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Major Uses of Land in the United States, 2007

Cynthia Nickerson, Robert Ebel,
Allison Borchers, and Fernando Carriazo



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A Report from the Economic Research Service

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Major Uses of Land in the United States, 2007

Cynthia Nickerson, cnickerson@ers.usda.gov

Robert Ebel, rebel@ers.usda.gov

Allison Borchers, aborchers@ers.usda.gov

Fernando Carriazo

Abstract

The United States has a total land area of nearly 2.3 billion acres. In 2007, the major land uses were forestland at 671 million acres (30 percent); grassland pasture and rangeland at 614 million (27 percent); cropland at 408 million (18 percent); special uses (primarily parks and wildlife areas) at 313 million acres (14 percent); miscellaneous uses (like tundra or swamps) at 197 million acres (9 percent); and urban land at 61 million acres (3 percent). This report presents findings from the most recent (2007) inventory of U.S. major land uses, drawing on data from the U.S. Census Bureau, public land management and conservation agencies, and other sources. The data are synthesized by State to estimate the use of several broad classes and subclasses of agricultural and nonagricultural land over time. National and regional trends in land use are compared with earlier major land-use estimates.

Keywords: Land use, land-use change, agricultural land, nonagricultural land, cropland, forest-use land, forestland, pasture, rangeland, rural residential land, urban land

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Preface

The U.S. Department of Agriculture's Economic Research Service (ERS) has provided major land-use estimates for the United States for over 50 years, offering the only consistent accounting of all major uses of public and private land in the United States. Francis Marschner made some of the earliest contributions (1922-40) in the *Atlas of American Agriculture* when he was with ERS's predecessor agency, the Bureau of Agricultural Economics. A consistent series was started in 1945 and has since been published at intervals coinciding with the Censuses of Agriculture. Marschner was also involved in the 1945 land-use inventory (Reuss et al., 1948). A wide range of researchers, policy analysts, and organizations have used the data in econometric models and elsewhere. The annual cropland portion of the series has been maintained since 1910.

To ensure comparability with earlier estimates in the series, researchers rely on a standardized set of procedures to measure land use (Barnard and Hexem, 1988). Even so, comparability is sometimes hindered by changes in the types of data available over time. This change is inevitable because the estimates are not drawn from a single source but are derived by reconciling several data sources.

Economic analyses often require consistent acreage estimates of land use. Before 1945, area estimates of major land uses were not consistently available for all States and all major uses of land. Various agencies had data on land use that differed widely in definition, collection criteria, and acreage. No single agency provided data on all land uses that would sum to the total land in the United States. For example, the USDA Forest Service had data on forestland, while the Bureau of Land Management provided public grazing land acreage. The Census of Agriculture collected information on cropland and rangeland, but only if the acreage was included in "land in farms," missing agricultural land not in farms. Various other Federal and State agencies provided data on parks, fish and wildlife areas, roads, railroads, defense installations, and other categories.

Data availability has continued to improve due to new data collection efforts and advances in technology, such as satellite imaging and geographic information systems (GIS). For example, the U.S. Geological Survey produced a satellite-based National Land Cover Database (NLCD), which covered the 48 contiguous States for 1992, 2001, and 2006. These data offer comprehensive coverage and unparalleled detail on the distribution and pattern of land cover, as well as aggregate acreage statistics. Satellite data, however, cannot provide information on certain land uses as opposed to land covers. For example, NLCD cannot distinguish between grazed and ungrazed forests—both of which have tree cover, but have different uses—or between hayland (a crop) and pasture (used for grazing).

Since 1982, USDA's Natural Resources Conservation Service (NRCS) has published the National Resources Inventory (NRI), a successor to the Conservation Needs Inventory. The NRI is based on a survey of all non-Federal land and includes agricultural land not covered by the Census of Agriculture. The NRI, however, does not cover Federal land, which accounts for about 29 percent of total U.S. land area. Also, the 2007 NRI concentrated on the 48 contiguous States; estimates for Hawaii and Alaska's 365 million acres (16 percent of the total U.S. land area) are underway. ERS remains the only source of consistent major land-use estimates for all 50 States.

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Data files and additional summary tables with historical data are available online as part of the ERS data product, “Major Land Uses” at <http://www.ers.usda.gov/data/majorlanduses/>. This data product includes data by region and State (1945-2007) for major uses of cropland and components of cropland, pasture and range, land in special-use areas, forest-use land, urban area, and irrigated land in farms.

Summary

What Is the Issue?

The ERS *Major Land Uses* (MLU) series is the only accounting of all major uses of public and private land in all 50 States. These State estimates were started in 1945 and have been consistently published at roughly 5-year intervals, coinciding with the Census of Agriculture. Land use and land-use changes involve important economic and environmental implications for commodity production and trade, open space, soil and water conservation, and other policy issues. To study land-use change, statistics on land use over time must be developed. This publication presents the results of the latest inventory (2007) of U.S. major land uses and discusses national and regional trends in land use compared with earlier estimates.

What Did the Study Find?

The U.S. land area totals nearly 2.3 billion acres. Major land uses in 2007 included forest-use land at 671 million acres (30 percent); grassland pasture and range at 614 million acres (27 percent); cropland at 408 million acres (18 percent); special uses at 313 million acres (14 percent); miscellaneous uses at 197 million acres (9 percent); and urban land at 61 million (3 percent).

Cropland. Total cropland includes land planted for crops (82 percent of total cropland), cropland used for pasture, and idled cropland (including acreage removed from production under Government programs, such as the Conservation Reserve Program). Total cropland increased in the late 1940s, declined from 1949 to 1964, increased from 1964 to 1978, and decreased again from 1978 to 2007. Between 2002 and 2007, total cropland decreased by 34 million acres to its lowest level since this series began in 1945, even though harvested cropland (which accounts for most land planted to crops) increased 5 million acres due to a recovery of failed cropland from severe droughts in 2002. A 26-million-acre decline in cropland pasture contributed to this trend, partly due to methodological changes in the 2007 Census of Agriculture that reclassified some cropland pasture to permanent grassland pasture and range.

Grassland Pasture and Range. The estimated acreage of grassland pasture and range increased by 27 million acres (almost 5 percent) between 2002 and 2007, partly offsetting a decline in this land-use type during 1945-97. The recent increase almost exactly offsets the decline in cropland pasture over the same period. Based on acreage for all grazing land (the sum of grassland pasture and range, cropland used for pasture, and grazed forests), land available for grazing declined from 783 million acres in 2002 to 777 million acres in 2007, continuing a downward trend since the 1940s.

Forest-Use Land. Forest-use land in 2007 includes 127 million acres of grazed forests, but excludes an estimated 80 million forest acres in parks, wildlife areas, and other special uses. Forest-use land increased 20 million acres (3 percent) from 2002 to 2007, continuing a trend that became evident in 2002 and reversing an almost 50-year downward trend. The 14-percent decline in forest-use land between 1949 and 2002 was largely due to forest-use land reclassified to special-use areas.

Urban and Rural Residential Areas. Urban land acreage quadrupled from 1945 to 2007, increasing at about twice the rate of population growth over this period. Land in urban areas was estimated at 61 million acres in 2007, up almost 2 percent since 2002 and 17 percent since 1990 (after adjusting the 1990 estimate for the new criteria used in the 2000 Census). The Census Bureau estimates that urban area increased almost 8 million acres (13 percent) during the 1990s. Census estimates based on the previous criteria indicate that urban area increased 9 million acres (18 percent) during the 1980s, 13 million acres (37 percent) during the 1970s, and 9 million acres (36 percent) during the 1960s. Estimated rural residential acreage outside urban areas increased to 103 million acres between 2002 and 2007. In percentage terms, this 9-million-acre (10-percent) increase is about a third of the 21-million-acre (29-percent) increase over the previous 5-year period (1997-2002) and reflects the downturn in the residential housing market that occurred during the mid 2000s. Despite continuing large percentage increases in urban and rural residential areas, declines in the remaining rural area are small given the size of the available land base.

Special-Use Areas. Special-use areas include rural transportation, national/ State parks, wilderness and wildlife areas, national defense and industrial areas, and farmsteads and farm roads. Over all 50 States, special-use areas have increased nearly threefold since 1959, including a fourfold increase in rural parks and fish and wildlife areas. Over 2002-07, special-use areas increased more than 16 million acres (6 percent). Some of the estimated rise in special-use areas from 2002 to 2007 was driven by improved data, leading to a reclassification of miscellaneous and other land, which declined by 31 million acres (14 percent) over the same period.

Regional Patterns. Regional land-use patterns vary with differences in soil, climate, topography, and population. Relatively stable patterns of land use at the national level obscure larger land-use changes at regional and State levels. For example, while cropland used for crops remained constant nationally between 1964 and 2007, cropland used for crops increased by 12 million acres in the Corn Belt and Northern Plains and decreased by 12 million acres in the remaining regions. Over this 43-year period, the distribution of acreage used for crops across major crop-producing regions remained about the same.

Ownership. Nearly 60 percent (1.35 billion acres) of the land in the United States is privately owned. The Federal Government owns 29 percent (653 million acres), over a third of which is in Alaska. State and local governments own about 9 percent (198 million acres). About 3 percent (66 million acres) is in trust by the Bureau of Indian Affairs. There were no major changes in these aggregate ownership statistics from 2002 to 2007. Foreign ownership accounted for about 1 percent (22 million acres) of U.S. land in 2007.

How Was the Study Conducted?

Data from USDA Forest Service and National Agricultural Statistics Service, the U.S. Census Bureau, public land management and conservation agencies, and other sources were compiled by State to estimate the uses of several broad classes and subclasses of land in 2007. Standardized procedures were used to develop the estimates. Estimates of cropland, urban area, and special

uses, which are based largely on census data and administrative data, are developed first. The estimates of forest-use land and grassland pasture and range are then developed, followed by miscellaneous land uses. Though all land-use categories require reconciliation among sources at the State level, some categories in the MLU series are adjusted more than others based on the residual amount of land after other uses are tabulated. These categories include miscellaneous land and, to some extent, grassland pasture and range—categories for which less reliable data sources are available relative to cropland and forest-use areas. In general, more confidence should be put in the broader land-use trends over decades rather than specific 5-year fluctuations.

How Land Is Used

The United States has a total land area of about 2.3 billion acres, which are allocated among a variety of uses (fig. 1). In 2007, the largest shares of the Nation's land were allocated to **forest use, grassland pasture and range, and cropland** (see "Appendix: Definitions and Explanation of Data" for detailed descriptions of terms in **bold** in this report). About 18 percent of the U.S. land area was cropland in 2007, 27 percent was permanent grassland pasture and range, and 30 percent was forest-use land.¹ **Urban areas** accounted for 3 percent of U.S. land, while a variety of **special uses**—including parks and wilderness areas, transportation, and national defense areas—accounted for 14 percent of the land base, and **miscellaneous other** uses comprised the remaining 9 percent. These land-use percentages are affected significantly by the land area of Alaska, which, relative to the contiguous 48 States, has small amounts of cropland and pasture but large areas of forest-use, special-use, and miscellaneous other land. The full set of historical estimates and summary tables for 2007, by region and State, are available as an ERS data product, *Major Land Uses*.²

Land classified as cropland totaled about 408 million acres in 2007 (fig. 1) and represented all land in crop rotation, including **cropland pasture** (fig. 2). **Cropland used for crops—cropland harvested, cropland failure, and cultivated summer fallow**—totaled 335 million acres, or 82 percent of total cropland acreage (table 1). Nearly 9 percent of total cropland was used only for pasture, while another 9 percent of total cropland was classified as **idle cropland**. Acreage enrolled in the USDA Conservation Reserve Program (CRP) is included in this category. The CRP, established by the 1985 Food Security Act, is the largest Federal program idling cropland, offering annual rental payments to farm owners and operators who voluntarily retire environmentally sensitive cropland under 10- to 15-year contracts.³ In 2007, the CRP paid about \$1.8 billion to retire nearly 37 million cropland acres (an area slightly larger than the State of Iowa).

In 2007, land used for agricultural purposes—cropland, grassland pasture and range, **forestland grazed**, land in farmsteads, and farm roads and lanes—totaled 1.16 billion acres, about 51 percent of total U.S. land area (table 1). By comparison, the National Agricultural Statistics Service (NASS) estimated 921 million acres of "land in farms" in 2007 (USDA/NASS, 2009a). The difference between the two estimates is mostly accounted for by grazing lands (both forested and nonforested) that are not included in the NASS definition of a farm.

Livestock grazing was the primary use of an estimated 614 million acres of permanent grassland pasture and range, accounting for 27 percent of all U.S. land and slightly more than half of all agricultural land. When cropland pasture (36 million acres) and forested grazing land (127 million acres) were added to the permanent grassland acreage, total grazing land accounted for 777 million acres, or 34 percent of the total U.S. land area and two-thirds of all agricultural land.

Forest-use land not grazed (total forestland minus land grazed and in special uses, such as national and State parks) amounted to 544 million acres and the

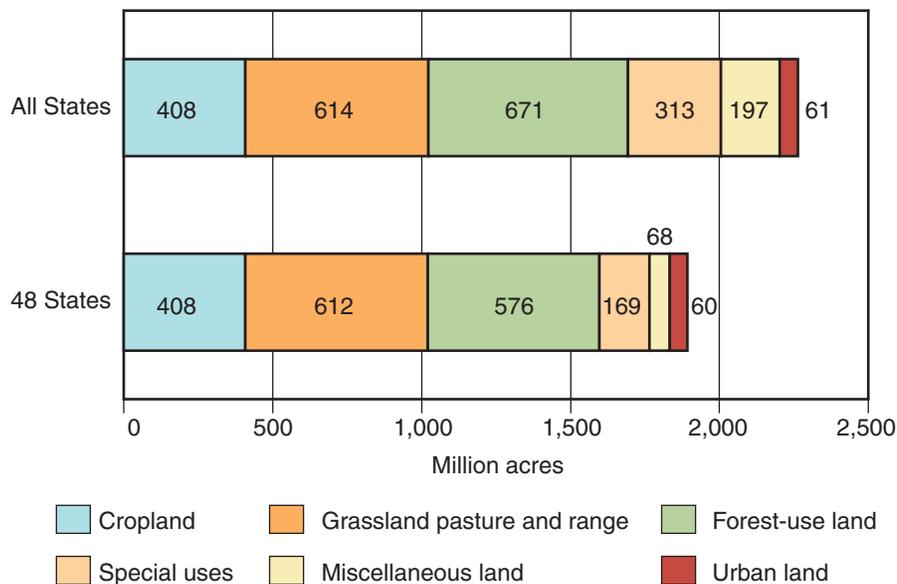
¹The forest-use designation excludes about 80 million acres of **forestland in special uses**, such as parks and wildlife areas. **Forestland** used for all purposes in 2002 totaled 749 million acres, nearly a third of the land area of the United States.

²See <http://www.ers.usda.gov/data/majorlanduses/>.

³Some CRP land is planted to trees. These lands are considered idled cropland because the CRP contracts are short term and the land could revert to cropland at the expiration of the contract. However, tree-covered CRP land may be less likely to revert to cropland once the contract expires (Petrolia and Ibendahl, 2008).

largest share of nonagricultural land (table 1). Nonagricultural special-use areas (excluding 12 million acres of special-use land in farmsteads and farm roads) accounted for an estimated 301 million acres, about 13 percent of the Nation’s land area. Of this amount, Federal and State parks, wildlife refuges, and related acres occupied 252 million acres, 11 percent of the total land base. **Rural transportation** land accounted for another 27 million acres, and defense and other public installations and facilities accounted for about 22 million acres.

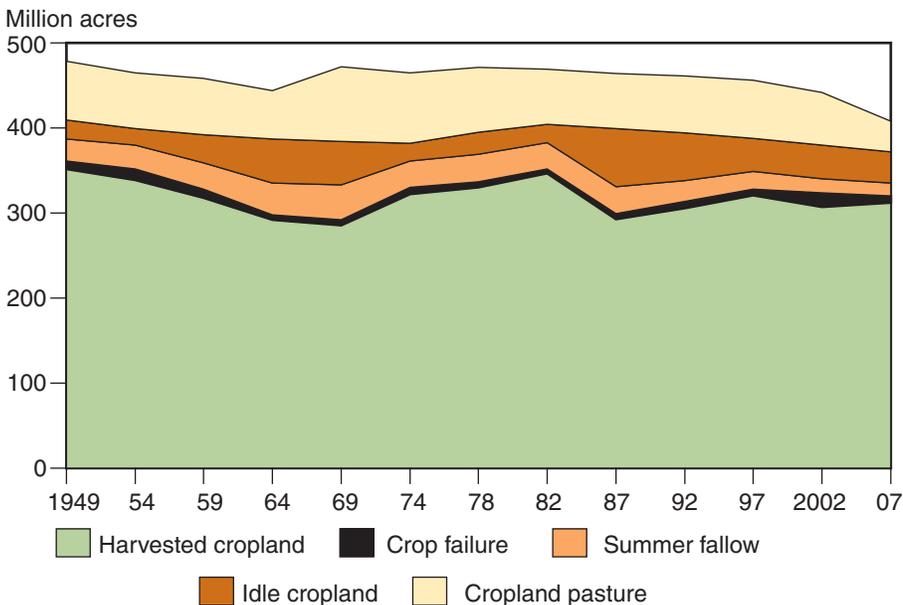
Figure 1
Major uses of land, 2007



Notes: Cropland includes all land in crop rotation, including cropland used for crops, idle cropland, and cropland used only for pasture. Idle cropland includes about 37 million acres under the Conservation Reserve Program (CRP). Grassland pasture and range includes permanent grassland and other nonforested pasture and range. Forest-use land is total forestland as classified by USDA Forest Service, excluding an estimated 80 million acres used primarily for parks, wildlife areas, and other uses. Special-uses land includes areas for rural transportation, recreation and wildlife, various public installations and facilities, farmsteads, and farm roads, including the 80 million acres of forested land. Miscellaneous land includes areas in various uses not inventoried, marshes, open swamps, bare rock areas, desert, tundra, and other land generally of low agricultural value. Urban uses are listed as a separate category and are not included under the special uses category as was done in previous *Major Land Uses* reports. The land base includes streams and canals less than an eighth of a mile wide, and ponds, lakes, and reservoirs covering less than 40 acres. Distributions by major use may not add to totals due to rounding. See Appendix 1 for more complete descriptions of the different land-use categories.

Sources: USDA, Economic Research Service calculations based on reports and records of the U.S. Department of Commerce/Census Bureau (2002b and 2003) and Federal, State, and local land management and conservation agencies, including the U.S. Department of the Interior/Bureau of Land Management (2007); U.S. Department of Transportation/Bureau of Transportation Statistics (2007); U.S. Department of Transportation/Federal Aviation Administration (2002); U.S. Department of Transportation/Federal Highway Administration (2007); U.S. Department of Transportation/Federal Railroad Administration (2004); U.S. Department of the Interior/Fish and Wildlife Service (2007); U.S. General Services Administration (2004); Geographic Data Technology (2007); USDA/National Agricultural Statistics Service (2009a and 2009b); USDA/Farm Service Agency (2008); U.S. Department of the Interior/National Park Service (2007); USDA/Natural Resources Conservation Service (2009); Smith et al. (2009); and Wilderness Institute (2009).

Figure 2
Major uses of U.S. cropland



Note: See Appendix 1 for descriptions of the different cropland categories.

Sources: USDA, Economic Research Service calculations for 2007 and 2002 are based on USDA/National Agricultural Statistics Service (2004a, 2004b, 2009a and 2009b) and USDA/Farm Service Agency (2003 and 2008). Estimates prior to 2002 are based on Vesterby and Krupa (2001); Daugherty (1991 and 1995); Frey (1973, 1979, and 1982); Frey and Hexem (1985); Frey et al. (1968); Wooten et al. (1962); Wooten and Anderson (1957); and Wooten (1953a).

Sixty-one million acres were classified as urban areas: All but 400,000 acres were in the contiguous 48 States.⁴ Urban acreage accounted for less than 3 percent of the Nation’s overall land area and just over 3 percent of the land area of the contiguous 48 States.

