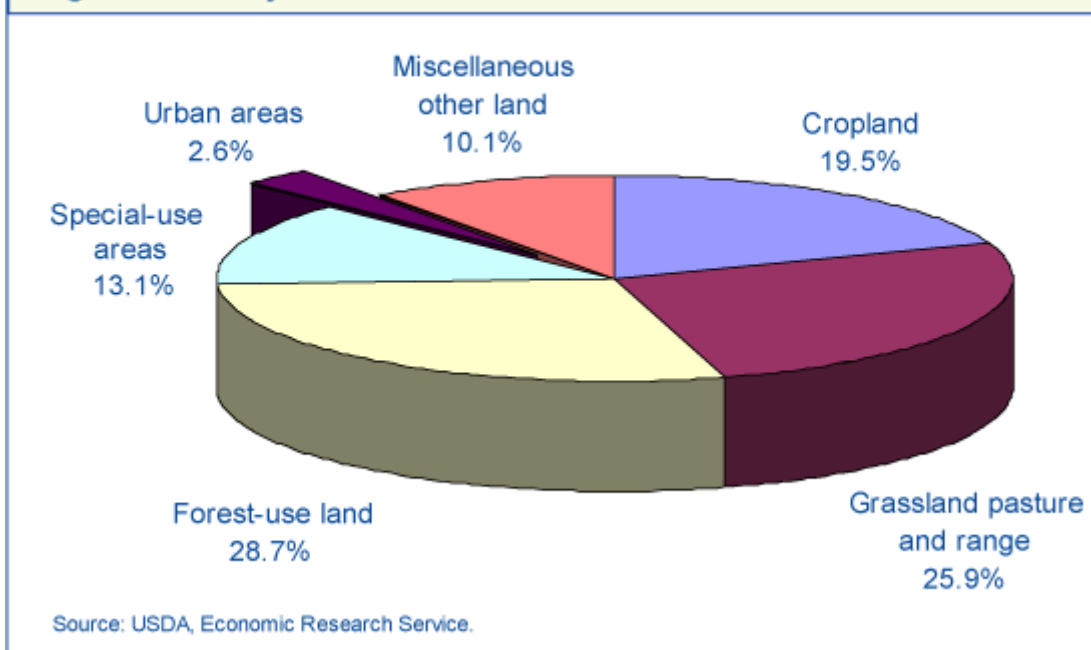
example, a large amount of residential land is associated with single-family housing units sited on 10-acre-plus non-farm lots, suggesting that the country has substantial capacity to absorb further residential development without expanding beyond the boundaries of already established urban areas.

Urban Areas

The ERS's Major Uses of Land in the United States uses a system developed by the Census Bureau to partition the nation's 2.26 billion acres into urban and rural areas. By 1990, cartography and computer techniques had advanced sufficiently to allow the Census Bureau to subdivide the nation's entire land surface into blocks (small areas usually bordered by roads, other visible features, and property or political boundaries) and maintain all boundaries in a single database. The process underwent substantial refinement in 2000 [1] such that the nation now comprises a little over 8.2 million census blocks.

Like other geographic units (counties, congressional districts, census tracts, and so forth), urban areas are contiguous collections of blocks and are designed to capture contiguous groups of densely settled blocks containing at least 2,500 persons [2]. The Census Bureau uses the term urban cluster for densely settled territory containing 2,500 to 50,000 inhabitants and the term urbanized area for densely settled territory containing more than 50,000 residents. Urban clusters and urbanized areas define all the densely settled or urban territory in the United States; everything else is rural. As for the rural areas, the ERS's Major Uses of Land in the United States uses data from a variety of surveys to divide the country's rural territory into a set of land use categories (Figure 1).

Figure 1. Major Uses of Land in the United States: 2002



Densely settled urban areas account for 59.6 million acres (or only 2.6 percent) of the nation’s land area—far less than any of the other major land uses. In fact, the land area encompassed by urban areas falls far short of the “grab bag” categories called special uses (features such as rural highways and national parks) and miscellaneous other uses (features such as swamps and deserts).

The ERS uses Census Bureau definitions of urban areas that are based on the most precise measurements available and comprehensively cover the territory of the United States. Unfortunately, however, definitional changes in 2000 mean that the 59.6 million acres reported in the ERS’s 2002 study are not comparable with figures reported in earlier studies. As a result, the ERS’s 2002 study states that the nation’s total urban area was 6 million acres lower than in 1997. Clearly, the figures do not imply that urban areas simply disappeared over time. It is safe to say, however, that—whatever the rate of urbanization in the United States between 1997 and 2002—it has not been sufficient to offset the reduction caused by increasing definitional precision.

