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U.S. DEPARTMENT OF AGRICULTURE

Economic Research Service

Economic Information Bulletin Number 275

September 2024

Major Uses of Land in the United States, 2017

Clayton Winters-Michaud, Alfredo Haro, Scott Callahan, and Daniel P. Bigelow

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Abstract

The United States has a total land area of 2.26 billion acres. In 2017, the major uses of land were grassland pasture and rangeland at 659 million acres (29 percent of the U.S. total), forest-use land at 622 million acres (28 percent), cropland at 390 million acres (17 percent), special uses (primarily parks and wildlife areas) at 318 million acres (14 percent), miscellaneous other uses (such as wetlands, tundra, and unproductive woodlands) at 197 million acres (9 percent), and urban land at 74 million acres (3 percent). This study presents findings from the most recent (2017) inventory of U.S. major land uses, drawing on data from the U.S. Department of Agriculture, the U.S. Department of Commerce, Bureau of the Census, the U.S. Department of Transportation, the U.S. Geological Survey, the U.S. Department of the Interior, and various other sources. The data sources are collected for each 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 discussed using earlier major land-use estimates dating back to 1945.

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

Acknowledgments

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About the Authors

Clayton Winters-Michaud and Scott Callahan are economists with USDA, Economic Research Service (ERS). Alfredo Haro was an intern with USDA, ERS through the Hispanic Association of Colleges and Universities Program when this research was conducted. Daniel P. Bigelow is an assistant professor in the Department of Applied Economics at Oregon State University, Corvallis, Oregon.

Contents

Glossary of Acronyms:

ACEP: Agricultural Conservation Easement Program

ACRE: Average Crop Revenue Election

AHS: American Housing Survey

BIA: Bureau of Indian Affairs

BLM: U.S. Department of the Interior, Bureau of Land Management

BTS: U.S. Department of Transportation, Bureau of Transportation Statistics

CDL: Cropland Data Layer

CRP: Conservation Reserve Program

CSB: Crop Sequence Boundary

DoD: Department of Defense

ERS: USDA, Economic Research Service

FAO: Food and Agriculture Organization of the United Nations

FCIRA: Federal Crop Insurance and Reform Act

FHA: U.S. Department of Transportation, Federal Highway Administration

FS: USDA, Forest Service

GIS: Geographic information systems

HUD: U.S. Department of Housing and Urban Development

LCMAP: Land Cover Monitoring Assessment and Projection

MLU: Major land uses

NARN: North American Rail Network

NASS: USDA, National Agricultural Statistics Service

NLCD: National Land Cover Database

NRCS: USDA, Natural Resources Conservation Service

NRI: National Resources Inventory

NTAD: National Transportation Atlas Databases

PAD-US: Protected Areas Database of the United States

RPA: Resources Planning Act

TIGER: Topologically Integrated Geographic Encoding and Referencing

USDA: United States Department of Agriculture

USDOT: U.S. Department of Transportation

USGS: U.S. Geological Survey

WRE: Wetland Reserve Easements

WRP: Wetlands Reserve Program

Preface

The U.S. Department of Agriculture's Economic Research Service (USDA, ERS) has provided major land-use (MLU) estimates for the United States for more than 70 years. These estimates offer the only consistent accounting of all major uses of public and private land in the United States over such a long period of time. Before the start of the current MLU series, which began in 1945, Francis Marschner made earlier contributions (1922–40) in the *Atlas of American Agriculture* when he was with USDA, ERS' preceding agency, the Bureau of Agricultural Economics. A consistent series began in 1945 and has been published at intervals that coincide with the USDA, National Agricultural Statistics Service's (NASS) Census of Agriculture (typically every 5 years), though the annual cropland portion of the series has been maintained since 1910. It should be noted that the MLU report typically corresponds to the prior Census of Agriculture year, rather than the more recent one as the data the report relies on comes from a wide range of sources beyond the Census of Agriculture, many of which are not published until after the Census of Agriculture is released. However, the most current Census of Agriculture is used to update the annual cropland portion of the series, available on the MLU topic page. A wide range of researchers, policy analysts, and organizations have used the data in numerous analyses of land-use patterns and trends.

To ensure comparability with earlier estimates in the series, researchers rely on a standardized set of procedures to measure land use (Barnard & Hexem, 1988). Even so, comparability is sometimes hindered by changes in the types of data available over time. These changes are 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, land area estimates of major uses were not consistently available for all U.S. States. Various Federal Government 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, at the time, USDA, Forest Service (FS) maintained data on forestland, whereas the U.S. Department of Interior, Bureau of Land Management maintained data on public grazing land acreage. The USDA, NASS' Census of Agriculture collected information on cropland and pastureland but only if the acreage was included in "land in farms," omitting agricultural land not in farms, such as public grazing lands. 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. Department of the Interior's U.S. Geological Survey (USGS) produced a satellite-based National Land Cover Database (NLCD), which covered the 48 contiguous States for 1992, 2001, 2006, 2011, 2016, and 2021. In 2020, USGS also released the Land Cover Monitoring Assessment and Projection (LCMAP), which provides data on land cover and land-cover changes for the 48 contiguous States and Hawaii, at an annual scale dating back to 1985. Similarly, USDA, NASS publishes the Cropland Data Layer (CDL), which provides crop-specific, 30-meter land-cover estimates at an annual scale. CDL has covered the extent of the continental United States since 2008, though earlier estimates are available for some States. A collaboration between USDA, NASS and USDA, ERS used annual CDL data to produce the Crop Sequence Boundary (CSB) data product, which aggregates the CDL's pixel-level estimates into annual field-level estimates dating back to 2008. By measuring land-cover changes at the field level, CSB is able to capture the relationships between land-cover and field characteristics such as size, contiguity, etc. These sources offer coverage of the entire contiguous United States, unparalleled detail on the distribution and pattern of land cover and crop plantings, and aggregate acreage statistics. However, satellite data are sometimes limited in the data's ability to provide information on land use as opposed to land cover. For example, NLCD does not distinguish between grazed and ungrazed forests, both of which have tree cover but have different uses, or between cultivated hay (cropland) and uncultivated cropland (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 USDA's Census of Agriculture. However, NRI does not cover Federal land, which accounts for about 28 percent of the total U.S. land area. Also, the 2017 NRI covered the 48 contiguous States and Hawaii but not Alaska and its 365 million acres, or 16 percent of the total U.S. land area. USDA, ERS has remained the only public source of comprehensive major land-use estimates for all 50 States over a longer time frame.

Data files and additional summary tables with historical data are available on the USDA, ERS website as part of the Major Land Uses data product. This data product includes data by region and State (1945–2017) for major uses of land including (1) cropland; (2) grassland pasture and range; (3) land in special-use areas; (4) forest-use land; (5) urban areas; and (6) **miscellaneous other land uses**.

Land Use and Land Cover

The terms land use and land cover are often related, but they have different meanings. Land use involves an element of human activity and reflects human decisions about how land will be used, such as agriculture, recreation, and urban development. Land cover refers to the vegetative characteristics or human-made constructions on the land's surface, such as forests, grasslands, or buildings. For example, within this report, a plot with forest land cover can be classified as either rural parks and wilderness areas within the special uses category, grazed or **ungrazed forest-use land**, or rural residential land (for detailed descriptions of land-use terminology in **bold** in this report, see appendix A). Often, different methods are used to develop land use and land cover estimates. Land use is generally determined by surveys based on field observations or enumeration such as USDA, NASS' Census of Agriculture, whereas land cover is generally determined using remote sensing techniques or interpretation of aerial photography.

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A report summary from the Economic Research Service *September 2024*

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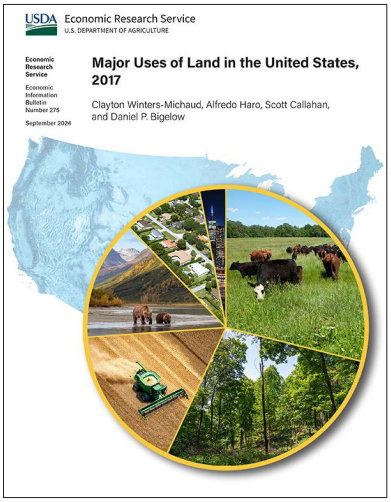
What Is the Issue?

Land uses and land-use changes have important economic and environmental implications. USDA, Economic Research Service's (ERS) Major Land Uses (MLU) series is the only inventory of all major uses of public and private land in all 50 U.S. States. Since 1945, these estimates have been published at near 5-year intervals, coinciding with the USDA's Census of Agriculture. This study presents the results of the latest inventory (2017) of U.S. major land uses and examines national and regional trends of land use over time.



What Did the Study Find?

Figure 1 shows the percent of the total U.S. land area (2.26 billion acres) devoted to each of the major land-use categories for 2017.

Cropland

Total cropland includes land used for crops (87 percent of total cropland), cropland used for pasture, and idled cropland, including acreage removed from production under Government programs such as the USDA, Farm Service Agency's (FSA) Conservation Reserve Program. Between 2012 and 2017, total cropland decreased by 2 million acres (0.5 percent) to its lowest level (390 million acres) since this series began in 1945. Between 2002 and 2012, the USDA's Census of Agriculture (the primary data source for our cropland estimates) used consecutive methodological changes that resulted in land that had formerly been classified as cropland, specifically cropland pasture, becoming reclassified as grassland pasture and range in subsequent censuses. These methodological changes coincided with a 50-million-acre (11 percent) decrease in total cropland between 2002 and 2012, 49 million of which had formerly been cropland pasture. Thus, despite 2017 representing a historic low for cropland acreage, a substantial portion of the decline between 2002 and 2012 should be viewed as the result of changes in how land at the intersection of cropland and pastureland was classified, rather than how the land was used.

Grassland Pasture and Range

Grassland pasture and range use increased by 4 million acres (1 percent) between 2012 and 2017 to 659 million acres, its highest recorded amount since 1945. Over this same period, acreage for all grazing land (the sum of grassland pasture and range, cropland used for pasture, and grazed forests) increased by 7 million acres (just under 1 percent) to 805 million acres, continuing a reversal of the downward trend observed from 1945 through 2007.

ERS is a primary source of economic research and analysis from the U.S. Department of Agriculture, providing timely information on economic and policy issues related to agriculture, food, the environment, and rural America.

Forest-Use Land

Forest-use land includes land that serves commercial forest uses, including grazed and ungrazed forest-use land, as opposed to land that has forest cover but is used for other purposes (e.g., forestland in parks, wildlife areas, or other special uses). Forest-use land in 2017 totaled 622 million acres and included 132 million acres of grazed forests. But the use excluded approximately 140 million forest acres in parks, wildlife areas, and other special uses where commercial timber harvests are rare. Forest-use land decreased by 10 million acres (2 percent) from 2012 to 2017, reversing an uptick from 1997 to 2007, while reserved forestland increased by 7.2 million acres. Total forested land used for all purposes amounted to 765.5 million acres in the United States in 2017, which represents a 0.1-percent (0.7 million acres) decrease from 2012.

Urban Areas

Land in urban areas was estimated to be 74 million acres in 2017, up 4 million acres since 2012. Urban land area increased by a factor of 4.9 from 1945 to 2017, growing at more than twice the rate of population growth over this period.

Special-Use Areas

Special-use areas include land for rural transportation, national and State parks, wilderness and wildlife areas, national defense and industrial areas, and farmsteads and farm roads. From 2012 to 2017, special-use areas exhibited a net increase of just under 2 million acres (less than 1 percent).

How Was the Study Conducted?

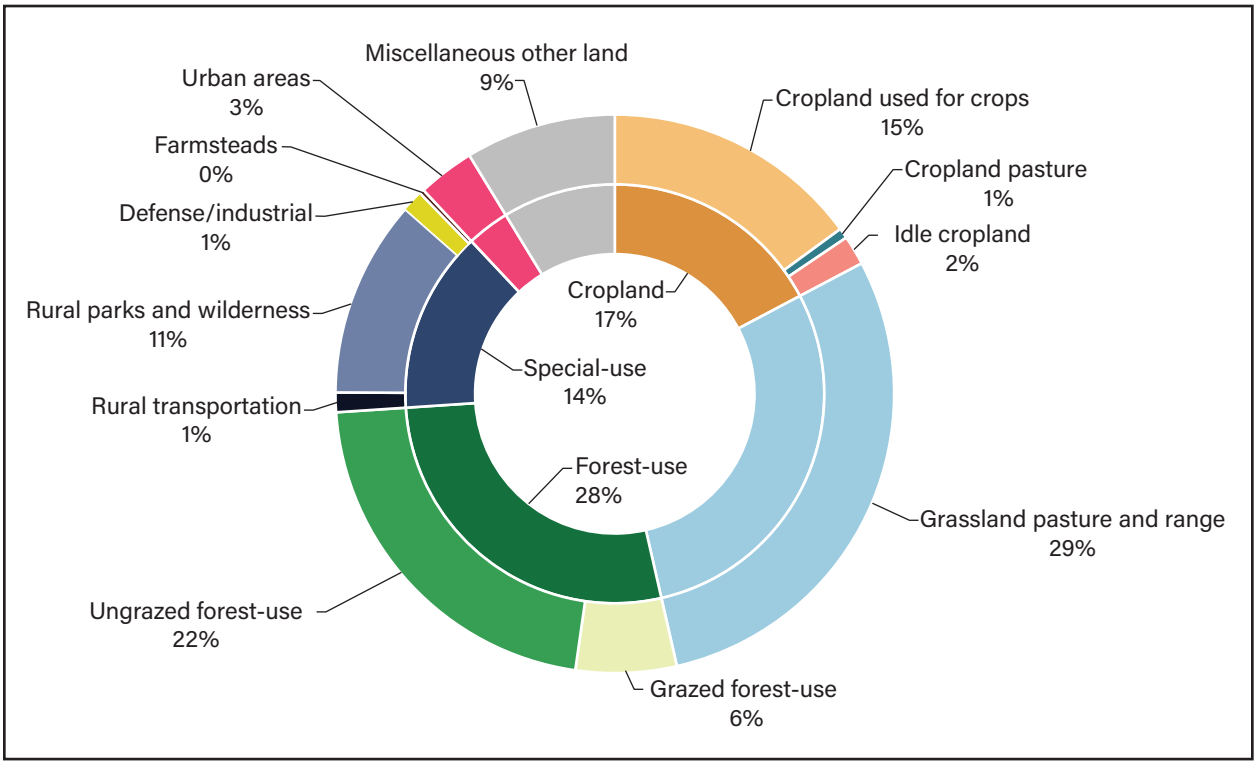
Data were compiled by State and used to estimate the uses of several broad classes and subclasses of land in 2017. The data came from the USDA's Forest Service, National Agricultural Statistics Service, and Natural Resources Conservation Service; the U.S. Department of Commerce, Bureau of the Census; the U.S. Department of Transportation; the U.S. Department of the Interior, U.S. Geological Survey; and other sources. Estimates were developed using the same standardized procedure as previous versions of this report while also incorporating new or improved data.

Introduction

How Land Is Used

The United States has a total land area of 2.26 billion acres, which is allocated among various uses (figure 2). In 2017, the largest shares of the United States' land were allocated to **grassland pasture and range**, **forest use**,[1] and **cropland** (for detailed descriptions of land-use terminology in **bold** in this report, see appendix A). Approximately 17 percent of the U.S. land area was cropland in 2017, 29 percent was permanent grassland pasture and range, and 28 percent was forest-use land. **Urban areas** accounted for 3 percent of U.S. land, while a variety of **special uses** accounted for 14 percent. Special uses include parks, wildlife refuges, wilderness areas, rural transportation corridors, and national defense areas. **Miscellaneous other land uses** made up the remaining 9 percent. Many of these land-use percentages are dramatically affected by the inclusion or exclusion of Alaska. Relative to the rest of the United States, Alaska has small amounts of cropland and pasture and large areas of special-use and miscellaneous other land. Prior to this study, the last comprehensive inventory of major land uses (MLU) in the United States was undertaken for 2012 (for more information about that inventory, see Bigelow & Borchers, 2017). The full set of historical estimates and summary tables for 2017, by region and State, are available in the USDA, Economic Research Service (ERS) Major Land Uses data series.

Figure 1
Major uses of the land in the United States, 2017



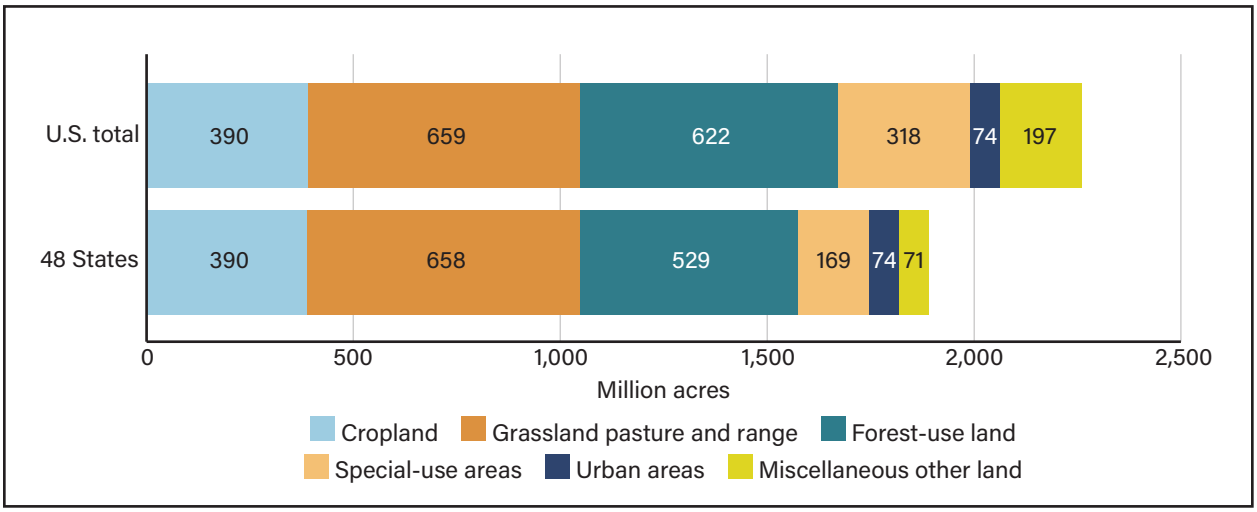
Note: See appendix A for definitions of major land-use categories and subcomponents. Totals may not sum due to rounding.

Source: USDA Economic Research Service estimates based on data from USDA, National Agricultural Statistics Service Acreage, Crop production, 2017 summary, and 2017 Census of Agriculture; USDA, Farm Service Agency, Conservation Reserve Program (CRP), summary and enrollment statistics, fiscal year 2017, and CRP emergency haying and grazing data, fiscal year 2017; USDA,

[1] The definition of forest use adopted in this report is intended to reflect land that is either used to produce timber and other forest products; or covered by forest and used for grazing. This definition excludes approximately 144 million acres of land considered to be forest by USDA's Forest Service (Oswalt et al., 2019). These lands are either reserved and accounted for in the Major Land Uses special-use category or considered to be unproductive forests and are, thus, included in the miscellaneous other land-use category. Using the less restrictive USDA, Forest Service definition, forestland used for all purposes totaled 765 million acres in 2017 (Oswalt et al., 2019), roughly one-third of the land area of the United States.

Natural Resources Conservation Service, Summary report: 2017 national resources inventory, 2017 national resources inventory, Wetlands Reserve Program (WRP) cumulative agreement data by State and fiscal year, and Agricultural Conservation Easement Program (ACEP) cumulative agreement data by State and fiscal year; USDA, Forest Service, Grazing statistical summary, fiscal year 2017, Land areas of the National Forest System as of September 30, 2017, and USDA, Forest Service grazing allotments; U.S. Department of Commerce, Bureau of the Census, 2010 Census of Population and Housing, summary population and housing characteristics, United States, 2013 American Housing Survey, and Census urban area national Topologically Integrated Geographic Encoding and Referencing (TIGER)/line shapefile; U.S. Department of Defense, Base structure report fiscal year 2018 Baseline; U.S. Department of the Interior, Bureau of Land Management, Public land statistics 2017, and National Park Service acreage report: Calendar year 2017; U.S. Department of the Interior, National Park Service, National Park Service acreage report: Calendar year 2017; U.S. Department of Transportation, Bureau of Transportation Statistics, National Transportation Atlas Databases (NTAD), North American Rail Network (NARN) dataset, NTAD Aviation facilities dataset; U.S. Department of Transportation, Federal Highway Administration, Highway statistics series: Highway statistics 2017; U.S. Department of the Interior, U.S. Geological Survey, Protected Areas Database of the United States (PAD-US); Oswalt, N.S., Smith, W.B., Miles, P.D., & Pugh, S.A. (2019). *Forest resources of the United States, 2017: A technical document supporting the Forest Service 2020 RPA Assessment* (Report No. General Technical Report WO-97). U.S. Department of Agriculture, Forest Service.; and Smith, J., & Leung, Y.F. (2019). *Select metrics describing the operations of America's state park systems.* Utah State University, University Libraries.

Figure 2
Major uses of U.S. land, 2017



Note: Data on land uses in Alaska and Hawaii are excluded in the bar labeled 48 States. Cropland includes all land considered to be in crop rotation, including cropland used for crops, idle cropland, and cropland used only for pasture. Land in the USDA Farm Service Agency's Conservation Reserve Program is classified as idle cropland. Grassland pasture and range include permanent grassland and other nonforested pasture and range. Forest-use land is total forestland as classified by the USDA, Forest Service. This land excludes land used primarily for parks, wildlife areas, and other uses, as well as land that meets USDA, Forest Service's forest definition, but it is not classified as forest-use for the purpose of this study due to the land's lack of timber production or grazing potential. Special-use land includes areas used for rural transportation, recreation and wildlife, various public installations and facilities, farmsteads, and farm roads. Some of this land may be forested. Miscellaneous land includes areas in various uses that is not inventoried such as marshes, open swamps, bare rock areas, desert, tundra, and other land generally of low agricultural value. The land base includes streams and canals that are less than one-eighth of a mile wide and ponds, lakes, and reservoirs covering areas that are less than 40 acres. Distributions by major use may not add to totals due to rounding. See appendix A for more complete descriptions of the different land use categories.

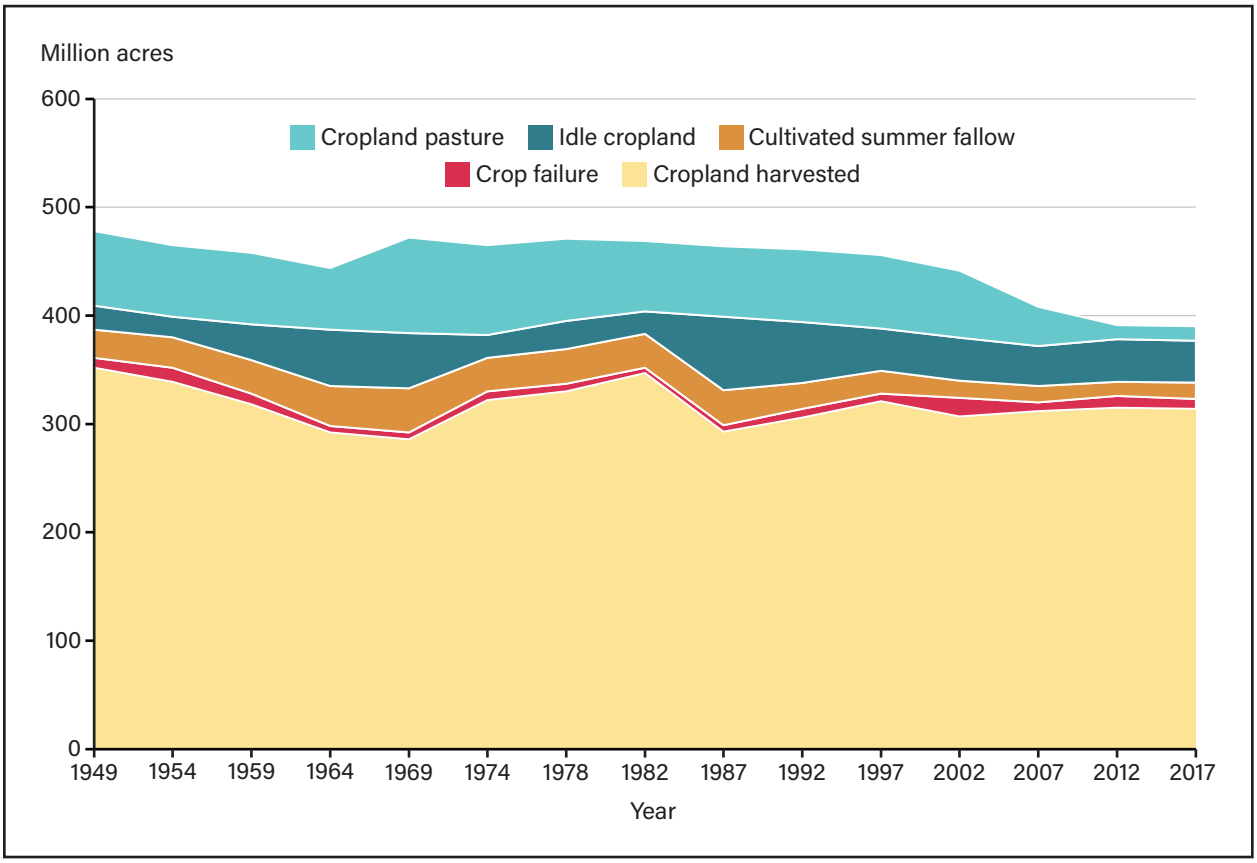
Source: USDA Economic Research Service estimates based on data from USDA, National Agricultural Statistics Service, Acreage, Crop production, 2017 summary, and 2017 Census of Agriculture; USDA, Farm Service Agency, Conservation Reserve Program (CRP), summary and enrollment statistics, fiscal year 2017 and CRP emergency haying and grazing data, fiscal year 2017; USDA, Natural Resources Conservation Service, Summary report: 2017 national resources inventory, 2017 national resources inventory, Wetland Reserve Program (WRP) cumulative agreement data by State and fiscal year, and Agricultural Conservation Easement Program (ACEP) cumulative agreement data by State and fiscal year; USDA, Forest Service (FS), Grazing statistical summary, fiscal year 2017, Land areas of the National Forest System as of September 30, 2017, and USDA, FS grazing allotments; U.S. Department of Commerce, Bureau of the Census, 2010 Census of Population and Housing, summary population and housing characteristics, United States, 2013 American Housing Survey, and Census urban area national Topologically Integrated Geographic Encoding and Referencing (TIGER)/line shapefile; U.S. Department of Defense, Base structure report fiscal year 2018 Baseline; U.S. Department of the Interior, Bureau of Land Management, Public land statistics 2017, and National Park Service acreage report: Calendar year 2017; U.S. Department of the Interior, National Park Service, National Park Service acreage report: Calendar year 2017; U.S. Department of

Transportation, Bureau of Transportation Statistics, National Transportation Atlas Databases (NTAD), North American Rail Network (NARN) dataset, and National Transportation Atlas Databases (NTAD), Aviation facilities dataset; U.S. Department of Transportation, Federal Highway Administration, Highway statistics series: Highway statistics 2017; U.S. Department of the Interior, U.S. Geological Survey Highway statistics series: Highway statistics 2017; Oswalt, N.S., Smith, W.B., Miles, P.D., & Pugh, S.A. (2019). *Forest resources of the United States, 2017: A technical document supporting the Forest Service 2020 RPA Assessment* (Report No. General Technical Report WO-97). U.S. Department of Agriculture, Forest Service.; and Smith, J., & Leung, Y.F. (2019). *Select metrics describing the operations of America's state park systems*. Utah State University, University Libraries. Utah State University, University Libraries.