The remaining 197 million acres (9 percent) of the U.S. land area included various miscellaneous uses not inventoried, including tundra, deserts, bare rock areas, snow and ice fields, swamps, marshes, and other areas not independently categorized in this MLU report, such as wetlands and rural residential. The land classified under other miscellaneous uses included some of the estimated 103 million acres of land used for rural housing lots in 2007.⁵

⁴In previous *Major Land Uses (MLU)* reports, urban areas were classified as part of special-use areas. Given the growing interest in urban land-use trends, urban areas are treated as a distinct use in this report.

⁵Given the data used to define rural **residential area**, it is not possible to distinguish rural housing lots from land classified under other uses, such as forests or grassland pasture and range.

Table 1

Agricultural and nonagricultural uses of U.S. land, 2007

Land use	Acreage		Proportion of total	
	48 States	United States	48 States	United States
	-----Million acres-----		-----Percent-----	
Agricultural:				
Cropland—				
Cropland used for crops ¹	335	335	17.7	14.8
Idle cropland	37	37	2.0	1.6
Grazing land—				
Cropland used only for pasture	36	36	1.9	1.6
Grassland pasture and range	612	614	32.3	27.1
Forestland grazed	127	127	6.7	5.6
Special uses—				
Farmsteads, farm roads	12	12	0.6	0.5
Total agricultural land ²	1,159	1,161	61.2	51.3
Nonagricultural:				
Forest-use land not grazed ³	449	544	23.7	24.0
Special uses—				
Transportation ⁴	26	27	1.4	1.2
Recreation and wildlife areas ⁵	110	252	5.8	11.1
National defense areas ⁶	21	23	1.1	1.0
Urban land	60	61	3.2	2.7
Miscellaneous other land ⁷	68	197	3.6	8.7
Total nonagricultural land ²	734	1,103	38.8	48.7
Total land area ²	1,894	2,264	100.0	100.0

¹ Cropland harvested, crop failure, and cultivated summer fallow.

² Distributions may not add to totals due to rounding.

³ Excludes 80 million acres of forestland in parks and land in other special uses.

⁴ Rural highways, roads and railroad rights-of-way, and rural airports.

⁵ National and State parks and related recreational areas, national and State wildlife refuges, and national wilderness and primitive areas.

⁶ Federal land administered by the U.S. Department of Defense for military purposes and land administered by the U.S. Department of Energy.

⁷ Includes areas in miscellaneous uses not inventoried, marshes, open swamps, bare rock areas, desert, and tundra.

Sources: USDA, Economic Research Service calculations based on reports and records of the U.S. Department of Commerce/Census Bureau (2002b and 2003) and Federal, State, and local land management and conservation agencies including the U.S. Department of the Interior/Bureau of Land Management (2007); U.S. Department of Transportation/Bureau of Transportation Statistics (2007); U.S. Department of Transportation/Federal Aviation Administration (2002); U.S. Department of Transportation/Federal Highway Administration (2007); U.S. Department of Transportation/Federal Railroad Administration (2004); USDA/Forest Service (2008); U.S. Department of the Interior/Fish and Wildlife Service (2007); U.S. General Services Administration (2004); Geographic Data Technology (2007); USDA/National Agricultural Statistics Service (2009a and 2009b); USDA/Farm Service Agency (2008); U.S. Department of the Interior/National Park Service (2007); USDA/Natural Resources Conservation Service (2009); Smith et al. (2009); and Wilderness Institute (2009).

Historical Trends in Major Land Uses

The total amount of land in the most dominant land-use categories has fluctuated over time. Total **cropland** area declined nearly 10 percent between 1945 and 2007 but not consistently (table 2).⁶ Total cropland area increased in the late 1940s, declined from 1949 to 1964, increased from 1964 to 1978, and then declined again from 1978 to 2007. Total cropland area in 2007 was 408 million acres, the lowest level since the MLU series began in 1945, and 34 million acres (8 percent) below the previous low in 2002. The decline over this 5-year period includes a 26-million-acre (42 percent) decline in **cropland pasture**, a reduction partly due to a change in how the 2007 Census of Agriculture estimated cropland pasture (a component of total cropland) and other pasture on farms (a component of grassland pasture and range). Offsetting the decline in cropland pasture over 2002-07 is a 27-million-acre increase in **grassland pasture and range**. These changes suggest that the

⁶ Major land-use estimates for the 48 contiguous States began in 1945, but estimation for the entire United States did not begin until 1949. Estimates for 1945 are indicative of total acreages in cropland, grassland pasture and range, and urban areas, which are concentrated in the contiguous 48 States, but not of forest, special uses, and other miscellaneous uses, which account for 99 percent of Alaska's land area.

Table 2
Major U.S. land uses, 1945-2007

Land use	1945 ¹	1949	1959	1964	1969	1974	1978	1982	1987	1992	1997	2002	2007
<i>Million acres</i>													
Cropland	451	478	458	444	472	465	471	469	464	460	455	442	408
Cropland used for crops	363	383	359	335	333	361	369	383	331	338	349	340	335
Idle cropland	40	26	34	52	51	21	26	21	68	56	39	40	37
Cropland pasture ²	47	69	66	57	88	83	76	65	65	67	68	62	36
Grassland pasture and range ²	659	632	633	640	604	598	587	597	591	591	580	587	614
Forest-use land ³	602	760	728	732	723	718	703	655	648	648	642	651	671
Grazed forest-use land	345	320	245	225	198	179	172	158	155	145	140	134	127
Other forest-use land	257	440	483	507	525	539	531	497	493	503	501	517	544
Special-use areas ⁴	85	87	123	144	141	147	158	270	279	281	286	297	313
Urban areas ⁵	15	18	27	29	31	35	45	50	57	59	66	60	61
Miscellaneous other land ⁶	93	298	293	277	291	301	301	224	227	224	236	228	197
Total land area ^{1, 7}	1,905	2,273	2,271	2,266	2,264	2,264	2,264	2,265	2,265	2,263	2,263	2,264	2,264

¹The estimates for 1945, and for special uses until 1959, only account for the 48 contiguous States. The estimates for all other years include all 50 States.

²The 2007 cropland pasture estimates are not directly comparable with estimates in prior years due to a methodological change by the source agency in estimating cropland pasture and other pasture on farms. The grassland pasture and range estimate excludes cropland used only for pasture and grazed forestland.

³Excludes forestland in parks and other special uses of land.

⁴Includes land specified in table 11.

⁵The 2002 and 2007 urban acreage estimates are not directly comparable with estimates in prior years due a change in the definition of urban areas in the 2000 Census of Population and Housing. The decrease in MLU "urban" acreage estimates between 1997 and 2002 should be viewed as a consequence of this definitional change, rather than reflecting a decline in acreage.

⁶Includes areas in miscellaneous uses not inventoried, marshes, open swamps, bare rock areas, desert, tundra, and other land generally with low value for agricultural purposes.

⁷Totals differ over time due to remeasurement of the land area. Distribution of land uses may not add to totals due to rounding.

Sources: Estimates for 2002 and 2007 are from the U.S. Census Bureau (2002b and 2003) and Federal, State, and local land management and conservation agencies, including the U.S. Department of the Interior/Bureau of Land Management (2003 and 2007); U.S. Department of Transportation/Bureau of Transportation Statistics (2004 and 2007); U.S. Department of Transportation/Federal Aviation Administration (2002); U.S. Department of Transportation/Federal Highway Administration (2002 and 2007); U.S. Department of Transportation/Federal Railroad Administration (2004); USDA/Forest Service (1998 and 2008); U.S. Department of the Interior/Fish and Wildlife Service (2001 and 2007); U.S. General Services Administration (2001 and 2004); Geographic Data Technology (2000 and 2007); USDA/National Agricultural Statistics Service (2004a, 2005, 2009a and 2009b); USDA/Farm Service Agency (2003 and 2008); U.S. Department of the Interior/National Park Service (2002 and 2007); USDA/Natural Resources Conservation Service (2004a and 2009); Smith et al. (2009); and Wilderness Institute (2002 and 2009). Estimates prior to 2002 are from Vesterby and Krupa (2001); Daugherty (1991 and 1995); Frey (1973, 1979, and 1982); Frey and Hexem (1985); Frey et al. (1968); and Wooten et al. (1962). The estimates are not strictly comparable.

Comparability of Land-Use Estimates

In maintaining the MLU series, USDA's Economic Research Service (ERS) attempts to use a consistent methodology for measuring land use, but tradeoffs are sometimes necessary between consistency and accuracy. As source agencies improve methodologies and improved data become available, the estimates are amended to incorporate new data. When our historical estimates cannot be adjusted, however, ERS reports, where possible, when changes in the source data cause our estimates to reflect differences on paper rather than differences in actual land use. For example, land in urban areas was estimated at 60 million acres in 2002, compared with an estimated 66 million acres in 1997. This decline is due to a change in the criteria used to define urban areas in the 2000 Census of Population (see "Urban and Rural Residential Uses," p. 29). The Census Bureau estimates that if the same criteria had been used in 1990 and 2000, the urban area estimates would have reflected a 13-percent increase over the period. However, when data sources do not quantify how changes in methodology affect historical results, we can neither adjust historical MLU estimates nor report on the extent to which land-use estimates have changed due to actual changes in land use. In these instances, we note that the change has occurred but that the effect cannot be quantified.

Changes in land-use estimates for one category necessarily imply changes in estimates for other land uses, given the fixed amount of total land. Though all land-use categories require reconciliation among sources at the State level, some categories in the MLU series are adjusted more than others based on the residual amount of land after other uses are tabulated. These categories include miscellaneous land, and, to some extent, grassland pasture and range—categories for which less reliable data sources are available relative to cropland and forest-use areas. In general, more confidence should be put in the broader land-use trends over decades rather than specific 5-year fluctuations.

2007 Census' methodological change resulted in the reclassification of a significant share of cropland pasture from temporary pasture to more permanent pasture. Indeed, a comparison with **National Resources Inventory** (NRI) data suggests that much of the change may be a result of the methodological change rather than an actual land-use change due to farm operator or owner decisions. Because of the change in methodology, these two estimates are not strictly comparable with prior years (see box above). **Forest-use** area generally declined from 1949 to 1997 but increased by more than 4 percent from 1997 to 2007. The most consistent trends in major land use during 1945-2007 have occurred in the upward trend in **special-use** and **urban** areas. Land classified under **miscellaneous other** uses declined between 1997 and 2007 by 39 million acres (17 percent).

Land-use shifts occur for a variety of reasons. Changing commodity prices, agricultural policies, and, more recently, bioenergy policies can affect land uses because landowners tend to respond to price and policy changes by shifting land to uses that maximize the returns to land. Increasing demand for land for residential, commercial, and industrial development also cause agricultural land-use changes near urban areas because characteristics that make land attractive for farming (e.g., relatively flat land) also make it attractive for development. Once converted to an urban use, however, land rarely transitions back to a less intensive agricultural use.

The effects of changing conditions on land use can vary over time. Though not a complete picture of changes in all land uses, the NRI identifies changes in non-Federal land over time in the 48 contiguous States (table 3). Because the same points are sampled over time, NRI data allow us to construct land-use transition matrices.^{7,8} The NRI data show that, since 1982, the period between 2002 and 2007 accounted for some of the largest gross flows into

⁷While wide coverage and repeat sampling make the NRI attractive as a data source for developing MLU estimates, NRI does not account for all land uses (e.g., Federal land and estimates for land in Alaska and Hawaii have been omitted). However, NRI data are used in the construction of the MLU grassland pasture and range estimates in the 48 contiguous States.

⁸Transition matrices specify where each inventoried change in land use came from and where it went. Selected transitions are presented for the largest land use categories in figure 3. NRI data on all transitions can be found in the 2007 *NRI Summary Report* (USDA/NRCS, 2009).

and out of cropland.⁹ Over this 5-year period, 14 million acres (nearly 4 percent) exited cropland and about 4 million acres (1 percent) transitioned to cropland (for a net loss of 10 million acres). Most of the changes in cropland uses occurred due to transitions between cropland uses, pasture/rangeland, and forest (fig. 3). Of the land exiting cropland, about 9.3 million acres (78 percent) transitioned into pasture or rangeland use, and 700,000 acres transitioned to forest. Of the land entering cropland uses, about 3.4 million acres (85 percent) had been in pasture or rangeland uses in 2002. The transitions between these three land-use categories resulted in a net loss of about 6.5 million acres (2 percent) of cropland over the 2002-07 period (USDA/NRCS, 2009).

⁹The NRI cropland category roughly corresponds to the sum of the MLU categories cropland used for crops plus cropland pasture.

While movement between major land uses happen annually, annual transitions constitute a relatively small proportion of the total agricultural land base. Between 2002 and 2007, NRI data reveal that 96-99 percent of agricultural land remained in its pre-existing use (table 4). When measured over a 25-year period, however, land-use transitions show more movement. For example, 78 percent and 86 percent of land used for cropland and pasture/

Table 3
Land use in the 48 contiguous States: National Resources Inventory estimates

Year	Cropland	Conservation Reserve Program (CRP) ¹	Pasture land	Range land	Forest land grazed	Forest land ungrazed	Other rural land ²	Developed land ³	Water and Federal areas	Total ⁴
<i>Million acres</i>										
1982	419.5	0.0	130.9	417.9	66.0	337.3	47.2	71.0	447.7	1937.7
1987	405.5	13.8	126.7	412.6	63.9	341.4	47.5	76.9	449.3	1937.7
1992	381.4	34.1	125.0	408.9	63.2	342.1	48.1	83.9	450.9	1937.7
1997	376.1	32.7	119.8	407.5	60.7	345.9	48.7	94.6	451.6	1937.7
2002	367.1	32.0	117.8	408.2	56.5	350.8	48.9	104.0	452.4	1937.7
2007	357.0	32.9	118.6	409.1	56.1	350.3	49.6	111.3	452.8	1937.7

¹ Initiated by the Farm Security Act of 1985.

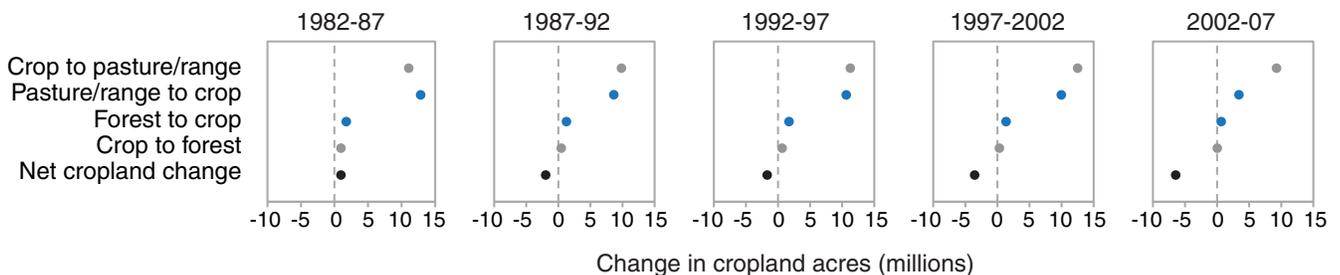
² Includes small and large urban built-up land as well as rural transportation land.

³ An NRI category, including farmsteads and other farm structures, field windbreaks, barren land, and marshland.

⁴ Distributions may not add to totals due to rounding.

Source: The National Resources Inventory (USDA/NRCS, 2009). Margins of error for the 2007 estimates (in millions of acres) are cropland (± 2.7); CRP land (not applicable); pastureland (± 2.3); rangeland (± 4.0); forest land (± 3.1); other rural land (± 1.4); and water and Federal areas (not applicable) (USDA/NRCS 2009).

Figure 3
Cropland transitions for selected land cover/use categories, 1982-2007



Note: Total cropland: 419.6 million acres (1982); 357.0 million acres (2007).

Source: USDA, Economic Research Services calculations based on analysis of National Resources Inventory data (USDA/NRCS 2009).

Table 4

Share of land use that remained the same, 1982-2007

	5-year periods					25-year period
	1982-87	1987-92	1992-97	1997-02	2002-07	1982-2007
	<i>Percent</i>					
Cropland	93	92	95	93	96	78
Pasture/rangeland	95	96	95	96	98	86
Forestland	98	98	98	98	99	92

Source: USDA, Economic Research Service calculations based on USDA's Natural Resources Conservation Service, National Resources Inventory data (2009).

range in 1982, respectively, remained in those uses in 2007. Forested acres were even more apt to remain in the same use, with more than 90 percent of forestland reported as forest over the 25-year period.

Comparison between NRI and MLU Land-Use Estimates

The land-use acreage totals and net changes in land use indicated by NRI differ from MLU estimates due to differences in estimation approach, coverage, and definitions. Nonetheless, comparing the changes in the two sets of estimates for the various land-use categories (rather than the levels of the estimates) shows how the two data sources are similar. The MLU cropland estimates, which are based on mandatory reporting in the Census of Agriculture, reveal a 61-million-acre decline in total cropland over 1982-2007. The NRI estimates are based largely on interpretation of high-resolution aerial photography; classifications according to land cover may not correspond to classifications according to land use. The NRI estimated decline in cropland for this period is 30 million acres if CRP and cropland are combined (CRP is classed as idle cropland in MLU but as a distinct land use in NRI). Some of this estimation difference is likely a result of methodological changes for measuring grassland pasture and other pasture on farms in the 2007 Census of Agriculture; MLU and NRI estimates were much closer over the 1982-2002 period (both indicated declines of about 20 million acres). Similarly, differences in estimated changes in grassland pasture and range—17-million-acre increase per MLU but a 16-million-acre decline per NRI—are due partly to this change in methodology. MLU's inclusion of Federal lands, accounting for more than a quarter of grassland pasture and rangelands (see "Major Uses of Land, by Class of Ownership," p. 37), may also contribute to this difference. For forestland, NRI shows an increase of 3 million acres from 1982 to 2007, while the MLU series shows an increase of 16 million acres. MLU includes public and Alaskan acreage in the forest-use category, excludes forested land in parks and other special uses, and employs different estimation procedures than NRI.

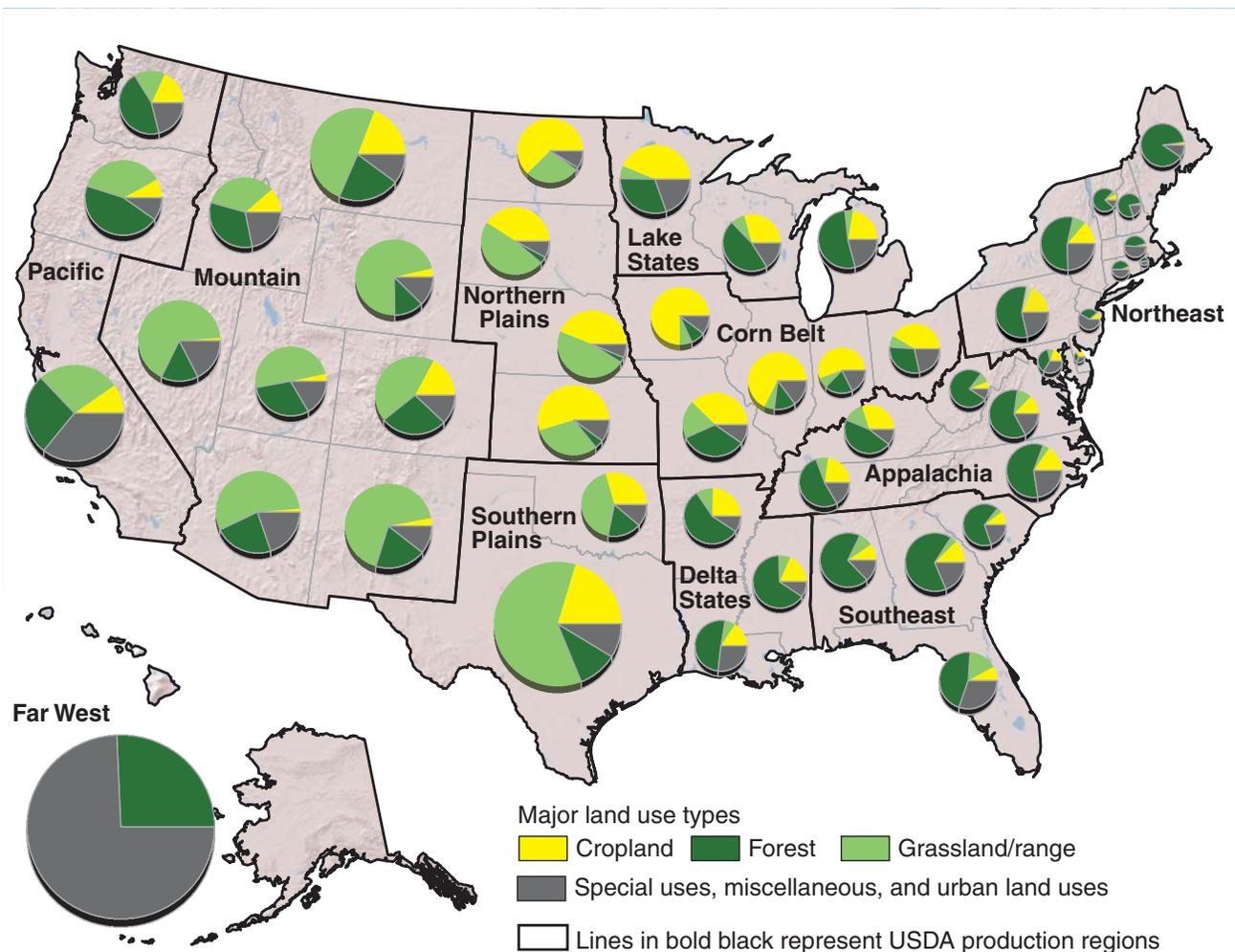
The MLU special-uses category increased by 43 million acres over 1982-2007. NRI does not include a similar special-uses category, but accounts for some of those acres in forestland, other rural land, developed land (which includes rural transportation), and Federal areas. These comparisons emphasize that MLU estimates land use for all land in the United States, including Federal land and for all 50 States.