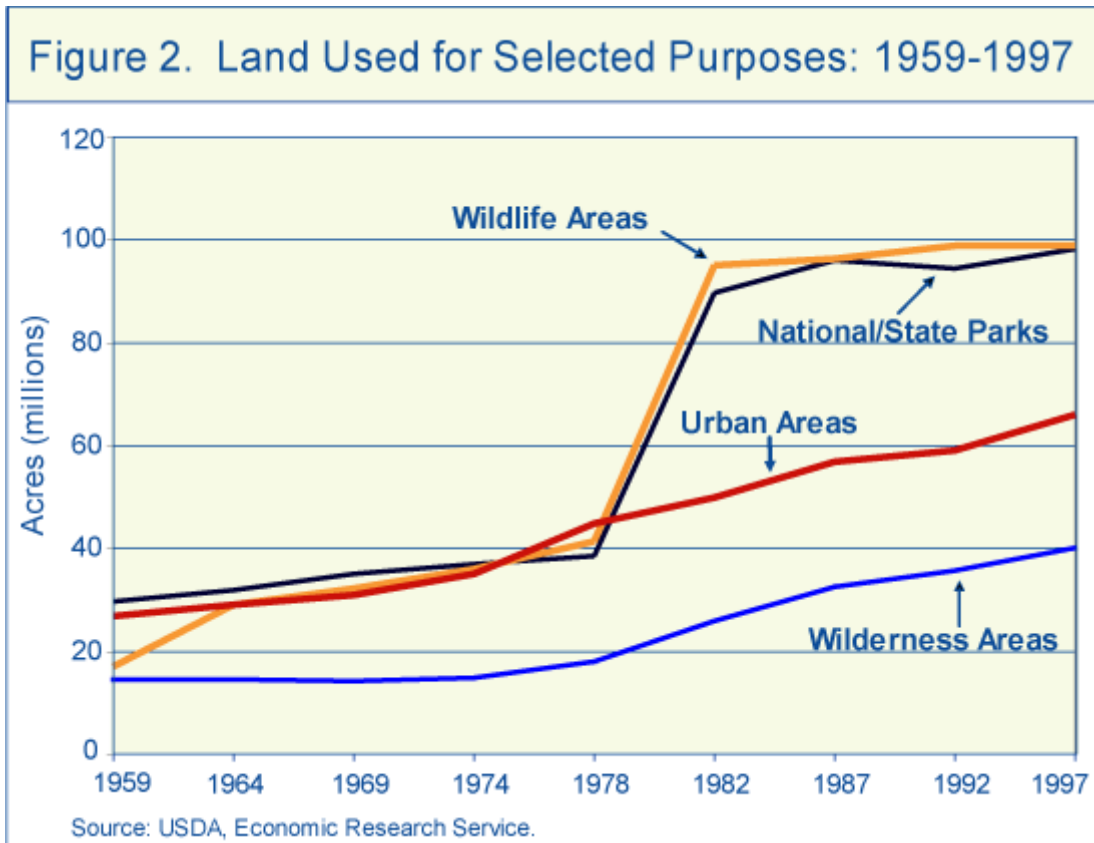
Over a longer period, an increase in the acreage of the nation’s urban land is easy to document. The section of the ERS study on trends in residential land use begins with the statement, “Urban land area has quadrupled from roughly 15 million acres in 1945 to an estimated 60 million acres in 2002.

The Census Bureau reports that the U.S. population nearly doubled over this same period. Thus, urban land area has increased at about twice the rate of population growth.”

Conservation and Agriculture

As the acreage of urban land continued to grow, acreage in other land use categories was also growing—particularly land uses that, like urban areas, covered a relatively small percentage of the nation’s total land area and could easily expand into territory that may not have been in high demand for other purposes after World War II.

It is instructive, for instance, to consider the subcategories of special uses associated with resource conservation. Figure 2 graphs percentages for special uses based on the ERS studies published between 1959 and 1997 (the period after Alaska and Hawaii became states but before the recent change in the definition of urban areas). While the amount of land in urban areas increased by 144 percent over the 38-year period, the land in wilderness areas (administered by the U.S. Forest Service and the Bureau of Land Management) increased by 176 percent, the land in national and state parks increased by 230 percent, and the land in wildlife areas (administered by the U.S. Fish and Wildlife Service and state wildlife agencies) increased by 476 percent. Based on these numbers, it is difficult to make the case that urbanization crowded out admittedly important conservation-related land uses.



Food production is a particularly important use of the nation’s land, and both the ERS and NRCS studies provide measures of cropland. The ERS study shows 442 million acres of cropland in the United States in 2002. The NRCS study, which is based on a different methodology and excludes Alaska and Hawaii, shows 368 million acres of cropland in 2003.