Land classified as cropland totaled about 390 million acres in 2017 (figure 2) and represented all land in crop rotation, including **cropland pasture** (figure 3). **Cropland used for crops**, including **cropland harvested**, **cropland failure**, and **cultivated summer fallow**, totaled 338 million acres, or 87 percent of total U.S. cropland acreage (table 1). Three percent of total cropland was used only for pasture, and the remaining 10 percent of cropland was classified as **idle cropland**. The acreage enrolled in the USDA, Farm Service Agency's (FSA) Conservation Reserve Program (CRP) accounts for a large share of land in the idle cropland category. Established by the Food Security Act of 1985, CRP is the largest Federal land retirement program. Farm owners and operators that participate in the program are offered annual rental payments to voluntarily retire environmentally sensitive land from crop production under 10-year to 15-year contracts.[2] In 2017, CRP covered 23 million acres of land, with program expenditures totaling over $1.8 billion.

[2] Some Conservation Reserve Program (CRP) land is planted with trees. These lands are considered idle cropland because CRP contracts are short term and the land could revert to cropland at the expiration of the contract. However, some research has shown that tree-covered CRP land may be less likely to revert to cropland once the contract expires (Bigelow et al., 2020; Petrolia & Ibendahl, 2008; Roberts & Lubowski, 2007). Others such as Bigelow et al. (2020) found that 79 percent of the land that exited CRP between 2013–16 has reverted back to annual crop production.

Figure 3
Major uses of U.S. cropland, 1949–2017



Note: Cropland harvested represents the land area on which crops are grown. Crop failure represents the cropland area planted with the intention of harvest that was not harvested. Cultivated summer fallow refers to cropland in subhumid areas that is cultivated for one or more seasons to control weeds and accumulate moisture before small grains are planted. Cropland pasture refers to grazed land on which no crops were harvested that year but is considered to be in long-term crop rotation and/or could have been cropped without additional improvement. Cropland pastured before or after crops were harvested is included as cropland harvested and not cropland pasture. While the MLU's definition of cropland pasture has not changed, methodological changes in the 2007 and 2012 USDA, Censuses of Agriculture have led to a large portion of what had previously been classified as cropland pasture being reclassified as grassland pasture and range. Idle cropland includes land in cover and soil-improvement crops, as well as cropland on which no crops were planted. Also includes land enrolled in USDA, Farm Service Agency's Conservation Reserve Program (CRP), Wetlands Reserve Program (WRP), and Agricultural Conservation Easement Program Wetland Reserve Easements (ACEP-WRE), with CRP land used for emergency haying and grazing in that year excluded.

Source: USDA Economic Research Service estimates based on data from USDA, National Agricultural Statistics Service, Acreage, Crop production, 2017 summary, and 2017 Census of Agriculture; USDA, Farm Service Agency, Conservation Reserve Program, summary and enrollment statistics, fiscal year 2017, and CRP emergency haying and grazing data, fiscal year 2017; and USDA, Natural Resources Conservation Service, Wetland Reserve Program (WRP) cumulative agreement data by State and fiscal year, and Agricultural Conservation Easement Programs (ACEP) cumulative agreement data by State and fiscal year. Estimates for 2012 are based on Bigelow, D., & Borchers, A. (2017). *Major uses of land in the United States, 2012* (Report No. EIB-178). U.S. Department of Agriculture, Economic Research Service.

Table 1
Agricultural and nonagricultural U.S. land uses, 2017

Land use	Acreage		Share of total	
	48 States	U.S. total	48 States	U.S. total
	Million acres		Percent	
Agricultural				
Cropland				
Cropland used for crops	338	338	17.9	15.0
Idle cropland	39	39	2.0	1.7
Grazing land				
Cropland used only for pasture	13	13	0.7	0.6
Grassland pasture and range	658	659	34.8	29.2
Grazed forest-use	132	132	7.0	5.8
Special uses				
Farmsteads, farm roads	6	6	0.3	0.3
Total U.S. agricultural land	1,186	1,187	62.7	52.5
Nonagricultural				
Ungrazed forest-use	397	490	21.0	21.7
Special uses				
Rural transportation	25	26	1.3	1.1
Recreation and wildlife areas	112	258	5.9	11.4
Defense and industrial areas	26	28	1.4	1.2
Urban land	74	74	3.9	3.3
Miscellaneous other land	71	197	3.8	8.7
Total U.S. nonagricultural land	706	1,073	37.3	47.5
Total U. S. land area	1,891	2,260	100	100

Note: See appendix A for a more detailed description of USDA, Economic Research Service, major land-use categories. Distributions may not add to totals due to rounding. The contiguous 48 States excludes Hawaii and Alaska.

Source: USDA Economic Research Service estimates based on data from USDA, National Agricultural Statistics Service Acreage, Crop production, 2017 summary, and 2017 Census of Agriculture; USDA, Farm Service Agency, Conservation Reserve Program (CRP), summary and enrollment statistics, fiscal year 2017, and CRP emergency haying and grazing data, fiscal year 2017; USDA, Natural Resources Conservation Service, Summary report: 2017 national resources inventory, 2017 national resources inventory, Wetland Reserve Program (WRP) cumulative agreement data by State and fiscal year, and Agricultural Conservation Easement Program (ACEP) cumulative agreement data by State and fiscal year; USDA, Forest Service (FS), Grazing statistical summary, fiscal year 2017, Land areas of the National Forest System as of September 30, 2017, and USDA, FS grazing allotments; U.S. Department of Commerce, Bureau of the Census, 2010 Census of Population and Housing, summary population and housing characteristics, United States, 2013 American Housing Survey, and Census urban area national Topologically Integrated Geographic Encoding and Referencing (TIGER)/line shapefile; U.S. Department of Defense, Base structure report fiscal year 2018 Baseline; U.S. Department of the Interior, Bureau of Land Management, Public land statistics 2017, and National Park Service acreage report: Calendar year 2017; U.S. Department of the Interior, National Park Service, National Park Service acreage report: Calendar year 2017; U.S. Department of Transportation, Bureau of Transportation Statistics, National Transportation Atlas Databases (NTAD), North American Rail Network (NARN) dataset, and National Transportation Atlas Databases (NTAD), Aviation facilities dataset; U.S. Department of Transportation, Federal Highway Administration, Highway statistics series: Highway statistics 2017; U.S. Department of the Interior, U.S. Geological Survey, Protected Areas Database of the United States (PAD-US); Oswalt, N.S., Smith, W.B., Miles, P.D., & Pugh, S.A. (2019). *Forest resources of the United States, 2017: A technical document supporting the Forest Service 2020 RPA Assessment* (Report No. General Technical Report WO-97). U.S. Department of Agriculture, Forest Service.; and Smith, J., & Leung, Y.F. (2019). *Select metrics describing the operations of America's state park systems.* Utah State University, University Libraries. Utah State University, University Libraries.

In 2017, land used for agricultural purposes—cropland (cropland used for crops and idle cropland), grazing land (cropland used only for pasture, grassland pasture and range, and **grazed forest-use land** and special uses (land in farmsteads, farm roads, and lanes)—totaled 1.19 billion acres, or 52.5 percent of total U.S. land area (table 1). By comparison, the USDA's National Agricultural Statistics Service (NASS) estimated that the "land in farms" during the same period only totaled 910 million acres (USDA, NASS, 2018b). USDA, NASS's definition of a farm only covers land in operations that are capable of earning at least $1,000 of revenue in a given year and, thus, may not include all low-value land used for agricultural purposes, such as grazing (both forested and nonforested). Importantly, the definition also does not include Federal land leased out for grazing, which accounts for roughly 238 million acres and explains 85 percent of this difference.

Livestock grazing was the primary use of an estimated 659 million acres of grassland pasture and range in 2017, accounting for 29 percent of all U.S. land and more than half of all agricultural land (55 percent). Livestock also graze on cropland pasture (13 million acres) and forested grazing land (132 million acres). Total grazing land (including Federal lands leased for grazing) accounted for 805 million acres in 2017, just over 35 percent of the total U.S. land area and approximately two-thirds of all agricultural land.

Ungrazed forest-use land (total forestland minus land grazed and in special uses, such as national and State parks) amounted to 490 million acres, nearly half of all nonagricultural land (table 1). Nonagricultural special-use areas (excluding 6 million acres of special-use land in farmsteads and farm roads) totaled 312 million acres or about 14 percent of the United States land area. Of this amount, national and State parks, wildlife refuges, and related lands occupied 258 million acres or 11 percent of the total land base. **Rural transportation land** accounted for another 26 million acres, and **defense and industrial areas** accounted for 28 million acres.

Approximately 74 million acres were classified as urban land in the United States, with all but 435,000 acres located in the contiguous 48 States. Urban land accounted for 3 percent of the total U.S. land area and just under 4 percent of the land area of the contiguous 48 States. The remaining 197 million acres (9 percent) of the U.S. land area accounted for various miscellaneous other land use that could not be separately inventoried. This land includes tundra, deserts, bare rock areas, snow and ice fields, swamps, marshes, and other areas not independently categorized in the MLU series, such as wetlands and some—but not all—rural residential housing.[3]

Basic Regional Land-Use Patterns

Land-use patterns vary widely across regions—reflecting differences in soil, climate, topography, and general economic activity. For example, in 2017, cropand accounted for just 11 percent of land in the Northeast region but 54 percent in the Corn Belt (table 2; see appendix C for the regions used in this report). Land use also varies among States within a region. For example, in the Corn Belt, cropland accounts for 75 percent of all land in Iowa but just 35 percent in Missouri.

[3] It is not possible to distinguish how much land used for rural housing is included in the miscellaneous other uses category and how much land is classified under other uses, such as forests, grassland pasture and range, or farmsteads.

Table 2

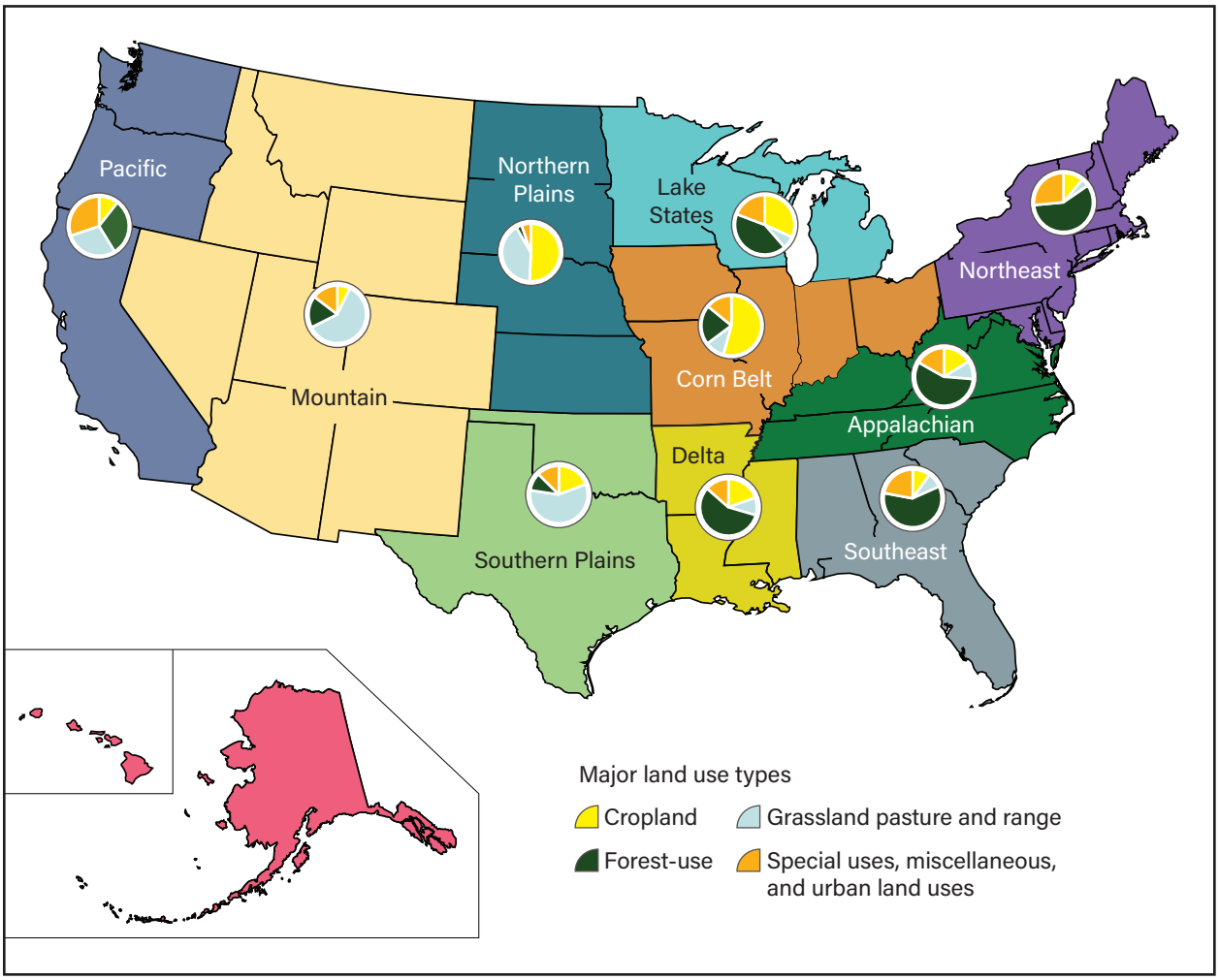
Major U.S. land uses by region, 2017

Region	Cropland		Grassland pasture and range		Forest-use land		Special-use and miscel-laneous-use land		Urban		Total U.S. land	
	Million acres (percent of regional total)											
Northeast	12.4	(11.2)	4.8	(4.3)	64.5	(58.1)	15.6	(14)	13.7	(12.4)	111.1	(100)
Lake States	38.9	(31.9)	8.2	(6.8)	51.4	(42.2)	18.3	(15.1)	4.9	(4.1)	121.8	(100)
Corn Belt	89.3	(54.3)	17.2	(10.5)	34.8	(21.2)	13.5	(8.2)	9.6	(5.8)	164.4	(100)
Northern Plains	98.6	(50.8)	79.4	(40.9)	6.1	(3.1)	8.7	(4.5)	1.3	(0.7)	194.2	(100)
Appalachian	20.0	(16.2)	12.4	(10.1)	70.4	(57.0)	11.9	(9.6)	8.8	(7.1)	123.4	(100)
Southeast	12.1	(9.9)	10.4	(8.5)	73.2	(59.6)	14.9	(12.1)	12.2	(10)	122.8	(100)
Delta States	17.8	(19.5)	9.1	(10.0)	51.8	(57.0)	9.3	(10.2)	3.0	(3.3)	91.0	(100)
Southern Plains	40.7	(19.3)	122.8	(58.2)	21.3	(10.1)	19.1	(9)	7.2	(3.4)	211.1	(100)
Mountain	39.3	(7.2)	330.7	(60.4)	97.1	(17.7)	75.2	(13.7)	5.3	(1)	547.7	(100)
Pacific	21.0	(10.3)	62.6	(30.7)	58.0	(28.5)	54.2	(26.6)	7.8	(3.8)	203.7	(100)
48 States	390.1	(20.6)	657.8	(34.8)	528.6	(28.0)	240.7	(12.7)	73.8	(3.9)	1,891.1	(100)
Alaska	0.1	(0.0)	0.7	(0.2)	92.0	(25.2)	272.3	(74.5)	0.2	(0)	365.2	(100)
Hawaii	0.1	(1.3)	0.8	(18.5)	1.3	(32.7)	1.7	(41.0)	0.3	(6.5)	4.1	(100)
U.S. total	390.2	(17.3)	659.3	(29.2)	621.9	(27.5)	514.7	(22.8)	74.3	(3.3)	2,260.4	(100)

Note: USDA, Economic Research Service, major land use regions correspond with historic USDA production regions. See appendix A for more detailed description of major land use categories. Distributions may not add to totals due to rounding.

Source: USDA Economic Research Service estimates based on data from USDA, National Agricultural Statistics Service Acreage, Crop production, 2017 summary, and 2017 Census of Agriculture; USDA, Farm Service Agency, Conservation Reserve Program, summary and enrollment statistics, fiscal year 2017, and CRP emergency haying and grazing data, fiscal year 2017; USDA, Natural Resources Conservation Service, Summary report: 2017 national resources inventory, 2017 national resources inventory, WRP cumulative agreement data by State and fiscal year, and ACEP cumulative agreement data by State and fiscal year; USDA, Forest Service (FS), Grazing statistical summary, fiscal year 2017, Land areas of the National Forest System as of September 30, 2017, and USDA, FS grazing allotments; U.S. Department of Commerce, Bureau of the Census, 2010 Census of Population and Housing, summary population and housing characteristics, United States, 2013 American Housing Survey, and Census urban area national TIGER/line shapefile; U.S. Department of Defense, Base structure report fiscal year 2018 Baseline; U.S. Department of the Interior, Bureau of Land Management, Public land statistics 2017, and National Park Service acreage report: Calendar year 2017; U.S. Department of the Interior, National Park Service, National Park Service acreage report: Calendar year 2017; U.S. Department of Transportation, Bureau of Transportation Statistics, National Transportation Atlas Databases (NTAD), North American Rail Network (NARN) dataset, and National Transportation Atlas Databases (NTAD), Aviation facilities dataset; U.S. Department of Transportation, Federal Highway Administration, Highway statistics series: Highway statistics 2017; U.S. Department of the Interior, U.S. Geological Survey, Protected Areas Database of the United States (PAD-US); Oswalt, N.S., Smith, W.B., Miles, P.D., & Pugh, S.A. (2019). *Forest resources of the United States, 2017: A technical document supporting the Forest Service 2020 RPA Assessment* (Report No. General Technical Report WO-97). U.S. Department of Agriculture, Forest Service.; and Smith, J., & Leung, Y.F. (2019). *Select metrics describing the operations of America's state park systems.* Utah State University, University Libraries.

Figure 4
Share of land in major uses by region, 2017



Note: See appendix A for definitions of major land-use categories. The special-uses, miscellaneous, and urban land-use categories were too small be to be distinguished as separate pie slices and were therefore combined into a single category. State estimates for each major land use category can be found in USDA, Economic Research Service's (ERS) Major Land Uses data series web page on the USDA, ERS website.

Source: USDA, Economic Research Service estimates based on data from USDA, National Agricultural Statistics Service, Acreage, Crop production, 2017 summary, and 2017 Census of Agriculture; USDA, Farm Service Agency, Conservation Reserve Program, summary and enrollment statistics, fiscal year 2017, and Conservation Reserve Program (CRP) emergency haying and grazing data, fiscal year 2017; USDA, Natural Resources Conservation Service, Summary report: 2017 national resources inventory, 2017 national resources inventory, Wetland Reserve Program (WRP) cumulative agreement data by State and fiscal year, and Agricultural Conservation Easement Program (ACEP) cumulative agreement data by State and fiscal year; USDA, Forest Service (FS), Grazing statistical summary, fiscal year 2017, Land areas of the National Forest System as of September 30, 2017, and USDA, FS grazing allotments; U.S. Department of Commerce, Bureau of the Census, 2010 Census of Population and Housing, summary population and housing characteristics, United States, 2013 American Housing Survey, and Census urban area national Topologically Integrated Geographic Encoding and Referencing (TIGER)/line shapefile; U.S. Department of Defense, Base structure report fiscal year 2018 Baseline; U.S. Department of the Interior, Bureau of Land Management, Fiscal year 2015 rangeland inventory, monitoring, and evaluation report, and Public land statistics 2017; U.S. Department of the Interior, National Park Service, National Park Service acreage report: Calendar year 2017; U.S. Department of Transportation, Bureau of Transportation Statistics, National Transportation Atlas Databases (NTAD), North American Rail Network (NARN) dataset, and National Transportation Atlas Databases (NTAD), Aviation facilities dataset; U.S. Department of Transportation, Federal Highway Administration, Highway statistics series: Highway statistics 2017; U.S. Department of the Interior, U.S. Geological Survey, Protected Areas Database of the United States (PAD-US); Oswalt, N.S., Smith, W.B., Miles, P.D., & Pugh, S.A. (2019). *Forest resources of the United States, 2017: A technical document supporting the Forest Service 2020 RPA Assessment* (Report No. General Technical Report WO-97). U.S. Department of Agriculture, Forest Service; and Smith, J., & Leung, Y.F. (2019). *Select metrics describing the operations of America's state park systems*. Utah State University, University Libraries. Utah State University, University Libraries.

When looking at the relative prevalence of different land uses across the United States, regional patterns emerge. Cropland is largely concentrated in the central regions of the contiguous United States. The majority of land in the Northern Plains and Corn Belt is cropland (51 percent and 54 percent, respectively). Shares of cropland in the Southern Plains, Lake States, and Delta States regions are also above the national average. Grassland pasture and range are concentrated in the Mountain and Southern Plains regions, where they account for more than half of the land. The Northern Plains and Pacific regions also have relatively high shares of grassland pasture and range acreage, with 41 and 31 percent of their land area, respectively, allocated to this use (table 2). Forest-use land is most prevalent in eastern regions—specifically the Northeast, Appalachian, Southeast, and Delta States—which have the majority of their land in forest uses. However, in terms of total acreage, most forest-use land is located in Alaska and the Mountain region. Special-use land, most of which is devoted to rural parks and wilderness areas, is largely concentrated in Alaska and the Mountain and Pacific regions. The Northeast and Southeast regions have the highest relative areas devoted to urban uses, whereas the Lake States, Corn Belt, Appalachian, Pacific, and Southern Plains regions also have urban-use shares above the national average (figure 12).

Historical Trends in Major Land Uses

The areas of land in the top land-use categories have fluctuated over time. Total cropland area decreased by about 18 percent between 1949 and 2017, though several periods during this timeframe were marked by increases (table 3).[4] Total cropland area in 2017 was 390 million acres, the lowest level since estimates for all 50 States began in 1949 and 2 million acres below the previous low observed in 2012. The decrease of cropland over this 5-year period stemmed from a 2-million-acre reduction in cropland used for crops. Grassland pasture and range increased through the early 1960s but then entered a long-term decline. By 2007, estimated acreage in the category had increased to 614 million acres but was still 3 percent below acreage in 1949. Between 2012 and 2017, grassland pasture and range increased by 4 million acres. Forest-use land generally decreased from 1949 to 1997, as it had increased by more than 4 percent from 1997 to 2007 and then declined by 7 percent from 2007 to 2017. The most consistent trends observed between 1945 and 2017 are observed in the expansion of special-use and urban land. Acreage classified under miscellaneous other uses declined from 301 million to 197 million acres over 1974–2017, partly due to improvements in methods used by Government agencies to measure land use (e.g., satellite technology) that led to better classification of previously unclassified areas.

[4] MLU estimates for the 48 contiguous States began in 1945, but estimates 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. The 1945 estimates did not cover forest, special uses, and miscellaneous other uses, which account for 99 percent of Alaska's land area.

Table 3

Major U.S. land uses, 1949–2017

Land use	1949	1959	1964	1969	1974	1978	1982	1987	1992	1997	2002	2007	2012	2017
	Million acres													
Cropland	478	458	444	472	465	471	469	464	460	455	442	408	392	390
Cropland used for crops	383	359	335	333	361	369	383	331	338	349	340	335	340	338
Idle cropland	26	34	52	51	21	26	21	68	56	39	40	37	39	39
Cropland pasture[1]	69	66	57	88	83	76	65	65	67	68	62	36	13	13
Grassland pasture and range[1]	632	633	640	604	598	587	597	591	591	580	587	614	655	659
Forest-use land[2]	760	745	732	723	718	703	655	648	648	642	651	671	632	622
Grazed forest-use land	320	245	225	198	179	172	158	155	145	140	134	127	130	132
Ungrazed forest-use land	440	501	507	525	539	531	497	493	503	501	517	544	502	490
Special-use areas[3]	87	115	144	141	147	158	270	279	281	286	297	313	316	318
Urban areas[4]	18	27	29	31	35	45	50	57	59	66	60	61	70	74
Miscellaneous other land	298	293	277	291	301	301	224	227	224	236	228	197	196	197
Total U.S. land area	2,273	2,271	2,266	2,264	2,264	2,264	2,265	2,265	2,263	2,263	2,264	2,264	2,260	2,260

Note: See appendix A for more detailed description of USDA, Economic Research Service, major land-use categories. Distributions may not add to totals due to rounding. Totals differ over time, due to a remeasurement of the land area.

[1] Consecutive methodological changes in the 2007 and 2012 USDA, Census of Agriculture editions led to a substantial amount of land that had previously been classified as cropland pasture becoming reclassified as grassland pasture and range in the MLU. While estimates for these two land types for 2012 and 2017 are directly comparable, estimates from 2007 onward are not directly comparable to earlier years. See box "Cropland Pasture in the Census of Agriculture" for more information.

[2] Much of the 16-percent decline from 1949 to 1997 was a result of land being reclassified from forest-use to special-use areas (see "Special Uses"). In 2012, the USDA, Resources Planning Act (RPA) Assessment changed the in situ height requirement for what constitutes a tree from 13.1 to 16.4 feet, leading to some lands that the major land use had previously classified as forest-use no longer being classified as such. This classification change mainly affects major land-use estimates for States in the Mountain and Pacific regions and Alaska.

[3] Estimates for 1949 do not include Alaska and Hawaii.

[4] Pre- and post-2000 urban estimates are not directly comparable due a change in the definition of urban areas in the U.S. Department of Commerce, Bureau of the Census' 2000 Census of Population and Housing.