Basic Regional Land-Use Patterns

Land-use patterns vary greatly by region, reflecting differences in soils, climate, topography, and patterns of population settlement. For example, **cropland** accounts for 12 percent of the total land in the Northeast and 54 percent in the Corn Belt (table 5; see fig. 4 for the farm production regions used in this report). Variation also exists among States within a region (fig. 4). For example, almost two-thirds of North Dakota is cropland, compared with 41 percent in South Dakota.

Some clear regional land-use patterns exist. Cropland is roughly concentrated in the central regions of the contiguous United States, where the Northern Plains and Corn Belt hold the majority of their land in cropland. The Southern Plains, Lake States, and Delta States also hold cropland shares above the national average. The Mountain region and Southern Plains have the majority of their land in **grassland pasture and range**. The Northern Plains and Pacific regions also have relatively high shares of grazing acreage,

Figure 4
Shares of land in major uses, by State, 2007



Notes: The size of the pie charts is proportional to the land area in each State. The miscellaneous, special use, and urban areas categories were too small to effectively illustrate separately.

with more than a third and a quarter of their land area, respectively, allocated to grassland and pasture and range. Forest-use land is most prevalent in the Eastern regions, such as the Northeast, Appalachian, Southeast, and Delta States, which have a majority of their land in **forest uses**. In addition, forest-use land constitutes a relatively high share of land in the Lake States and Pacific regions, where the topography and precipitation patterns are conducive to growing trees. The Northeast and Southeast have the highest shares of urban land, while the Lake States, Corn Belt, Appalachian, and Pacific regions also have urban shares above the Nation's average.

Table 5

Major land uses, by region, 2007

Region ¹	Cropland ²		Grassland pasture and range ³		Forest-use land ⁴		Special and miscellaneous land		Urban		Total land ⁵	
	Million acres	Percent	Million acres	Percent	Million acres	Percent	Million acres	Percent	Million acres	Percent	Million acres	Percent
Northeast	13.0	11.6	4.6	4.2	66.8	60.0	14.5	13.0	12.5	11.2	111.4	100.0
Lake States	40.6	33.2	7.5	6.1	50.8	41.6	19.0	15.6	4.2	3.5	122.1	100.0
Corn Belt	91.0	55.3	16.4	10.0	34.3	20.8	14.8	9.0	8.1	4.9	164.6	100.0
Northern Plains	97.7	50.3	74.8	38.5	5.7	2.9	15.0	7.7	1.1	0.5	194.3	100.0
Appalachian	22.7	18.3	10.6	8.5	70.8	57.2	13.0	10.5	6.7	5.4	123.7	100.0
Southeast	12.5	10.1	10.3	8.3	75.1	60.9	16.5	13.4	8.9	7.2	123.3	100.0
Delta States	18.2	20.0	7.2	7.9	52.3	57.4	11.2	12.3	2.3	2.5	91.2	100.0
Southern Plains	47.0	22.2	120.4	56.9	24.8	11.7	13.9	6.6	5.4	2.5	211.5	100.0
Mountain	43.2	7.9	303.4	55.4	121.5	22.2	76.0	13.9	3.8	0.7	547.9	100.0
Pacific	22.1	10.8	57.0	28.0	74.0	36.3	43.4	21.3	7.2	3.6	203.8	100.0
48 States	407.9	21.5	612.3	32.3	576.0	30.4	237.4	12.5	60.1	3.2	1,893.8	100.0
Alaska	0.1	0.0	0.7	0.2	93.8	25.6	271.3	74.1	0.2	0.0	366.0	100.0
Hawaii	0.1	3.5	0.7	18.0	1.6	37.8	1.4	35.2	0.2	5.5	4.1	100.0
United States	408.1	18.0	613.7	27.1	671.4	29.7	510.1	22.5	60.5	2.7	2,264.0	100.0

¹ See figure 4 for a map of the farm production regions used in this report.

² Total cropland, including cropland used for crops, cropland used only for pasture, and idle cropland.

³ Open permanent pasture and range, both in farms and not in farms, excluding cropland pasture.

⁴ Total forestland, including forests grazed but excluding an estimated 80 million forest acres in parks and other special uses of land.

⁵ Distribution of land uses and percentages may not add to totals due to rounding.

Sources: USDA, Economic Research Service calculations based on reports and records of the U.S. Census Bureau (2002b and 2003) and Federal, State, and local land management and conservation agencies, including the U.S. Department of the Interior/Bureau of Land Management (2007); U.S. Department of Transportation/Bureau of Transportation Statistics (2007); U.S. Department of Transportation/Federal Aviation Administration (2002); U.S. Department of Transportation/Federal Highway Administration (2007); U.S. Department of Transportation/Federal Railroad Administration (2004); U.S. Department of the Interior/Fish and Wildlife Service (2007); U.S. General Services Administration (2004); Geographic Data Technology (2007); USDA/National Agricultural Statistics Service (2009a and 2009b); USDA/Farm Service Agency (2008); U.S. Department of the Interior/National Park Service (2007); USDA/Natural Resources Conservation Service (2009); Smith et al. (2009); and Wilderness Institute (2009).

Cropland

Cropland includes five components of acreage (table 6). The sum of three components—**cropland harvested**, **crop failure**, and **cultivated summer fallow**—is **cropland used for crops** or the acreage devoted to crop production in any year. The other two components—**cropland pastured** and **idle cropland**—are not directly involved in crop production in a given year, but may rotate into production in other years. Total cropland was estimated at 408 million acres in 2007.

Cropland Used for Crops

At 82 percent of the Nation’s cropland base, cropland used for crops (335 million acres in 2007) accounts for the vast majority of total cropland (table 6). While cropland used for crops occurs in every region, half of all this acreage was located in two regions: the Northern Plains and the Corn Belt (25 percent of cropland used for crops in each region). The Northeast and Southeast regions contained the least amount of cropland used for crops, with each region containing about 3 percent of the total (see MLU for cropland acreage, by region and State, from 1945 to 2007 at <http://www.ers.usda.gov/data/majorlanduses/>).

Regional land-use patterns in cropland used for crops are largely driven by the geographic distribution of cropland harvested, the dominant component

Table 6
Major uses of cropland, selected years, 1949-2007

Year	Cropland used for crops				Idle ³	Cropland pasture ⁴	Total cropland ²
	Harvested	Failed	Fallowed ¹	Total ²			
<i>Million acres</i>							
1949	352	9	22	383	26	69	478
1954	339	13	28	380	19	66	465
1959	318	10	31	359	34	66	458
1964	292	6	37	335	52	57	444
1969	286	6	41	333	51	88	472
1974	322	8	31	361	21	83	465
1978	330	7	32	369	26	76	471
1982	347	5	31	383	21	65	469
1987	293	6	32	331	68	65	464
1992	306	8	24	338	56	67	460
1997	321	7	21	349	39	68	455
2002	307	17	16	340	40	62	442
2007	312	8	15	335	37	36	408

¹ Cultivated summer fallow.

² Distribution may not add to totals due to rounding.

³ Includes all acreage diverted from crops under the Acreage Reduction Program (ARP), the Conservation Reserve Program (CRP), and other Federal acreage reduction programs shown in figure 5.

⁴ Cropland used only for pasture.

Sources: Estimates for 2002 and 2007 are from USDA/National Agricultural Statistics Service (2004a, 2004b, 2005, 2008, 2009a and 2009b) and USDA/Farm Service Agency (2003 and 2008). Estimates prior to 2002 are from Vesterby and Krupa (2001); Daugherty (1991 and 1995); Frey (1973, 1979, and 1982); Frey and Hexem (1985); Frey et al. (1968); Wooten et al. (1962); Wooten and Anderson (1957); and Wooten (1953).

of cropland used for crops. Cropland harvested totaled 312 million acres in 2007 and includes row and closely sown crops, tree fruits and nuts, and vegetables. Crop failure occurred on 7.8 million acres (just over 2 percent) of the acreage planted for harvest in 2007, with a third occurring in the Northern Plains and about 27 percent in the Southern Plains. The 2007 failure rate is close to the average for recent years, excluding 2002, when 17.1 million acres (5 percent) failed. From 1945 to 2002, the rate of cropland failure averaged less than 3 percent.¹⁰

Cultivated summer fallow refers to cropland in sub-humid regions that is cultivated for a season or more to control weeds and accumulate moisture before small grains are planted. Summer fallow is used extensively in the semiarid West. The use of summer fallow has been decreasing since the late 1960s. In 2007, almost 15 million acres were devoted to summer fallow, 26 million acres lower than MLU 1969 estimates. Forty percent of 2007 summer fallow acres were in the Mountain region, 36 percent in the Northern Plains region, and 24 percent in the Pacific and Southern Plains regions.

Cropland Pasture and Idle Cropland

The remainder of total cropland—the portion not used for crops—was used for pasture (36 million acres) or was **idle** (37 million acres) in 2007. In contrast to permanent **grassland pasture** and **range**, **cropland pasture** is considered crop rotation. Much of the cropland used for pasture is rotated between crop and pasture use, although the rotation period varies.

While cropland used for pasture accounted for 14 percent of all cropland in 2002 (62 million acres), the 2007 reported acreage (36 million acres) was nearly half that total and under 9 percent of all cropland.¹¹ The relative distribution of cropland pasture across U.S. regions, however, remains the same. The largest acreages in cropland pasture were found in the Southern and Northern Plains and the Mountain States.

The quantity and quality of cropland used for pasture varies across regions. Cropland pasture acreage in the Corn Belt and adjacent areas reflects the high proportion of land classified as cropland. On many farms in this region, the only land available for pasture may be good quality cropland. In contrast, cropland pasture in the Plains regions and much of the South is associated with higher proportions of marginal cropland.

Idle cropland includes both land completely idled and land seeded to cover or soil improvement crops, such as buckwheat and clover, but not harvested or pastured, and acreage diverted from crops under the CRP (initiated in 1985) and other Federal acreage reduction programs (in effect prior to 1996). Idle cropland totaled 37 million acres in 2007, about 9 percent of U.S. cropland. Regionally, idle cropland ranged from 5 percent in the Corn Belt and Delta States to 17 percent in the Mountain States. In 2007, the Farm Service Agency (FSA) reported that almost 37 million acres were held under CRP contracts, or approximately 99 percent of idle land (USDA/FSA, 2008), compared with the 34 million acres (85 percent) of the 40 million acres idled in 2002. Some cropland is idle each year because of adverse weather and soil conditions at planting time or the lack of economic incentives to plant. However, high commodity prices and increased demand for corn arising from

¹⁰Regional and State-level MLU estimates of cropland failure from 1910 to 2007 are available at <http://www.ers.usda.gov/data/majorlanduses/>.

¹¹The cropland pasture estimate for 2007 is not strictly comparable with previous MLU estimates (see discussion on pp. 5-6).

Federal bioenergy policies likely contributed to the low amounts of non-CRP idled cropland in 2007 (Wallander et al., 2011). Overall, the amount of cropland idle in 2007 nearly equals the U.S. historical average of 38 million acres since the major land-use series began in 1945, but a great deal of fluctuation in land use has taken place over time.¹²

Trends in Cropland Uses

Total cropland acreage has remained relatively constant since World War II but has declined slowly in recent decades. A drop from 478 million acres in 1949 to 444 million acres in 1964 was largely the result of surplus production and subsequent acreage reduction programs. Cropland acreage was at or above 455 million acres in each census year from 1969 to 1997 (see table 6). Between 1997 and 2002, total cropland dropped 13 million acres (about 3 percent) to 442 million acres, then dropped another 34 million acres (about 8 percent) from 2002 to 2007. The drop during 2002-07 can be explained largely by methodological changes in source agency estimates of cropland pasture, which declined 26 million acres (see discussion on pp. 5-6). With the change in methodology, the estimate of total cropland acres is below any previous estimate since the MLU series began in 1945.

Changes in Cropland Used for Crops and Idled Cropland. Cropland used for crops declined between 1949 and 1969 and then rose to 383 million acres in 1982, matching the record high level set in 1949 near the advent of the MLU series. Since 1982, cropland used for crops has declined, though unevenly. Over the 2002-07 period, cropland used for crops fell 5 million acres to 335 million acres, despite an increase in cropland harvested over this period due to a reversion of an historic rate of crop failure in 2002 (see cropland harvested discussion).

An inverse relationship exists between two of the components of total cropland: As cropland used for crops decreases, idled cropland increases and vice versa. Cropland used for crops was at a record high in 1949 at 383 million acres, when no acres were idled by Federal programs (see table 6, fig. 5). In 1972, cropland used for crops was at a near record low of 334 million acres when Federal programs idled 61 million acres. Two years later, the area under Federal cropland acreage reduction programs decreased to less than 3 million acres in 1974 (fig. 5). This decline was accompanied by a 27-million-acre (8 percent) increase in cropland used for crops over the period. Cropland used for crops climbed to 387 million acres in 1981, when Federal programs did not idle any cropland, and dropped to 333 million acres in 1983, when Federal program set-aside acres reached their historic peak of 78 million acres. Between 1987 and 2007, cropland used for crops fluctuated between 331 million acres (historic low) and 349 million acres, while acreage idled by Federal programs dropped from 76 million acres to just under 37 million acres.

The general trend of the changes in cropland used for crops and the land area idled under Federal acreage-reduction programs fluctuate with commodity prices (fig. 6). Declines in real commodity prices appear to be followed by increases in idled acreage and corresponding decreases in cropland used for crops, and vice versa. This relationship is consistent with a response by commodity producers to changing market incentives and with Government

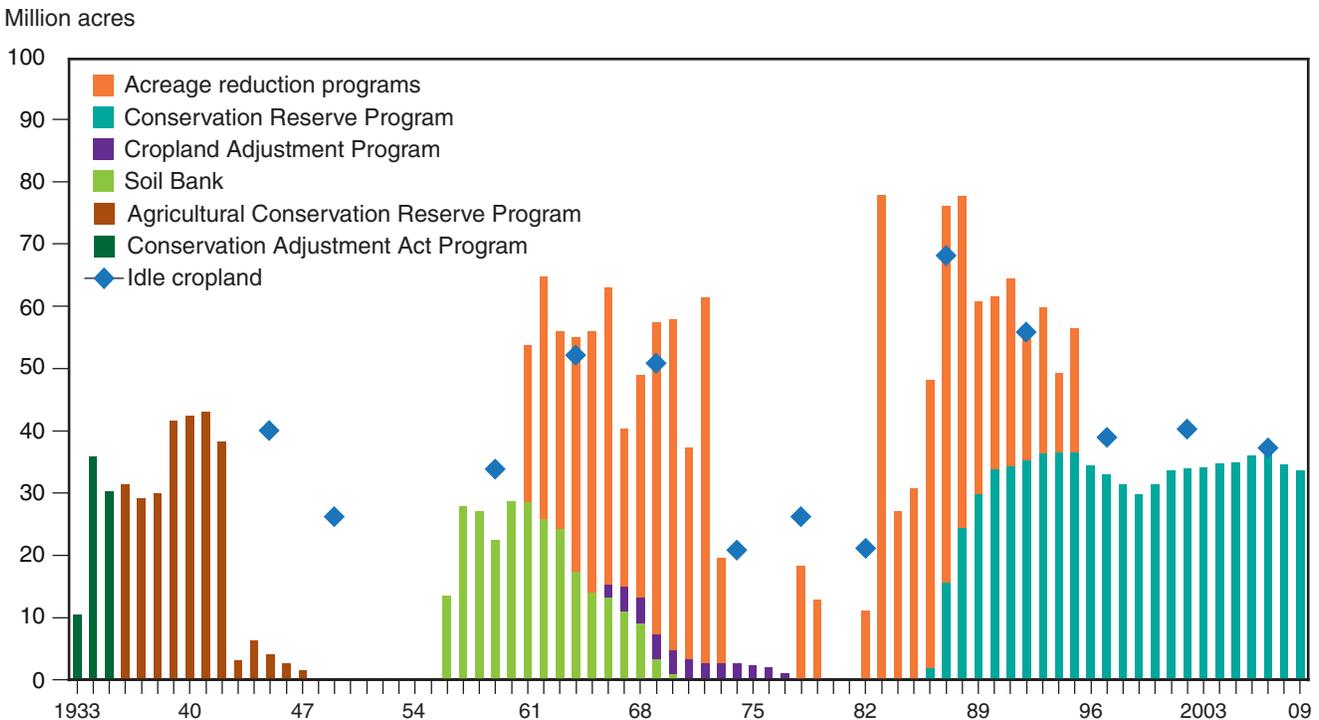
¹²Regional and State-level MLU estimates of idle cropland from 1945 to 2007 are available at <http://www.ers.usda.gov/data/majorlanduses/>.

efforts to manage commodity supplies and support farm incomes under adverse market conditions.¹³ The relative changes in acreage, however, are smaller than the relative changes in prices. Between 1980 and 2002, the prices of major commodities (e.g., wheat, corn, soybeans, etc.) declined by over 60 percent in inflation-adjusted terms, while total cropland used for crops dropped by about 6 percent. Productivity increases might have mitigated some of the effect of real price declines on the real returns to crop production. The variation in cropland used for crops in the 1990s was also smaller than in the 1980s, despite significant variation in real prices. This pattern may reflect the phasing out and elimination of Federal acreage-reduction programs other than the CRP in 1996. The pattern may also reflect the fact that, as the area of cropland used for crops declines, the remaining cropland is generally of higher average quality and less likely to move in and out of production with short-term price fluctuations. Since 2002, prices of major commodities dropped and then spiked between 2006 and 2008, while cropland used for crops changed very little.

¹³See Roberts et al. (2004) for a discussion of the counter-cyclical nature of Federal farm payments and the role of Government farm programs in insuring producer risks.