What matters for food production, however, is the actual acreage of cropland in production (some land sits idle). The ERS study shows 340 million acres of cropland used for production in 2002. Whether the trend for cropland in production shows an increase or decrease depends on the starting point. For example, the study shows that cropland used for production declined by about 6 percent between 1974 and 2002 but increased by 2 percent between 1969 and 2002 (Table 1).

Table 1. Change in the Amount of Land Used for Crops Differs Depending on When You Start Measuring		
Base Year	Cropland Used for Crops (millions of acres)	Change between Base Year and 2002
1959	359	-5.3%
1964	335	+1.5%
1969	333	+2.1%
1974	361	-5.8%
1978	369	-7.9%
1982	383	-11.2%
1987	331	+2.7%
1992	338	+0.6%
1997	349	-2.6%
2002	340	0.0%

Source: USDA, Economic Research Service.

The NRCS study shows a slow but steady decline (average 0.7 percent per year) in cultivated cropland between 1992 and 2003 but a steady increase (average 1.9 percent per year) in the acreage of non-cultivated cropland. These net changes appear to mask considerable underlying activity. The NCRS 2002 study (which is designed to track movements into and out of various land uses) concludes, “Land use is surprisingly dynamic, with annual shifts in and out of different uses. . . . In agriculture, there are frequent shifts in the use of land among cropland, pastureland, rangeland, and forest land.”

The tendency toward a shift in land uses makes it difficult to argue that urbanization is crowding out agricultural activity in any significant way, especially given the small amount of acreage in urban use relative to cropland. Some observers characterize the quadrupling of urban land since World War II as sprawl, but it is important to remember that, to date, urban areas have managed to “sprawl” over only 2.6 percent of the nation’s land.

Other Definitions

Though precise, the Census Bureau’s definition of urban area used by the ERS excludes some territory that may be of interest to residential developers, namely, areas outside urban areas that account for a significant number of housing units [3]. This reality, among other factors, has led USDA researchers to produce acreage estimates based on broader definitions of land use. Such estimates, however, arm no-growth advocates with arguments pointing to urbanization’s rapid consumption of land. Indeed, such advocates of no-growth policies often cite one of the broader measures simply because it covers a larger proportion—although still less than 7 percent—of the nation’s land. For comparability, the percentages in Table 2 are derived by dividing the number of acres in a particular category by the total acres of land in the United States as reported in the ERS 2002 study. (It is important to note that some of the acreage statistics come from the NRCS survey, which excludes Hawaii and Alaska).

Table 2. 2002 Land Use Estimates Based on Different Definitions		
	Land Area (millions of acres)	Percent of All Land in the United States
Urban areas 1	59.6	2.6%
Built-up land 2	84.3	3.7%
Developed land 2	107.3	4.7%
Urban plus rural residential 3	154.0	6.8%

Sources:
1U.S. Census Bureau.
2USDA, National Resource Conservation Service.
3USDA, Economic Research Service.
All numbers reported in *Major Uses of Land in The United States, 2002*, USDA, Economic Research Service.

The alternative definition that comes closest in spirit to the Census Bureau’s urban area concept is NRCS’s urban and built-up land, which encompasses territory in residential, industrial, and commercial uses [4]. Urban and built-up land is based on the NRI survey of land sites rather than on census blocks and captures 3.7 percent rather than 2.6 percent of the nation’s land

In general, the amount of urban and built-up land is a statistic that often goes unreported. The NCRS 2003 study, for example, does not use the statistic anywhere in its description of land uses. Instead, it reports the amount of developed land, which covers 4.7 percent of the nation’s land and includes,

in addition to urban and built up areas, rural transportation land (all public and private highways, roads, railroads, and associated rights-of-way outside urban and built-up land). Given that rural transportation has little relation to housing and accounts for over 30 million of the 107 million acres in developed land, the developed land category is not as useful as the other measures in Table 2 in a discussion about residential development.

Subject to several qualifications, a relevant measure is the 154 million acres reported in the ERS study as urban plus rural residential land. The study arrives at that figure by starting with the roughly 60 million acres in urban areas and then using data from the American Housing Survey (AHS) to calculate a rural residential land estimate of 94 million acres. The rural residential estimate, in turn, is derived from lot sizes reported by AHS respondents residing in housing units located outside of urban areas. The ERS study then makes two adjustments to the total land area covered by these lots to arrive at the final figure of 94 million acres. First, to exclude cropland, it subtracts lots for which respondents report earning farm income. Second, it adds an estimate for the land occupied by multifamily units (for which the question on lot size is not asked) that is derived by multiplying the number of multifamily units in rural areas by the smallest lot size observed for a single-family lot in the AHS sample.