Source: USDA Economic Research Service estimates based on data from USDA, National Agricultural Statistics Service, Acreage, Agricultural land: Land values and cash rents, and 2017 Census of Agriculture; USDA, Farm Service Agency, Conservation Reserve Program (CRP), summary and enrollment statistics, fiscal year 2017, and CRP emergency haying and grazing data, fiscal year 2017; USDA, Natural Resources Conservation Service, Summary report: 2017 national resources inventory, 2017 national resources inventory, table F-1 Cropland and pastureland by specific land cover/use and year, Wetland Reserve Program (WRP) cumulative agreement data by State and fiscal year, and Agricultural Conservation Easement Program (ACEP) cumulative agreement data by State and fiscal year; USDA, Forest Service (FS), Grazing statistical summary, fiscal year 2017, Land areas of the National Forest System as of September 30, 2017, and USDA, FS grazing allotments; U.S. Department of Commerce, Bureau of the Census, 2010 Census of Population and Housing, summary population and housing characteristics, United States, 2013 American Housing Survey, and Census urban area national TIGER/line shapefile; U.S. Department of Defense, Base structure report fiscal year 2018 Baseline; U.S. Department of the Interior, Bureau of Land Management, Fiscal year 2015 rangeland inventory, monitoring, and evaluation report, and Public land statistics 2017; U.S. Department of the Interior, National Park Service, National Park Service acreage report: Calendar year 2017; U.S. Department of Transportation, Bureau of Transportation Statistics, National Transportation Atlas Databases (NTAD), North American Rail Network (NARN) dataset, and National Transportation Atlas Databases (NTAD), Aviation facilities dataset; U.S. Department of Transportation, Federal Highway Administration, Highway statistics series: Highway statistics 2017; U.S. Department of the Interior, U.S. Geological Survey, Protected Areas Database of the United States (PAD-US); Oswalt, N.S., Smith, W.B., Miles, P.D., & Pugh, S.A. (2019). *Forest resources of the United States, 2017: A technical document supporting the Forest Service 2020 RPA Assessment* (Report No. General Technical Report WO-97). U.S. Department of Agriculture, Forest Service.; and Smith, J., & Leung, Y.F. (2019). *Select metrics describing the operations of America's state park systems.* Utah State University, University Libraries. Estimates prior to 2017 are based on Bigelow, D., & Borchers, A. (2017). *Major uses of land in the United States, 2012* (Report No. EIB-178). U.S. Department of Agriculture, Economic Research Service.

The changes in acreage in the different MLU categories reflect true shifts between land uses, as well as changes in methods and definitions employed by the MLU data sources. For example, the cropland pasture reduction and some of the grassland pasture and range increase during 2002–12 is likely due to a change in the way information on cropland pasture and other pasture on farms was measured and elicited in the 2007 and 2012 Censuses of Agriculture (see box, "Cropland Pasture in the Census of Agriculture"). Similarly, changes in forest area reflect a combination of actual land-use changes and alterations to the definition of forestland.[5] Because of these changes in methodology, not all MLU categories are strictly comparable across years (for more information, see the box "Comparability of Land-Use Estimates"). In general, the longer-term land-use trends may be more reliable as indicators than the changes for specific 5-year intervals, particularly in cases where a definitional or methodological change has been noted.

Although the methodological and definitional changes mentioned above (and discussed in more detail throughout this report) can muddle recent short-term trends across USDA, ERS's historic MLU categories, it is possible to account for many of these potentially artificial changes if we regroup the various subcomponents of our agency's MLU categories. To that end, the authors also considered five alternative land-use categories, namely ungrazed cropland and miscellaneous farmland,[6] grazing lands,[7] ungrazed forest and parks/wildlife areas,[8] urban areas, and other land[9] (figure 5).

[5] For more information on how to interpret the forest-use estimate, see "Forest-Use Land and Total Forested Land."

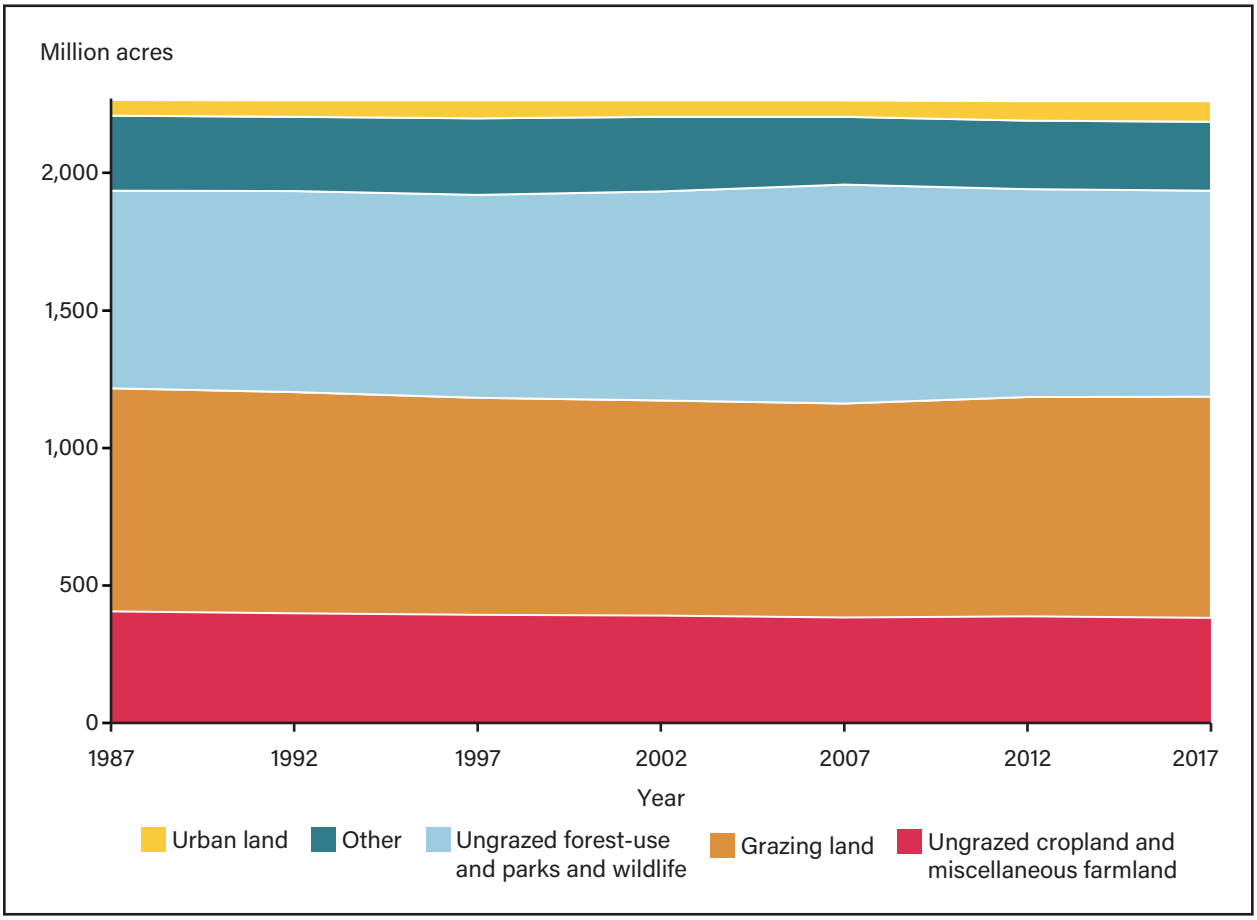
[6] Ungrazed cropland and miscellaneous farmland = cropland used for crops + idle cropland + farmsteads.

[7] Grazing lands = grassland pasture and range + cropland pasture + grazed forest-use.

[8] Ungrazed forest and parks/wildlife areas = ungrazed forest-use + rural parks and wildlife areas.

[9] Other land = miscellaneous other land + rural transportation + defense/industrial land.

Figure 5
Land-use trends under an alternative grouping, 1987–2017



Ungrazed cropland and miscellaneous farmland = cropland used for crops + idle cropland + farmsteads. Grazing land = grassland pasture and range + cropland pasture + grazed forest-use. Ungrazed forest-use and parks and wildlife = ungrazed forest-use + rural parks and wildlife areas. Other = miscellaneous other land + rural transportation + defense and industrial land.

Source: USDA Economic Research Service estimates based on data from USDA, National Agricultural Statistics Service, Acreage, Agricultural land: Land values and cash rents, and 2017 Census of Agriculture; USDA, Farm Service Agency, Conservation Reserve Program (CRP), summary and enrollment statistics, fiscal year 2017, and CRP emergency haying and grazing data, fiscal year 2017; USDA, Natural Resources Conservation Service, Summary report: 2017 national resources inventory, 2017 national resources inventory, table F-1 Cropland and pastureland by specific land cover/use and year, Wetland Reserve Program (WRP) cumulative agreement data by State and fiscal year, and Agricultural Conservation Easement Program (ACEP) cumulative agreement data by State and fiscal year; USDA, Forest Service (FS), Grazing statistical summary, fiscal year 2017, Land areas of the National Forest System as of September 30, 2017, and USDA, FS grazing allotments; U.S. Department of Commerce, Bureau of the Census, 2010 Census of Population and Housing, summary population and housing characteristics, United States, 2013 American Housing Survey, and Census urban area national Topologically Integrated Geographic Encoding and Referencing (TIGER)/line shapefile; U.S. Department of Defense, Base structure report fiscal year 2018 Baseline; U.S. Department of the Interior, Bureau of Land Management, Fiscal year 2015 rangeland inventory, monitoring, and evaluation report, and Public land statistics 2017; U.S. Department of the Interior, National Park Service, National Park Service acreage report: Calendar year 2017; U.S. Department of Transportation, Bureau of Transportation Statistics, National Transportation Atlas Databases (NTAD), North American Rail Network (NARN) dataset, and National Transportation Atlas Databases (NTAD), Aviation facilities dataset; U.S. Department of Transportation, Federal Highway Administration, Highway statistics series: Highway statistics 2017; U.S. Department of the Interior, U.S. Geological Survey, Protected Areas Database of the United States (PAD-US); Oswalt, N.S., Smith, W.B., Miles, P.D., & Pugh, S.A. (2019). *Forest resources of the United States, 2017: A technical document supporting the Forest Service 2020 RPA Assessment* (Report No. General Technical Report WO-97). U.S. Department of Agriculture, Forest Service.; and Smith, J., & Leung, Y.F. (2019). *Select metrics describing the operations of America's state park systems*. Utah State University, University Libraries. Estimates prior to 2017 are based on Bigelow, D., & Borchers, A. (2017). *Major uses of land in the United States, 2012* (Report No. EIB-178). U.S. Department of Agriculture, Economic Research Service.

Under this classification system, between 1987 and 2017, the amount of ungrazed cropland and miscellaneous farmland available nationwide was down 6 percent (almost 23 million acres); grazing lands were down 1 percent (almost 7 million acres); ungrazed forest and parks/wildlife was up 4 percent (30 million acres); urban land area was up 31 percent (almost 18 million acres); and the other category was down 8 percent (almost 23 million acres). Between 1987 and 2017, agricultural land more broadly (i.e., grazing lands + ungrazed crop-

land and miscellaneous farmland) decreased by 2 percent (30 million acres), ultimately a reduction from 53.6 percent of the U.S. land area in 1987 to 52.3 percent in 2017. These 2017 estimates were all within roughly 1 percent of their 2012 values, except for urban land, which was up 6 percent (just over 4 million acres).

Comparability of Land-Use Estimates

In maintaining the Major Land Uses (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 the Federal and State agencies from which our data is sourced improve their methodologies and more accurate data become available, the estimates are amended to incorporate the new data. However, when historical estimates cannot be adjusted, we do our best to make the reader aware that differences on paper may not reflect 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 USDA, Census of Population. The U.S. Department of Commerce, Bureau of the Census estimated that if the same criteria had been used in 1990 and 2000, the urban area estimates would reflect a 13-percent increase over the 1990–2000 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. Although 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 other 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.

Changes in land use occur for various reasons, and some changes are less reversible than others. Commodity prices, environmental factors (e.g., soil quality and weather patterns), government policies and programs (e.g., CRP), population growth, and bioenergy demand can affect land-use decisions because they influence the relative economic returns for different uses. Economic theory suggests that profit-maximizing (i.e., private) landowners put land to the use (or uses) that maximizes the discounted sum of current and future net returns.[10] Although this theory may not always hold in practice, changes in the relative profitability of one land use over another, along with idiosyncratic landowner objectives and preferences, can influence transitions between land uses (Lubowski et al., 2008). Economic theory would suggest that increased demand for residential, commercial, and industrial development can cause agricultural and forestland to be converted to developed uses when the relative rents to farm, timber, and/or developed uses change (Deaton & Lawley, 2022). However, once the land is developed, the land rarely transitions back to less intensive agricultural or forest uses. The amount of urban land has increased continuously since 1945, and according to USDA, Natural Resources Conservation Service (NRCS) (USDA, NRCS, 2020a), more than 98 percent of land that was developed in 1982 remained developed in 2017.[11] In contrast, land-use changes from cropland to pasture (and vice versa) are more common and less costly to reverse.

[10] Public lands, in contrast, are established to protect certain lands from the economic/development pressures faced by private landowners. They are generally managed for the public good and are less likely to experience land-use changes.

[11] Note that the decline in urban land between 1997 and 2002 reflects a change in census (of population) methodology rather than a true decline in the U.S. urban land footprint.

Although the changes are informative, trends in individual land-use categories can mask offsetting changes into and out of different uses. Although it does not paint a complete picture of changes for all land uses, the National Resources Inventory (NRI), a recurring dataset maintained by USDA, NRCS, identifies plot-level changes in non-Federal land over time in the 48 contiguous States and Hawaii. Because the same plots are sampled over time, NRI data allow for the construction of land-use transition matrices (table 4).[12]

Table 4
National Resources Inventory transition matrix for 2012–17

From land use and/or land cover, 2012	To land use and/or land cover, 2017					
	Cropland and CRP	Pasture and range	Forest	Developed	Other rural	Water
	Percent of land converted, 2012–17					
Cropland and CRP	98.1	1.4	0.2	0.6	1.1	0.0
Pasture and range	1.8	98.3	0.6	0.9	1.5	0.0
Forest	0.1	0.1	99.1	1.0	0.8	0.1
Developed	0.0	0.0	0.0	97.4	0.0	0.0
Other rural	0.0	0.1	0.1	0.1	96.6	0.0
Water	0.0	0.0	0.0	0.0	0.0	99.9

CRP=Conservation Reserve Program.

Note: The numbers in the main body of the table represent the percentage of land in the corresponding column that was converted from the land use and/or land cover in the corresponding row 5 years earlier, with the diagonals representing land that remained in the same use and cover. Thus, 1.8 (first column, second row) represents the percent of 2017 land in cropland and CRP that had previously been land in pasture and range in 2012. Distribution may not sum to 100 due to rounding.

Source: USDA Economic Research Service based on data from USDA, Natural Resources Conservation Service, Summary report: 2017 national resources inventory.

The NRI data show that, between 2012 and 2017, 40 percent of the total amount of land that was converted to a developed use was previously forest use and/or forest cover. An additional 34 percent was previously in pasture or range use, whereas 22 percent was cropland or enrolled in CRP.[13] In addition to land development, land-use changes can also occur between undeveloped uses. Between 2012 and 2017, the majority (85 percent) of new pasture and rangeland came from land that was previously used for crops or enrolled in CRP. Similarly, 92 percent of new cropland or CRP acreage was formerly in pasture or range use (USDA, NRCS, 2020a).[14] The NRI data also illustrate the relative infrequency of changes in land use and land cover. For example, roughly 98 percent of the NRI cropland and CRP land identified in 2012 remained in that use in 2017. For a better understanding of how land-use definitions differ between different sources, see appendix A.

Cropland

Total cropland has five components (table 5). The sum of three of these components, cropland harvested, crop failure, and cultivated summer fallow, constitutes the cropland used for crops category or the acreage devoted

[12] Although the 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 have been omitted). However, NRI data are used in the construction of the MLU grassland pasture and range and grazed forest estimates in the 48 contiguous States and Hawaii.

[13] NRI uses a more restrictive definition of forestland relative to that used by USDA's Forest Service, the main source of the MLU forest-use estimates. The NRI cropland category roughly corresponds to the sum of the MLU categories of cropland used for crops plus cropland pasture.

[14] The NRI cropland and CRP categories are combined to stay consistent with the definition of cropland used in MLU. Most new CRP land came from land that was previously cropland. The vast majority of pasture and range conversions to cropland and/or CRP were from pasture and range to cropland, not CRP.

to crop production in a given year.[15] The other two components, cropland pasture and idle cropland, are not directly used for crop production in a given year but may rotate into production in other years. Total U.S. cropland was estimated at 390 million acres in 2017. This number represents a decrease of 2 million acres (0.5 percent) from the 2012 estimate of 392 million acres.

Table 5
Major uses of U.S. cropland, 1949–2017

Year	Cropland used for crops[1]				Idle	Cropland pasture[2]	Total U.S. cropland
	Harvested	Failed	Fallowed	Total			
	Million acres						
1949	352	9	26	387	22	69	478
1954	339	13	28	380	19	66	466
1959	318	10	31	359	33	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	305	8	24	337	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
2012	315	11	13	340	39	13	392
2017	314	9	15	338	39	13	390

Note: See appendix A for a more detailed description of the cropland category and its components. "Fallowed" denotes cultivated summer fallow. Distributions may not add to totals due to rounding.

[1]The components of the cropland used for crop estimates are taken from Summary Table 3 of the Major Land Uses data product. For 1949, 1954, and 1992, these estimates differ slightly from the State-level estimates provided in other data product tables.

[2]The 2007, 2012, and 2017 cropland pasture estimates are not directly comparable with estimates in prior years due to two consecutive methodological changes in 2007 and 2012 by USDA, National Agricultural Statistics Service, Census of Agriculture in estimating cropland pasture and other pasture on farms. However, 2012 and 2017 estimates are directly comparable. See box "Cropland Pasture in the USDA, National Agricultural Statistics Service's Census of Agriculture" for more information.

Source: USDA Economic Research Service estimates based on data from USDA, National Agricultural Statistics Service, Acreage, 2017 Agricultural land: Land values and cash rents, and 2017 Census of Agriculture; USDA, Farm Service Agency, Conservation Reserve Program (CRP), summary and enrollment statistics, fiscal year 2017, and CRP emergency haying and grazing data, fiscal year 2017; and USDA, Natural Resources Conservation Service, Wetland Reserve Program (WRP) cumulative agreement data by State and fiscal year, and Agricultural Conservation Easement Program (ACEP) cumulative agreement data by State and fiscal year. Estimates prior to 2017 are based on Bigelow, D., & Borchers, A. (2017). *Major uses of land in the United States, 2012* (Report No. EIB-178). U.S. Department of Agriculture, Economic Research Service.

[15] Cropland used for crops is the only component of USDA, ERS's Major Land Uses (MLU) data series that is updated annually. Although table 5 shows acreage estimates for cropland used for crops only for the years in which the full MLU series is published, annual estimates are currently available for each year from 1910 to 2020. For the full cropland used for crops dataset, see the MLU data series summary table 3 on the USDA, ERS website.

Cropland Used for Crops

At 87 percent of the United States cropland base, cropland used for crops (338 million acres in 2017) accounted for the vast majority of total cropland (table 5).[16] This number represents a decrease of 2 million acres (0.5 percent) from the 2012 estimate of 340 million acres. Cropland harvested, the dominant subcomponent of cropland used for crops, totaled 314 million acres in 2017, which includes row and closely sown crops, tree fruits and nuts, and vegetables. Crop failure (i.e., planted cropland that was intended to be harvested but was not) accounted for 9 million acres in 2017, with about 32 percent in the Southern Plains and 31 percent in the Northern Plains. The 2017 failure rate (3 percent of the acreage planted for harvest) is below the 20-year average and roughly equal to the 2012 rate (3 percent) (for more information, see footnote 15). Crop failure stems from a variety of factors, including poor weather conditions, pest infestations, and plant disease. In other instances, crop failure reflects farm revenue losses due to inadequate labor supply, low crop prices, or other factors.

Cultivated summer fallow, or simply summer fallow, refers to cropland in subhumid regions that is unplanted for a season or more to control weeds and accumulate moisture. Summer fallow is used extensively in the semiarid West, and the MLU estimates are restricted to the regions in that area. The use of summer fallow has been decreasing since the late 1960s. In 2017, more than 13 million cropland acres were devoted to summer fallow, one-third of the land at its peak in 1969. Thirty-nine percent of 2017 summer fallow acres were in the Mountain region, 35 percent were in the Northern Plains region, and 26 percent were in the Pacific and Southern Plains regions combined.

Cropland Pasture

The remainder of total cropland in 2017 was used for pasture (13.4 million acres) or was idle (38.7 million acres).[17] Focusing on cropland pasture, this number represents approximately a 5-percent increase from the 2012 estimate of 12.8 million acres. In contrast to permanent grassland pasture and range, cropland pasture is considered to be in crop rotation or could be used for crops without improvements. Much of the cropland used for pasture is rotated between crop and pasture use, although the length of the rotation period varies across farms.

Sequential changes in the 2007 and 2012 Censuses of Agriculture have resulted in a substantial amount of land that the MLU series had previously classified as cropland pasture becoming reclassified as grassland pasture and range. As a result, estimates before 2012 are not strictly comparable with previous MLU estimates, though estimates for 2012 and 2017 can be directly compared (see the box "Cropland Pasture in the USDA, National Agricultural Statistics Service's Census of Agriculture").

Cropland Pasture in the USDA, National Agricultural Statistics Service's Census of Agriculture

Pasture or rangeland can generally take one of two forms. First and foremost, pasture includes land that is permanently used for animal grazing. Indeed, noncropped grassland pasture and range make up most of the grazing land reported in USDA, Economic Research Service's (ERS) Major Land Uses (MLU) data series, accounting for at least two-thirds of the grazing lands since 1959. Land may also be grazed intermittently in rotation with other uses, such as crop farming or forestry. Cropland pasture estimates, one of two nonpermanent grazing uses tracked in the MLU series, declined by nearly 79 percent in the 10 years between 2002 and 2012 after exhibiting relative stability for more than 50 years. This decline is largely

[16] See the MLU data series summary table 2 on the USDA, ERS website for cropland acreage broken out by region and State.

[17] Although the values in table 5 are rounded to whole numbers, more precise historical estimates for idle cropland and cropland pasture are provided in table 6 and table 8, respectively.

attributable to methodological changes in the collection of cropland pasture data in USDA, National Agricultural Statistics Service's (NASS) Census of Agriculture, the data source for the cropland pasture category. In USDA, NASS' 2002 Census of Agriculture, respondents were asked to report the acreage of "Cropland used only for pasture or grazing (include rotation pasture and grazing land that could have been used for crops without additional improvements)." This was the second item in the land-use section of the census questionnaire, falling under the broad heading of "Cropland" and immediately following the question about harvested cropland. In 2007, the wording of the cropland pasture question was identical to that used in 2002, but the question was moved from the second (of five) items in the Cropland section to the last (of three) items in the Pasture section. In USDA, NASS' 2012 Census of Agriculture, additional changes were made. While the cropland pasture question remained in the same place as in 2007, the wording was changed to: "Other pasture and grazing land (including rotational pasture) that could have been used for crops without additional improvements." There is no way to definitively determine the extent of the effects of changes in the placement and wording of the cropland pasture question. However, it seems likely (given the relatively stable cropland pasture acreage trend from 1949 to 2002) that these changes contributed to the large decrease between 2002 and 2012. However, the wording and placement of this question in 2017 were identical to that of 2012, allowing us to directly compare recent trends in cropland pasture once more. A table comparing the wording, placement, and reported values for the cropland pasture question in the Census of Agriculture between 1997 and 2017 can be found in appendix D of this report. It should be noted that 2022 will also match 2012 and 2017.

Idle Cropland

Idle cropland includes land that is completely idle, such as the area diverted from crops under the Conservation Reserve Program (CRP began in 1985); the Wetland Reserve Program (WRP began in 1992, transitioned to the Agricultural Conservation Easement Program (ACEP) in 2014); the Agricultural Conservation Easement Program's Wetland Reserve Easements (ACEP-WRE began in 2014); and land seeded to cover or soil-improvement crops, such as buckwheat and clover, but not harvested or pastured.[18] Idle cropland in 2017 totaled 38.7 million acres or approximately 10 percent of total U.S. cropland. This number represents a 600,000-acre decrease (1.5 percent) from the 2012 estimate of 39.3 million acres. Regionally, the Southern Plains and Mountain regions had the largest acreage of idle cropland, both with more than 6 million acres. The Northeast and Far West (Alaska and Hawaii) regions had the smallest acreage of idle cropland, with more than 1 million acres each.

In 2017, USDA, FSA reported that 23 million acres were enrolled under CRP, while USDA, NRCS reported 3 million acres were enrolled under ACEP-WRE (including acres previously enrolled under WRP). Of the 23 million acres enrolled under CRP in 2017, emergency haying was allowed on roughly 800,000 acres, and emergency grazing was allowed on roughly 500,000 million acres (table 6). The Northern Plains received 55 percent of the emergency haying and grazing exemptions, whereas the Mountain region received 31 percent. This portion of CRP area is not included in the idle cropland estimates, as this portion of CRP area was either pastured or harvested in 2017 and is, therefore, accounted for in those respective land-use categories (i.e., grassland pasture and range and cropland harvested, respectively). In addition to land idled through Government programs, some cropland is left idle each year for other reasons. In 2017, this additional idle cropland totaled 13.5 million acres (table 6). Overall, the amount of idle cropland in 2017 was roughly equal to the U.S. historical average of 38 million acres since 1945; total amounts have fluctuated throughout the period.[19]

[18] The Agricultural Act of 2014 established the Agricultural Conservation Easement Program (ACEP). As part of this new program, ACEP repealed WRP and transferred all existing WRP contracts to ACEP as part of ACEP's Wetland Reserve Easements (WRE) program. The total number of acres reported equals the number of acres enrolled in the WRP through the end of 2013, along with ACEP-WRE enrollment in 2014–17.

[19] For regional-level and State-level data on idle cropland from 1945 to 2012, see the MLU data series on the USDA, ERS website.