A number of major changes in farm program policy could also have influenced agricultural land-use decisions during this period. Farm legislation in the 1980s and 1990s marked a shift toward greater market orientation with the addition of income-supporting (rather than price-supporting) commodity loan programs in 1985 and the introduction of planting flexibility on acres qualifying for commodity program payments in 1990. The Federal Agriculture Improvement and Reform (FAIR) Act of 1996 subsequently

Figure 5
Cropland acreage reductions, by program type, 1933-2009

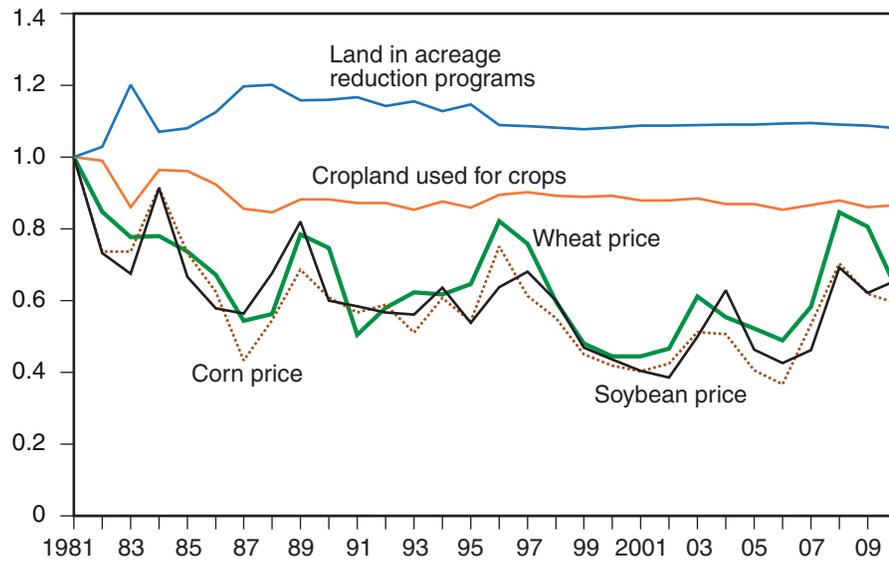


Notes: "Acreage reduction programs" include Acreage Conservation Reserve; 0, 50/85-82 programs; Paid Land Diversion; and Payment-in-Kind programs. Land under these programs is classified as idled cropland in MLU estimates. For yearly detail of programs during 1974-95, see USDA/ERS, 1997.

Source: USDA, Economic Research Service calculations based on Crosswhite and Sandretto (1991) and USDA/Farm Service Agency (2008).

Figure 6
U.S. cropland used for crops and commodity prices of key crops

Real price and cropland indices



Notes: Prices are plotted with a 1-year lag to better track incentives at the time of planting. Prices and land areas are indexed to 1 for 1980 to illustrate relative time trends. To construct the index for land in acreage reduction programs, the acreage is scaled as a share of the acreage in cropland used for crops. As a result, equal percentage changes in the two cropland indices indicate equivalent changes in land area.

Source: USDA, Economic Research Service calculations based on prices from the National Agricultural Statistics Service, deflated with the producer price index for all commodities from the Bureau of Labor Statistics.

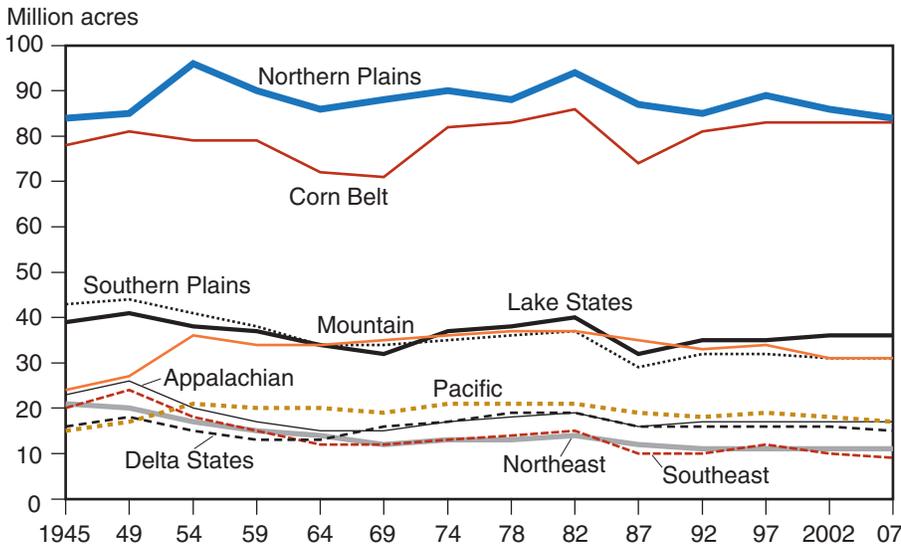
eliminated acreage set-aside requirements and virtually all cropping restrictions that had been in effect under previous farm programs. The FAIR Act also replaced commodity payments directly tied to current planting decisions with payments tied to historic production choices (Nelson and Schertz, 1996). Analyses of land-use changes have found that Federal direct payments to farmers increased land in crops, but the effects are offset by CRP cropland retirements (Lubowski et al., 2008; Gardner, 2002; Westcott et al., 2002).

Meanwhile, the Federal Crop Insurance and Reform Act (FCIRA) of 1994 increased Federal crop insurance premium subsidies, and additional increases were introduced in 2000 (Glauber and Collins, 2002). Programs that help insure crops against losses could increase landowner incentives to expand crop production to less productive land. A study on the effect of crop insurance subsidy increases after 1994 estimated that the subsidies increased cultivated acreage in 1997 by about 1 percent, with most of the land coming out of hay and pasture (Lubowski et al., 2006b).¹⁴

Relatively stable patterns at the national level obscure larger and sometimes offsetting changes at regional and State levels. Between 1964 and 2007, total acreage in cropland used for crops fluctuated, but began and ended the period at 335 million acres. While cropland used for crops peaked in every region in 1982 and subsequently declined during the farm crisis of the 1980s, not all regions followed the same overall trend. Cropland increased over the 1964-2007 period in the Corn Belt (11 million acres) and in the Lake, Appalachian, and Delta regions (2 million acres each) and decreased by 17 million acres in the remaining regions (fig. 7).

¹⁴The land-use changes induced by insurance subsidies were also found to increase annual wind and water erosion by an estimated 1.4 and .9 percent, respectively, in 1997 (Lubowski et al., 2006b).

Figure 7
Cropland trends, by region, for contiguous United States, 1945-2007



Source: See sources for figure 2. Data by region are summarized in the USDA, Economic Research Service, *Major Land Uses* data product, 2011 (<http://www.ers.usda.gov/data/majorlanduses/>).

Some regional changes in cropland used for crops represent year-to-year fluctuations that tend to balance out over time. However, both the Northeast and Southeast have experienced a long-term decline in cropland used for crops. Urban pressures and a comparative disadvantage in many crops have resulted in the conversion of cropland to other uses in these regions.

Changes at the regional level resulted in little change in the concentration of acreage used for crops in major crop-producing regions over the 1964-2007 period.¹⁵ The Corn Belt represented 25 percent of U.S. land used for crops in 2007, compared with 21 percent in 1964. The remaining regions of the country experienced only 1-percentage-point changes in their proportion of the Nation's cropland in crops over this same period.

Changes in cropland harvested. Changes in cropland harvested parallel changes in cropland used for crops, except when the latter is affected by large changes in crop failure and cultivated summer fallow. Cropland harvested declined from 352 million to 286 million acres (19 percent) between 1949 and 1969, then rose to 347 million acres in 1982. Between 1982 and 2007, the amount of cropland harvested declined, but not steadily, varying between 293 million acres in 1987 to 321 million acres in 1997 in response to commodity price and policy changes (see table 6). The increase in cropland harvested from 307 to 312 million acres during 2002-07 partly demonstrates the recovery from a severe drought that occurred in some parts of the country in 2002, primarily in the Northern Plains, Southern Plains, and Mountain States.

Changes in failed cropland. Land marked by crop failure has ranged between 5 million and 22 million acres since 1945. The possibility of a large acreage failure is always present. Crop failure in 1988, 1993, 1996, 1998, 2000, and 2001 hovered around 10 million acres due to severe drought, extensive flooding, or wet weather. In 2002, crop failure on 17 million acres

¹⁵MLU estimates by region and State are available at <http://www.ers.usda.gov/data/majorlanduses/>.

was the highest since the extensive droughts experienced in 1956. Moderate to extreme drought reached more than half of the contiguous United States during the summer of 2002 (NOAA, 2003). In 2007, the estimated 8 million acres of crop failure reflects the average for the last 30 years.

Changes in fallowed cropland. Summer fallow declined from its peak of 41 million acres in 1969 to about 15 million acres in 2007, with a plateau of about 31 million acres annually from 1974 to 1987. Summer fallow occurs mostly in the Plains States, where it is used in alternate years with small grains, primarily wheat, to conserve moisture and control weeds. The long-term decline in the area under cultivated summer fallow is partly attributed to the adoption of moisture-conserving soil conservation practices, such as no-till and mulch-till, that have reduced the need for summer fallow. With less summer fallow, farm operators can use more land to grow crops, increasing farm income potential. Some of the decrease in summer fallow may also be attributable to the CRP. Much of the CRP acreage is in the Northern and Southern Plains regions, where summer fallow is commonly practiced. Land taken out of production and placed in the CRP includes some land that might otherwise have been in summer fallow.

Changes in cropland pasture. At 36 million acres in 2007, cropland used for pasture appears to have been at its the lowest level in the 60 years that ERS has reported land-use statistics. However, this reduction is at least partly a result of the methodological changes in the 2007 Census of Agriculture that reclassified some cropland pasture to permanent grassland pasture (see discussion on pp. 5-6). Prior to 2007, the previous low was in 1964 at 57 million acres, compared with a high of 88 million acres in 1969 (see table 6).

Trends in Irrigated Land

U.S. agriculture consumes over 80 percent of the water used in the United States (Schaible, 2004). Irrigation technology is an important contributor to U.S. agriculture, yet competing demands for water due to population growth, energy sector growth, and environmental needs have intensified. In 2007, nearly 57 million acres (17 percent of all cropland used for crops) was irrigated, yet this acreage generated nearly half the value of all crops sold. In 2007, the amount of irrigated land surpassed the previous high of 56 million acres set in 1997.¹⁶ Seventy-five percent of irrigated acreage is located in the more arid Western regions (Northern and Southern Plains and Mountain and Pacific regions).¹⁷ Though it contains less cropland than many other regions, the Pacific region is the most dependent on irrigation, with nearly two-thirds of its 17.4 million acres of cropland used for crops irrigated in 2007.

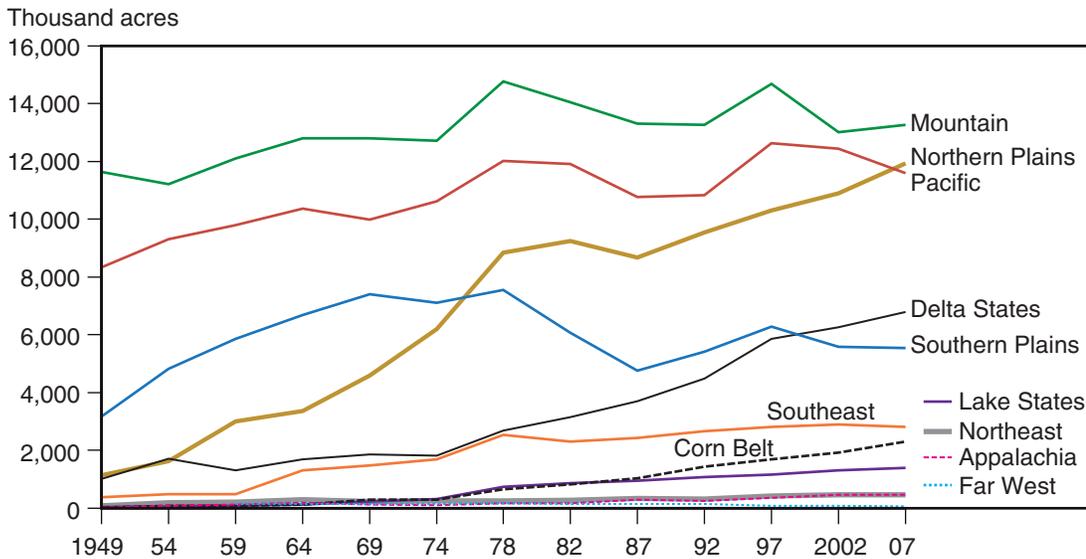
The proportion of irrigated cropland used for crops has been increasing since 1949, when nearly 26 million acres were irrigated. Between 2002 and 2007, the small net increase of 1.3 million acres (2 percent) in the total amount of irrigated cropland masks greater changes occurring within regions (fig. 8). Most regions experienced either a decline in irrigated acreage or a slowing of irrigated expansion. The 1-million-acre increase in irrigated cropland acreage in the Northern Plains occurred almost entirely in Nebraska and could be due to the potential for future restrictions on new irrigation development.¹⁸ Smaller expansions in irrigated acreage in the Delta, Mountain, Corn Belt, Lake States, and Northeast regions are attributed to recurring

¹⁶MLU estimates for irrigated land acreage by region and State are available at <http://www.ers.usda.gov/data/majorlanduses/>.

¹⁷The 17 States in these four regions accounted for about 85 percent of total agricultural withdrawals of freshwater in 2000 (Golleson and Quimby, 2006).

¹⁸Glenn Schaible's personal communication with Professor Raymond J. Supalla, Agricultural Economics Department, University of Nebraska-Lincoln.

Figure 8
Irrigated acres, by farm production region, 1949-2007



Source: Censuses of Agriculture (USDA/NASS, 2009a). Data by region are summarized in the USDA, Economic Research Service, *Major Land Uses* data product, 2011 (<http://www.ers.usda.gov/data/majorlanduses/>).

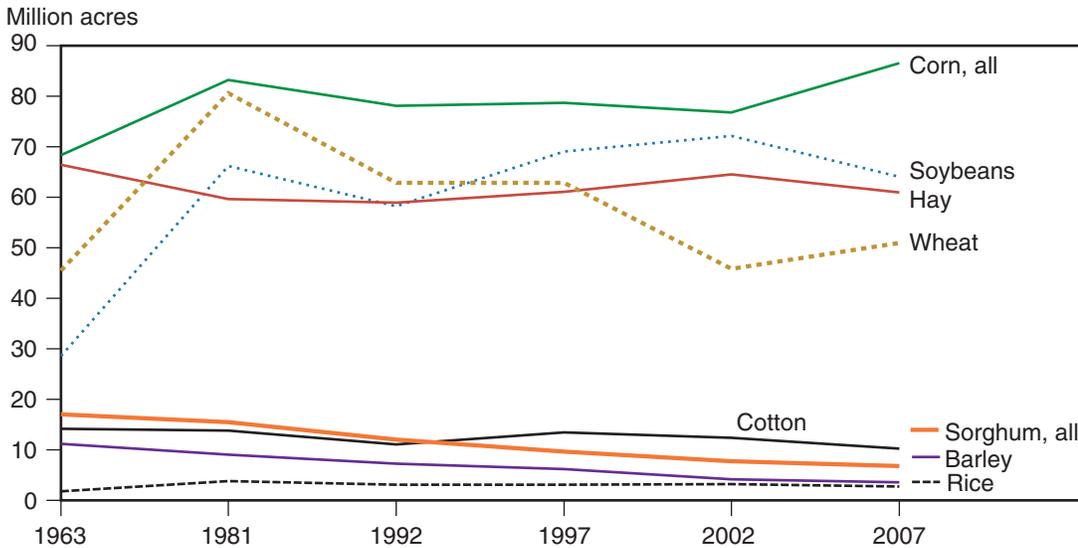
regional droughts, increased biofuel demand for corn, and increased irrigation cost-effectiveness (USDA/Natural Resources Conservation Service, 2006). Irrigated cropland acreage decreased in the remaining regions, with an 800,000-acre decline in the Pacific region (mainly California, where increasing salinity has reduced soil productivity) and an 80,000-acre decline in the Southeast (primarily Florida, for a variety of reasons) (Ayars, 2010; California Department of Conservation, 2011; USGS, 2008).

Changes in Principal Crops Harvested

Like trends in cropland used for crops, historical trends in the total principal crops harvested are closely associated with levels of cropland diverted from production through Federal programs (see fig. 5). In 1963, 56 million acres of cropland were diverted through the Soil Bank and other acreage reduction programs. Between 1963 and 1981, harvested acreage of principal crops increased by 68 million acres and peaked at 354 million acres in 1981, when no cropland was diverted through acreage reduction programs. Between 1981 and 2007, principal crops harvested declined nearly 58 million acres partly due to cropland diversions into the CRP, which had diverted almost 37 million acres from production in 2007 (USDA/FSA, 2008).

Changes in the mix of crops also occurred between 1963 and 2007. Strong growth in the export market and rapid expansions through double-cropping of soybeans and small grains marked the 1970s and early 1980s. Food crops, such as soybeans, registered substantial increases over this time (fig. 9). Soybean acreage more than doubled from about 29 million acres in 1963 to over 64 million acres in 2007 and by 1997 had surpassed wheat as the second-leading food and feed crops in acreage terms (more acreage was planted to corn than any other crop during 1963-2007). Wheat acreage, some of which was double-cropped ahead of soybeans, increased 77 percent (35

Figure 9
Principal U.S. crops harvested, 48 contiguous States, 1963-2007



Notes: The solid lines are feed crops and dashed lines are food crops. Some feed crops are used for biofuel purposes.

Source: USDA, Economic Research Service calculations based on data for principal crops harvested from Daugherty (1995) and USDA/National Agricultural Statistics Service (1999b, 2005, and 2009b).

million acres) between 1963 and 1981 then declined nearly 37 percent (30 million acres) between 1981 and 2007 (table 7). Total food crop acreage increased by 93 percent between 1963 and 1981, from 84 to 162 million acres, due to substantial increases in harvested wheat and soybeans over the period. By 2007, total food crop acreage was 51 percent higher than 1963 levels, due primarily to the 124-percent increase in soybean acreage from 1963 to 2007.

Feed crop acreage, on the other hand, declined from 1963 to 1981, as a whole, and remained below 1963 levels in 2007 (table 7). Feed crops' 10-percent decline from 1963 to 2007 was a result of losing 43 million acres in oats, barley, sorghum, and hay—a 93-percent reduction in oat acres, 69-percent decrease in barley acres, 58-percent decrease in sorghum acres, and 8-percent decrease in hay acres. Corn's 36-percent increase of 24 million acres counteracts the downward trend in the other feed crops.

Other principal crops (cotton, flaxseed, and tobacco) declined by more than 4.2 million acres (27 percent) since 1981 (table 7). Cotton, accounting for 94 percent of other crop acreage, declined by 24 percent from 1981 to 2007, while flaxseed and tobacco acreage each declined by over 50 percent.

Market forces and changes in farm programs have affected the supply and demand for the four agricultural crops (corn, soybeans, wheat, and hay) that comprise 86 percent of total harvested acres in the United States (see fig. 9). The increase in planting flexibility, introduced with the Food, Agriculture, Conservation, and Trade Act of 1990 and culminating with the Federal Agriculture Improvement and Reform Act of 1996, allowed producers to increase more profitable soybean acreage without losing base acreage of wheat, corn, and other program crops, which could have been costly under

previous farm programs. In addition, new varieties of corn and soybeans allowed expansion of these crops into previously wheat-producing areas of the Plains States (USDA/ERS, 2004).

The use of crops as a renewable energy source has increased over the last 30 years. In the past decade, the use of corn for this purpose has increased sharply due to the mandate in the Energy Policy Act of 2005 to increase the amount of renewable fuels in the U.S. fuel supply. This law, coupled with an expansion of required amounts of renewable fuels in 2007, significantly increased the production of corn ethanol. A congressional mandate in 2007 also set an annual target of 16 billion gallons of cellulosic biofuels by 2022. A variety of feedstocks may potentially be used for cellulosic production, including stalks, leaves, grasses, or trees (USDA/ERS and OCE, 2011).