Clearly, urban plus rural residential land represents a creative use of available data, but it is essential to remember that the U.S. Department of Housing and Urban Development and the Census Bureau conduct the AHS for purposes other than reporting on the nation's land area. Therefore, relying on AHS data to estimate rural residential land involves some drawbacks. First, it is impossible to distinguish the AHS-based rural residential land estimate from land in any of the other categories reported in the ERS study. The ERS study speculates that rural residential land may represent some combination of areas also counted as forest, grassland, or miscellaneous, but there is no way to verify such a speculation. Second, and a point not mentioned in the ERS study, a portion of the land counted as rural residential could also be counted as urban. This seeming contradiction occurs because the area identified as urban in the AHS is based on the 1980 Census Bureau definition of urban land [5]. Reliance on the current definition of urban land and the addition of an estimate of rural residential based on what was classified as nonurban in 1980, per the ERS study, could therefore result in double counting [6]. The change in urban areas is

relatively small, however, so the impact of any double counting on the 94 million acres of rural residential land would be minor.

As compared with urban areas, the amount of rural residential land estimated by the ERS is not only greater, but it is also growing faster (almost 30 percent between 1997 and 2002). Accordingly, any concern about expanded use of land for housing in the United States should focus on rural residential areas.

Inside the Totals

The size of the affected area and rate of growth make it worthwhile to examine the rural residential category in more detail. Using data from the most recent (2005) AHS and following the procedure used in the ERS study, we look at single-family housing units in rural areas. In addition to excluding housing units that report significant income from farming, we exclude any units that report another house sited on the lot, thereby permitting an unambiguous measure of density (housing units per acre). Rural residential lots with significant farm income account for about 8.8 million acres; rural residential lots with more than one housing unit account for about another 500,000 acres.

The AHS data indicate that, in rural areas, about 34 million lots have only one single-family home and do not generate significant farm income. They are spread out at an average density of about one home per 3.5 acres, but the distribution is far from even. Homes on lots of at least 10 acres account for nearly 79 million acres of the total land covered by rural residential lots (at an average density of about one home per 18 acres).

In many cases, it seems unlikely that all 10-acre-plus lots are developed in a manner suggestive of lots in urban subdivisions. At one home per 18 acres, much of the land probably more closely resembles the average person's concept of open space. Moreover, a substantial share of the land making up large rural lots likely could be converted to another use, such as agriculture, if the right economic incentives were in place.

For urban areas, there is a perhaps surprising analogy to the large-lot analysis. The 2005 AHS shows that about 22 million acres of land in urban areas account for single-family homes sited on 10-acre-plus lots that are not generating significant farm income [7]. Again, the average density is about one home per 18 acres. As with large lots in rural areas, it seems likely that

the right economic incentives could free land on these large urban lots for other uses, such as the creation of additional residential subdivisions.

Conclusion

Residential development, food production, and the conservation of natural resources all represent important uses of the nation's land. Misconceptions abound about the amount of land available and the role played by residential development in the overall mix of acreage. Even though the USDA produces several land use measures, each of which must be decoded to understand its underlying factors, it does not appear credible to argue that home building is crowding out other important land uses at the national level. Clearly, though, the land supply may be severely constrained in particular local areas.

Urban or residential land, however it is measured, covers a relatively small percentage (at most 7 percent) of the total land area in the United States. The only USDA statistic indicating that residential development's share accounts for more than 4 percent of the nation's total land area or has recently been growing at an unambiguously fast pace is the ERS's estimate of urban plus rural residential land. However, the data used to generate the estimate show that a large portion of the affected land consists of individual homes sited on lots that average 18 acres—in urban as well as rural areas—a figure that does not correspond even closely to the conventional notion of residential development.

In rural areas, the fact that large lots are not used for farming suggests that the land is not sufficiently productive to make farming profitable, given current demand for agricultural products. In urban areas, large lots provide a means by which the supply of housing could be significantly increased without expanding beyond existing urban boundaries, provided that local jurisdictions allow an increase in overall housing density.

Footnotes:

[1] It primarily changed the system used to assign a number to each block, which allowed the Census Bureau to define a greater number of blocks.

[2] Densely settled generally means at least 1,000 persons per square mile, plus surrounding and connecting areas with lesser population densities, at least 500 persons per square mile, or other blocks with lower densities.

[3] Urban areas also, of course, include territory that is not residential.

[4] The official NRI definition also lists institutional land; construction sites; public administrative sites; railroad yards; cemeteries; airports; golf courses; sanitary landfills; sewage treatment plants; water control structures and spillways; small parks within urban and built-up areas; and highways and other transportation facilities if surrounded by urban areas.

[5] The AHS deliberately maintains old geographic classifications to facilitate comparisons between surveys conducted in different years.

[6] It could also inappropriately miss counting some residential lots because urban territory contracted somewhat in 2000 (although not back to the land area covered in 1980) due to the refinement in the Census Bureau's classification system.

[7] In the AHS data, none of the single-family homes in urban areas shows significant farm income.

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