Table 6
Idle U.S. cropland by type, 2012–17

	2012	2017	Change 2012–17
	Million acres		
CRP	29.5	23.4	-6.1
Emergency haying	1.4	0.8	-0.6
Emergency grazing	1.4	0.5	-0.9
WRP and ACEP-WRE	2.6	3.1	0.5
Cropland idled in Federal Government programs[1]	29.3	25.2	-4.1
Other idle cropland	10.0	13.5	3.6
Total U.S. idle cropland	39.3	38.7	-0.6

CRP = Conservation Reserve Program. WRP = Wetland Reserve Program. ACEP-WRE = Agricultural Conservation Easement Program, Wetland Reserve Easements.

[1]Net of CRP land used for emergency haying and grazing.

Source: USDA Economic Research Service estimates based on data from USDA, National Agricultural Statistics Service, 2017 Census of Agriculture; and USDA, Farm Service Agency, Conservation Reserve Program (CRP), summary and enrollment statistics, fiscal year 2017, and CRP emergency haying and grazing data, fiscal year 2017.

Trends in Cropland Uses

Total cropland acreage in the United States has been steadily declining 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 each year the USDA, NASS Census of Agriculture was conducted from 1969 to 1997 (table 5). Between 2002 and 2012, total cropland declined by 50 million acres (approximately 11 percent) to 392 million acres before declining by another 2 million acres from 2012 to 2017 to reach the lowest level ever recorded by the MLU series (i.e., 390 million acres of total cropland). Despite this long-term decline in total cropland, cropland used for crops (i.e., the top cropland-use category) increased by 5 million acres from 2007 to 2017 to reach an overall level of 338 million acres, although there was a 2 million-acre-decrease between 2012 and 2017. Much of the total cropland decrease between 2007 and 2012 was the result of a series of methodological changes in USDA, NASS' Census of Agriculture that reclassified land as permanent grassland pasture and range that was previously classified as cropland pasture (for more information, see the Changes in Cropland Pasture section and the "Cropland Pasture in the USDA, National Agricultural Statistics Service's Census of Agriculture" box). Therefore, it would not be accurate to say that the United States has lost 11 percent of the cropland it had in 2002, as much of that land has simply been reclassified as grassland pasture and range.

Changes in Cropland Used for Crops and Idle Cropland

Between 1949 and 1969, cropland used for crops declined steadily from 387 million acres in 1949 to 333 million acres in 1969. This trend reversed in the 1970s, ultimately reaching 383 million acres in 1982. However, during the U.S. farm crisis of the 1980s, a period when dramatic decreases in farmland values during a time of high farm debt led to record foreclosures, cropland used for crops declined by 52 million acres from 1982 to 1987 and has since remained at or below 340 million acres in each period except for 1997 (table 5). While the declines observed between 1982 and 1987 correspond to the 1980s farm crisis, the declines are likely also attributable to the large increases in land enrolled in acreage reduction programs observed over that time, including the establishment of CRP in the 1985 Farm Bill.

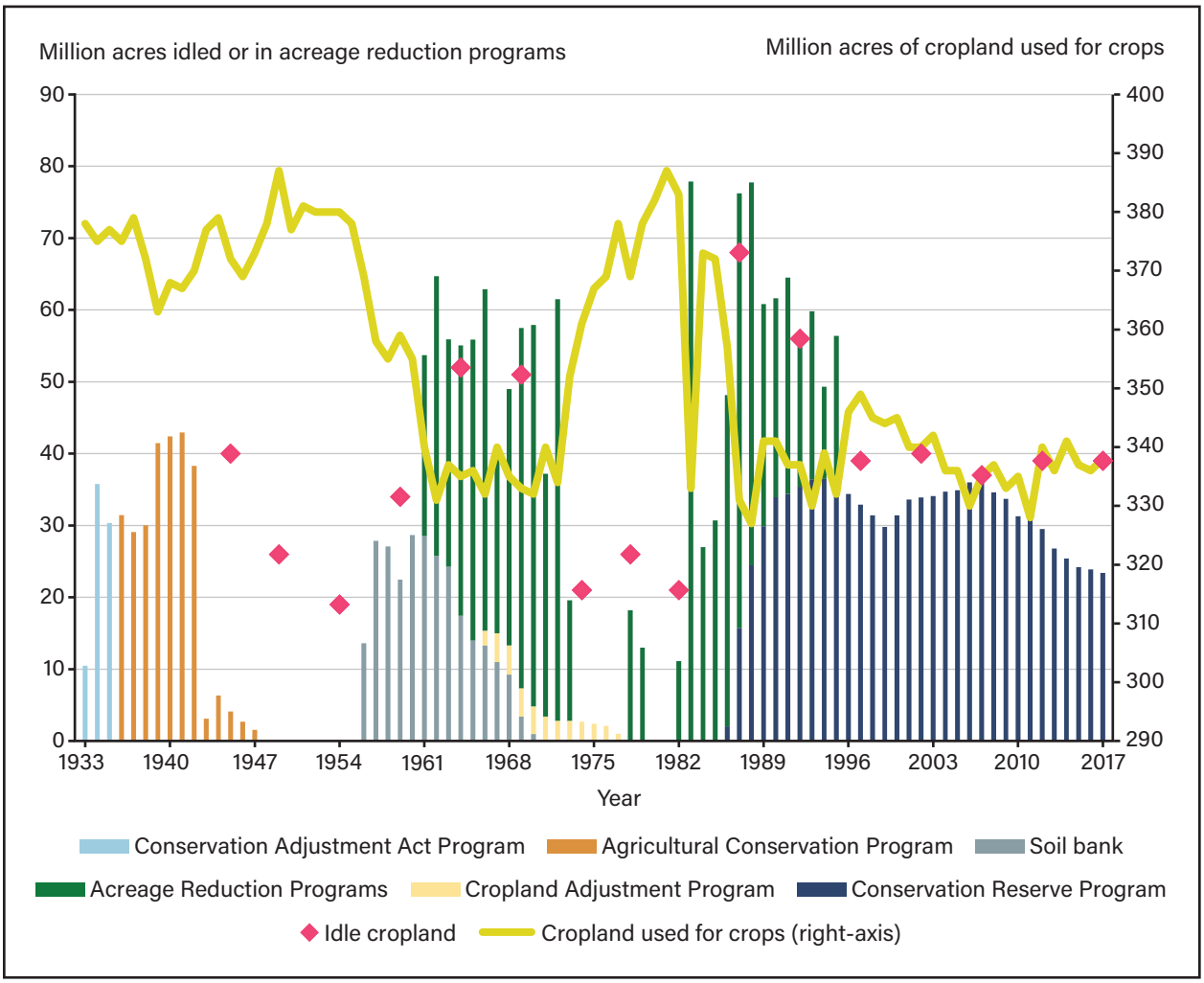
During 2007–12, cropland used for crops increased by 5 million acres (1.5 percent) to 340 million acres, then decreased by 2 million acres (0.5 percent) from 2012 to 2017 to reach a total of 338 million acres. Historically, an inverse relationship exists between cropland used for crops and idle cropland, with the amount of idle cropland being largely driven by changes in the existing acreage reduction programs (figure 6). However, between 2007 and 2012, both cropland used for crops and idle cropland increased despite a 7-million-acre decrease in CRP acreage. This historical inverse relationship also did not hold between 2012 and 2017, where both cropland used for crops and idle cropland slightly decreased.

The 2007–17 decrease in CRP land follows the trend in the CRP acreage enrollment cap. The cap was reduced to 32 million acres under the Food, Conservation, and Energy Act of 2008 and then further reduced to 24 million acres by 2017 under the Agricultural Act of 2014.[20] However, as noted earlier, 32 percent of cropland idled in 2017 came from land not enrolled in CRP (table 6).

Although such a positive correlation runs counter to historical norms, it is plausible that the concurrent decreases in idle cropland and cropland used for crops are the combined result of fluctuations in commodity prices (figure 7) and changes in Government programs. For example, the high corn prices of 2012 likely incentivized farmers to plant corn on land not typically used for crops. However, as crop prices subsequently decreased, some of that land likely went back to being idle, pasture, or noncropland. These conditions would typically cause an increase in idle cropland but for a simultaneous decrease of 6 million acres in CRP land due to the reduction in the CRP acreage enrollment cap.

[20] The Agricultural Act of 2014 further reduced the CRP acreage enrollment cap to 27.5 million acres in 2014, 26.0 million acres in 2015, 25.0 million acres in 2016, and, eventually, 24.0 million acres in 2017 and in 2018.

Figure 6
Cropland acreage reductions by program type, 1933–2017



Note: All values are plotted on the left axis except for cropland used for crops, which is plotted on the right axis. Acreage Reduction Programs include Acreage Conservation Reserve, 0, 50/85-92 programs, Paid Land Diversion, and Payment-in-Kind programs.

Source: USDA Economic Research Service based on data from USDA, Farm Service Agency, Conservation Reserve Program, summary and enrollment statistics, fiscal year 2017. Estimates prior to 2017 are based on Bigelow, D., & Borchers, A. (2017). *Major uses of land in the United States, 2012* (Report No. EIB-178). U.S. Department of Agriculture, Economic Research Service.

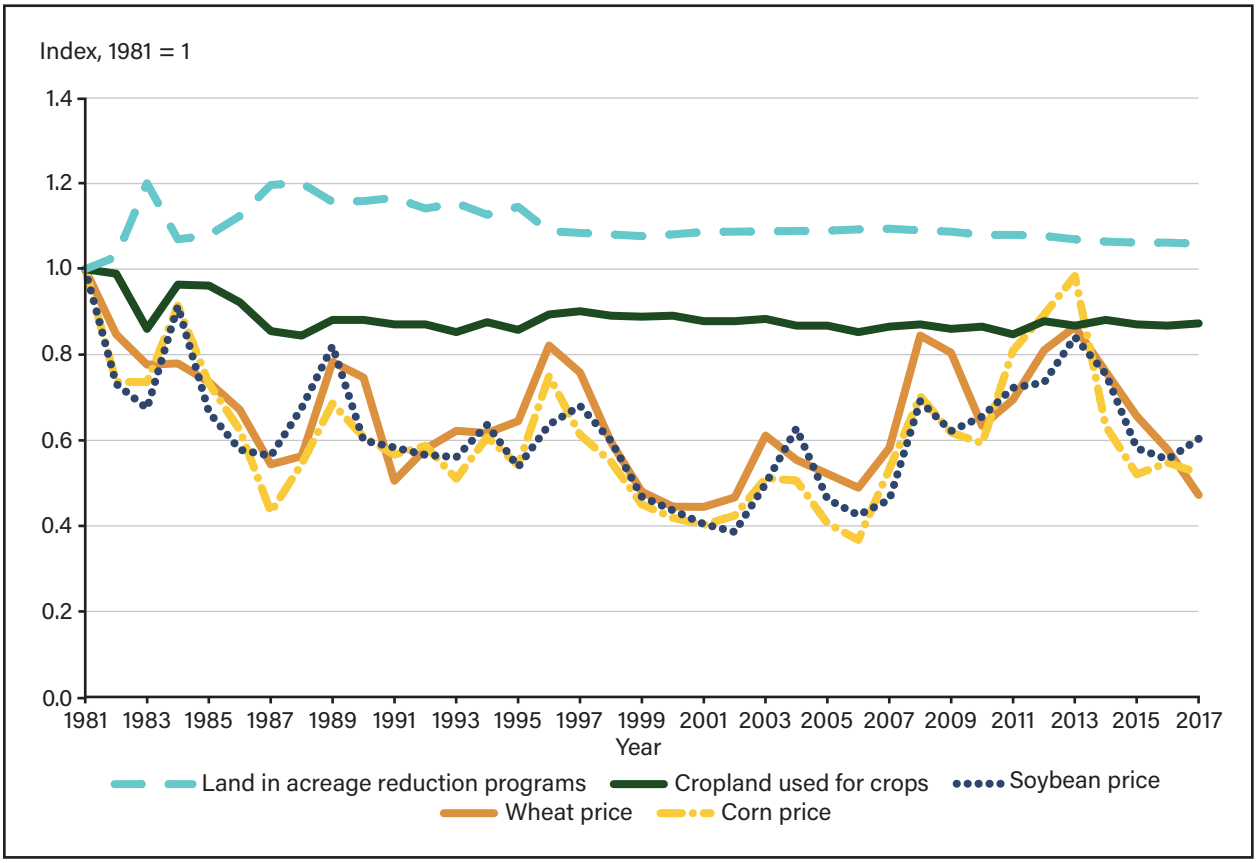
From 1980 to 2002, declines in real commodity prices were followed by increases in idled acreage and corresponding decreases in cropland used for crops. This inverse relationship is consistent with commodity producers' response to changing market incentives as well as Government efforts to manage commodity supplies and support farm incomes under adverse market conditions. However, the relative changes in acreage were smaller than the relative changes in prices, which follows logically if there is a positive option value associated with planting decisions. Furthermore, some of the supply-side responses to price changes may have come at the intensive margin of production (i.e., double cropping and other efforts to increase production on land already used for crops, as opposed to the extensive margin (i.e., changes in the acreage devoted to cropland used for crops).

Between 1980 and 2002, major commodity prices (e.g., wheat, corn, and soybeans) declined by approximately 60 percent in inflation-adjusted terms, while the total cropland used for crops declined by about 12 percent. The variation in cropland used for crops in the 1990s was smaller than in the 1980s despite significant variations in real prices. This pattern may reflect the phasing out and elimination of all Federal acreage-

reduction programs, aside from CRP in 1996. Also, as the area of cropland used for crops declined, the remaining cropland was generally of higher average quality and less likely to move in and out of production with short-term price fluctuations.

However, since 2002, although prices of major commodities have continued to exhibit considerable variation (generally increasing until 2013 before falling significantly through the end of the study period in 2017; figure 7), the area of cropland used for crops and idle cropland has remained relatively constant. Government programs aimed at minimizing the impact of price decreases, such as USDA, FSA's Average Crop Revenue Election (ACRE) program, may have caused some farms to keep land in crop use despite price fluctuations (Mitchell et al., 2012).[21] The relative lack of an extensive margin response to price movements may also, in part, be due to increased crop farm consolidation. Economies of scale give larger farms a greater ability to absorb the revenue losses from short-term price declines, such as those observed between 2012 and 2017 (figure 7), without taking land out of production (MacDonald et al., 2013).

Figure 7
Cropland used for crops and commodity prices for key crops, 1981–2017



Note: 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 1981 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.

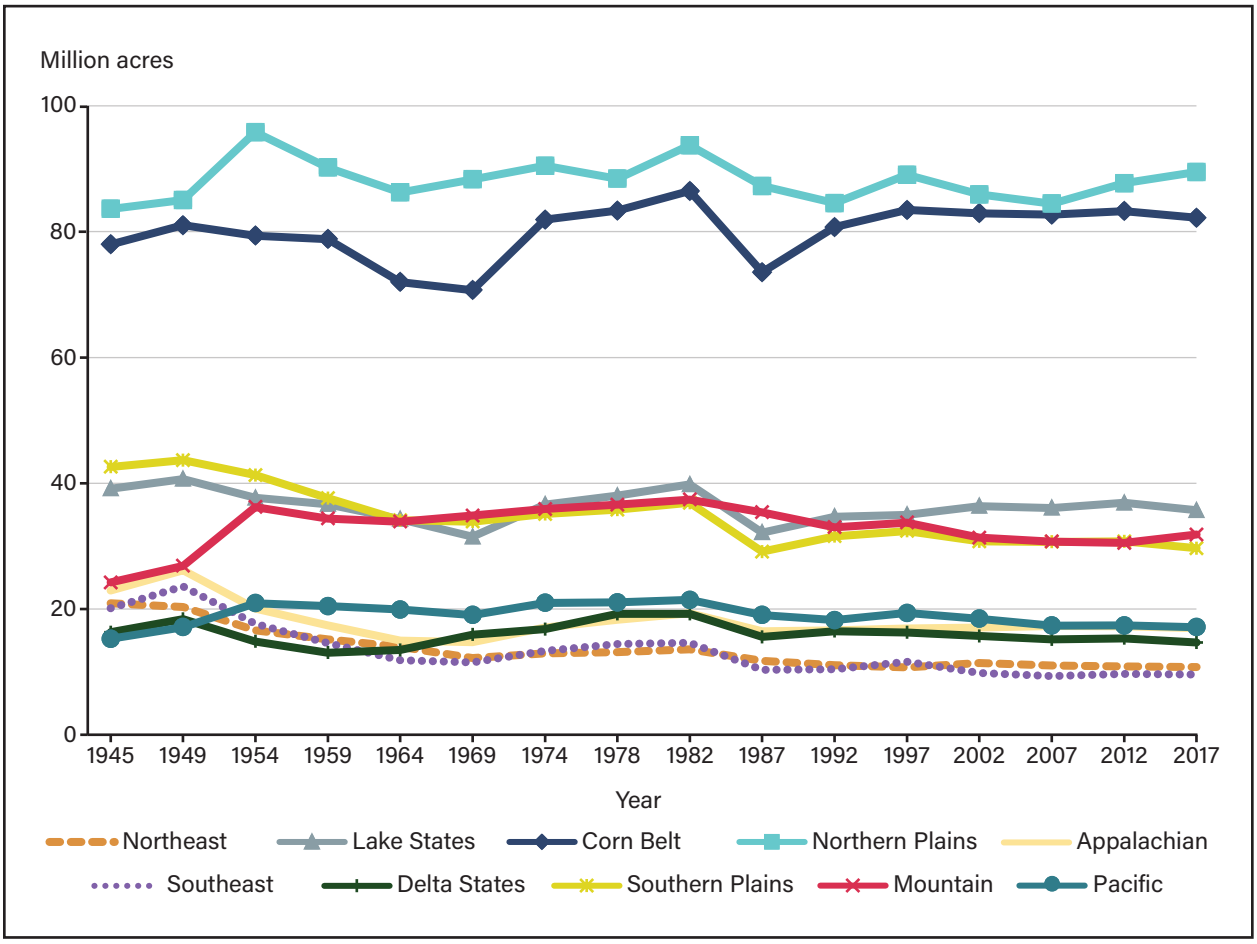
Source: USDA, Economic Research Service estimates using data from USDA's National Agricultural Statistics Service, deflated with the producer price index for all commodities from the U.S. Department of Labor, Bureau of Labor Statistics.

[21] The Average Crop Revenue Election program was introduced in the Food, Conservation, and Energy Act of 2008 but repealed in 2014 and replaced with the Price Loss Coverage and Agricultural Risk Coverage programs.

Crop insurance has gained prominence in recent years as a farm safety net program. The Federal Crop Insurance and Reform Act (FCIRA) of 1994 increased Federal crop insurance premium subsidies, and additional subsidy increases were introduced in 2000 (Glauber & 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 that occurred after 1994 estimated that the subsidies increased cultivated acreage in 1997 by approximately 1 percent, with most of the land coming out of hay and pasture (Lubowski et al., 2006b).[22] This issue has received some additional attention in recent years, as the Agricultural Act of 2014 largely phased out direct payment programs in favor of expanding crop insurance subsidy programs. For example, both Claassen et al. (2017) and Miao et al. (2016) found that Federal crop insurance programs have a positive, albeit small, effect on the likelihood of noncropland being converted to cropland. However, findings by Weber et al. (2016) suggested that expanded insurance coverage had no effect on levels of cropland harvested over 2000–13.

Relatively stable cropland trends at the national level can obscure large, offsetting changes at regional and State levels. Trends since 1964 indicate that cropland used for crops peaked in every region in 1982 and subsequently declined during the U.S. farm crisis of the 1980s (figure 8). However, changes across regions varied following agriculture's economic recovery. In 2017, cropland used for crops was 95 percent of its 1982 high in the Corn Belt and Northern Plains but only about 65 percent of its 1982 high in the Southeast (figure 8).

Figure 8
Cropland used for crops by region for 48 States, 1945–2017



Note: USDA, Economic Research Service (ERS), Major land use regions correspond with historic USDA production regions. State estimates can be found in USDA, ERS's Major Land Use data series web page on the USDA, ERS website.

Source: USDA, Economic Research Service estimates based on USDA, National Agricultural Statistics Service data.

[22] The land-use changes induced by insurance subsidies were also found to increase annual wind and water erosion by an estimated 1.4 and 0.9 percent, respectively, in 1997 (Lubowski et al., 2006a).

Some regional changes in cropland used for crops represent year-to-year fluctuations that tended to balance out over time, but both the Northeast and Southeast experienced gradual, long-term declines. Urban pressures and a comparative disadvantage in cropland profitability resulted in the conversion of cropland to alternative, more profitable uses in these regions.[23] However, changes at the regional level had resulted in little change in the concentration of acreage used for crops in major crop-producing regions during the 1969–2017 period (for more information about trends by region and State, see the MLU data series on the USDA, ERS website). The Northern Plains region accounted for 26 percent of the U.S. land used for crops in 2017, compared with 27 percent in 1969, while the other regions had smaller changes in shares of the U.S. total over the same period.

Changes in Cropland Harvested

Changes in cropland harvested paralleled changes in cropland used for crops, except when the latter was driven by large changes in crop failure or cultivated summer fallow (figure 3). Between 2012 and 2017, cropland harvested decreased by roughly 1 million acres (roughly one-third of a percent) but remained above 2002 and 2007 levels.

Changes in Failed Cropland

Land marked by crop failure has ranged between 5 million acres (1982) and 22 million acres (1956) since 1949. For farmers, large acreage failures are always possible. Crop failures in 1988, 1993, 1996, 1998, 2000, and 2001 averaged around 10 million acres and were attributed to severe drought, extensive flooding, or wet weather. In 2002, crop failure covering 17 million acres was the highest in the United States since widespread drought in 1956 wiped out 22 million acres. In 2017, the 9 million failed cropland acres returned to the 68-year average.

Changes in Fallowed Cropland

Cultivated summer fallow declined from its peak of 41 million acres in 1969 to about 15 million acres in 2017. Cultivated summer fallow occurs mostly in the Mountain region (39 percent), 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 used for cultivated summer fallow can be 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 more intensively use cropland, increasing farm income potential.

Changes in Cropland Pasture

At 13.4 million acres in 2017, cropland used for pasture increased by roughly 5 percent since 2012. This number still represented a substantial decline from its 1945–2002 average of 68 million acres. However, the steep declines observed from 2002 to 2012 were likely due, in large part, to methodological changes in USDA's Census of Agriculture. These changes appeared to have reclassified a large amount of land previously classified as cropland pasture as permanent grassland pasture (for more information, see the box "Cropland Pasture in the USDA, National Agriculture Statistics Service's Census of Agriculture"). Given the fact this methodology was unchanged between 2012 and 2017, there are now two pieces of evidence supporting the

[23] The case in the Northeast region can best be exemplified by New Jersey, which in 2017 (USDA, National Agricultural Statistics Service (NASS), 2017b) simultaneously had an average cropland value that was more than four times that of the national average and an average cropland rental rate that was roughly half of the national average. This dramatic disparity simultaneously illustrates the strong competing demands for land and the relatively low profitability of agriculture in the region that had led to a decrease in cropland acreage. For the Southeast region, data from the U.S. Department of Interior, U.S. Geological Survey's Land Cover Trends project (accessible on the USGS Land Cover Trends website) indicated that conversion to forest use was a common driver of agricultural land-use change in the region.

fact that the large drop in cropland pasture (and thus total cropland) observed between 2002 and 2012 was primarily the result of cropland pasture being reclassified as grassland pasture and range. The first piece of evidence is that, in the absence of methodological changes, the decline we observed has not only abated but has reversed slightly. Second, from both 2002–07 and 2007–12, the decreased cropland pasture acreage was mirrored by similar or larger increases in grassland pasture and range. For example, the 2002–07 decline in cropland pasture of 26 million acres corresponded to a 27-million-acre increase in grassland pasture and range, while the 2007–12 decrease in cropland pasture of 23 million acres corresponds to a 42-million-acre increase in grassland pasture and range.[24] This being the case, an accurate description of long-term trends should compare changes before 2007, along with changes from 2012 to 2017. Before 2007, the amount of cropland pasture in the Northeast, Lake States, Corn Belt, Northern Plains, and Appalachia regions had trended downward. This trend reversed for the Northeast, Corn Belt, and Northern Plains regions from 2012 to 2017 (up 23 percent, 6 percent, and 13 percent, respectively), while the Lake States, Appalachia, Delta States, Mountain, and Pacific regions saw continued declines. As such, the Lake States and Appalachia regions had experienced continued long-term declines in cropland pasture, whereas the Southeast and Southern Plains regions have experienced continued increases in cropland pasture after controlling for methodological changes in USDA's Census of Agriculture.

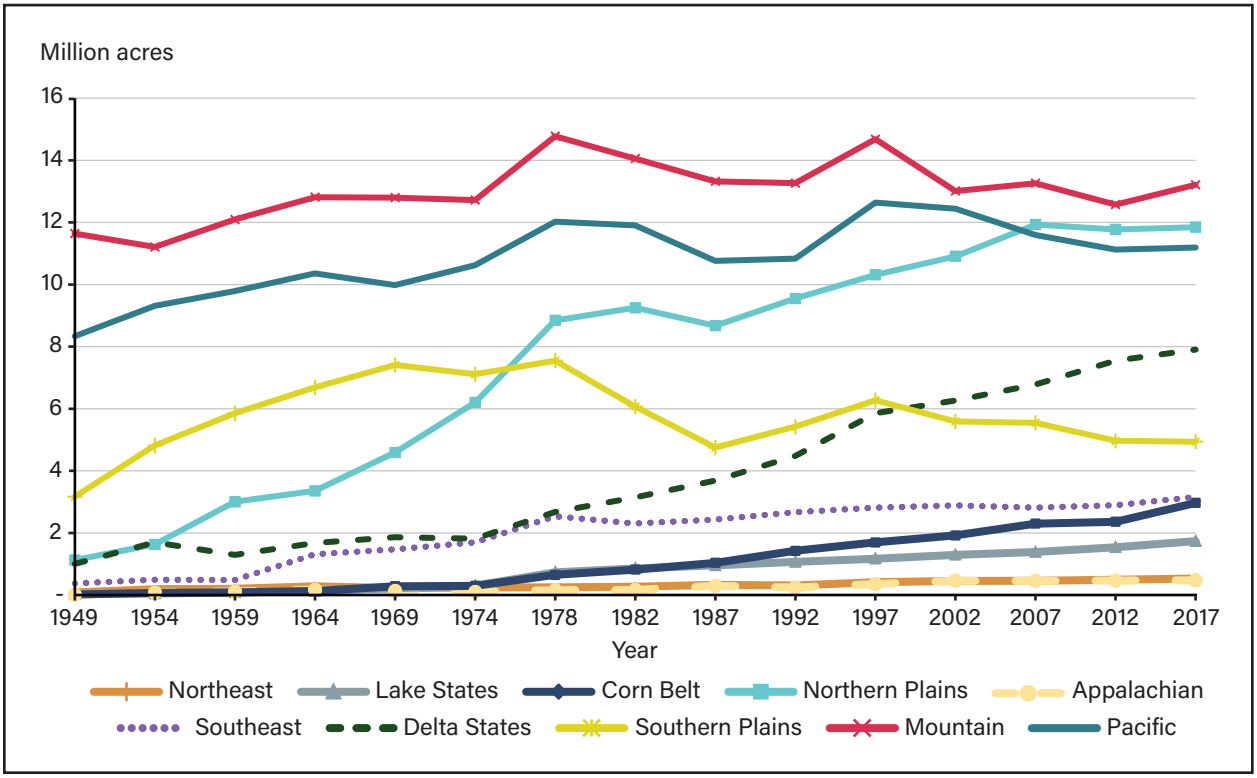
Trends in Irrigated Land

The agricultural sector consumes about 85 percent of the water used in the United States (Schaible & Aillery, 2017). In 2017, 58 million cropland acres, approximately 54 million of which were used for crops (16 percent of cropland used for crops), were irrigated. However, 54 percent of the value of all crops sold were derived from irrigated land (Hrozencik & Aillery, 2021). Despite the importance of irrigation to U.S. agriculture, competing demands for water resources have intensified over the past few decades due to population growth, water use by the energy sector, and water use for environmental needs. Despite these competing demands, the amount of irrigated land reported for 2017 increased slightly from this report's record high of 57 million acres in 2007 to reach a new record high of 58 million acres.