Table 7
Principal U.S. crops harvested, 48 contiguous States, 1963-2007

Crop	1963	1981	1992	1997	2002	2007	Change		
							1963-81	1981-2007	2002-07
<i>Million acres</i>									
Food crops:									
Wheat	45.5	80.6	62.8	62.8	45.8	51.0	35.1	-29.6	5.2
Soybeans	28.6	66.2	58.2	69.1	72.2	64.1	37.6	-2.1	-8.1
Rice	1.8	3.8	3.1	3.1	3.2	2.7	2	-1.1	-0.5
Rye	1.6	0.7	0.4	0.3	0.3	0.3	-0.9	-0.5	-0.1
Peanuts	1.4	1.5	1.7	1.4	1.3	1.2	0.1	-0.3	-0.1
Sunflowers	NR	3.8	2	2.8	2.2	2.0	3.8	-1.8	-0.2
Dry edible beans	1.4	2.2	1.5	1.8	1.7	1.5	0.8	-0.7	-0.2
Dry edible peas	0.3	0.1	0.2	0.3	0.3	0.8	-0.2	0.7	0.5
Potatoes	1.3	1.2	1.3	1.4	1.3	1.1	-0.1	-0.1	-0.2
Sweet potatoes	0.2	0.1	0.1	0.1	0.1	0.1	-0.1	0.0	0.0
Sugar beets	1.2	1.2	1.4	1.4	1.4	1.2	0	0.0	-0.2
Sugarcane	0.5	0.7	0.9	0.9	1.02	0.9	0.2	0.2	-0.1
Total	83.8	162.1	133.6	145.4	130.8	126.9	78.3	-35.3	-4.0
Feed crops:									
Corn, all	68.3	83.2	78.1	78.7	76.8	92.6	14.9	9.4	15.8
Sorghum, all	17	15.5	12	9.6	7.7	7.2	-1.5	-8.3	-0.5
Oats	21.3	9.4	4.5	2.8	2.1	1.5	-11.9	-7.9	-0.6
Barley	11.2	9	7.3	6.2	4.1	3.5	-2.2	-5.5	-0.6
Hay	66.4	59.6	58.9	61.1	64.5	61.0	-6.8	1.4	-3.5
Total	184.2	176.7	154.8	158.4	155.2	165.8	-7.5	-10.9	10.6
Other crops:									
Cotton	14.2	13.8	11.1	13.4	12.4	10.5	-0.4	-3.3	-1.9
Flaxseed	3.2	0.6	0.2	0.1	0.1	0.3	-2.6	-0.3	0.2
Tobacco	1.2	1.0	0.8	0.8	0.1	0.4	-0.2	-0.6	0.3
Total	18.6	15.4	12.1	14.3	12.6	11.2	-3.2	-4.2	-1.4
Total principal crops ¹	286.6	354.2	300.5	318.1	298.6	303.9	67.6	-50.4	5.2

NR = Not reported.

¹ Distributions may not add due to rounding.

Sources: USDA, Economic Research Service calculations based on data for principal crops harvested from Daugherty (1995) and USDA/National Agricultural Statistics Service (1999b, 2005, and 2009b).

In recent years, higher corn prices, driven partly by increased demand for corn as an ethanol feedstock, have contributed to complex changes in the production of principal crops. Using data from a special survey of corn and soybean farmers, Wallander et al. (2011) found that the expansion in corn acreage over 2006-08 was due to soybean producers shifting acreage into corn. However, other producers shifted acreage from other crops, primarily cotton, into soybeans, offsetting much of the shift from soy into corn. Total acreage in harvested crops on corn and soybean farms expanded, with about a third of the increase due to shifts from hay and CRP land, as well as increases in double-cropping and a reduction in idle land. Because the MLU data is presented only through 2007, it does not fully capture these changes.

Grassland Pasture and Range, and Total Grazing Land

Nearly 35 percent of U.S. land area, or 777 million acres in 2007, is grazing land (i.e., **grassland pasture and range, cropland pasture, and forestland grazed**) (see table 1). This estimate of total grazing area includes forestland on which grazing occurs as a multiple use, but the estimate excludes land grazed before or after crops were harvested (e.g., fall and winter grazing of small grains and after-harvest grazing of hay land). The three types of grazing land measured differed greatly in terms of acreage, distribution, productivity, and other characteristics (see Daugherty (1989) for an overview of U.S. grazing lands from 1950 to 1982).

Grassland Pasture and Range

The 614 million acres of grassland pasture and range account for more than three-quarters of total grazing land.¹⁹ Four regions have about 556 million acres (91 percent) of U.S. grassland pasture and range—over half of grassland pasture and range is in the Mountain region; another 20 percent is in the Southern Plains; and the Northern Plains and Pacific regions together account for 21 percent. The rest is distributed among the remaining regions, none of which have more than 2 percent. Grassland pasture and range dominate all other types of grazing land in all regions.

Grassland pasture and range account for more than half of the total land area in the Southern Plains and Mountain regions. Grazing of this varied cover type accounts for 39 percent of the area in the Northern Plains, where a larger proportion of the land area is used for crops, and 28 percent of the area in the Pacific region, where forest-use land predominates. In other regions, the proportion of area in grassland pasture and range varied from 10 percent in the Corn Belt to less than 1 percent in the Far West (Alaska and Hawaii). Eighteen percent of the land in Hawaii is grazed, but because of the State's small size, grassland pasture there contributes little to the total national acreage.

Cropland Pasture

At 36 million acres, cropland pasture—the smallest but generally most productive component of grazing acreage—accounted for 2 percent of total U.S. land area and 5 percent of total grazing acreage in 2007. While cropland pasture is considered part of the cropland base and is included in the estimate of total cropland, it may be marginal for crop use and remain in pasture for extended periods. Two-thirds of the 36 million acres in this category were concentrated in the Southern Plains (30 percent), Mountain (14 percent), Northern Plains (12 percent), and Corn Belt (10 percent) regions. The share of land area in grassland pasture is much higher in the Plains and Mountain regions than in the coastal regions.

Grazed Forestland

The 127 million acres of grazed forestland include acreage in open forest, land reverting to forest, and other forested areas with grass or other forage growth that are grazed to some extent. Grazed forestland ranged from

¹⁹Although both “grassland pasture” and “range” are used for grazing, the two terms are primarily distinguished by the type of grass species present. The former term is more commonly used in the Eastern United States and the latter is used in the Western United States.

less than 1 million acres in Alaska and Hawaii to 68 million acres in the Mountain region. Acreage of this pasture type is relatively high throughout the West. The value of forestland for grazing varies widely across regions and depends on the productivity of forested grazing, the demand for grazing, the amount of forestland, and other factors, including climate and forest characteristics, such as species composition, stand density, and tree canopies. Values are relatively high on open stands of pine in the South, for example, where climate permits grazing throughout the year. Upland hardwoods, on the other hand, with a more complete canopy, allow little production of forage, although substantial acreage is grazed because of their availability on farms. Ponderosa pine and other open forest types in the West enable seasonal grazing, but forestland with thick growing trees, such as fir, offers little grazing value.

Trends in Grazing Acreage

Total grazing land in 2007 accounted for 777 million acres, the lowest amount since the MLU series began in 1945.²⁰ Total grazing land declined by about 243 million acres (about 24 percent) from 1949 to 2007 (table 8). Over the most recent 5-year period (2002-07), cropland pasture declined by 26 million acres, and estimated acreage of grassland pasture and range increased by 27 million acres; these offsetting changes are at least partly due to methodological changes in the Census of Agriculture for estimating cropland pasture (see additional discussion on pp. 5-6).

Pasture and range acreage sometimes converts to cropland when demand for crop products is high. Cropland pasture, in particular, may shift to cropland used for crops when commodity prices are high. Shifts are more frequent, however, between idled cropland and cropland used for crops because idled cropland is generally more suited to crop production than cropland pasture; these shifts may be more pronounced in regions with higher quality cropland pasture, such as the Corn Belt.

In general, grazing lands are less economically suited for crop production than for other uses. Substantial acreages of land used for grazing have shifted to recreational, wildlife, and environmental uses. Under favorable growing conditions, particularly in the South, pasture land may revert to forest. Some acres are converted to urban uses to serve the needs of a growing population. These factors have combined to cause a long-term net decline in grazing acreage, from over 1 billion acres in 1949 to 777 million acres in 2007 (table 8).

Not all regions experienced long-term declines (see MLU for trends by region at <http://www.ers.usda.gov/data/majorlanduses/>). Between 1949 and 2007, nonforested grazing land (cropland pasture and pasture and range) declined by 51 million acres in total, but increased by 28 million acres in the Southern Plains and by 1 million acres in the Southeast. These increases offset large declines in the Mountain (44 million acres) and Corn Belt regions (11 million acres). Large decreases in the Western States mainly involved Federal range that was withdrawn for wilderness and similar purposes or that was reclassified as unsuitable for grazing.

²⁰Statistics for 1945 do not include Alaska and Hawaii. Nevertheless, these States have little influence on total grazing acreage, accounting for just 0.22 percent of the total grazing area in 1949.

Grazed forestland decreased 192 million acres (60 percent) from 1949 to 2007 (table 8), and by 7 million acres during 2002-07. The long decline in forest grazing activity may be partly due to fewer farms and less land in farms, increases in forest stand density restricting grazing possibilities, and improvements in both livestock feeding and forest management practices. All of these factors have been especially important in the South, where woodland grazing acreages have been high.

Table 8
Total U.S. grazing land, by type, 1945-2007

Year	Cropland pasture ¹	Grassland pasture and range ²	Subtotal ³	Forestland grazed ⁴	Total ³
<i>Million acres</i>					
1945	47	659	706	345	1,051
1949	69	632	701	319	1,020
1954	66	634	700	301	1,001
1959	66	633	699	245	944
1964	57	640	697	225	922
1969	88	604	692	198	890
1974	83	598	681	179	860
1978	76	587	663	172	835
1982	65	597	662	158	820
1987	65	591	656	155	811
1992	67	591	658	145	803
1997	68	580	648	140	788
2002	62	587	648	134	783
2007	36	614	650	127	777

¹ Cropland used only for pasture estimate based on the Censuses of Agriculture (USDA/National Agricultural Statistics Service, 2009a).

² Grassland and other nonforested pasture and range based on the National Resources Inventory (e.g., USDA/Natural Resources Conservation Service, 2009), Censuses of Agriculture (e.g., USDA/National Agricultural Statistics Service, 2009a), and estimates of open or nonforested grazing land on Federal land (e.g., USDA/Forest Service, 2010; U.S. Department of the Interior/Bureau of Land Management, 2011).

³ Distribution may not add to totals due to rounding.

⁴ Estimates of total grazed forest acreage are based on acreage estimates of active grazing allotments in National Forests, plus grazed woodlands on non-Federally owned land from the Census of Agriculture and the National Resources Inventory. Though available for grazing, not all the acreage in active grazing allotments may be currently grazed.

Sources: USDA, Economic Research Service calculations based on reports and records of the Census Bureau and Federal and State land management and conservation agencies. The estimates are not strictly comparable. Estimates for 2007 and 2002 based on U.S. Department of the Interior/Bureau of Land Management (2003 and 2011); USDA/Forest Service (1989 and 2008); U.S. General Services Administration (2001 and 2004); USDA/National Agricultural Statistics Service (2004a, 2004b, 2005, and 2009a); and USDA/Natural Resources Conservation Service (2000, 2004a, and 2009). Estimates for years prior to 2002 are from Daugherty (1989); Frey (1983); and previous *Major Land Uses* reports by: Vesterby and Krupa (2001); Daugherty (1991 and 1995); Frey (1973, 1979, and 1982); Frey and Hexem (1985); Frey et al. (1968); Wooten et al. (1962); Wooten and Anderson (1957); and Wooten (1953).

Forest-Use Land and Total Forested Land

Forested land used for all purposes totaled 751 million acres in 2007, including **forest-use land** and land in **special uses** that has forest cover (table 9). The “forest-use” category is based on the use of the forestland as opposed to the forest cover alone. The forest-use designation includes both grazed and ungrazed forests but excludes forestland in parks, wildlife areas, and other special uses. This reduced area is a more realistic approximation of the land that may serve commercial forest uses as opposed to having forest cover.

Forest-Use Land

An estimated 671 million acres were in a forest-use in 2007. About 127 million acres of forest-use land (19 percent) is grazed. Forest-use land is about equally divided between the eastern half of the country (Northeast, Appalachian, Southeast, Lake, Corn Belt, and Delta regions) and the western half (the Plains States, Mountain, Pacific, and Far West regions) (table 9). Forest-use land predominates in the Northeast, Southeast, Appalachian, and Delta States, comprising 57-61 percent of all land in these regions. Forest-use land is also a relatively large share of the Lake States and Pacific regions, accounting for 36-42 percent of all land in these regions. Forest-use acreages in the Mountain region and Alaska are quite large but make up a smaller proportion of total land area in those regions (22 and 26 percent, respectively).

Total Forested Land

More than two-thirds of total forested land in 2007 was **timberland**—forests capable of commercial timber production but not removed from timber use by statute or administrative regulation (table 10, fig. 10). The greatest proportion of timberland was in the Southeast (15 percent), followed by the Appalachian (14 percent), Northeast, and Mountain regions (13 percent

Table 9

Total U.S. forested land, by region, 2007

Region	Grazed forest	Other forest-use land	Total forest-use land	Forested land in special uses	Total forested land
<i>1,000 acres</i>					
Northeast	511	66,263	66,774	6,015	72,789
Lake States	1,638	49,122	50,759	1,451	52,211
Corn Belt	5,258	29,006	34,264	768	35,032
Northern Plains	2,824	2,853	5,677	79	5,757
Appalachian	3,150	67,668	70,819	1,851	72,670
Southeast	2,773	72,377	75,150	1,220	76,369
Delta States	3,695	48,622	52,317	357	52,674
Southern Plains	10,877	13,902	24,779	159	24,938
Mountain	68,402	53,076	121,478	23,427	144,905
Pacific	27,975	46,045	74,021	11,245	85,266
Far West	27	95,327	95,354	33,264	128,617
United States	127,130	544,261	671,390	79,837	751,228

Source: See sources for tables 2, 8, and 10.

Table 10

Total U.S. forestland, by major class and region, 2007

Region	Timberland			Reserved and other forested land ²	Total forestland		
	Federal	Non-Federal	Total ¹		Federal	Non-Federal	Total ¹
	<i>1,000 acres</i>						
Northeast	1,884	66,122	68,006	4,783	2,335	70,454	72,789
Lake States	6,182	43,996	50,178	2,033	7,323	48,888	52,211
Corn Belt	2,744	31,293	34,038	994	2,989	32,043	35,032
Northern Plains	1,294	3,993	5,287	469	1,449	4,307	5,757
Appalachian	6,459	64,124	70,583	2,087	8,106	64,564	72,670
Southeast	4,290	70,099	75,019	1,350	5,883	70,487	76,369
Delta States	5,638	46,493	52,132	542	5,964	46,711	52,674
Southern Plains	1,234	16,859	18,093	6,845	1,405	23,533	24,938
Mountain	47,318	18,362	65,681	79,224	103,620	41,284	144,905
Pacific	30,310	32,324	62,633	22,632	45,904	39,361	85,266
48 States ¹	107,984	393,665	501,649	120,961	184,978	437,633	622,610
Alaska	4,750	7,114	11,865	115,004	63,423	63,446	126,869
Hawaii	0	700	700	1,049	12	1,736	1,748
United States ¹	112,734	401,479	514,213	237,014	248,413	502,814	751,228

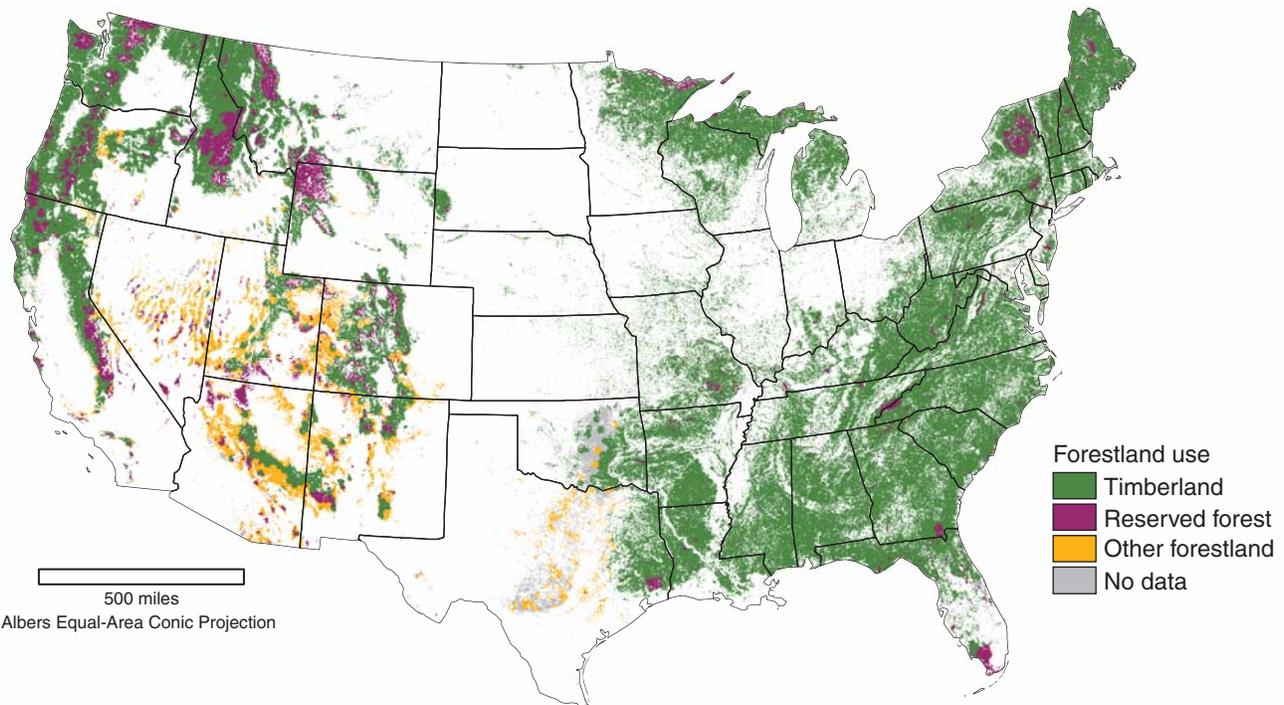
¹Distributions may not add due to rounding.

² Includes about 80 million acres of forestland in parks, wildlife areas, and other special land uses.

Source: Smith et al. (2009).

Figure 10

Timberland, reserved forest, and other forestland in the contiguous United States



Source: Perry et al. (2009).

each). The remainder of total forested land is a combination of **reserved forestland** and **other forestland**. Much of the reserved forestland is available for recreational use (see “Special Uses,” p. 33). These forested lands provide watershed protection, wildlife habitats, and parks and serve other special purposes depending on the region. Other forested land includes land that is less productive for commercial harvest, but produces other wood and tree products, such as fuelwood. Much of this land is located in high-elevation areas like Alaska or in the dry, piñon-juniper lands of the interior West (Smith et al., 2009).

About 43 percent of the reserved and other forested land (e.g., parks, wilderness areas, and wildlife refuges) are in the Mountain and Pacific regions, where it accounts for over 44 percent of all forested land in those regions. Much of the remainder (49 percent) is in Alaska, where it accounts for 91 percent of all forested land in that State (table 10). In contrast, acreages of reserved and other forestland in the Eastern States are relatively small, accounting for no more than 8 percent of all forested land in any region east of the Mississippi River.

Trends in Forest-Use and Forested Acreage

Forest-use land, which does not include the forest area counted under special uses, increased 20 million acres (3 percent) from 2002 to 2007 due mainly to increases in timberland on non-Federal land in many regions, but also due to better classification of forestland in some States.²¹ Forest-use land trended downward from 1949 to 1997, but has increased over the past 10 years. Much of the 14-percent decline in forest-use land from 1949 to 2002 was a result of land reclassification from forest-use to special-use areas (see “Special Uses,” p. 33). Urbanization of forested land in Southern regions also contributed to the declines; declines, however, may have been greater if various Federal and State programs had not provided incentives for private landowners to plant trees (Smith et al., 2009).

Total forested land, including forest-use land (the MLU classification) and multiple-use areas, declined from colonial times until about 1920, increased from 1920 to 1960, then trended downward until 1987 (USDA/FS, 1982). Total forested area has increased since 1987, rising by about 15 million acres between 1987 and 1997 and by about 5 million acres between 1997 and 2007. Forested land classed as timberland has followed a similar upward trend since 1987, when it was at a 35-year low of 485 million acres. Timberland area increased by 19 million acres over 1987-97 and increased another 10 million acres over 1997-2007, due largely to re-evaluations of productivity that resulted in reclassification of other forestlands to timberland and to marginal farmland in the East reverting to productive forestland (Smith et al., 2009). Even when total forested acreage does not change, forests change in terms of composition and health due to human-induced changes and natural processes of mortality and regeneration (Smith et al., 2009).

Recent increases in timberland area are partially the result of a reclassification of some national forestland due to standardization with protocols in use on other land ownerships. Some of the increases in total timberland since 1987 may also indicate a response to rising real prices for forest products.