Sixty-three percent of irrigated acreage is located in the more arid western United States (i.e., the Northern Plains, Mountain, and Pacific regions). Although the acreage contains less cropland than many other regions, the Pacific region is the most dependent on irrigation, with roughly two-thirds of its 17 million acres of cropland used for irrigated crops in 2017. The 4-percent increase in the total amount of irrigated land between 2012 and 2017 reflects steady increases in 9 out of 10 regions (figure 9). Over the same period, irrigated acreage made large gains in the Corn Belt (up 611,000 acres or 26 percent) and Lake States (up 198,000 acres or 13 percent) regions, with small net gains approaching 10 percent in the Northeast, Southeast, and Appalachia regions. Irrigated acreage demonstrated slower growth in the regions most dependent on irrigation, with the one decrease occurring in the Southern Plains region (down 32,000 acres, or 1 percent). Irrigated acreage in the Mountain, Pacific, and Northern Plains regions reversed trends from 2012 and increased irrigated acres by smaller amounts ranging from 1 to 5 percent in 2017. The Far West region (Alaska and Hawaii) contains less than 30,000 irrigated acres and is too small to include in figure 9. For more information on trends in U.S. irrigated agriculture, see the Farm Practices & Management topic page on the USDA, ERS website.

[24] The additional increase in grassland pasture and range is also likely the result of land previously classified as forest becoming reclassified as grassland pasture and range due to a 2012 change in the definition used by the Forest Inventory Analysis (for more information, see the "Trends in Forest-Use and Forested Acreage" section).

Figure 9
Irrigated cropland acres by region, 1949–2017



Note: USDA, Economic Research Service, major land-use regions correspond with historic USDA production regions.

Source: USDA, Economic Research Service using USDA, National Agricultural Statistics Service, 1949–2017 Census of Agriculture data.

Changes in Principal Crops Harvested

Like the broader trends in cropland used for crops, historical variability in the area of land on which principal crops are harvested is closely tied to the amount of cropland diverted from production through Federal programs.[25] In 1963, 56 million acres of cropland were diverted through the USDA's Soil Bank program and other acreage-reduction programs. Between 1963 and 1982, harvested acreage of principal crops increased from 287 million acres to 350 million acres (table 7). In the early 1980s, harvested acreage was high, and the amount of cropland diverted by acreage-reduction programs was negligible. Land on which principal crops were harvested declined by 17 percent to 289 million acres between 1982 and 1987 when the U.S. farm crisis resulted in Federal programs diverting a near-record high of 76 million acres.

Between 1987 and 1997, the phasing out of the Acreage Reduction Program coincided with increased harvested principal crop acreage of nearly 29 million acres, even as land enrolled in CRP expanded. In the ensuing 10-year period (1997–2007), principal crop acreage declined, while land enrolled in CRP was relatively steady. This trend has reversed in recent years as the Food, Conservation, and Energy Act of 2008 and the Agricultural Act of 2014 lowered the enrollment cap for CRP (for more information, see footnote 20 and the "Changes in Cropland Used for Crops and Idled Cropland" section). This enrollment-cap change led to two consecutive periods (2007–12 and 2012–17) of decreased CRP acreage, which coincided with increased principal crops harvested. Although the factors driving the changes varied from crop to crop, the increases generally stemmed from a combination of changing prices, export growth, Government programs, and production technology.

[25] For a complete list of all principal crops, see USDA, NASS (2019). In table 7, we show the historical trends in the principal crops with the largest acreages or changes in acreage over time.

The mix of principal crops changed noticeably between 1963 and 2017. Food crop acreage—particularly wheat—increased substantially during the early part of this period but then declined in subsequent decades (figure 10). Total food crop acreage rose 68 percent between 1963 and 1982, from 55 million to 93 million, due to large increases in harvested wheat acreage. However, this gain was reversed by a roughly 45-percent decline in acreage from 1982 to 2017.

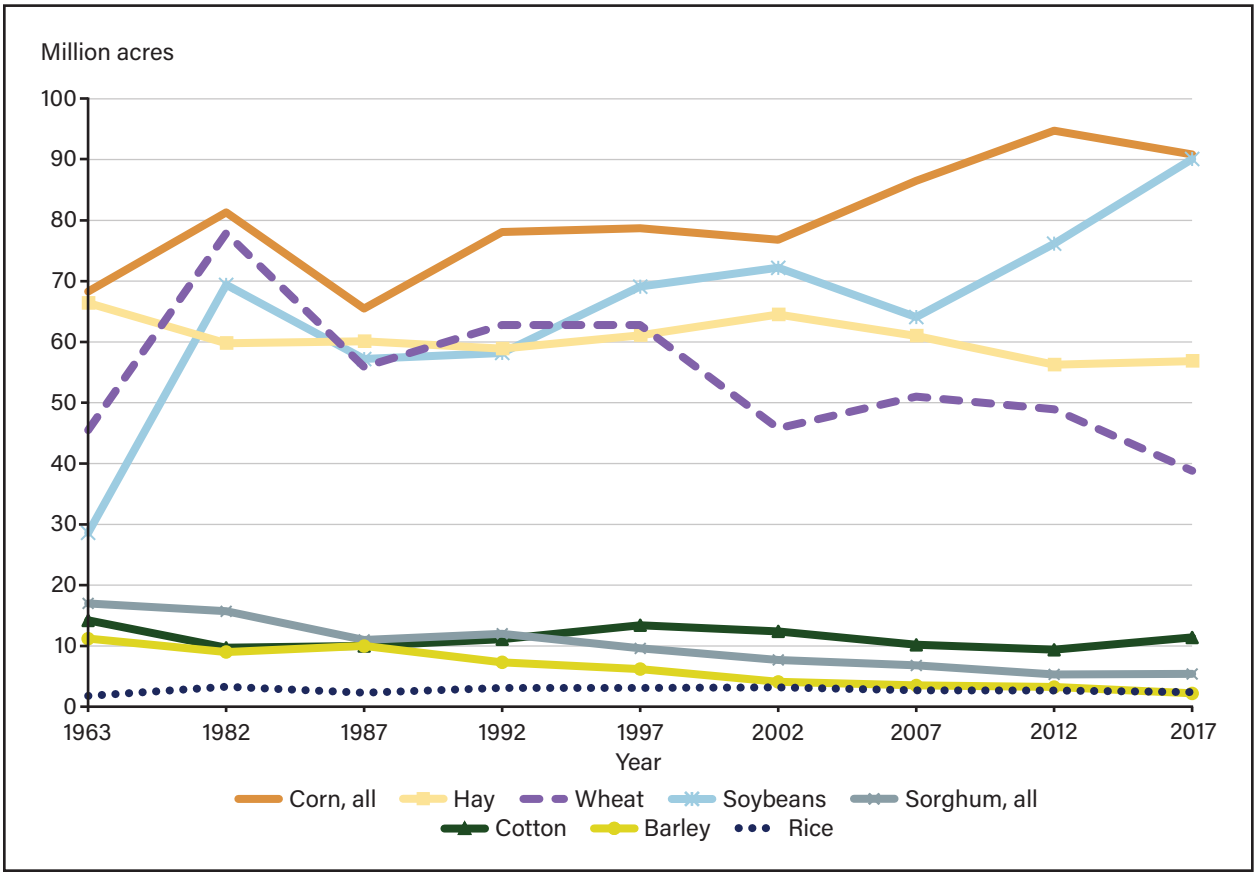
The largest change in food crops harvested during the period was the 50-percent decrease in wheat acreage from its historic high of almost 78 million acres in the early 1980s (figure 10). Factors contributing to this downward trend included a reduction in the relative profitability of wheat due to increased foreign competition, CRP participation in wheat-producing areas, and genetic refinements to corn and soybean varieties that allowed these crops to be planted in areas previously used primarily for wheat (Vocke & Ali, 2013; Bond & Liefert, 2017).

Feed crop acreage increased by an amount similar to that of food crops from 1963 to 1982, followed by a relatively sharp decline during the 1980s and a subsequent rebound over 1992–2017 (table 7). The 16-percent increase in feed crop acreage over five decades stemmed from a combined 87-percent increase (84 million acres) in harvested soybean and corn acreage. A joint 50-million-acre reduction in land harvested for oats (down 96 percent), barley (down 80 percent), sorghum (down 68 percent), and hay (down 14 percent) had partly offset the upward movement of soybean and corn acreage.

Soybean acreage more than tripled, from roughly 29 million acres in 1963 to more than 90 million acres in 2017. In 1997, soybeans surpassed wheat as the second-leading U.S. food and feed crop (behind corn) in terms of planted acreage. In 2017, following a 7.1-million-acre decrease in planted corn acreage and a 13-million-acre increase in planted soybean acreage (from 2012), they have reached equal acreage, with 90.2 million acres of both crops planted in 2017 (though corn is still slightly ahead in terms of harvested acres; table 7). Between 1995 and 2017, the inflation-adjusted dollar value of U.S. soybean exports more than doubled, largely due to increased demand from China, the leading destination for U.S. soybean exports in 2017. For more information on U.S. agricultural exports, see Morgan et al. (2022).

Figure 10

Acres harvested of most common principal crops, contiguous 48 States, 1963–2017



Note: The dashed lines represent strictly food crops, whereas the solid lines represent feed and nonfood crops. Some feed crops are used as inputs to food products and biofuels (e.g., corn).

Source: USDA, Economic Research Service using USDA, National Agricultural Statistics Service, 1963–2017 Census of Agriculture data.

Table 7

Principal U.S. crops harvested, 1963–2017

Crop	1963	1982	1987	1992	1997	2002	2007	2012	2017	Change 1963–1982	Change 1982–2017
	Million acres										
Food crops											
Wheat	45.5	77.9	55.9	62.8	62.8	45.8	51.0	48.9	38.8	32.4	-39.1
Sugarbeets	1.2	1.0	1.3	1.4	1.4	1.4	1.2	1.2	1.1	-0.2	0.1
Potatoes	1.3	1.3	1.3	1.3	1.4	1.3	1.1	1.1	1.1	0.0	-0.2
Dry edible peas	0.3	NR	0.2	0.2	0.3	0.3	0.8	0.6	1.1	NA	NA
Sugarcane	0.5	0.7	0.7	0.9	0.9	1.02	0.8	0.9	0.8	0.2	0.1
Rice	1.8	3.3	2.3	3.1	3.1	3.2	2.7	2.7	2.4	1.5	-0.9
Rye	1.6	0.7	0.7	0.4	0.3	0.3	0.3	0.2	0.3	-0.9	-0.4
Sunflowers	NR	4.7	1.8	2.0	2.8	2.2	1.7	1.8	1.3	NA	-3.4
Dry edible beans	1.4	1.8	1.7	1.5	1.8	1.7	1.5	1.7	1.5	0.4	-0.3
Sweet potatoes	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	-0.1	0.1
Peanuts	1.4	1.3	1.5	1.7	1.4	1.3	1.2	1.6	1.8	-0.1	0.5
Total	55.2	92.8	67.5	75.4	76.3	58.6	62.4	61.0	50.5	37.6	-42.3

Crop	1963	1982	1987	1992	1997	2002	2007	2012	2017	Change 1963–1982	Change 1982–2017
	Million acres										
Feed crops											
Corn, all	68.3	81.3	65.5	78.1	78.7	76.8	86.5	94.8	90.8	13.0	9.5
Soybeans	28.6	69.4	57.2	58.2	69.1	72.2	64.1	76.2	90.1	40.8	20.7
Sorghum, all	17.0	15.7	11.0	12.0	9.6	7.7	6.8	5.3	5.4	-1.3	-10.3
Barley	11.2	9.0	10.0	7.3	6.2	4.1	3.5	3.2	2.2	-2.2	-6.8
Oats	21.3	10.3	6.9	4.5	2.8	2.1	1.5	1.0	0.8	-11.0	-9.5
Hay	66.4	59.8	60.1	58.9	61.1	64.5	61.0	56.3	56.9	-6.6	-2.9
Total	212.8	245.5	210.7	219.0	227.5	227.4	223.4	236.8	246.3	32.7	0.8
Other crops											
Tobacco	1.2	0.9	0.6	0.8	0.8	0.1	0.4	0.3	0.3	-0.3	-0.6
Cotton	14.2	9.7	10.0	11.1	13.4	12.4	10.2	9.4	11.4	-4.5	1.7
Flaxseed	3.2	0.7	0.5	0.2	0.1	0.1	0.3	0.3	0.3	-2.5	-0.4
Total	18.6	11.3	11.1	12.1	14.3	12.6	10.9	10.0	12.0	-7.3	0.7
Total principal crops	286.6	349.6	289.3	306.5	318.1	298.6	296.7	307.8	308.8	63.0	-40.8

NA = Calculation not available. NR = Data not reported.

Note: Alaska and Hawaii are not included. Distributions may not add due to rounding. The above crop classifications (food, feed, and other) are based on the predominant use of each crop. Due to data limitations, it is not possible to distinguish between the harvested acreages for multi-use crops (e.g., soybeans).

Source: USDA Economic Research Service based on data from USDA, National Agricultural Statistics Service, 2017 Census of Agriculture. Estimates prior to 2017 are based on Bigelow, D., & Borchers, A. (2017). *Major uses of land in the United States, 2012* (Report No. EIB-178). U.S. Department of Agriculture, Economic Research Service.

Market forces and changes in Government farm programs have affected supply and demand for the four most common principal crops—corn, soybeans, wheat, and hay—that account for 90 percent of the principal crop harvested acres in the United States (figure 10). 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, enabled producers to increase more profitable soybean plantings without jeopardizing payments associated with their base acreage in wheat, corn, and other program crops. Such shifts could have been costly under previous farm programs. Additionally, studies found that Federal crop insurance had a positive, albeit small, effect on corn plantings (Claassen et al., 2017; Walters et al., 2012).

Another trend that has affected U.S. crop plantings over the past 25 years is the use of crops as a biofuel input source. Over the past decade, the use of corn for biofuel has increased sharply due to the mandate in the Energy Policy Act of 2005 to increase the amount of renewable fuel in the U.S. fuel supply. This law, coupled with an expanded requirement for larger amounts of renewable fuels in 2007, boosted corn ethanol production. Using data from a special survey of corn and soybean farmers, Wallander et al. (2011) found that producers' shifts from soybeans to corn drove the expansion in corn acreage over the 2006–08 period. However, producers shifted acreage from other crops (primarily cotton) to soybeans, offsetting much of the shift from soybeans to corn. Total acreage of harvested cropland on corn and soybean farms expanded during the period, with about one-third of the increase being due to shifts from hay, idle land, and increases in double cropping. Beckman et al. (2013) found that gains in planted corn acreage over the longer 2001–12 period, in response to biofuel demand, resulted in a net decrease in land used to grow barley, oats, and sorghum. Sands et al. (2017) found that prices for oats and hay, consumed almost entirely by livestock, rose the most as bioenergy crop production increased. However, between 2012 and 2017, planted corn acres decreased by roughly 7.1 million, while total planted acres of barley, oats, and sorghum decreased by 1.9 million acres. These decreases, along with a 9.2-million-acre decrease in planted wheat, were largely offset by a 13-million-acre increase in planted soybeans, along with small increases in other crops (USDA, NASS, 2018a).

Despite a 4-percent decrease in the acres of corn harvested between 2012 and 2017, corn yields in 2012 were significantly lower than in 2017 (123 bushels per acre in 2012 compared with 176 bushels per acre in 2017, according to USDA, NASS). As a result, roughly 37 percent more corn was produced in 2017 compared with 2012. In 2017, 5.4 billion bushels of corn were used for ethanol production (37 percent of total corn use), compared with 5 billion bushels (40 percent of total corn use) in 2012 and 2.1 billion bushels (19 percent) in 2007 (USDA, ERS, 2022). This result explains the simultaneous decrease in the harvested corn acreage and the increase in corn use as an input for bioenergy production observed between 2012 and 2017.

Grassland Pasture and Range and Total Grazing Land

In 2017, just over 35 percent of U.S. land area, or 805 million acres, was used for grazing (i.e., grassland pasture and range, cropland pasture, and grazed forestland) (table 8). This number represents an increase of more than 6 million acres (just under 1 percent) from 2012. This estimate includes forested land on which grazing occurs, but the estimate excludes land that is grazed and used for crop production in a single year (e.g., fall and winter grazing of small grains and after-harvest grazing of hay land). The three types of grazing land discussed here differ greatly in terms of acreage, distribution, productivity, and other characteristics (for an overview of U.S. grazing lands from 1950 to 1982, see Daugherty, 1989).

Table 8
Total U.S. grazing land by type, 1949–2017

Year	Cropland pasture	Grassland pasture and range	Subtotal	Grazed forestland	U.S. total
			Million acres		
1949	69.5	632.4	701.9	320.2	1,022.2
1954	66.1	633.8	699.9	301.3	1,001.1
1959	65.6	633.1	698.7	244.6	943.4
1964	57.4	640.4	697.9	224.5	922.4
1969	88.2	603.6	691.8	198.0	889.9
1974	82.7	597.8	680.6	179.4	860.0
1978	76.2	586.7	662.9	171.8	834.7
1982	65.0	596.7	661.7	158.0	819.7
1987	65.0	591.1	656.1	155.0	811.1
1992	66.8	591.2	658.0	145.5	803.5
1997	67.5	580.2	647.7	140.7	788.4
2002	61.8	586.5	648.4	134.4	782.8
2007	36.0	613.7	649.7	127.1	776.9
2012	12.8	655.5	668.3	129.8	798.1
2017	13.4	659.3	672.7	131.8	804.5

Note: Consecutive methodological changes in the 2007 and 2012 versions of USDA, Census of Agriculture led to a substantial amount of land that had previously been classified as cropland pasture becoming reclassified as grassland pasture and range in the USDA, Economic Research Service, Major Land Use data series. While estimates for these two land types for 2012 and 2017 are directly comparable, estimates from 2007 onward are not directly comparable to earlier years. See the box in this document "Cropland Pasture in USDA, National Agricultural Statistics Service's of Agriculture" for more information. Grassland pasture and range and grazed forest-use include grazing land on Federal land. See appendix A for more details. Distributions may not add to tools due to rounding.

Source: USDA Economic Research Service estimates based on data from USDA, Natural Resources Conservation Service, Summary report: 2017 national resources inventory, and 2017 national resources inventory, table F-1 Cropland and pastureland by specific land cover, land use, and year; USDA, National Agricultural Statistics Service, 2017 Census of Agriculture; U.S. Department of the Interior, Bureau of Land Management, Fiscal year 2015 rangeland inventory, monitoring, and evaluation report; USDA, Forest Service (FS), Grazing statistical summary, fiscal year 2017, Land areas of the National Forest System as of September 30, 2017, and USDA, FS grazing allotments. Estimates prior to 2017 are based on Bigelow, D., & Borchers, A. (2017). *Major uses of land in the United States, 2012* (Report No. EIB-178). U.S. Department of Agriculture, Economic Research Service.

Grassland Pasture and Range

The vast majority of U.S. grazing land (659 million acres or more than 82 percent) was used as grassland pasture and range in 2017.[26] This number represents an increase of 4 million acres (0.6 percent) from the 2012 estimate of 655 million acres. Four regions accounted for about 596 million acres (or 90 percent) of U.S. grassland pasture and range: 50 percent in the Mountain region, 19 percent in the Southern Plains, and 21 percent in the combined total from the Northern Plains and Pacific regions (table 2). No other region holds more than 3 percent of the total grassland and pasture range acreage. In all regions, grassland pasture and range acreage is the dominant type of grazing land. Grassland pasture and range accounts for more than half of the total land area in the Southern Plains (58 percent) and Mountain regions (60 percent). Other regions with large shares of their total land base used for grassland pasture and range include the Northern Plains (41 percent) and the Pacific (31 percent) regions.

Cropland Pasture

At 13.4 million acres, cropland pasture—the smallest but generally the most economically productive component of grazing acreage—accounted for 1 percent of total U.S. land area and 2 percent of total U.S. grazing acreage in 2017. This number represents an increase of 700,000 acres (roughly 5 percent) from the 2012 estimate of 12.7 million acres. Although cropland pasture is considered part of the cropland base and is included in the estimate of total cropland, it may be marginal from the perspective of crop production and can remain in pasture for extended periods of time. Cropland pasture is concentrated in the Southern Plains region, where 36 percent of all cropland pasture is located. The regional shares of total cropland pasture are generally much higher in the central United States, where most of the United States cropland is located.

Grazed Forestland

In 2017, the 132 million acres of grazed forestland in the United States included acreage in open forest, land reverting to forest, and other forested areas with grass or other forage growth that were grazed to some extent. This number represents an increase of 2 million acres (1.5 percent) from the 2012 estimate of 130 million acres. Grazed forestland ranged from less than 1 million acres in the Far West region to 72 million acres in the Mountain region. In the Mountain and Pacific regions, the majority of grazed forestland is on land managed by the USDA's Forest Service, whereas the majority of grazed forestland in other regions tends to be privately owned. This pattern reflects the distribution of USDA, Forest Service land across the country (Vincent & Hanson, 2020). The value of forestland for grazing varies widely across regions and depends on grazing productivity and demand, the amount of forestland, and other idiosyncratic factors, including climate and forest characteristics such as species composition, tree stand density, and tree canopy cover. For example, grazing is more common in open tree stands of pine in the South region where the warm climate permits grazing throughout the year. Nevertheless, upland hardwood tree stands, which have a more complete canopy, promote lower forage production. However, a substantial amount of acreage may be grazed due to the availability and limited alternative uses. Ponderosa pine and other open forest types in the West region enable seasonal grazing, but forestland that is thick with growing trees (such as fir trees) generally offers little grazing value.

Trends in Grazing Acreage

Total U.S. grazing land declined by approximately 243 million acres (about 24 percent) from 1949 to 2007 (table 8). However, there was a 21-million-acre increase during 2007–12 following the long-term decline—

[26] Although both "grassland pasture" and "range" are used for grazing, the two terms are primarily distinguished by the type of grass species present. For example, grassland pasture typically consists of managed vegetation adapted for livestock, while rangelands typically support native vegetation. The former term is more commonly used in the eastern United States, and the latter is used in the western United States.

the first estimated increase in this land use since the start of the MLU estimates in 1949. This increase was followed by an 11-million-acre increase from 2012 to 2017, bringing the total grazing acreage in 2017 to a level similar to that from 30 years before.

Decreases in grazed forestland drove much of the decrease in total grazing acreage during 1949–2007. From 1949 to 2007, grazed forestland decreased by 193 million acres (60 percent). A number of factors combined to trigger this long-term decline, including increases in forest-stand density restrictions that reduced grazing possibilities, improvements to both livestock feeding and forest management practices, and a large decline in total farmland and the number of farms since 1950. These factors had the largest impact in the South, where grazing in wooded areas is relatively common. As with total grazing acreage, this trend has reversed in recent years, with grazed forest acreage increasing by 3 million acres during 2007–12, followed by a 2-million-acre increase during 2012–17.

As discussed earlier, it is difficult to independently analyze medium-term trends in cropland pasture and grassland pasture and range (for more information, see the box "Cropland Pasture in USDA, National Agricultural Statistics Service's Census of Agriculture" and the Changes in Cropland Pasture section). This difficulty is due to sequential methodological changes in the way USDA's Census of Agriculture collected data on cropland pasture in 2007 and 2012. In each of these two agricultural censuses, a portion of land that would have previously been classified as cropland pasture was reclassified as grassland pasture and range. As such, from 2002 to 2007, the United States experienced a 26-million-acre decrease (42 percent) in cropland pasture acreage that coincided with a 27-million-acre increase in grassland pasture and range acreage. From 2007 to 2012, there was a 23-million-acre decrease (64 percent) in cropland pasture that coincided with a 41-million-acre increase in grassland pasture and range. Along with the 2012–17 increase in cropland pasture, these numbers suggest that the 2002–12 decrease of 49 million acres of cropland pasture was largely due to land that was previously classified as cropland pasture being reclassified as grassland pasture and range (as opposed to representing actual changes in land use). However, consistent methodologies between the 2012 and 2017 Censuses of Agriculture allow us, for the first time in a decade, to provide a reliable comparison of cropland pasture and grassland pasture and range trends over the most recent 5-year period (2012–17).

Between 2012 and 2017, cropland pasture increased by just more than 500,000 acres, or roughly 5 percent. Over this same period, grassland pasture and range increased by 4 million acres (less than 1 percent) to 659 million acres, which is the highest value ever recorded in the MLU series (although some of these increases are the results of the methodological changes already discussed). The subtotals shown in table 8 (cropland pasture plus grassland pasture and range) are not affected by these methodological changes. Therefore, it is probably most accurate to state that after a long decline, such lands have rebounded to a level just short of their 1974 acreage.

Transitions in Pastureland and Rangeland

Data provided by the 2017 USDA, NRCS' NRI revealed land that had been moved into and out of non-Federal pastureland and rangeland.[27] Roughly 2 percent of the land classified as non-Federal pastureland or rangeland in 2012 had been transitioned to another use by 2017. Of this land, 60 percent had transitioned into cropland, 24 percent transitioned into forestland, 9 percent transitioned into developed land, 6 percent transitioned into other rural land, and 2 percent transitioned into water (USDA, NRCS, 2020a).

[27] As defined by NRI. USDA's NRI only examines non-Federal lands. We use the term "non-Federal pastureland and rangeland" to refer to the sum of the two NRI categories of pastureland and rangeland. This category does not include grazed forestland, which is counted as forestland. The category does not include grazing on lands managed by the U.S. Department of Interior, Bureau of Land Management, USDA, Forest Service, or any other Federal agency. The category does include nonforest and noncropland grazing on State, county, municipal, or Tribal lands.

Roughly 2 percent of the land classified as non-Federal pastureland or rangeland in 2017 had been transitioned from another use in 2012. Of this land, 85 percent had been transitioned from cropland, 8 percent transitioned from forestland, 1 percent transitioned from developed land, 4 percent transitioned from other rural land, and 1 percent transitioned from water (table 4).

It is important to note that USDA's NRI uses different land-use categories than the MLU series. As such, these estimates do not account for cropland pasture or grazed forestland. The estimates should be thought of as transitions into and out of grassland pasture and range rather than into and out of total grazing lands. In other words, pasture and rangeland that NRI counted as transitioning between either cropland or forestland may have transitioned into or out of cropland pasture or grazed forestland, respectively, meaning that the total transitions into and out of grazing lands are, more broadly, likely to be smaller.

Forest-Use Land and Total Forested Land

Table 9 shows the total forested land used for all purposes amounted to 765.5 million acres in the United States in 2017. This number represents a 0.1-percent (700,000 acres) decrease from 2012. Total forested land can be broken up into two separate categories. The first category is forest-use land. This category is comprised of all grazed forestland and all ungrazed forestland capable of being used for timber harvests (regardless of timber status). The second category is forested land in other uses. This category contains forestland in parks, wildlife areas, and other special uses where commercial timber harvests are rare. By excluding land that has forest tree cover but cannot generally be used for timber harvests or grazing, the total forest-use land is a more realistic approximation of the land serving commercial forest uses. To see how competing data sources define various forested lands, see appendix A.

Table 9
Total U.S. forested land by use and region, 2017

Region	Grazed forest-use land	Ungrazed forest-use land	Total forest-use land	Forest in other uses[1]	Total U.S. forestland
			Thousand acres		
Northeast	399	64,126	64,525	8,127	72,652
Lake States	1,833	49,542	51,375	3,422	54,797
Corn Belt	5,477	29,303	34,780	1,485	36,265
Northern Plains	2,942	3,143	6,085	712	6,797
Appalachian	2,530	67,864	70,394	2,965	73,359
Southeast	2,194	70,983	73,176	4,771	77,947
Delta States	3,390	48,432	51,822	1,581	53,403
Southern Plains	13,286	7,992	21,278	31,603	52,881
Mountain	71,634	25,491	97,125	26,717	123,842
Pacific	27,953	30,092	58,045	25,298	83,343
Far West	156	93,184	93,340	36,866	130,206
U.S. total	131,792	490,153	621,945	143,547	765,492

Note: USDA, Economic Research Agency, major land-use regions correspond with historic USDA production regions. See appendix A for more a detailed description of major land-use categories. Distributions may not add to totals due to rounding.

[1]Forested land not included in the forest-use category was reclassified for the purposes of the Major Land Use series. Much of this land was determined to fit under the special-uses category, which includes forested parks and wilderness areas. However, in some States (e.g., Texas and Oklahoma), grassland pasture and range appeared to be the best fit. In Alaska, much of the other forested land is contained in the special-use or miscellaneous other land category.

Source: USDA Economic Research Service estimates based on data from Oswalt, N.S., Smith, W.B., Miles, P.D., & Pugh, S.A. (2019). *Forest resources of the United States, 2017: A technical document supporting the Forest Service 2020 RPA Assessment* (Report No. General Technical Report WO-97). U.S. Department of Agriculture, Forest Service; USDA, National Agricultural Statistics Ser-

vice, 2017 Census of Agriculture; USDA, Natural Resources Conservation Service, Summary report: 2017 national resources inventory; and USDA, Forest Service (FS), Grazing statistical summary, fiscal year 2017, Land areas of the National Forest System as of September 30, 2017, and USDA, FS grazing allotments.

Forest-Use Land

An estimated 622 million acres in the United States were classified as forest-use land in 2017 (table 9). This number represents a decrease of 10 million acres (1.5 percent) from the 2012 estimate of 632 million acres. About 132 million acres of forest-use land (21 percent) were grazed, with the remainder being used (or capable of being used) for timber production. It is important to note that grazed forest-use land may or may not also be being used for timber production. Forest-use land is about equally divided between the eastern (Northeast, Appalachia, Southeast, Lake States, Corn Belt, and Delta regions; 56 percent) and western (Northern and Southern Plains, Mountain, Pacific, and Far West; 44 percent) United States (table 2). Relative to other land uses, forest-use land predominates in the Northeast, Southeast, Appalachia, and Delta States and accounts for 57–61 percent of all land in these regions. A relatively large share of the Lake States and Pacific regions is also devoted to forest uses, at 42 and 28 percent of all land, respectively. Forest-use acreages in the Mountain region and Alaska are quite large but make up smaller shares of each region's total land area (18 and 25 percent, respectively).[28]

Total Forested Land

As table 10 shows, more than two-thirds of the total forested land in the United States in 2017 (514.5 million acres) was **timberland**, forests capable of commercial timber production and not removed from timber use by statute or administrative regulation, according to the USDA, Forest Service, which may or may not be grazed.[29] The greatest shares of timberland were in the Southeast (15 percent), Appalachia (14 percent), Northeast (13 percent), Mountain (12 percent), and Pacific (11 percent) regions.

The remainder of the U.S. total of forested land is a combination of **reserved forestland** (just more than 10 percent) and other forestland (22 percent).[30] Much of the reserved forestland is available for recreational use and provides watershed protection, wildlife habitats, carbon sequestration, and other ecosystem services. **Other forestland** 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, in Alaska, or in the dry, pinion-juniper lands of the interior West (Oswalt et al., 2019).

About 34 percent of all reserved and other forested land in the United States is in the Mountain and Pacific regions. Similarly, the Mountain and Pacific regions jointly account for more than 41 percent of all forested land in their respective regions. Much of the remainder (46 percent) of reserved and other forested land is in Alaska, where the land accounts for 90 percent of all forested land (table 10). In contrast, the combined area of reserved and other forestland accounts for no more than 7 percent of all forested land in any region east of the Mississippi River.

[28] Roughly 75 percent of Alaska's land area is classified as either special-use or miscellaneous other land.

[29] The difference between this estimate of timberland (514.5 million acres) and our 490 million acres of ungrazed forest-use land implies that just under 25 million acres of timberland were also used for grazing.

[30] Land withdrawn from management for production of wood products through statute or administrative designation. Examples include designated Federal wilderness areas, national parks and monuments, and most State parks.

Table 10
Total U.S. forestland by type and region, 2017

Region	Forestland			
	Timberland	Reserved	Other	U.S. total
	1,000 acres			
Northeast	66,832	5,560	260	72,652
Lake States	51,575	2,396	826	54,797
Corn Belt	34,780	1,189	296	36,265
Northern Plains	6,085	139	573	6,797
Appalachian	70,888	2,252	219	73,359
Southeast	75,255	2,388	304	77,947
Delta States	52,378	949	76	53,403
Southern Plains	21,278	540	31,063	52,881
Mountain	63,569	18,167	42,106	123,842
Pacific	58,045	13,012	12,286	83,343
48 States	500,685	46,592	88,009	635,286
Alaska	12,996	33,370	82,369	128,735
Hawaii	744	727	0	1,471
U.S. total	514,425	80,689	170,378	765,492

Note: USDA, Economic Research Service, major land-use regions correspond with historic USDA production regions. Distributions may not add to totals due to rounding.

Source: USDA, Economic Research Service based on data from Oswalt, N.S., Smith, W.B., Miles, P.D., & Pugh, S.A. (2019). *Forest resources of the United States, 2017: A technical document supporting the Forest Service 2020 RPA Assessment* (Report No. General Technical Report WO-97). U.S. Department of Agriculture, Forest Service.

Trends in Forest-Use and Forested Acreage

Changes in Forest-Use Land

Forest-use land area acreage has generally trended downward since 1949 (table 3). Much of the 16-percent decline in acreage from 1949 to 1997 was a result of land being reclassified from forest-use to special-use areas. From 1997 to 2007, there was a 29-million-acre increase in the forest-use area, followed by a 39-million-acre decrease from 2007 to 2012. However, it is impossible to tell how much of this 39-million-acre decrease was the result of true land changes and how much was the result of the underlying data (i.e., the Resources Planning Act (RPA) Assessment) that changed the in situ height requirement of what constitutes a tree from 13.1 to 16.4 feet in 2012 to be consistent with the Food and Agriculture Organization of the Unification Nations (FAO) internationally agreed-upon definition (Oswalt et al., 2014). For comparison, the USDA's NRI estimates of non-Federal forestland are identical for 2007 and 2012, though this comparison also contains forestland the MLU series classifies as special-use land. Such reclassifications make it difficult to analyze long-term trends. However, estimates for 2012 and 2017 are directly comparable and indicate a decrease of 10 million acres, or roughly 1.5 percent, over the 2012–17 period. However, reserved forestland, which is not included in forest-use land, increased by 7.2 million acres over the same period.

Changes in Total Forestland

Although forested land provides numerous ecosystem services (such as carbon sequestration, water filtration, and wildlife habitat), total forested land in the United States declined from European colonization to approximately 1920. Total forestland increased from 1920 to 1960, followed by another downward trend between

1960 and 1987 (USDA, Forest Service, 1982). Although urbanization and the conversion of forested land to agricultural uses in the southern United States contributed to this decline, development-induced changes could have been even more pronounced if various Federal and State programs had not provided incentives for private landowners to plant trees (Smith et al., 2009).

From 1987 to 2012, total forested land increased by about 34 million acres, mirroring the trend in timberland, the largest component of total forested land (Oswalt et al., 2014). This growth accounts for increases in timberland area stemming from a partial reclassification of some national forestland due to standardization with protocols in use on other types of land ownership. Some of the increases in total timberland since 1987 may also reflect a response to rising real prices for forest products. Based on a national-level analysis of NRI data, Lubowski et al. (2008) found that increases in net returns from timber production, combined with a decline in profits from crops, were the major determinants of forest-area change from 1982 to 1997 (i.e., an increase of 4 million acres, according to NRI data).[31]

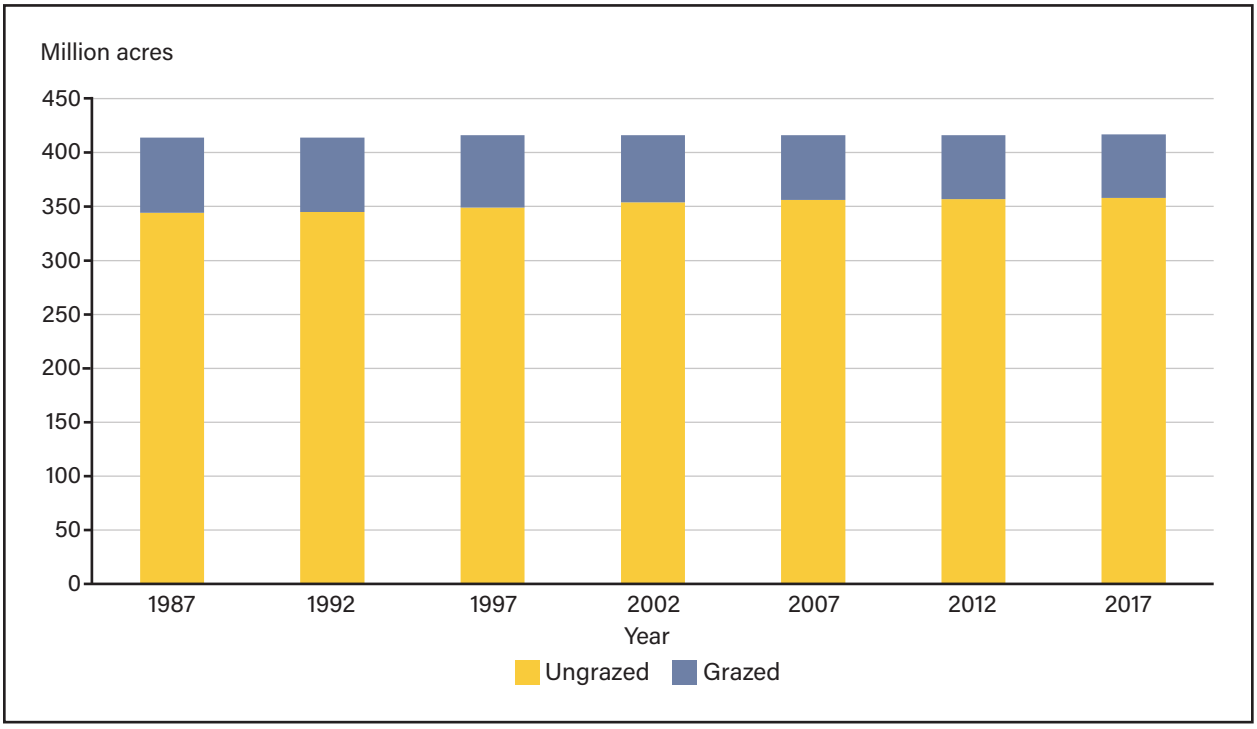
From 2012 to 2017, total U.S. forestland decreased by 0.1 percent (700,000 acres). While the total forested area was relatively stable from 2012 to 2017, forest-area changes may have occurred at more local scales, often in dynamic ways not reflected in the total acreage. For example, while the total area of timberland decreased by roughly 7 million acres from 2012 to 2017, this decrease was offset by a similar increase in reserved forestland over the same period (Oswalt et al., 2019). This offsetting may help explain why we observe a 10-million-acre decrease in forest-use land, while only observing a 700,000-acre decrease in total forestland. It is also worth noting that while timberland acreage decreased nationally from 2012 to 2017, changes were not uniform across the country, reflecting the regional nature of forest product markets and forest protections.

Along with changes in forest tree cover, forests can also change in species, age composition, and health due to human-induced changes and natural processes of mortality and regeneration (Smith et al., 2009). For example, recent research indicates that Douglas-fir tree growth rates have been negatively impacted by increased temperatures and sustained droughts in western forests resulting from climate change (Restaino et al., 2016). Similarly, since the 1950s, the share of timberland occupied by sawtimber-sized trees has increased in the eastern United States. Over the same period, the relative amount of pole timber, seedlings, and saplings decreased (Oswalt et al., 2019).

In addition to data from the USDA, Forest Service, including the 2020 Resources Planning Act (RPA) Assessment (USDA, Forest Service (FS), 2023) and its many supporting documents and reports (Oswalt et al., 2019; Nelson et al., 2020), other USDA agency reports explore forestland use in the United States. The appraisal report of the Soil and Water Conservation Act (USDA, NRCS, 2011) reported that the last 100 years had seen relative stability in the United States non-Federal forest acreage, compared with the approximately 200-million-acre loss between 1630 and the last half of the 19th century. However, stability should not be interpreted as no change between different types of forestland. Their findings mirror total forestland trends that are also seen in the 2017 MLU report (figure 11).

[31] See also Wear (2011), who used the model developed by Lubowski et al. (2008) as part of the 2010 Resource Planning Act (RPA) Assessment.

Figure 11
Non-Federal forestland by grazing status, 1987–2017



Note: Includes only non-Federal land. Includes forest-use land and forestland contained in the special uses USDA, Economic Research Service, major land-use category.

Source: USDA, Economic Research Service using data from USDA, Natural Resources Conservation Service, *Summary report: 2017 national resources inventory.*

Transitions in Forestland

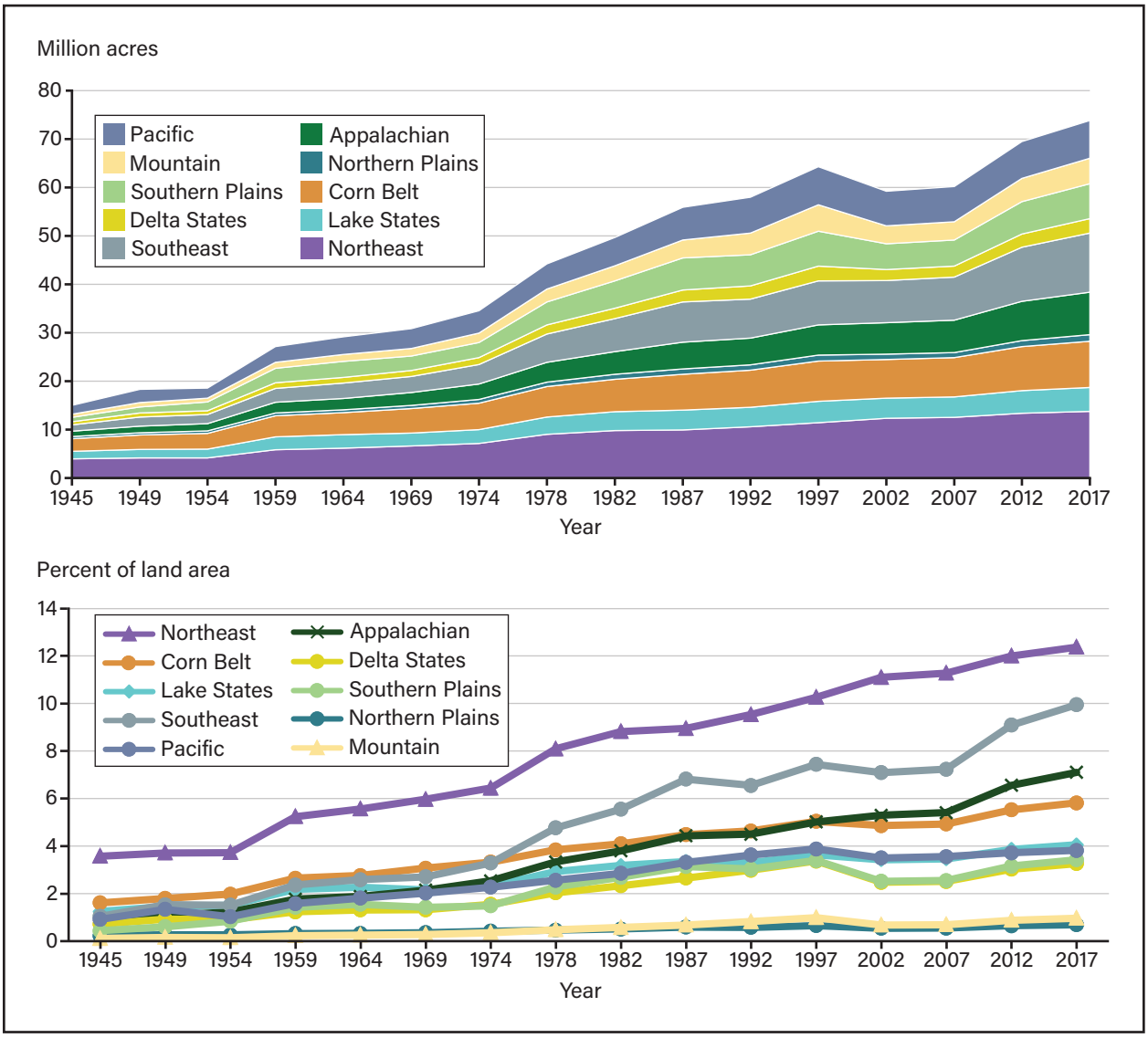
Data provided by USDA, NRCS's 2017 National Resource Inventory (NRI) allowed us to examine land that has been moved into and out of non-Federal forestland as NRI only examines non-Federal land. For a better understanding of how the definition of various forested lands differs between different sources, see appendix A.

NRI estimated there were roughly 416 million acres of non-Federal forestland in 2002, 2007, and 2012, while non-Federal forestland in 2017 was estimated to be 417 million acres. This number was the result of roughly 2.8 million acres (less than 1 percent) transitioning out of forestland and 3.9 million acres transitioning into forestland. Of the land that transitioned from forestland, 9 percent transitioned into cropland, 25 percent transitioned into pasture and/or rangeland, 42 percent transitioned into developed land, 12 percent transitioned into other rural land, and 11 percent transitioned into water. Of the land that transitioned into forestland, 68 percent came from pasture and/or rangeland, 21 percent came from cropland, 6 percent came from other rural land, 4 percent came from developed land, and 1 percent came from water (USDA, NRCS, 2020a).

Urban and Rural Residential Uses

Total land in urban use in the United States was estimated at 74 million acres in 2017, a 6-percent increase over the previous estimate for 2012 (70 million acres). The 2017 urban land-use estimate was the highest recorded since the start of the MLU series, replacing 2012 as the previous high.

Figure 12
Urban land by region, 1945–2017



Note: USDA, Economic Research Service, major land-use regions correspond with historic USDA production regions. Does not include Alaska and Hawaii. The urban-area definition was revised in the U.S. Department of Commerce, Bureau of the Census' 2000 Census of Population and Housing to take advantage of advances in geographic information systems (GIS) processing technology, which resulted in fewer outlying low-density developed areas being included in census-recognized urban areas, making pre- and post-2000 estimates not directly comparable. Similarly, urban area for places of 2,500 or more replaced the previous 1969 estimates, which were for places of 1,000 or more. The definition of urban areas in the 2010 Census was largely the same that was used in the 2000 Census. For additional information on the current urban-area definition used by the U.S. Department of Commerce, Bureau of the Census, including the changes that led to the current definition, see U.S. Department of Commerce, Bureau of the Census. (2010). *Proposed urban area criteria for the 2010 census.* U.S. Department of Commerce, Bureau of the Census. Estimates for inter-census years are based on linear extrapolations.

Source: USDA Economic Research Service estimates using data from U.S. Department of Commerce, Bureau of the Census, 2010 Census of Population and Housing, summary population and housing characteristics, United States; and Bigelow, D., & Borchers, A. (2017). *Major uses of land in the United States, 2012* (Report No. EIB-178). U.S. Department of Agriculture, Economic Research Service.

U.S. Department of Commerce, Bureau of the Census's (Census Bureau) American Housing Survey (AHS), a periodic national survey administered by the U.S. Department of Housing and Urban Development (HUD) and the Census Bureau, can be used to derive estimates of land area in urban and rural areas attributable to residential housing lots. We estimated that the combined urban and rural residential land area in the United States amounted to roughly 145 million acres. Of this total, 110 million acres (76 percent) were attributable to rural residential lots. The remaining 35 million acres represented urban residential land. This finding suggests that 46 percent of urban land is residential. Using data from the U.S. Department of Transportation (USDOT), Federal Highway Administration (FHA) (USDOT, FHA, 2018), we estimated that an additional 11 percent (8.3 million acres) is devoted to urban roads and highways. Taken in combination, the AHS and MLU series estimates suggest that urban land and rural residential areas accounted for 184 million acres or just over 8 percent of the total U.S. land area.

Trends in Urban and Rural Residential Uses

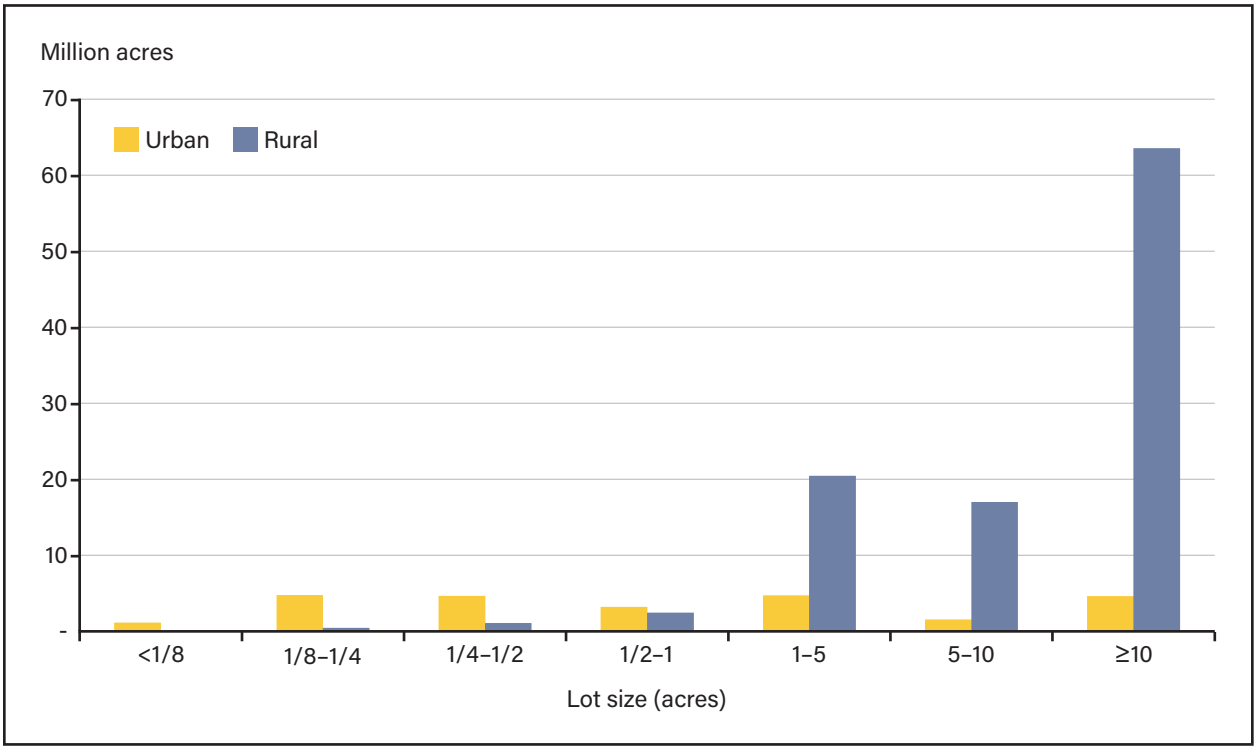
The urban land area of the United States increased by a factor of 4.9, having risen from roughly 15 million acres in 1945 to an estimated 74 million acres in 2017. According to the Census Bureau, the same period simultaneously saw the population of the United States increase from approximately 140 million people to 325 million from 1945 to 2017. Although the definition of urban land used by the Census Bureau changed over time, these broad measures suggest that the pace of urban development increased at a rate more than twice that of population growth.