²¹In particular, reclassifications of low productivity forestland from the MLU miscellaneous category explain the 5-million-acre and nearly 2-million-acre increases in Texas and Washington State forest-use land estimates, respectively, between 2002 and 2007. Also, forest-use land in Wyoming increased 2 million acres over this period, reflecting a change in the U.S. Forest Service’s definition of a forest to include lands in the Great Plains that historically had not been classified as forest (e.g., wide windbreaks and strips). Also the Forest Service’s definitional change to exclude chaparral, sparse juniper, and scrub oak land in the West largely explains the 6.8-million-acre decline in California forest-use land (Smith et al., 2009).

Based on a national-level analysis of NRI data, Lubowski et al. (2008) estimate that increases in net returns from timber production, combined with a decline in crop profits, were the major determinants of forest area change from 1982 to 1997. While timberland acreage increased nationally, changes were not uniform across the country. Some timber-producing States, such as California, Washington State, and Michigan, experienced small decreases in timberland acreage from 1997 to 2002 (1.0, 0.4, and 0.3 percent, respectively).

Forestlands under non-Federal ownership have remained relatively constant over the last 10 years. Acreage classified as woodlands on farms decreased by about 1 million acres (1 percent) from 1997 to 2002 and by 2 million acres from 2002 to 2007 (USDA/NASS, 1999a and 2009a). Federal timberland increased by about 600,000 acres (0.5 percent) from 1997 to 2002 and by 3 million acres from 2002 to 2007. Earlier declines in Federal timberland area from 1952 to 1992 were primarily the result of transferring timberland into reserved areas.

Urban and Rural Residential Uses

The land in **urban areas** was estimated at 61 million acres in 2007, less than 3 percent of the total land area in the United States, or an increase of 1 million acres since 2002. The 2007 estimate remains below the 1997 estimate of 66 million acres in urban areas (see table 2) due to changes in the definition of urban and rural areas in the 2000 Census, the source for the MLU estimate (DOC/CB, 2002b). The census' redefining of urbanized areas was intended to more precisely delimit high-density areas, which resulted in a downward revision of urban area estimates (see DOC/CB (2002a) for a complete overview). Although restating all prior year estimates is not possible, the Census Bureau did re-estimate the amount of land in urban areas in 1990 based on the 2002 definition. The results of this analysis showed that land in urban areas increased by about 7.8 million acres from 1990 to 2000. These historical changes in census definitions are also discussed in the 2002 MLU report (Lubowski et al., 2006a).

The Census Bureau's method for estimating urban area includes urbanized areas with at least 50,000 people and urban clusters with 2,500-50,000 people but excludes portions of extended cities that are essentially rural in character and lands in rural residential uses. The 2007 **American Housing Survey** (AHS), a periodic national survey published by the U.S. Department of Housing and Urban Development (HUD) and the U.S. Census Bureau, provides estimates of land area in both urban and rural regions attributable to residential housing lots (DOC/CB, 2008). Land in residential use in both urban and **rural areas** was estimated at 135.7 million acres; 32.7 million acres was estimated to be urban **residential area** (and included in the 61 million acres estimated in urban uses). The MLU estimate for nonfarm, rural residential areas was 103 million acres in 2007. Urban land plus rural residential areas together comprise 164 million acres, or 7.2 percent of total U.S. land area.

The **National Resource Inventory** (NRI) is another data source available for estimating developed land areas in both urban and rural regions of the United States. Unlike the Census Bureau definition of urban areas, the NRI-developed land area estimate seeks to identify all residential, industrial, and commercial lands of at least a quarter acre in size or larger (see Alig and Healy (1987) for a discussion of the differences). According to the NRI, developed land totaled 111 million acres in 2007 (see table 3). This estimate includes 89 million acres in **urban and built-up areas** and 22 million acres in **rural transportation land**²² (USDA/NRCS, 2009).

Distinguishing these rural residential lands from land areas identified in other MLU categories is difficult. The NRI urban and built-up area estimate of 89 million acres overlaps the Census Bureau-based estimate of urban land area, but only a portion of the AHS-based estimate of rural residential land area. In addition, the NRI-based estimate includes nonresidential built-up rural land area not captured in other estimates in this section, but may fall under the **miscellaneous other** land category in the MLU series (see "Miscellaneous Other Land Uses" section, page 36). Also, rural residential lots may have been classed as forests or grassland pasture and range, particularly given that NRI estimates are based largely on the interpretation of high-resolution

²²An estimate of the land area used for rural transportation based on U.S. Department of Transportation records is included in the MLU special uses category, see page 33.

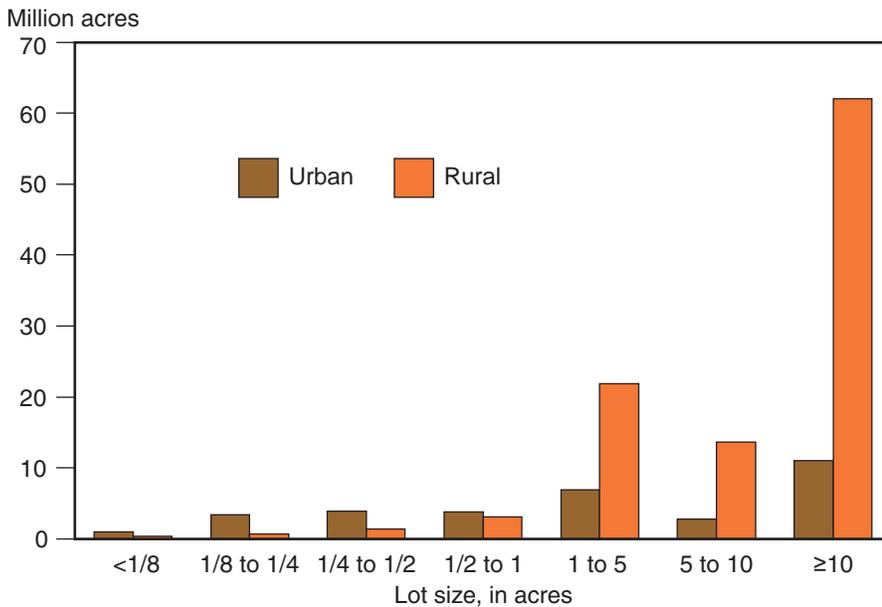
aerial photography, and the prevalence of large lots in rural residential land use and the potential for a house to be obscured by vegetative cover may contribute to their classification in other uses (fig. 11). To partially account for the potential overlap with farmsteads included in “Special Uses,” rural residential lots associated with farms (with annual agricultural sales greater than \$1,000) have been excluded from the rural residential estimate. Due to these data constraints, the estimate of rural residential area is presented but is not added to the urban estimate.

Trends in Urban and Rural Residential Uses

Urban land area has quadrupled from roughly 15 million acres in 1945 to an estimated 61 million acres in 2007. The Census Bureau reports that the U.S. population nearly doubled over this same period. Though the definition of urban land area changed somewhat in 2000, urban land area has increased at about twice the rate of population growth. The change in definitions used by the U.S. Census Bureau makes changes in urban land areas over shorter, more recent periods more difficult to compare from this data source. The prior definition showed that census estimates of urban areas increased by 9.1 million acres (36 percent) in the 1960s, 12.8 million acres (37 percent) in the 1970s, and 8.6 million acres (18 percent) in the 1980s. The new definition showed estimates of a 7.4-million-acre increase (14 percent) from 1990 to 2000. The estimated increase from 2002 to 2007 was 1 million acres (less than 2 percent).

The AHS-based estimate of land in rural residential use has also been continually increasing, from 56 million acres in 1980, 73 million acres in 1997, to

Figure 11
U.S. urban and rural residential area, by lot size, 2007



Notes: Farm housing units and housing units with unreported lot sizes (e.g., apartments) are not included in these estimates. The American Housing Survey topcodes some of the data fields to preserve respondent confidentiality. For this reason, the estimates of residential area in lots greater than 10 acres is conservative, as all lots greater than 22 acres have been recorded as 22 acres.

Source: U.S. Department of Housing and Urban Development and Department of Commerce, Census Bureau, 2007.

94 million acres in 2002. The estimated 10-percent increase of land area in rural residential use from 2002 to 2007 was significantly below the estimated 29-percent increase in rural residential land use seen in the 5-year period prior.

NRI estimated that urban and built-up areas increased from 49.7 million acres to 89 million acres (79 percent) from 1982 to 2007. The increases in urban and built-up areas varied over this period. Between 1982 and 1992, these areas increased 12.8 million acres (26 percent), and between 1992 and 2002 these areas increased 19.6 million acres (31 percent). Over 2002-07, the estimated increase was 7 million acres (8 percent).

Only a relatively small fraction of the American landscape is dedicated to urban uses (about 3 percent), however, the U.S. population continues to grow which, in combination with household formation, drives the conversion of agricultural and forestland to residential, commercial, and industrial uses. Over 1982-2007, NRI data indicated that most of the rural land converted to urban uses was previously in agricultural use. Over 23 million acres of cropland, pasture, and rangeland were converted to developed uses, representing 56 percent of the 40 million acres developed during that period. An additional 41 percent of land developed was previously in forest uses, some of which may have been grazed.

Even when rural land is not converted, proximity to these forces can affect landowner decisions about investing in and using rural land. The amount of land subject to urban influence is not insignificant. Nationally, about 20 percent of the land in farms was subject to some form of urban influence in 2007.²³ On average, ERS estimates that an additional 4 percent of agricultural land became newly subject to urban influence between 1980 and 2000. The relative influence of urban areas expanded the most in the Appalachian and Southeast regions, where ERS estimates an additional 13 percent of land became newly subject to urban influence over this period (fig. 12). On a State level, the greatest proportion of land in Delaware—an additional 40 percent of land—became newly subject to urban influence by 2000.

Proximity to urban areas can have both positive and negative impacts on land remaining in rural uses. One benefit of proximity is easier access to markets (Heimlich and Anderson, 2001). Using Census Bureau delineations of counties based on proximity to population centers and 2007 Census of Agriculture data, ERS analysis reveals that about 40 percent of the market value of agricultural products sold was produced on farms in metropolitan counties,²⁴ where urban influence and conversion pressures are greatest. Also, about 40 percent of farms were located in these counties. Farms in metro areas tend to be smaller, more diverse, and more focused on high-value crops than nonmetro farms (Barnard and Heimlich, 1993; Heimlich and Barnard, 1992 and 1997). Dairy, fruit, and vegetable production comprise much of farming activity near urban areas, and 65 percent of the market value of these products was produced on farms in metropolitan counties. Yet, the often highly fragmented conversion of rural lands to urban uses can cause conflicts between rural landowners and new nonfarming neighbors (Heimlich and Anderson, 2001). These challenges have led every State (and many localities) to pass legislation to control urban growth and/or protect the rights of rural landowners to farm (Heimlich and Anderson, 2001). Many of these policies,

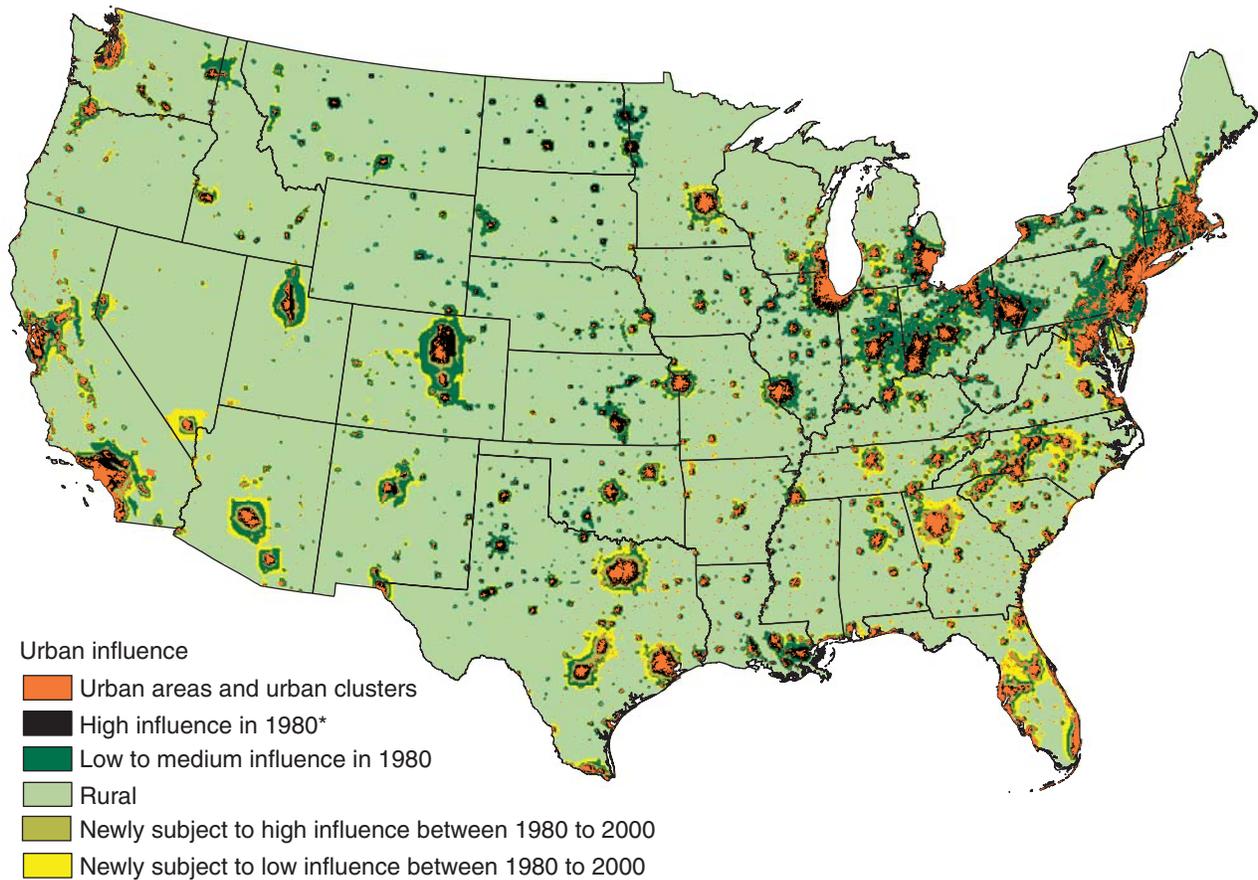
²³The estimate is based on ERS analysis of NRI data using a 2000 index measuring proximity to population called Population-Interaction Zones for Agriculture (PIZA) codes. PIZA codes are based on a population-interaction index, which provides a cardinal measure of the potential interaction between a nearby urban-related population and agricultural production activities in each 5-kilometer grid cell in the continental 48 States.

²⁴See metropolitan counties definition at <http://www.ers.usda.gov/Briefing/Rurality/RuralUrbCon/>.

however, are often intended to both protect high-quality rural land from the pressures of development and to maintain the amenities offered by rural agricultural and forested land for the suburban and rural residents in these fringe areas (e.g., Hellerstein et al., 2002).

Several studies also suggest that forest production is negatively impacted by urban influence. These studies found evidence that population growth, population density, and urban expansion decrease management, investment, and harvest rates on private forestlands (Kline et al., 2004; Munn et al., 2002; Wear et al., 1999). Development near forested land is also found to impact forests negatively due to the increased threat from pests, disease, pollution, and fire (Smith et al., 2009). Increasing urban influence has had both economic implications for the timber industry and environmental implications for the forestland. Forestland in some regions of the country is under more pressure than other regions, such as in the rapidly developing Northeast and Southern United States. Concern over the interaction of urban pressures and forestland is heightened in these regions, as the Eastern United States accounts for 90 percent of the hardwood timber volume (Smith et al., 2009). Populations located near forestland, however, do receive benefits from the forest resource, such as ecosystem services and recreational opportunities.

Figure 12
Degree of urban influence, 1980-2000



* includes some low density development not defined by the Census Bureau as urban areas or urban clusters.
 Sources: USDA, Economic Research Service calculations based on 2000 Census population data and U.S. Census Bureau 2003 urban areas.

Special Uses

Land for all **special uses**, including parks, recreational areas, rural highways, roads, railroads, and airport rights-of-way, comprised 313 million acres in 2007 (table 11). These areas, reflecting a continuum of intensity of use, represented 14 percent of all land in the United States in 2007.

The largest share—land used for outdoor recreation and land being maintained in its natural/wild/preserved state—is estimated at 252 million acres (80 percent of the special uses total). This acreage can be further dissected into national and State parks (32 percent of the special uses total) and wilderness/wildlife uses (49 percent of the special uses total). Of the total acreage used for parks, recreation, and wildlife purposes in 2007, 30 percent was in the Mountain and Pacific regions (combined) and 56 percent was in Alaska. The remaining 14 percent spans rural parks, recreation, and fish and wildlife refuges east of the Rocky Mountains, including large tracts in New York, Pennsylvania, Michigan, Minnesota, North Carolina, Tennessee, Florida, and Texas (each with a million or more acres). Areas like the national parks system were selected because of specific or unique site characteristics, including natural amenities or historical significance (DOI/NPS, 2000).

Table 11
Trends in special uses of U.S. land, 1959-2007

Special-use areas ¹	1959	1964	1969	1974	1978	1982	1987	1992	1997	2002	2007
	<i>Million acres</i>										
Rural transportation	25	26	26	26.3	26.7	26.8	25.7	25.2	25.4	27.3	26.5
Highways/roads	20.2	21.2	21	21.2	21.5	21.5	21.2	21	21	21.8	21.2
Railroads	3.4	3.3	3.2	3.1	3	3	2.3	2	1.9	3.1	3.0
Airports	1.4	1.5	1.8	2	2.2	2.3	2.2	2.2	2.5	2.4	2.4
Rural parks and wilderness areas	61.4	75.5	81.4	87.5	97.9	210.9	224.9	228.8	237.1	242.2	251.7
National/State parks	29.7	31.9	35	36.8	38.5	89.7	96	94.3	98.1	99.2	99.5
Wilderness areas	14.5	14.6	14.3	14.8	18.1	26	32.5	35.7	40	41.4	47.5
Wildlife areas	17.2	29	32.1	35.9	41.3	95.2	96.4	98.8	99	101.6	104.8
Defense/industrial	26.3	31.9	25.6	25	24.9	24	20.9	20.5	16.4	16.7	23.0
Farmsteads	10.1	9.2	8.4	8.1	8.4	8	7.1	6.2	6.6	10.8	12.2
Total ²	122.8	142.6	141.4	146.9	157.9	269.7	278.6	280.8	285.5	296.8	313.4

¹ See definitions in Appendix 1. The MLU data product with regional and State-level estimates from 1945 to 2007 is available at <http://www.ers.usda.gov/data/majorlanduses/>.

² Distributions may not add to totals due to rounding.

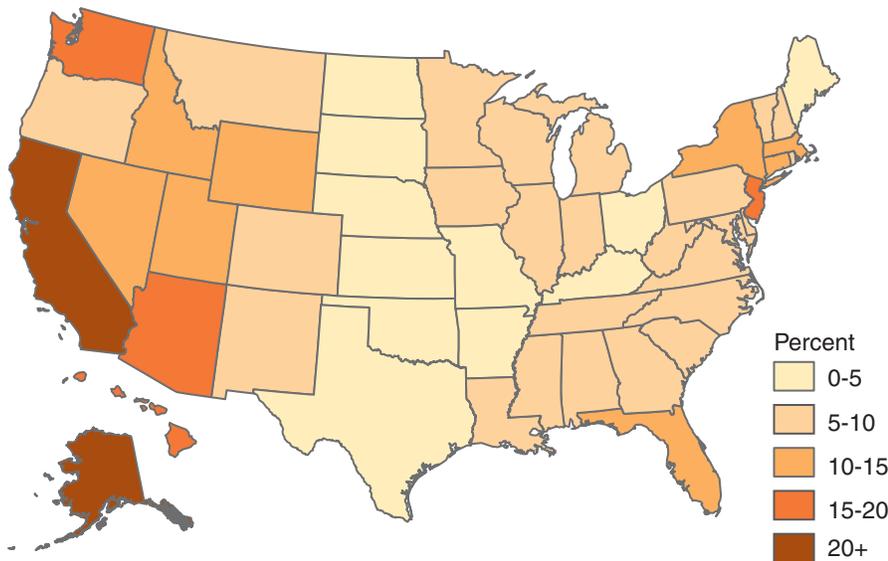
Sources: USDA, Economic Research Service calculations. Estimates for 2002 and 2007 are based on reports and records of the U.S. Department of Commerce/Census Bureau (2003) and Federal and State land management and conservation agencies, including the U.S. Department of the Interior/Bureau of Land Management (2003 and 2007); U.S. Department of Transportation/Bureau of Transportation Statistics (2004 and 2007); U.S. Department of Transportation/Federal Aviation Administration (2002); U.S. Department of Transportation/Federal Highway Administration (2002 and 2007); U.S. Department of Transportation/Federal Railroad Administration (2004); USDA/Forest Service (1998 and 2008); U.S. Department of the Interior/Fish and Wildlife Service (2001 and 2007); U.S. General Services Administration (2001 and 2004); Geographic Data Technology (2000 and 2007); USDA/National Agricultural Statistics Service (2004a and 2009); U.S. Department of the Interior/National Park Service (2002 and 2007); USDA/Natural Resources Conservation Service (2000 and 2009); Wilderness Institute (2002 and 2009); U.S. Department of Defense (2007); and U.S. Department of Energy (2007). Estimates prior to 2002 are from Vesterby and Krupa (2001); Daugherty (1991 and 1995); Frey (1973, 1979, and 1982); Frey and Hexem (1985); Frey et al. (1968); and Wooten et al. (1962).