Periodic changes—particularly in more recent years—had seen the Census Bureau's definition of urban land evolve, which made inter-Census survey comparisons of urban land acreage challenging.[32] These limitations notwithstanding, results based on past urban-area definitions indicated decadal gains of 9.1 million acres of urban land area (1960s), 12.8 million acres (1970s), and 8.6 million acres (1980s). These results aligned with those derived from the Census Bureau's updated urban-area definition, which suggested a gain of 7.4 million acres in the 1990s and 9.0 million acres in the 2000s.

The difference between population growth rates and urban-land areas can (to some degree) be attributed to the increased prevalence of suburban residential land use, which characterized the way many urban cities expanded over time (Heimlich & Anderson, 2001). Suburban land use typically took place on larger lots and thus reduced population density relative to development that may have occurred in more centralized urban areas (Nickerson et al., 2011). Despite the rapid growth of urban areas, rural development—specifically large-lot residential land—has caused significantly more farmland and forestland loss in the United States (Newburn et al., 2022) and, thus, posed a larger challenge to farmland preservation (Newburn & Berck, 2006). Heimlich & Anderson (2001) found that almost 80 percent of the land converted to residential uses occurred in rural areas. Of these uses, 94 percent of the acreage consisted of lots that were 1 acre or more, with 57 percent of the acreage consisting of lots that were 10 acres or more. This finding aligns with our AHS-based estimates (figure 13), which illustrated that 96 percent of the rural residential acreage comprises lots of 1 acre or more, whereas 60 percent comprises lots of 10 or more acres.

[32] The urban area definition was revised in the 2000 Census of Population and Housing to take advantage of advances in geographic information systems (GIS) processing technology, which resulted in fewer outlying low-density developed areas being included in census-recognized urban areas and subsequently reduced the amount of acreage considered urban. The definition of urban areas in the 2010 Census was largely the same as the definition used in the 2000 Census (U.S. Department of Commerce, Bureau of the Census, 2010), providing an opportunity to construct the 2012 and 2017 MLU urban areas from two consistently measured census estimates. For more information on the current urban-area definition used by the Census Bureau, including the changes that led to the current definition, see U.S. Department of Commerce, Bureau of the Census (2010).

Figure 13
U.S. urban and rural residential area by lot size, 2017



Note: This chart only includes single-unit structures. The U.S. Department of Commerce, Bureau of the Census's American Housing Survey (AHS) truncates 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. This result occurs in both the urban and rural residential area estimates.

Source: USDA Economic Research Service estimates using data from U.S. Department of Commerce, Bureau of the Census, 2007 American Housing Survey, and 2017 American Housing Survey; and Nickerson, C., Harper, M., Henrie, C.J., Mayberry, R., Shimmin, S., Smith, B., & Smith, J.H. (2013). *Sources of data providing land use and land cover estimates for the United States.* Report prepared for the Interagency Council on Agricultural and Rural Statistics, Subcommittee of the Interagency Council on Statistical Policy.

Land used for rural residential use nearly doubled between 1980 and 2007, though it had seen a substantially slower rate of growth between 2007 and 2017. According to AHS-based estimates, there were 56 million acres of rural residential land in 1980, 73 million in 1997, 94 million in 2002, 103 million in 2007, 106 million in 2013, and 110 million in 2017. The relatively slower growth experienced over the preceding decade coincides with a decreasing rural population over this time, as well as an expanding urban footprint.

Regional Trends

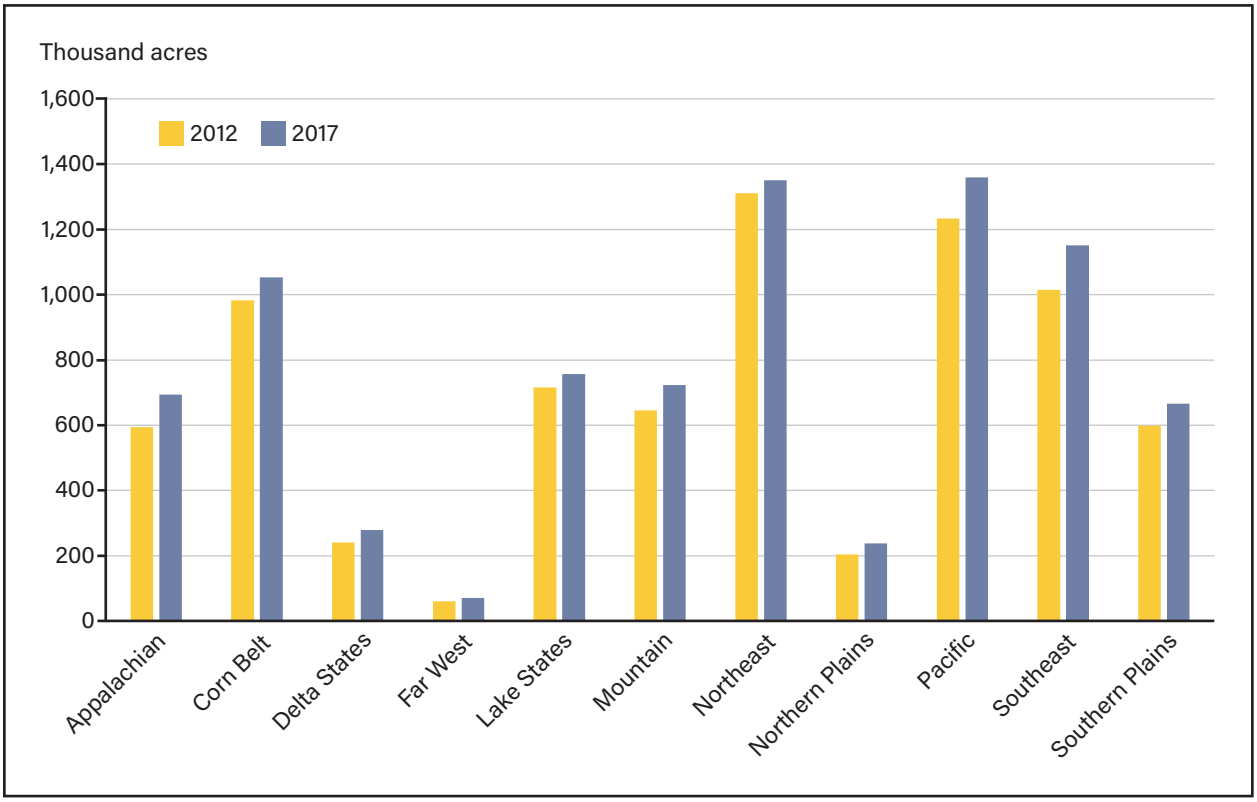
Between 1945 and 2017, the region that saw the largest increase in urban acreage, both in absolute and percent terms, was the Southeast. The Southeast increased by 856 percent, from an estimated urban acreage of 1.3 million in 1945 to an estimated 12.2 million in 2017. The region that saw the smallest increases in urban acreage between 1945 and 2017, both in absolute and percent terms, was the Northern Plains. Urban acreage in the Northern Plains increased 209 percent, from 400,000 acres in 1945 to 1.3 million in 2017.

Over the last 25 years (1992–2017), the Southeast region underwent the largest absolute increase in urban area, which saw a roughly 4.2-million-acre increase. The Appalachian region experienced the largest increase in urban acreage in percent terms, with a 58-percent increase, from 5.5 million acres in 1992 to 8.7 million acres in 2017. During this same period, the Northern Plains region had the smallest increase in urban acreage in absolute terms, with a roughly 200,000-acre increase, up 19 percent from 1992. The Pacific region saw the smallest increase in urban acreage in percent terms, with a roughly 5-percent increase, from 7.4 million acres in 1992 to 7.8 million acres in 2017. Regional trends from 1945 to 2017 are presented in figure 12.

Urban Highways and Roads

In 2017, there were 8.3 million acres of urban highways and roads in the United States, up 700,000 acres (or nearly 10 percent) from a 2012 acreage of 7.6 million. Between 2012 and 2017, acreage in urban roads increased in every region. The largest increase (136,000 acres) was in the Southeast. The Pacific also saw large gains (126,000 acres) that resulted in it overtaking the Northeast as the region with the largest area of urban highways and roads. The region with both the smallest increase and smallest total was the Far West (Hawaii and Alaska). A comparison of the acreage of urban highways and roads by region for 2012 and 2017 is shown in figure 14.

Figure 14
Urban highways and roads by region, 2012 and 2017



Note: USDA, Economic Research Service, major land-use regions correspond with historic USDA production regions.

Source: USDA, Economic Research Service using U.S. Department of Transportation, Federal Highway Administration, Highway statistics series: Highway statistics 2017.

Trends in Developed Land

The MLU urban-area estimates are derived from the U.S. Department of Commerce, Bureau of the Census's Decennial U.S. Census of Population and Housing. The urban estimates represent densely populated "urbanized areas" with at least 50,000 people and "urban clusters" with 2,500–50,000 people. These estimates exclude portions of extended cities that are essentially rural in character and rural residential lots.

USDA's NRI offers an alternative classification with its developed land category. Unlike the urban land definition in the Census of Population and Housing, USDA's NRI estimates developed land by calculating the area that has been removed from rural uses (Nickerson et al., 2013). According to USDA's NRI, there were 116.3 million acres of developed land, including 22.3 million acres devoted to rural transportation (i.e., roads

and railways, but excluding airports) in 2017.[33] Excluding rural transportation (which the MLU includes in the Special Uses section), developed acreage in 2017 increased by 43 million acres (85 percent) to 94 million acres, relative to its 1982 value of 51 million acres and increased by 2.5 million acres (roughly 3 percent) from its 2012 value of 91.4 million acres.

Tracking land use of individual plots over time using USDA's NRI facilitates a deeper examination of the sources of land-use change. Of all the land-use types, developed land is the least likely to transition to another use. More than 98 percent of the land classified as developed in 1982 remained developed in 2017 and 99.7 percent of the land classified as developed in 2012 remained developed in 2017. These outward transition probabilities are only slightly lower than those for the NRI category "**water areas** and Federal land."

Roughly 40 percent of the land classified as developed in 2017 was classified as having a different land use in 1982 (the start of USDA's NRI time series). Of this land, 40 percent had been classified as forestland, 29 percent had been pasture and/or rangeland, 28 percent had been cropland, and 3 percent had been other rural land. In 2017, of the 3 percent of developed land that had a different use in 2012, 40 percent had been forest, 34 percent had been pasture and/or rangeland, 22 percent had been cropland, and 4 percent had been other rural land (USDA, NRCS, 2020a). Though these numbers are comparable over both the long and short term, these recent changes suggest that of the agricultural land that is becoming developed, an increasing majority of the land area is pasture and/or rangeland. However, as there are roughly two-thirds more grassland pasture and range acreage than cropland acreage, a single acre of cropland is still slightly more likely to transition to developed land than a single acre of grassland pasture and range.

Special Uses

Land for all special uses included parks, recreational areas, rural highways, roads, railroads, and airports, which totaled approximately 318 million acres in the United States in 2017 (table 11). This number represents an increase of 2 million acres (0.6 percent) from the 2012 estimate of 316 million acres. These areas, which reflect a variety of land-use objectives, accounted for approximately 14 percent of the total land in the United States. It should be noted that the special uses category does not contain urban recreational areas, as MLU classifies such land strictly as urban areas (see the "Urban Uses" section).

[33] An 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.

Table 11
Special uses of U.S. land, 1964–2017

Special use	1964	1969	1974	1978	1982	1987	1992	1997	2002	2007	2012	2017
Rural transportation	26.0	26.0	26.3	26.6	26.7	25.7	25.2	25.4	27.3	26.5	26.9	25.6
Highways and roads	21.2	21.0	21.2	21.5	21.5	21.2	21.0	21.0	21.8	21.2	21.1	20.9
Railroads	3.3	3.2	3.1	3.0	3.0	2.3	2.0	1.9	3.1	3.0	3.0	2.3
Airports	1.5	1.8	2.0	2.2	2.3	2.2	2.2	2.5	2.4	2.4	2.8	2.5
Rural parks and wilderness	75.5	81.3	87.5	98.0	211.0	224.9	228.8	237.1	242.2	251.7	253.6	258.0
National and State parks	31.9	35.0	36.8	38.5	89.7	96.0	94.3	98.1	99.2	99.5	101.4	103.7
Wilderness areas	14.6	14.3	14.8	18.1	26.0	32.5	35.7	40.0	41.4	47.5	45.5	45.1
Wildlife areas	29.0	32.1	35.9	41.3	95.2	96.4	98.8	99.0	101.6	104.8	106.8	109.2
Defense and industrial use	31.9	25.6	25.0	24.9	24.0	20.9	20.5	16.4	16.7	23.0	27.0	28.0
Farmsteads	10.5	10.3	8.1	8.4	8.0	7.1	6.2	6.6	10.8	12.3	8.3	6.0
Total U.S. special use	143.9	143.2	146.9	157.9	269.7	278.6	280.8	285.5	296.8	313.5	315.9	317.7

Note: See appendix A for definitions of land in special uses. Distributions may not add to totals due to rounding.

Source: USDA, Economic Research Service estimates based on data from U.S. Department of the Interior, National Park Service, National Park Service acreage report: Calendar year 2017; Smith, J., & Leung, Y.F. (2019). *Select metrics describing the operations of America's state park systems.* Utah State University, University Libraries; USDA, Forest Service, Land areas of the National Forest System as of September 30, 2017; U.S. Department of the Interior, Bureau of Land Management, Public land statistics 2017; U.S. Department of Defense, Base structure report fiscal year 2018 baseline; U.S. Department of Interior, U.S. Geological Survey, Protected Areas Database of the United States (PAD-US); U.S. Department of Transportation, Federal Highway Administration, Highway statistics series: Highway statistics 2017.; U.S. Department of Transportation, Bureau of Transportation Statistics; National Transportation Atlas Databases (NTAD), North American Rail Network (NARN) dataset, and National Transportation Atlas Databases (NTAD), Aviation facilities dataset; U.S. Department of Commerce, Bureau of the Census, 2013 American Housing Survey, and Census urban area national TIGER/line shapefile; USDA, National Agricultural Statistics Service, 2017 Census of Agriculture. Estimates prior to 2017 are based on Bigelow, D., & Borchers, A. (2017). *Major uses of land in the United States, 2012* (Report No. EIB-178). U.S. Department of Agriculture, Economic Research Service.

The largest share of land in special uses (i.e., land used for outdoor recreation and land maintained in its natural, wild, and/or preserved state) collectively referred to as rural parks and wilderness was estimated at 258 million acres (81 percent of total special uses land). This acreage can be further dissected into national and State parks (33 percent of total special uses land) and wilderness and wildlife areas (48 percent of total special uses land). In 2017, the total acreage used for rural parks and wilderness purposes in the Mountain and Pacific regions (combined) was 29 percent, and Alaska was 56 percent. Almost all of the remaining 14 percent of rural parks and wilderness land was located east of the Rocky Mountains, with large tracts in New York, Pennsylvania, Michigan, Minnesota, North Carolina, Tennessee, Florida, Arkansas, Louisiana, and Texas (each with 1 million or more acres).

Of the nearly 104 million acres of national and State parks, 85 million were in national parks, with the remaining 19 million acres in State parks. Of the 45 million acres classified as wilderness areas, 37 million acres were managed by USDA, Forest Service, with the remaining roughly 8 million acres managed by the U.S. Department of Interior's Bureau of Land Management. The 109 million acres designated as wildlife areas include 98 million acres managed by the U.S. Department of the Interior, U.S. Fish and Wildlife Service, and just over 11 million acres are managed by State Fish and Wildlife agencies.

According to U.S. Department of Transportation (USDOT) data, land used for rural transportation accounted for nearly 26 million acres or 8 percent of total special-use land in 2017. Approximately 21 million

acres (81 percent) were on highways and roads, with the remaining 5 million acres roughly equally divided between railways and airports (USDOT, 2017; USDOT, 2018; USDOT, 2021).

National defense and industrial areas accounted for 28 million acres of U.S. land or just under 9 percent of all special use land. Just over half of the land used for national defense and industrial purposes is located in four States: Nevada (15 percent), New Mexico (14 percent), California (13 percent), and Arizona (11 percent). The vast majority (94 percent or 26.3 million acres) of these 28 million acres were owned or leased by the U.S. Department of Defense, with the remaining 1.7 million owned by the U.S. Department of Energy.

The remaining 6 million acres of land in special uses were in farmsteads (i.e., a combination of residential farmland and farm roads). Of these 6 million acres, roughly three-quarters represented residential lots on farms, with the remaining one-quarter representing farm roads. A little more than 20 percent of this land can be found in the Corn Belt region, with Iowa and Ohio having the largest percentage of total land devoted to farmsteads (roughly 0.8 percent).

Trends in Special Uses

Since 1964, land use has more than doubled for rural transportation, recreation, wildlife, defense, and other special uses in the United States, growing from 144 million acres in 1964 to 318 million acres in 2017. This finding is largely the result of a fourfold increase in rural parks and wilderness areas. Alaska now has about 145 million acres (56 percent of the U.S. total) of special-use acreage. Alaska's special-use development is due to national parks, wilderness areas, and wildlife refuges being established on land that earlier MLU efforts had inventoried as being forest-use land or miscellaneous other land. Alaska has the largest share of land in special uses (40 percent), followed by Hawaii (33 percent) and California (25 percent). Among regions, the lowest shares of land in special uses are in the Northern Plains, Southern Plains, and Corn Belt (figure 15).

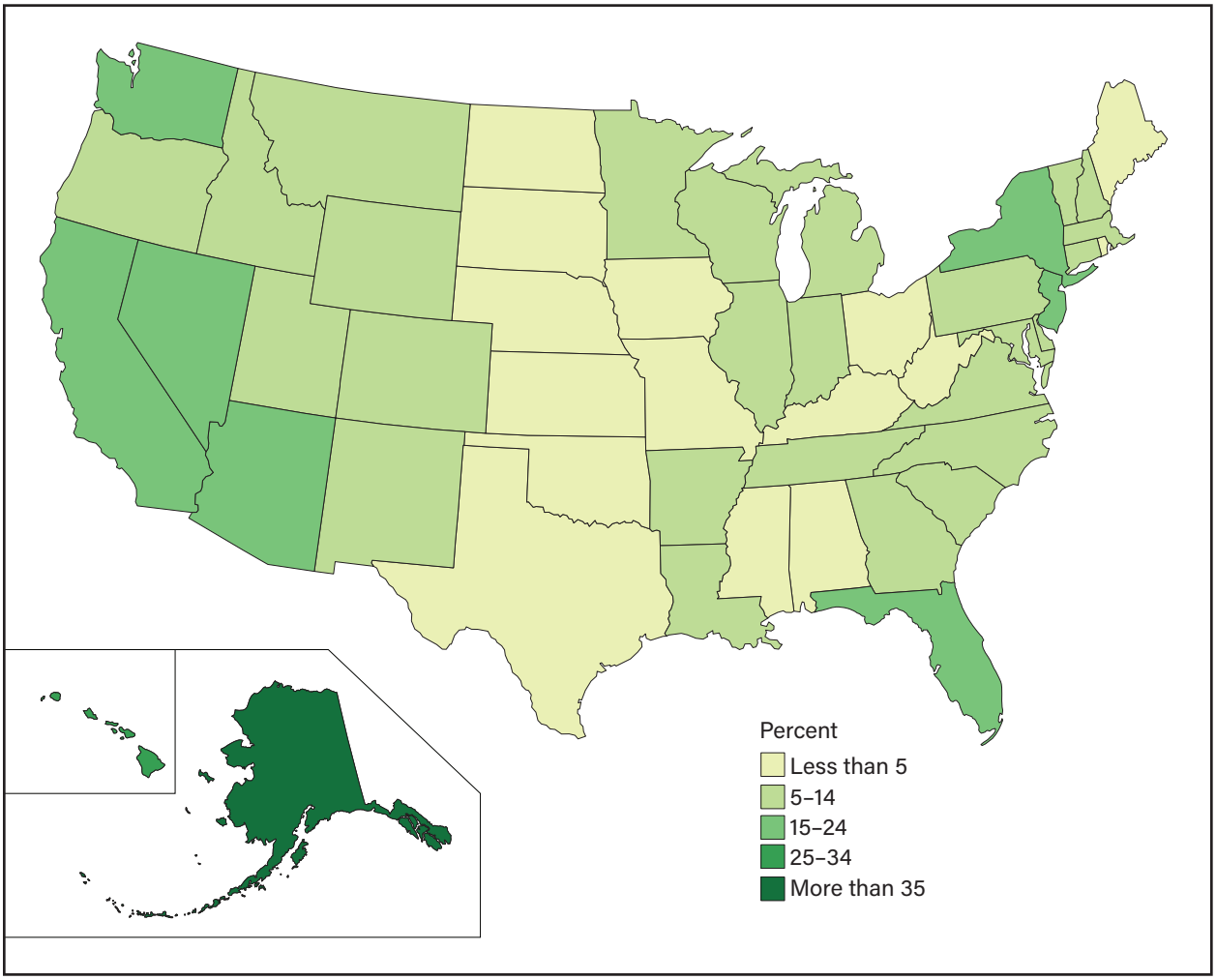
From 2012 to 2017, special-use areas in the United States increased by 1.8 million acres (0.6 percent), continuing a steady upward trend that began in the 1940s. However, the long-term change should be interpreted with caution as the change reflects an upward adjustment due to new data and methods.

A 4.4-million-acre increase in rural parks and wilderness land and a 1-million-acre increase in defense and industrial areas caused special land use to increase between 2012 and 2017. The increases had more than offset the approximately 2.3-million-acre farmstead-area reduction and the 1.3-million-acre reduction in land in rural transportation. Much of the reported loss in farmstead areas was attributable to methodological changes rather than true changes in land use. In preparing the 2017 report, we discovered an error in our previous calculations of the average rural lot sizes used in the 2012 report. If the updated estimates were applied to 2012, the total farmstead area for that year would be 6.1 million acres, only slightly larger than the 6 million acres estimated for 2017. This small decrease was due to the fact that there were 2.04 million farms reported in 2017 compared with the 2.11 million farms reported in 2012. It is also worth noting that the methodology for calculating farmstead acreage changed in the 2012 report, such that earlier estimates were not directly comparable.

National defense and industrial lands differ from other special uses, mainly in that the location is paramount and higher value uses characterize much of the land. The national defense and industrial land-use category totaled 28 million acres in 2017, an increase of 1 million acres higher than the 2012 estimate and the largest defense and industrial acreage since 1964.

Between 2012 and 2017, land used for rural transportation decreased by 1.3 million acres. This change was the result of decreases across all subcategories part of the rural transport category, including roads, railroads, and airports. Similar to the approach used for the 2012 estimate, we used spatial data in a geographic information system (GIS) for the 2017 estimate of the area covered by railroads and airports (USDOT, Bureau of Transportation Statistics (BTS), 2017; USDOT, BTS, 2021). However, improved data availability allowed us to obtain better estimates of airport sizes, as well as exclude inactive railroads. This improvement likely played a role in the decreased acreage observed.

Figure 15
Percent of land in special uses by State, 2017



Source: USDA Economic Research Service estimates based on data from U.S. Department of Commerce, Bureau of the Census (2017); U.S. Department of Defense, Census urban area national Topologically Integrated Geographic Encoding and Referencing (TIGER)/line shapefile; U.S. Department of the Interior, National Park Service, National Park Service acreage report: Calendar year 2017; U.S. Department of Transportation, Bureau of Transportation Statistics, National Transportation Atlas Databases (NTAD), North American Rail Network (NARN) dataset, and National Transportation Atlas Databases (NTAD), Aviation facilities dataset; U.S. Department of Transportation, Federal Highway Administration, Highway statistics series: Highway statistics 2017; U.S. Department of the Interior, U.S. Geological Survey, Protected Areas Database of the United States (PAD-US); and Smith, J., & Leung, Y.F. (2019). *Select metrics describing the operations of America's state park systems*. Utah State University, University Libraries, University Libraries.

Miscellaneous Other Land Uses

The remaining 197 million acres (9 percent of the total U.S. land area) were included in the miscellaneous other land category in 2017 (table 2). These lands increased by 1 million acres (approximately 1 percent) from 2012 to 2017, ultimately returning to their 2007 level. The Far West region, specifically Alaska's ecologically sensitive tundra areas, contains 125 million acres of miscellaneous other land or approximately 63 percent of the U.S. total miscellaneous other land uses. In the contiguous United States, the Pacific and Mountain regions contain 14 percent of miscellaneous other land uses combined.

The miscellaneous other land category remains difficult to itemize, given the various sources of land use and land cover data in the United States. This category is generally comprised of land in cemeteries, golf courses, mining areas, quarry sites, marshes, swamps, sand dunes, bare rocks, deserts, tundra, and other unclassified land, as well as some—but not all—industrial, commercial, and residential sites in rural areas. However, the

land in this category is calculated differently than the other major land-use categories. Rather than summing the land in those individual miscellaneous categories to get a total, we estimated all the land that cannot be classified as either cropland, grassland pasture and range, forest use, special use, or urban. This distinction is important as it allows us to avoid the potential double counting of land since some wetlands may be classified as cropland or forest, whereas some Alaskan tundra is classified as rangeland, and some rural residential land is classified as forest.

Wetlands

According to the USDA, NRCS, non-Federal wetlands acreage in the contiguous 48 States totaled 111 million acres in 2017 (USDA, NRCS, 2020a). USDA, NRCS estimated that more than 59 percent of these wetland acres were on forestland; 23 percent were on cropland, pasture, and rangeland; 3 percent were grouped with water areas; and 1 percent were on developed land. The amount of wetland cover declined by 187,000 acres between 1992 and 1997, increased by 76,000 acres in 1997–2002, increased by 29,000 acres in 2002–2007, declined by 53,000 acres in 2007–2012, and then declined again between 2012 and 2017 by nearly 64,000 acres for a total of 111 million acres (USDA, NRCS, 2020a). However, it is important to note that these changes were smaller than the margin of error provided by the USDA's NRI estimates, so the true value may be more stable. These estimates were in line with those performed by the U.S. Department of the Interior, U.S. Fish and Wildlife Service (Dahl, 2011). Using a different sampling technique, this study estimated wetland acreage in the contiguous 48 States at 110 million acres in 2009, a 62,000-acre decrease from 2004.

Major Land Uses, by Class of Ownership

Land ownership can have far-reaching implications for how land is used, as owners may differ on the goals and objectives they have for their land. For example, some owners may focus on meeting individual or private needs, whereas other owners—particularly governments—may focus on achieving broader societal benefits. Diverging objectives for owning land may also affect the willingness to convert land from one use to another, to adopt different farm and forestry practices, and to participate in government programs.