Land used for rural transportation accounted for roughly 27 million acres, based on U.S. Department of Transportation records, about 9 percent of the total special use land. The 23 million acres in national defense and industrial areas are concentrated primarily in less agriculturally productive areas of the Western States and Alaska (with smaller areas in the Eastern States). Over 70 percent of the national defense and industrial lands are in the Mountain and Pacific regions. Land in farmsteads accounted for the remaining 12 million acres of land in special uses, as of 2007.

Trends in Special Uses

Land used for rural transportation, recreation, wildlife, defense, and other special uses in the United States has increased about 2.5 times over a 48-year period, increasing from 123 million acres in 1959 to 313 million acres in 2007. This increase is largely a result of a fourfold increase in rural parks and wilderness/wildlife areas. Alaska alone now has about 146 million acres (46 percent) of total special-use acreage due to the establishment of national parks, wilderness areas, and wildlife refuges in what was previously inventoried as forest or other unclassified land use. At 39 percent of its land base, Alaska has the largest share of land in special uses, followed by California at 25 percent. The Midwest and Delta States have the lowest percentage of land in special uses (fig. 13).

Figure 13
Percent of U.S. land in special uses, by State, 2007



Sources: USDA, Economic Research Service calculations based on reports and records of the U.S. Department of Commerce/Census Bureau (2003) and Federal, State, and local land management and conservation agencies, including the U.S. Department of the Interior/Bureau of Land Management (2007); U.S. Department of Transportation/Bureau of Transportation Statistics (2007); U.S. Department of Transportation/Federal Aviation Administration (2002); U.S. Department of Transportation/Federal Highway Administration (2007); U.S. Department of Transportation/Federal Railroad Administration (2004); USDA/Forest Service (2008); U.S. Department of the Interior/Fish and Wildlife Service (2007); U.S. General Services Administration (2004); Geographic Data Technology (2007); USDA/National Agricultural Statistics Service (2009); U.S. Department of the Interior/National Park Service (2007); Smith et al. (2009); Wilderness Institute (2009); U.S. Department of Defense (2007); and U.S. Department of Energy (2007).

Special-use areas increased 16.6 million acres (5.6 percent) from 2002 to 2007, continuing a steady upward trend since the 1940s. The long-term change, however, should be interpreted with caution, as it reflects an upward adjustment due to new data and methods.

Nearly two-thirds of the estimated increase in special-use land over 2002-07 resulted from a nearly 10-million-acre increase in rural parks and wildlife/wilderness land. Driving this number are substantial increases in federally owned outdoor recreation and preservation areas, State-owned fish and wildlife areas, and State parks. Complementary ERS research shows that these increases in rural natural amenities are associated with increasing rural population and job growth (USDA/ERS, 2011).

National defense (airfields, training land, and miscellaneous military land) and industrial (energy and research areas) acres differ from other special uses mainly in that location is paramount and higher values and intensive uses characterize much of the land. This land category consisted of 23 million acres in 2007, an increase of 6.3 million acres over the 2002 estimate, returning defense and industrial acreage to levels more comparable with pre-1990. The 37-percent increase may be partly attributable to improved data sources.²⁵

Estimated land in rural transportation uses decreased by less than 1 million acres from 2002 to 2007. The change in estimated rural area in roads, airports, and railroads likely reflects improved transportation data; some acreage may also have been reclassified as urban due to expansion of those areas. For this report, the availability of data and the use of GIS techniques improved the estimations of rural transportation land.

Land in farmsteads and associated uses (farm roads and lanes) continues to trend upward. The 2007 estimate was nearly double the 1992 estimate. The current estimate was computed from NRI data using the average farmstead size in 2007 (USDA/NRCS, 2009), then multiplied by the number of farms in 2007. Census of Agriculture data show a significant increase in the number of small farms from 2002 to 2007 (USDA/NASS, 2010), as special emphasis was placed on identifying more small farms. MLU reports prior to 2002 used significantly smaller coefficients for average farmstead size and did not utilize the NRI data.

²⁵The 2002 MLU report utilized aggregated 2000 GSA data (the most recent). The 2007 MLU report utilized 2007 data directly from the Department of Defense and the Department of Energy. The sharp increase may be a result of the increased defense budgets and military operations post-September 11, 2001.

Miscellaneous Other Land Uses

The remaining 197 million acres (9 percent) of the Nation's land are included in the miscellaneous other land category (see table 2). Miscellaneous land declined by 31 million acres (14 percent) from 2002 to 2007, due partly to the improved measurement of other land-use categories. These acres consist largely of wetlands, **rural residential land** (see "Urban and Rural Residential Uses" section on page 29), desert, tundra, and other barren land generally of low value for agricultural purposes that are not independently classified in the MLU report. Acreage of this unclassified land is relatively large in arid portions of the West and several Atlantic and Gulf Coast areas. Alaska and its ecologically sensitive tundra areas had 128 million acres, 65 percent of the total.

According to the NRI, non-Federal acreage of wetlands in the contiguous 48 States totaled almost 111 million acres in 2007, of which NRI estimated over 60 percent were wetland acres on forestland; 22 percent were on cropland, pasture and rangeland; 1 percent was on developed land; and 3 percent were grouped with water areas (USDA/NRCS, 2009). Fifteen million (13 percent) of these wetland acres are included in **miscellaneous other** land in MLU. The amount of wetland cover fluctuated in the decade from 1992 to 2002. Between 2002 and 2007, the estimate remained unchanged (USDA/NRCS, 2009).

Using a different sampling technique and including Federal and non-Federal land, the U.S. Fish and Wildlife Service (FWS) estimated total wetland acreage in the contiguous 48 States at 108 million acres in 2004, nearly 5 percent of land area, and a 0.2-percent increase in area from 1998 (Dahl, 2006).²⁶

The **miscellaneous other** MLU category remains difficult to itemize given the various sources of land-use and land-cover data in the United States and the various definitions, motivations, and missions for each data-gathering entity.

²⁶See USDA (2009, p.6) for details on the differences between NRI and FWS wetland estimates.

Major Land Uses, by Class of Ownership

About 60 percent of the land in the United States is privately owned (table 12). The Federal Government owns 29 percent of the land base, mostly in the West. State and local governments own nearly 9 percent, and Indian trust land accounts for about 2 percent. These proportions have changed only gradually over time, except in Alaska, where large areas of Federal land have been transferred to State and native (private) ownership.

Federal land, at 653 million acres in 2007, includes the original public domain and land acquired by purchase and other means. Total federally owned land increased by 18 million acres between 2002 and 2007. About 39 percent of all Federal land is in Alaska, 40 percent in the Mountain region, and 14 percent in the Pacific region. The remaining 7 percent is distributed among the other eight farm production regions and Hawaii. The largest portion among these remaining regions—1.5 percent of all Federal land—is found in the Appalachian region.

About 145 million acres of Federal grassland and a portion of Federal forestland are used for grazing. Federal land also includes forestland in **special uses** and **miscellaneous other** land, such as marshes, open swamps, bare rock areas, desert, and special uses not inventoried.

State and local governments have accumulated landholdings of various sizes through grants from the Federal Government, tax reversions, purchases, gifts,

Table 12
Ownership and use of U.S. land, by major categories, 2007

Ownership	Cropland	Grassland pasture and range	Forestland	Total special, urban, and mis- cellaneous land	Total land area
<i>Million acres</i>					
Federal ¹	-	145	165	343	653
State and other public ²	-	40	75	83	198
American Indian ³	6	49	9	2	66
Private	402	380	422	142	1,347
Total ⁴	408	614	671	570	2,264

- = Less than 500,000 acres.

¹ Includes reserved forestland in parks and other special uses.

² Excludes an estimated 80 million acres in special uses that have forest cover and, therefore, are included with forestland in this table.

³ Managed in trust by the Bureau of Indian Affairs. Does not include the 36 million acres of land in Alaska managed for Alaskan Natives.

⁴ Distributions may not add to totals due to rounding.

Sources: Federal, State, and local Government and Indian land acreage are approximations based on public records and reports (U.S. Department of the Interior; USDA Forest Service; U.S. General Services Administration). Private land is the remainder of the land in each use category. Land-use data are from U.S. Department of Housing and Urban Development/Census Bureau (1992, 2002, and 2003); U.S. Department of the Interior/Bureau of Land Management (2003); U.S. Department of Transportation/Bureau of Transportation Statistics (2004); U.S. Department of Transportation/Federal Aviation Administration (2002); U.S. Department of Transportation/Federal Highway Administration (2002); U.S. Department of Transportation/Federal Railroad Administration (2004); USDA/Forest Service (1989 and 1998); U.S. Department of the Interior/Fish and Wildlife Service (2001); U.S. General Services Administration (2001); Geographic Data Technology (2000); USDA/National Agricultural Statistics Service (2004a, 2004b, and 2005); U.S. Department of the Interior/National Park Service (2002); USDA/Natural Resources Conservation Service (2000 and 2004a); and Wildlife Institute (2002).

and escheats.²⁷ These publicly administered areas are distributed throughout the Nation more evenly than Federal land, but are still highly concentrated in the Western States. State and local governments hold land for forests, parks, wildlife refuges, highways and roads, institutional uses, and other specific purposes. Most Western States also own relatively large acreages to earn income, provide financial support to schools, and meet other objectives. About 40 million acres in this category are used for grazing.

The Bureau of Indian Affairs (BIA) manages 66 million acres in trust for tribes and individuals. Like Federal and State land, most land managed by BIA is concentrated in the Western States. About 49 million acres is grazing land and a small amount of acreage is used for crop production.

Private land, except that under American Indian ownership, totaled 1.3 billion acres in 2007. Privately owned land includes about 99 percent of the Nation's **cropland**; 62 percent of the **grassland pasture and range**; 63 percent of the forest-use land; and 25 percent of the special-use, urban, and miscellaneous land. Between 2002 and 2007, private ownership of **forest-use** land remained about the same; private ownership of land in **special uses, urban,** and **miscellaneous** declined by about 20 million acres. This decline is likely attributable to the increases seen in federally owned outdoor recreation and preservation areas, State-owned fish and wildlife areas and State parks, and National defense and industrial acres (see "Special Uses" section on page 33).

Land ownership can have far-reaching implications for how the land is managed, as different types of owners may have different objectives for owning land, such as for generating short-term profits versus as a long-term capital investment or for meeting individual/private needs versus achieving broader societal benefits. These different objectives give owners different incentives to adopt farming and forestry practices that minimize potential environmental degradation. Research in the agricultural sector found that operators who farm rented land were significantly less likely than owner-operators to adopt conservation practices that provide only long-term benefits, such as grassed waterways, strip cropping, and contour farming (Soule et al., 2000). In a survey of forest owners, the USDA Forest Service found that of the 264 million acres of privately owned forestland, only 19 percent were covered by forest management plans (Smith et al., 2009).

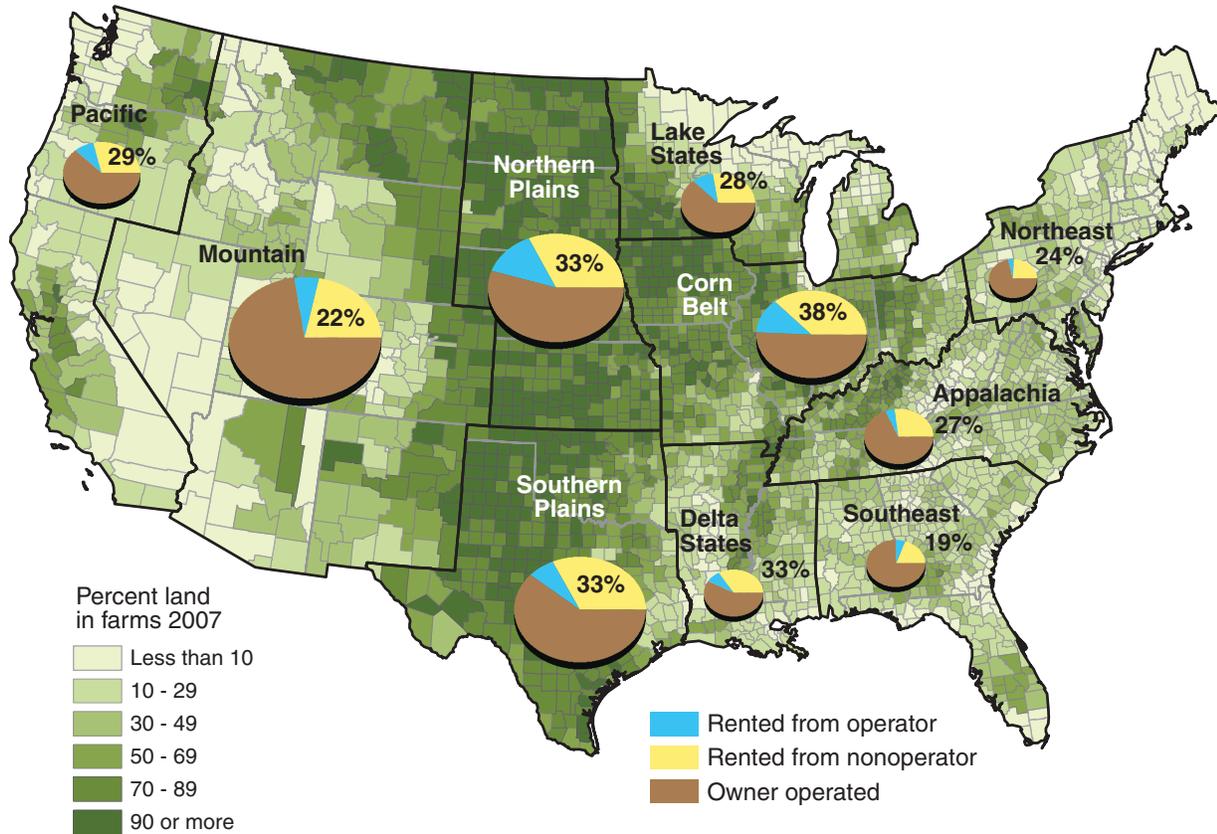
Of the 922 million acres of land in farms—cropland, privately owned pasture and rangeland, and privately owned grazed woodland on farms—62 percent is owned by individuals that farm the land. These operating owners rent an additional 9 percent to other operators, and 29 percent of land in farms is owned by entities that are not otherwise engaged in farming (USDA/NASS, 2009a). In 2007, in three of the top four regions with the most land in farms, nonoperating landlords owned more than 30 percent of the land (fig. 14).

The USDA Forest Service tracks ownership patterns of timberland—the component of **forest-use land** used for commercial timber production. Ownership patterns vary across the country. Most federally owned timberland is in the western half of the country (Northern and Southern Plains, Mountain, Pacific, and Far West regions), while most privately owned land is in the eastern half of the country (fig. 15). The private corporate category includes timber investment management organizations (TIMOs) and real

²⁷A common law doctrine that operates to ensure that property is not left in limbo and ownerless.

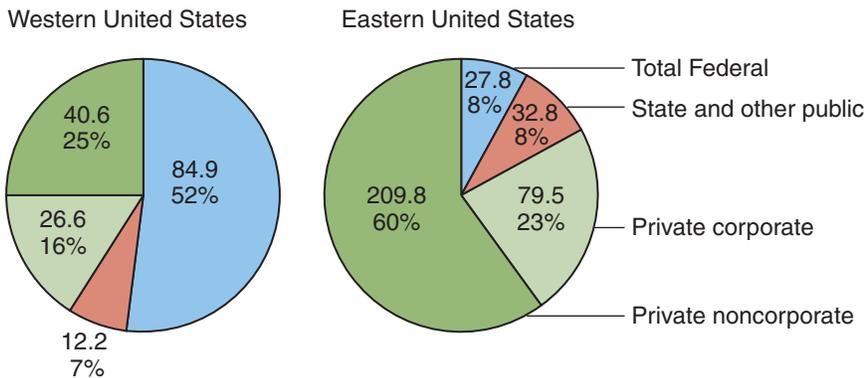
estate investment trusts (REITs). TIMOs and REITs account for much of the land previously classified as forest industry land, which was sold off or converted by the latter ownership type (Smith et al., 2009).

Figure 14
Share of U.S. farmland, by ownership type, 2007



Source: USDA, National Agricultural Statistics Service.

Figure 15
Share of U.S. timberland area (million acres), by major ownership categories, 2007



Source: Smith et al. (2009).

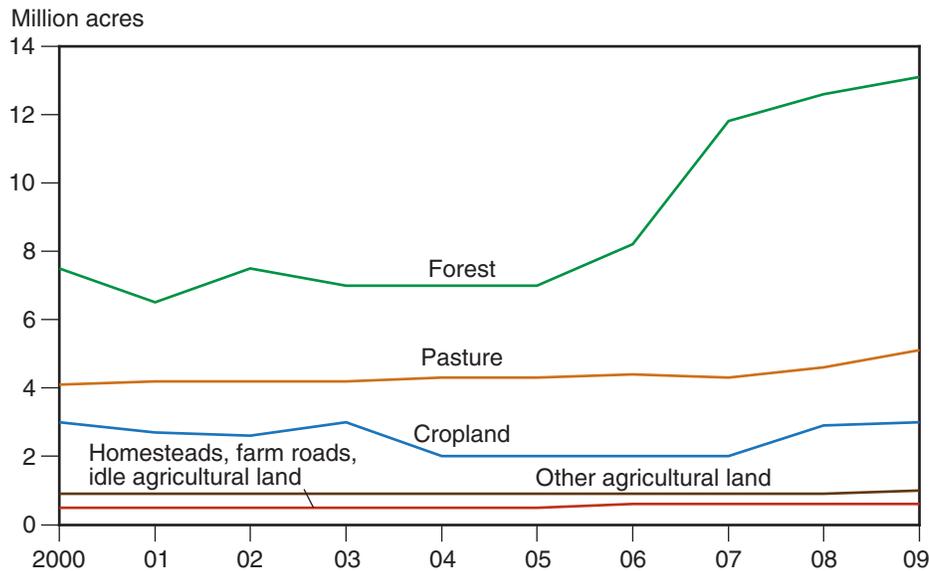
Land use is closely interlinked with land ownership, and these proportions reflect historic land management priorities. During the 19th century, Federal agencies actively encouraged westward settlement and economic development through the selective transfer of more productive agricultural lands from Federal ownership to private companies and individuals (Wiebe et al., 1996). After the turn of the 19th century, the emphasis of land-use policies evolved to balance private economic interests with the provision of recreation, wilderness and wildlife, and environmental and resource conservation.

Foreign Ownership of Land

The private land category includes land held by foreign owners. Since 1978, foreign owners have been required to submit information to the U.S. Department of Agriculture on farm and forestland holdings in compliance with the Agricultural Foreign Investment Disclosure Act of 1978.

In 2007, foreign owners held an interest in 21.8 million acres (1 percent) of U.S. land, 19.5 million acres of which were farm and forestland (Blevins et al., 2008). These holdings represent about 1.2 percent of farm and forestland (based on MLU estimates). While foreign land holdings of farm and forestland have remained relatively constant between 1996 and 2006, foreign holdings of these lands increased 23 percent (3.6 million acres) from 2006 to 2007. This significant increase was largely in forestlands (fig. 16) and occurred as a result of timber company acquisitions by foreign-owned companies (Blevins et al., 2008). Foreign landowners hold property in all U.S. States, primarily forest or timber land, with the largest amount of foreign-owned land in Maine (3.324 million acres, about 17 percent of foreign-held farm and forestland). Foreign landowners hold more than 1 million acres of farm and forestland in Texas, Alabama, Washington State, and Florida, with less than a million acres owned in other States.

Figure 16
Trends in foreign holdings of U.S. agricultural land, by type of use, 2000-09



Source: Blevins et al. (2009).

Conclusions and Challenges To Resolve

This update to the MLU series presents land-use estimates spanning from 1945 to 2007 for the United States (State-level estimates are available at <http://www.ers.usda.gov/Data/MajorLandUses/>). In addition to providing the only comprehensive estimates covering all land uses for that length of time, this report also provides a number of insights into the factors driving changes in major land-use categories over time.

Primary Challenges When Compiling Estimates for All Major Land Uses

Out of necessity, the data are drawn from a number of sources. A challenge arises because each source defines land-use categories somewhat differently to best meet its own agency's needs, and no single agency measures all land uses. These definitional differences create challenges when attempting to use the land-use estimates provided by multiple agencies. Yet, the land that could potentially fall into multiple land-use categories, such as grassland on which forest is starting to regenerate, may be the most susceptible to factors causing land-use change, so it is important to accurately measure changes in those lands. A systematic effort to clearly highlight the differences between data-sets that provide estimates of the same land-use types would facilitate use of data by those seeking to explain the factors driving land-use changes.

Another challenge arises from understanding what various data collection efforts actually measure. Advances in GIS mapping techniques and increased availability of satellite imagery and high resolution aerial photography provide state-of-the-art capability for developing estimates of land cover at spatially disaggregate levels, but the extent to which land cover corresponds to land use is often unclear. For example, interpretation of satellite imagery or aerial photographs could result in residential land being classified as forest if the canopy cover obscures dwellings; canopy could also easily obscure areas actually used for grazing purposes. Clarifying the extent to which land cover corresponds with land use in different regions will improve our understanding of how and when land-use changes lead to land-cover changes.

Many factors impact land uses, including policy, socioeconomic, and environmental factors. Identifying which factors make the most significant impact is challenging because data are not always available at the same spatial or temporal scale. Ideally, data on land use should be available at a spatially disaggregated level and collected at the same point over time. Satellite data/aerial photography and the NRI (a survey covering 800,000 data points) collect data on land use and natural resource characteristics over time but do not offer much information about the land operators or owners who make land-use decisions. Conversely, other data sources like the Census of Agriculture collect data on how land operators and owners use land, but generally these data are not linked to the land base, limiting users' understanding of how physical land characteristics can affect land-use decisions. Combining these data can potentially improve policymakers' understanding of the factors that drive land-use changes and whether the relative importance of different factors varies across regions.

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Appendix 1: Definitions and Explanation of the Data

The major land uses presented in this report are the latest in a series of land-use inventories conducted by USDA's Economic Research Service and predecessor agencies. The inventories are based on available data from a wide variety of sources. The estimates were constructed from available data, rather than used exactly as developed by source agencies because land-use data, regardless of origin or utility for specific purposes, have limitations for comprehensive inventory purposes.

Data are typically obtained from censuses and surveys that differ greatly in scope, methods, definitions, and other characteristics. Individual sources account for only few uses and for only a limited part of the total land area. The available data contain conflicts and overlaps that must be reconciled or removed.

Definitions and Explanations of the Various Land-Use Categories

American Housing Survey (AHS)—A periodic survey conducted by the U.S. Census Bureau to obtain housing statistics for the U.S. Department of Housing and Urban Development (HUD). This national survey began in 1973 as the Annual Housing Survey. The current series began in 1981 and is conducted every odd-numbered year by field representatives who collect information through interviews with home occupants, landlords, rental agents, and neighbors (in 2007 the sample was 52,850 and the response rate was 88 percent). The sample is randomly drawn from the 1980 Census and updated for coverage improvement and newly constructed housing units. Weights are used to adjust the responses to reflect the probability of selection and noninterview adjustments. Additional information on the AHS can be found in the *Current Housing Report*, and sample design and weighting is detailed in that report's Appendix B (DOC/CB, 2008).

Cropland—Total cropland includes five components: cropland harvested, crop failure, cultivated summer fallow, cropland used only for pasture, and idle cropland. The estimate of total cropland in 2007 included total cropland as reported by the 2007 Census of Agriculture (USDA/NASS, 2009a) plus an upward adjustment to conform to data on principal crops harvested in each State as reported by the National Agricultural Statistics Service for 2007 (USDA/NASS, 2009b). In 2007, the census' estimate of total principal crops harvested was about 98 percent of the estimate for the same crops from NASS.

The Census of Agriculture data are derived from a census of all farm operations that produce, or normally would produce and sell, \$1,000 or more of agricultural products annually. USDA's NASS undertakes extensive procedures to include all eligible farms in the census. The census was conducted through mailings and, to a lesser extent, telephone or personal enumeration with a goal of achieving at least a 75-percent response rate in all counties. Missing data were calculated from responses to other surveys or imputed from reporting farms of a like type. The response rate for the 2007 Census of Agriculture was 85.2 percent, compared with 88.0 and 86.2 percent for

the 2002 and 1997 Censuses, respectively. Details on the methodology and reliability of estimates are contained in Appendix A of the 2007 Census of Agriculture (USDA/NASS 2009a).

The components of cropland are:

Cropland used for crops—Three of the cropland acreage components—cropland harvested, crop failure, and cultivated summer fallow—are collectively termed cropland used for crops, or the land input to crop production. Annual estimates of cropland harvested are based on both census data and the series on principal crops harvested as maintained by NASS. Annual estimates of crop failure are based on differences in planted and harvested acreage of principal crops from the NASS data series. Annual estimates of cultivated summer fallow historically have been based on fragmentary data from a variety of sources. Since the late 1970s, the estimates have been based on data from the Census of Agriculture and unpublished NASS data.

Cropland harvested: Includes row crops and closely sown crops; hay and silage crops; tree fruits, small fruits, berries, and tree nuts; vegetables and melons; and miscellaneous other minor crops. In recent years, farmers have double-cropped about 4 percent of this acreage.

Crop failure: Consists mainly of the acreage on which crops failed because of weather, insects, and diseases, but does include some land not harvested due to lack of labor, low market prices, or other factors. Crop failure is calculated using the difference between cropland planted and cropland harvested. However, some cropland planted is not intended to be harvested. Thus, the acreage planted to cover and soil improvement crops not intended for harvest is excluded from crop failure and is considered idle. In recent years, crops have failed on about 2-3 percent of the acreage planted for harvest.

Cultivated summer fallow: Refers to cropland in subhumid regions of the West that are cultivated for one or more seasons to control weeds and accumulate moisture before small grains are planted. This practice is optional in some areas, but it is a requirement for crop production in the drier cropland areas of the West. Other types of fallow, such as cropland planted to soil improvement crops but not harvested and cropland left idle all year, are not included in cultivated summer fallow but are included as idle cropland.

Cropland pasture—Generally is considered to be in long-term crop rotation. This category includes acres of crops hogged or grazed but not harvested and some land used for pasture that could have been cropped without additional improvement. Cropland pastured before or after crops were harvested was included as harvested cropland and not cropland pasture. Estimates in this land-use category are derived from the Census of Agriculture (USDA/NASS, 2009a).

Idle cropland—Includes land in cover and soil-improvement crops and cropland on which no crops were planted. Some cropland is idle

each year for various physical and economic reasons. Acreage diverted from crops to soil-conserving uses (if not eligible for and used as cropland pasture) under Federal farm programs is included in this component. Cropland enrolled in the Federal Conservation Reserve Program (CRP) and Wetlands Reserve Program (WRP) is included in idle cropland.

Grassland pasture and range—Grassland pasture and range encompass all open land used primarily for pasture and grazing, including shrub and brush-land types of pasture, grazing land with sagebrush and scattered mesquite, and all tame and native grasses, legumes, and other forage used for pasture or grazing—regardless of ownership. Because of the diversity in vegetative composition, grassland pasture and range are not always clearly distinguishable from other types of pasture and range. At one extreme, permanent grassland may merge with cropland pasture, or grassland may often be found in transitional areas with forested grazing land. The estimates in this report are composites of data from the National Resources Inventory (NRI), Census of Agriculture, the Bureau of Land Management, USDA Forest Service, and several other Federal agencies (see definitions for cropland, forested land, special uses, and NRI for details on the data from these sources). The 614 million acres classed as grassland pasture and range in 2007 included 409 million acres in farms (USDA/NASS, 2009a). Also included are estimates of private grazing land not in farms and public, nonforested grazing land.

Forested land—As defined by the USDA Forest Service, the 751 million acres of forested land in 2007 (see table 9) consists of “land at least 10-percent stocked by trees of any size, including land that formerly had such tree cover and that will be naturally or artificially regenerated.” Forested land includes transition zones, such as areas between heavily forested and nonforested lands, that have at least 10 percent cover (or equivalent stocking) with live trees and forest areas adjacent to urban and built-up lands. Fruit orchards or other tree covered areas in agricultural production settings, or tree-covered areas in urban settings such as city parks, are not considered forest land (Smith et al., 2009).

The USDA Forest Service’s inventories of forested land are the primary basis for the *Major Land Uses* (MLU) estimate of forest-use land. The inventories are based on remote sensing data and supplemented by field sampling to exclude lands with forest cover that are not considered forest use (primarily but not exclusively urban uses) (Smith et al., 2009).¹ The inventories are designed so that estimates are accurate within 1 standard deviation at the 67-percent confidence level for each State. States with little forest area will be of lower accuracy, and users of the inventory are cautioned to consider small States, such as those in New England, as a group for analysis (see Appendix A in Smith et al., 2009). There are a number of components to total forestland, including:

Timberland: Forestland that produces or is capable of producing crops (in excess of 20 cubic feet per acre per year) of industrial wood and not withdrawn from timber utilization by statute or administrative regulation. Currently inaccessible and inoperable areas are included (Smith et al., 2009).

¹The USDA Forest Service notes that forest area estimates in parts of Texas, Oklahoma, and in interior Alaska have been based on remote sensing without field inventory verification.

Reserved forestland: Forestland withdrawn from timber utilization through statute, administrative regulation, or designation without regard to productive status (Smith et al., 2009). Wilderness areas and parks are included in this category. The definition changed slightly in 1997. Prior to 1997, the reserved forestland definition depended on the timberland designation. Reserved timberland was classed as “productive reserved” forest, while nontimberland reserved forests were classed as “unproductive reserved” and included under the “other forest” land category (see below).

Other forestland: Forestland other than timberland and reserved forest land. This includes available and reserved unproductive forest land, which is incapable of producing 20 cubic feet per acre per year of industrial wood under natural conditions because of adverse site conditions, such as sterile soils, dry climate, poor drainage, high elevation, steep slopes, or rockiness (Smith et al., 2009). This definition changed slightly starting in 1997. “For 1997, Other Forest no longer includes land classified as unproductive reserved. This area, amounting to about 12 million acres in 1997, is now included in the Reserved Forest category” (Smith et al., 2001).

Forest-use land—An MLU category based on the use of the forestland as opposed to the forest cover alone. The forest-use category includes both grazed and ungrazed forests but excludes an estimate of forestland in parks, wildlife areas, and similar special-purpose uses from the USDA Forest Service’s inventory of total forest land. While it is impossible to eliminate overlap with other uses, this reduced area is a closer approximation of the land that may serve commercial forest uses as opposed to having forest cover. Nevertheless, some forest-use land may still be economically unsuited for timber harvests. In addition, private landowners may have objectives other than timber harvest. For example, Birch (1996) found that only 29 percent of private forest owners reported managing their land primarily for timber production. There are two components of forest-use land:

Forest land grazed: Forested pasture and range consisting mainly of forest, brush-grown pasture, arid woodlands, and other areas within forested areas that have grass or other forage growth. The total acreage of forested grazing land includes woodland pasture in farms plus estimates of forested grazing land not in farms. For many States, the estimates include significant areas grazed only lightly or sporadically. The Census of Agriculture, the NRI, and the USDA Forest Service data on active grazing allotments are the principal sources of data used to develop the MLU estimate (USDA/NASS, 2009; USDA/NRCS, 2009). Historical data from these and other sources were useful in developing the 129-million-acre approximation.

Forestland not grazed: Forest-use land not used for grazing.

Forestland in special uses—Forest land in special uses, such as in parks, wildlife areas, and similar special-purpose uses, estimated at 80 million acres for 2007.

Miscellaneous other land—Includes miscellaneous other uses, such as industrial and commercial sites in rural areas, cemeteries, golf courses, mining areas, quarry sites, marshes, swamps, sand dunes, bare rocks, deserts, tundra, rural residential, and other unclassified land. In this report, urban land is reported as a separate category.

National Resources Inventory (NRI)—The NRI has been conducted by USDA’s Natural Resources Conservation Service (NRCS), in cooperation with Iowa State University since 1982, to assess the condition and trends in soil, water, and natural resources on the Nation’s non-Federal lands. The NRI covers privately owned land, tribal and trust lands, and lands controlled by State and local governments in the 48 contiguous States, and by 2011, estimates for Alaska, Hawaii, and U.S. territories are expected to be available. The NRI was conducted in 5-year intervals between 1977 and 1997; since 2000, NRI data have been gathered annually on about 40,000 “core” points and a rotating panel of about 31,000 points. The NRI is a survey conducted using a stratified two-stage, unequal probability area sampling scheme and includes about 800,000 total points. The use of remote sensing techniques increased during the 1990s and is supplemented by onsite verification and comparison against administrative data (USDA/NRCS, 2009). See table 3 in the NRI report for margins of error associated with the NRI estimates.

NRI defines the following land-cover/use categories as (USDA/NRCS, 2009):

Cropland: Areas used for the production of adapted crops for harvest, including pasture that is in a rotation with row or close-grown crops.

Pastureland: Land with a vegetative cover of grasses, legumes, and/or forbs, regardless of whether it is being grazed by livestock.

Rangeland: Includes land on which the climax or potential plant cover is composed principally of native grasses, grasslike plants, forbs or shrubs suitable for grazing and browsing and introduced forage species that are managed like rangeland. Grasslands, savannas, many wetlands, some deserts, and tundra are considered rangeland. Certain communities of low forbs and shrubs, such as mesquite, chaparral, mountain shrub, and pinyon-juniper, are also included as rangeland.

Forestland: Includes land that is at least 10-percent stocked by single-stemmed woody species of any size that will be at least 4 meters (13 feet) tall at maturity. This category also includes land bearing evidence of natural regeneration of tree cover (cut over forest or abandoned farmland) and not currently developed for nonforest use. Ten-percent stocked, when viewed vertically, equates to an areal canopy cover of leaves and branches of 25 percent or greater. The minimum area for classification as forestland is 1 acre, and the area must be at least 100 feet wide.

Other rural land: Includes farmsteads and other farm structures, field windbreaks, barren land, and marshland.

Developed land in the NRI consists of urban and built-up areas and land devoted to rural transportation.

Urban and built-up areas: Consists of residential, industrial, commercial, and institutional land; construction and public administrative sites; railroad yards; cemeteries; airports; golf courses; sanitary landfills; sewage plants; water control structures; and small parks and transportation facilities within urban areas.

Large urban and built-up areas: Include developed tracts of 10 acres or more.

Small built-up areas: Include developed tracts of a quarter of an acre to 10 acres, which do not meet the definition of urban area but are completely surrounded by urban and built-up land.

Rural transportation land: Includes highways, roads, railroads, and rights-of-way outside of urban and built-up areas.

Water areas—Include water bodies and streams that are permanent open water.

Residential area—The sum of acres in lots used for housing units. This data series was introduced in 1997 to the MLU report. Due to the limits of available data, it is not possible to distinguish rural housing lots from land classed under other uses. The majority of this land may be included with “miscellaneous other” land, but some overlap could also exist with forest use, grassland pasture and range, and other categories. Data for this series come from the AHS, which is conducted every other year (DOC/CB, 1996, 1999a, 1999b, 2002, 2004, and 2008).

Special-use areas—Includes highways, roads, and railroad rights-of-way and airports; Federal and State parks, wilderness areas, and wildlife refuges; national defense and industrial areas; and farmsteads and farmroads. Estimates are based on reports and administrative records of the Census Bureau and Federal and State land management and conservation agencies.

Urban area—Urban areas in the MLU series follow the Census Bureau urban areas definition. The Census Bureau compiles urban area every 10 years, coincident with the census of population. Census urban areas include densely populated areas with at least 50,000 people (“urbanized areas”) and densely populated areas with 2,500 to 50,000 people (“urban clusters”). Densely populated areas include census blocks with a population density of at least 1,000 people per square mile, surrounding blocks with a density of at least 500 people per square mile, and “less densely settled blocks that form enclaves or indentations, or are used to disconnect discontinuous areas with qualifying densities” (DOC/BOC, 2002). In the 2000 Census, urban clusters (UCs) replaced previous designations that were based on the boundaries of census-designated places. The census’ urban area definition includes residential areas and concentrations of nonresidential urban areas, such as commercial, industrial, and institutional land; office areas; urban streets and roads; major airports; urban parks and recreational areas; and other land within urban-defined areas. The definition allows for exceptions and special cases. Portions of extended cities that are essentially rural in character are excluded.

Appendix 2: MLU Estimates: Primary Data Sources

Land use	Primary data sources ¹
Cropland: Cropland used for crops, idled cropland and cropland pasture	Census of Agriculture, conducted every 5 years (USDA/National Agricultural Statistics Service, 2009a) and Conservation Reserve Program administrative data (USDA/Farm Service Agency, 2008).
Grassland pasture and range	National Resources Inventory (USDA/Natural Resources Conservation Service, 2009), Census of Agriculture (USDA/National Agricultural Statistics Service, 2009a), and estimates of open or nonforested grazing land on Federal land (USDA/Forest Service, 2010; U.S. Department of the Interior/Bureau of Land Management, 2011).
Forest-use land	Forest Inventory (Smith et al., 2009). Estimates of total grazed forest acreage are based on acreage estimates of active grazing allotments in national forests (USDA/Forest Service, 2008), plus grazed woodlands on nonfederally owned land from the Census of Agriculture (USDA/National Agricultural Statistics Service 2009a) and the National Resources Inventory (USDA/Natural Resources Conservation Service, 2009).
Special-use areas	<p>National parks and wilderness areas include areas in national and State park systems (U.S. Department of Commerce/Census Bureau, 2003; U.S. Department of the Interior/National Park Service, 2007; U.S. Department of the Interior/Bureau of Land Management, 2007; Wilderness Institute, 2009).</p> <p>Wildlife areas include areas administered by the U.S. Fish and Wildlife Service (U.S. Department of the Interior/Fish and Wildlife Service, 2007) and State wildlife agencies (from numerous State fish and wildlife agency websites).</p> <p>Defense and industrial uses based on areas administered by the U.S. Department of Defense, 2007; and Department of Energy, 2007.</p> <p>Rural highway and road estimates use average right-of-way widths and mileage data (U.S. Department of Transportation/Federal Highway Administration, 2007). Railroad area is from U.S. Department of Transportation/Federal Railroad Administration, (2004). Airport area is from U.S. Department of Transportation/Bureau of Transportation Statistics, (2007); U.S. Department of Transportation/Federal Aviation Administration, (2002) and Geographic Data Technology, (2007).</p> <p>Farmsteads and farm roads are estimated based on the State-by-State number of farms and acreage of unclassified land in farms from the Census of Agriculture. Farmstead area was computed using the average based on National Resources Inventory data (USDA/Natural Resources Conservation Service, 2009) multiplied by the number of farms in 2007 (USDA/National Agricultural Statistics Service, 2009).</p>
Urban areas	Decennial Census of Population (U.S. Department of Commerce/Census Bureau, 2002b). Inter-census estimates are extrapolated.
Miscellaneous other land	Miscellaneous land and low density residential land from the National Resources Inventory (USDA/Natural Resources Conservation Service, 2009).

¹The year refers to the source used to construct the 2007 MLU estimates.