More than 60 percent of the land area in the United States is privately owned. The Federal Government owns approximately 28 percent of the total land base, mostly in western States. State and local governments own about 9 percent of all land, and American Indian Alaska Native Tribes' trust land accounts for the remainder (just under 3 percent). These shares have changed gradually over time, except in Alaska. In 1971, the Alaska Native Claims Settlement Act resulted in the transfer of 44 million acres of Federal land to private Native American ownership interests.

Federal Lands

Federal land, at roughly 640 million acres of the total U.S. land area in 2017, included the original public domain and land acquired by purchase or other means. This total acreage is approximate, as there is currently no Federal agency solely responsible for keeping track of all land owned by the Federal Government. Between 601 and 607 million acres have been managed by four Federal agencies including the U.S. Department of the Interior, Bureau of Land Management (BLM); USDA, Forest Service; U.S. Department of the Interior, U.S. Fish and Wildlife Service; and U.S. Department of Interior, National Park Service (Vincent et al., 2017; Vincent & Hanson, 2020), with another 8.8 million managed by the U.S. Department of Defense (DoD) in 2017 (DoD, 2018).

Despite a 13-million-acre decline of between 2007 and 2015 (largely attributable to disposal of U.S. Department of the Interior, BLM land in Alaska, and U.S. Department of the Interior, BLM and DoD land in Arizona), federally-owned acres have stayed constant at 640 million acres for the two most recent reports

from 2015 and 2018 (Vincent et al., 2014; Vincent et al., 2017; Vincent & Hanson, 2020). Approximately 35 percent of all Federal land is in Alaska, 43 percent is in the Mountain region, and 15 percent is in the Pacific region. The remaining 7 percent is distributed among the other eight regions and Hawaii.

Approximately 168 million acres of Federal land are forest use (60 million acres of which is grazed), whereas another 165 million acres are grassland pasture and range. Federal land also includes land in special uses, such as land contained in the U.S. National Park System or used for national defense. Additionally, Federal land includes miscellaneous other land, such as marshes, open swamps, bare rock areas, deserts, and special uses not inventoried, which combined account for just under half of all federally-owned land.

State and Local Lands

State and local governments have accumulated land holdings of various sizes through grants from the Federal Government, tax reversions, purchases, gifts, and escheats.[34] The land acquired by State and local governments may also be divested through sales and other exchanges. As with Federal lands, no single agency is responsible for tracking the total amount of land owned by State and local governments. State-owned lands total roughly 200 million acres (roughly 9 percent of the total U.S. land base), while local governments (i.e., towns, cities, and counties) own roughly 10 million acres (0.5 percent of the total U.S. land base). These publicly administered areas are distributed throughout the United States more evenly than Federal land but are still highly concentrated in western States, with the majority of State-owned land (105 million acres) residing in Alaska (Nelson, 2018). State and local governments hold land in forests, parks, wildlife refuges, highways and roads, institutional uses, and other specific purposes. Most western States also own and manage relatively large acreages to earn income through leasing and royalty payments, provide financial support to schools, and meet other State-level policy objectives. About 36 million acres in this category are used for grazing.

Native American Lands

American Indian and Alaska Native Tribal lands, which are managed by the U.S. Department of the Interior, Bureau of Indian Affairs (BIA), totaled 57 million acres in 2017. In addition, 18 million acres of this land (or one-third) represented forested land, though only 8 million of these forested lands had met the MLU's definition of forest-use land. More than 46 million acres of this land have been used for farming and grazing, with roughly 88 percent fitting into the grassland pasture and range category. Approximately 3 million acres of Tribal lands have been on land the MLU would classify as special use, urban, or miscellaneous other land. Like Federal and State lands, most of the land managed by BIA is concentrated in western States.

Private Land

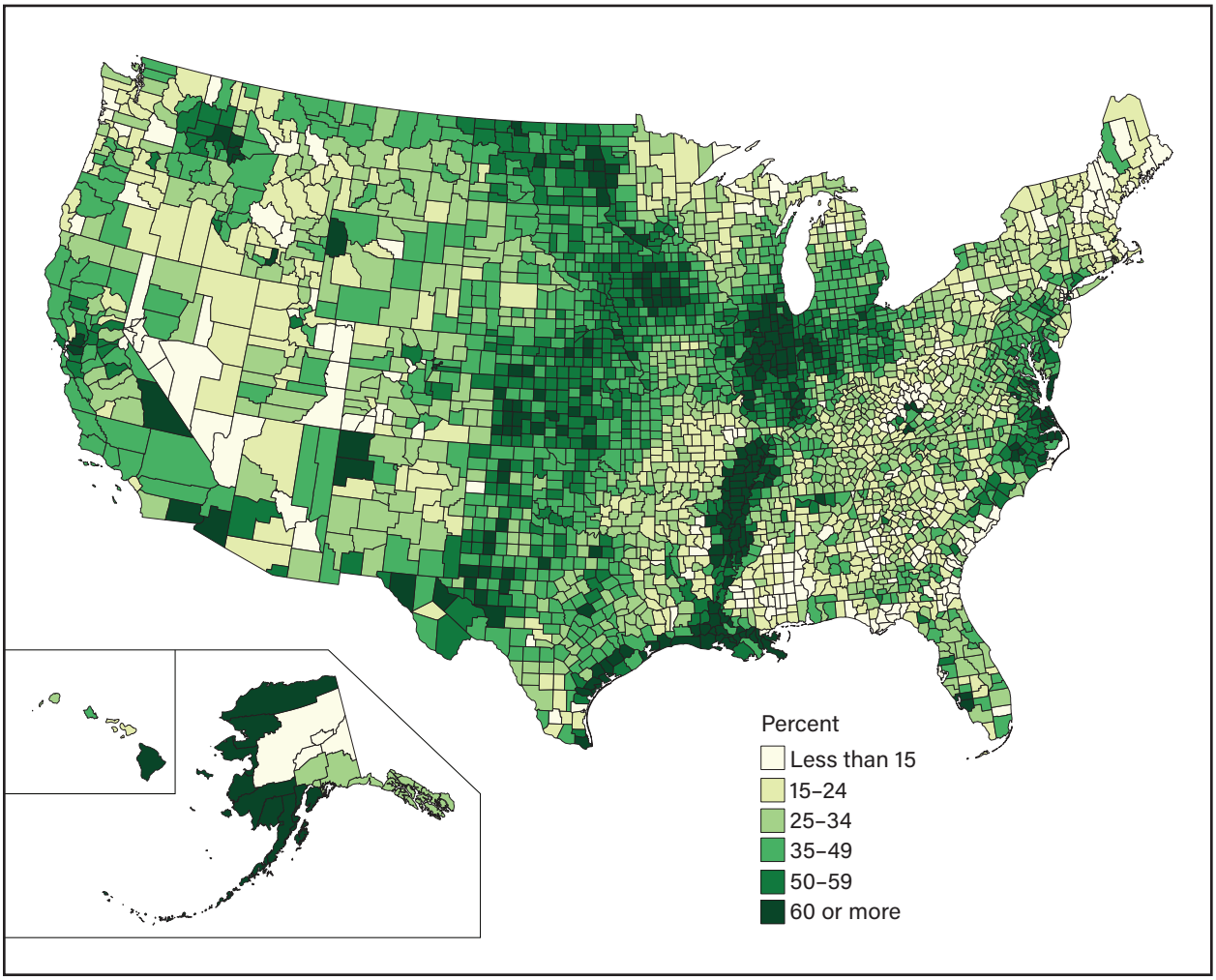
Private land, not including that under American Indian and Alaskan Native Tribal ownership, totaled more than 1.36 billion acres in 2017, a 2-million-acre decrease from 2012. Private interests hold about 98 percent of U.S. cropland, roughly two-thirds of grassland pasture and range, and 70 percent of forest-use land. Of the remaining land, roughly one-third is privately held. Between 2012 and 2017, privately-owned forest-use land and cropland both experienced a net decline of roughly 1.5 million acres each. The remaining increase of 1 million acres is attributable to increases in urban and grassland pasture and range land, much of which is likely to be owned by private entities.

[34] Escheats relate to a common law doctrine that operate to ensure that property is not left in limbo and ownerless.

Owned and Rented Land in Farms

Land-use decisions on farmland can also depend on whether the farm operator owns or rents the land. Of the 900 million acres of U.S. farmland in 2017, including cropland, privately owned pasture and rangeland, and privately owned grazed woodland, 61 percent were owner operated. The remaining land was rented, either from one farm operator to another or from a nonoperator (i.e., an ownership entity not actively engaged in farming) to a farm operator. Absentee landlords (a subset of nonoperator landlords who live relatively far away from their farmland) control more than 20 percent of rented acreage in Kansas, North Dakota, and Mississippi (Bawa & Callahan, 2021). Farmland ownership varies across the country, with higher shares of renting and nonoperator ownership generally in the Midwest and both the Southern and Northern Plains regions (figure 16). According to USDA, National Agricultural Statistics Service (NASS) data from 2014, nearly half (46 percent) of cropland was rented out, which contrasted with just 28 percent of pastureland being rented out (Bigelow et al., 2016).

Figure 16
Share of farmland rented, 2017



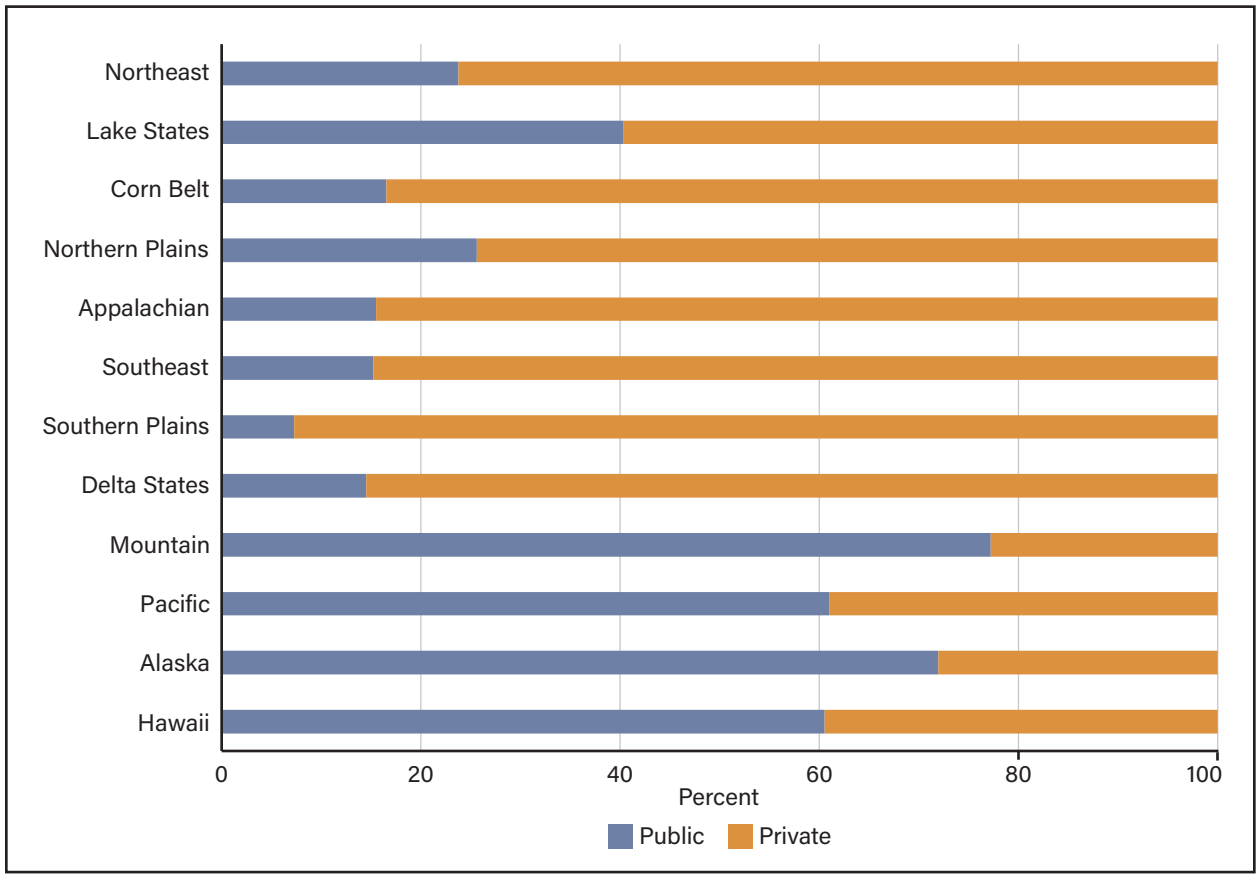
Source: USDA Economic Research Service based on data from USDA, National Agricultural Statistics Service, 2017 Census of Agriculture.

Forest Ownership

It is often thought that privately owned forests are subject to narrower, more profit-driven motives than publicly owned forests. In total, 42 percent of the forestland in the United States is publicly owned, with roughly three-quarters of the 42 percent owned by the Federal government, of which 60 percent is made up of national forests. Focusing on timberland, which makes up the majority of forest-use land, approximately 30 percent is publicly owned.[35] The distribution of public or private forest ownership varies greatly by region. For example, the majority of western forests (i.e., those located in the Pacific and Mountain regions, plus Alaska and Hawaii) are publicly owned, whereas the majority of forest-use land in the eastern United States (the remaining regions) is privately owned.

Of the privately owned forestland in the United States, roughly one-third is owned by private corporations. However, roughly half of these lands are family owned and the majority of these forestlands (62 percent of parcels) are less than 10 acres according to data collected in the 2017–18 USDA, Forest Service's National Woodland Owner Survey (Butler et al., 2021). According to this same report, family-owned forestland is more likely to be part of a home than part of a farm and the reasons for owning such land are dominated by nonmarket considerations (Butler et al., 2021). For example, the top three reasons (by acreage) behind family forest ownership were "beauty or scenery," "wildlife habitat," and "nature protection," while "timber products," "firewood," and "nontimber forest products" ranked last out of 13 reasons, in that order (Butler et al., 2021).

Figure 17
Share of total forest ownership by owner type, 2017



Note: USDA, Economic Research Service, major land-use regions correspond with historic USDA production regions.

Source: USDA, Economic Research Service using data from Oswalt, N.S., Smith, W.B., Miles, P.D., & Pugh, S.A. (2019). *Forest resources of the United States, 2017: A technical document supporting the Forest Service 2020 RPA Assessment* (Report No. General Technical Report WO-97). U.S. Department of Agriculture, Forest Service.

[35] The percent of U.S. forests under private ownership is much higher than the global average (Whiteman et al., 2015; Siry et al., 2010).

Foreign Holdings of U.S. Land

Private land ownership in the United States includes land held by foreign individuals and companies. Since 1978, foreign owners (including those holding long-term leases of 10 or more years) have been required to submit information to the USDA on farm and forestland holdings, in compliance with the Agricultural Foreign Investment Disclosure Act of 1978.

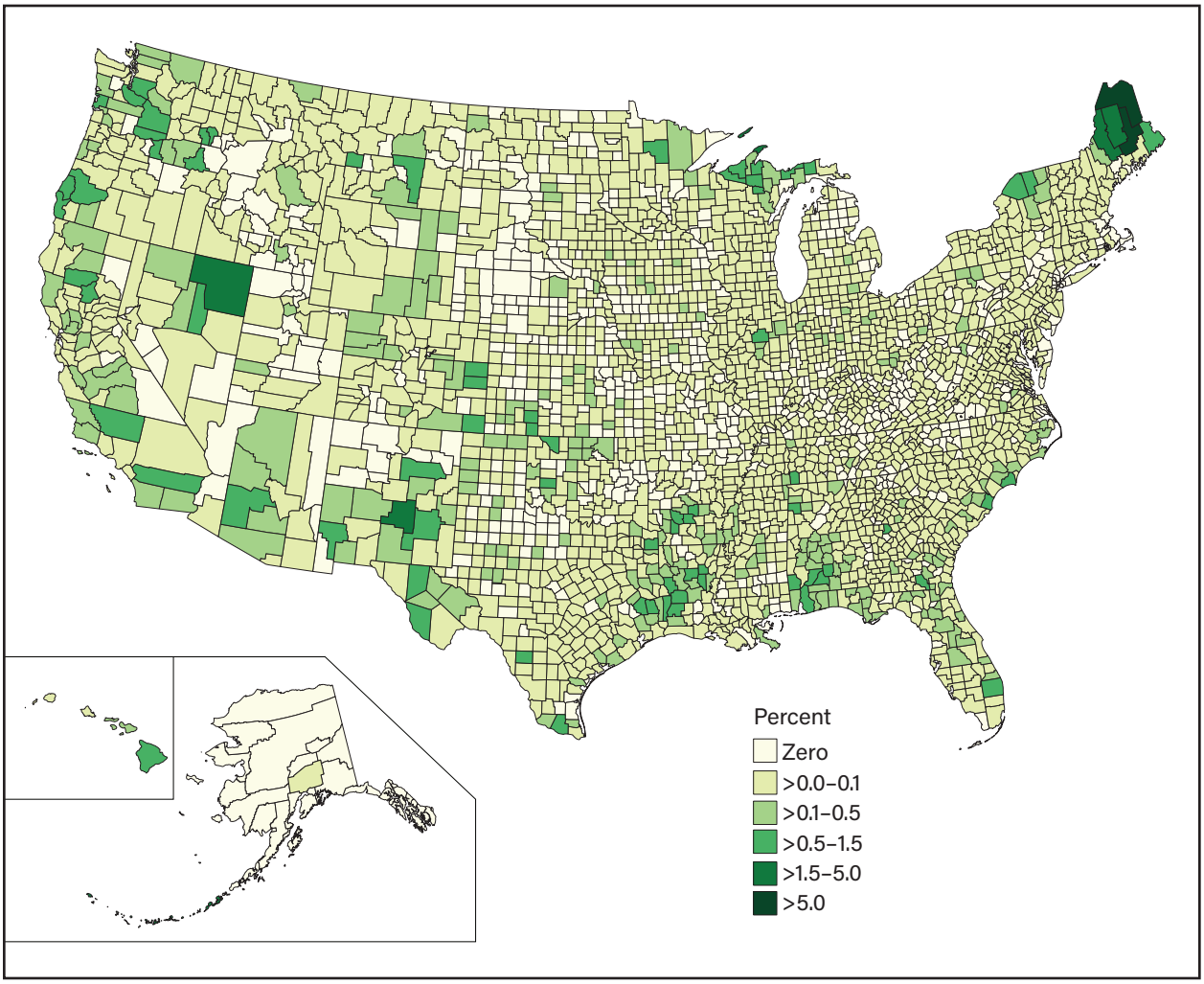
In 2017, foreign entities held 29.1 million acres of agricultural land (including forestland). Of these 29.1 million acres, 15.6 million acres (54 percent) were forestland, 6.2 million acres (21 percent) were pasture, 5.9 million acres (20 percent) were cropland, and 1.4 million acres (5 percent) were classified as other agricultural land (Barnes et al., 2020; figure 19).

According to MLU estimates, these foreign holdings accounted for 1.7 percent of the land in farms (cropland as well as grassland pasture and range) and forest-use land, and 1.3 percent of the total U.S. land area. Farm roads and other infrastructure are included in the nonagricultural land category, which totaled an additional 700,000 acres.

All U.S. States have foreign landowners, the majority being Canadians. Maine has the most foreign-held agricultural land in the United States at 3.2 million acres, consisting almost entirely of forestland, which represents roughly 18 percent of the State's agricultural land. Texas ranked second in the United States, with just more than 3 million foreign-held agricultural acres, followed by Alabama's 1.6 million acres of foreign-held agricultural land. Hawaii has the second-highest percentage of foreign holdings of U.S. agricultural land, with 9 percent of the privately owned agricultural land in the State but less than 1 percent of the reported foreign-held agricultural land in the United States. Land use continues to vary by State. For example, Hawaii's foreign-held agricultural land is primarily pastureland, while Maine's foreign-held agricultural land is primarily forestland.

Nearly 25 percent of counties had zero foreign-held agricultural land (figure 18). Approximately 64 percent of counties had less than 0.5 percent of their total land area in foreign-held agricultural land, whereas roughly 73 percent had less than 1 percent of their total land area in foreign-held agricultural land. Around 8 percent of counties had at least 5 percent of their land area classified as foreign-held agricultural land, whereas 0.5 percent (16 counties) had more than 25 percent of their land in foreign-held agricultural land. Only one county (Keweenaw, Michigan) had a majority (76 percent) of agricultural land that was foreign owned.

Figure 18
County concentration of foreign-held U.S. agricultural land as a percent of total land area, 2017

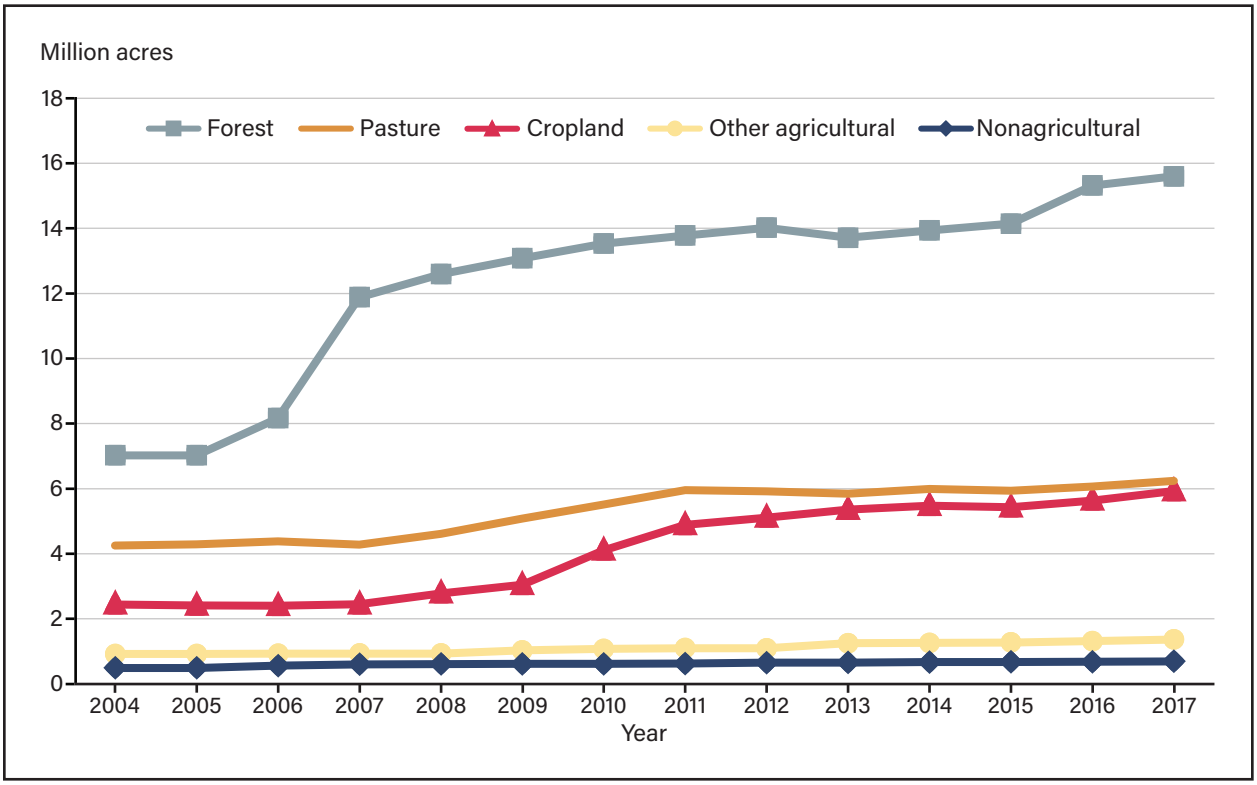


Source: USDA, Economic Research Service using data from Barnes, T., Estep, M., Gray, V., Feather, C., & Scronce, P. (2020). *Foreign holdings of U.S. agricultural land through December 31, 2017*. U.S. Department of Agriculture, Farm Service Agency.

Trends in Foreign-Held U.S. Land

Between 2004 and 2017, the acreage of foreign-held agricultural land in the United States roughly doubled from 14.6 million to 29.1 million acres. This increase was primarily driven by large increases in cropland and forestland, which saw increases of 143 percent and 122 percent, respectively. Pastureland and other agricultural land both saw increases of just below 50 percent.

Figure 19
Foreign holdings in U.S. agricultural land by land-use type, 2004–17



Note: "Nonagricultural" represents land in buildings and other infrastructure that is located within a larger plot of agricultural land and is not meant to represent other lands not related to agriculture. Land-use categories are self-reported by land holders and may not perfectly correspond with the major land-use categories that are presented elsewhere in this report.

Source: USDA, Economic Research Service using data from Barnes, T., Estep, M., Gray, V., Feather, C., & Scronce, P. (2020). *Foreign holdings of U.S. agricultural land through December 31, 2017*. U.S. Department of Agriculture, Farm Service Agency.

More recently, the foreign U.S. land holdings from 2012 to 2017 increased by a little more than 11 percent. Although forestland and cropland saw the biggest absolute increases at 1.6 million acres (11.3 percent) and 800,000 acres (16 percent), respectively, the largest percentage increase was in other agricultural land, which grew by more than 25 percent (less than 300,000 acres). Changes in cropland and pastureland were largely due to the execution (and termination) of long-term leases over a large number of acres by foreign-owned wind energy companies (Bigelow & Borchers, 2017).

The three States with the highest increases in the number of acres of agricultural land owned by foreigners between 2012 and 2017 were Oklahoma (107,000 acres), Maine (129,000 acres), and Kansas (118,000 acres). The fulfillment of long-term leasehold rights by wind and solar energy corporations was a main driver of this growth. However, not all States have experienced increases in foreign-owned land. Washington had a loss of more than 27,000 acres in foreign-owned agricultural acres, New York had a 1,300-acre decrease, and Nevada had a 1,000-acre decrease.

Conclusion and Challenges to Resolve

Conclusion

This report presented the update of the Major Land Uses (MLU) series by estimating land-use under different categories spanning from 1945 to 2017 for individual U.S. States and the United States as a whole.[36] In addition to providing the only comprehensive estimates covering all land uses for that length of time, this study provided context and insights into the factors driving changes in MLU categories over time. Notable changes from the last edition of MLU (Bigelow & Borchers, 2017) include a 4-million-acre (less than 1 percent) increase in grassland pasture and range, accompanied by a 10-million-acre (1.5 percent) decrease in forest-use land. Cropland decreased by 0.5 percent (approximately 2 million acres), although idle cropland remained steady at 39 million acres, despite a decrease of 6 million acres enrolled in the USDA, Conservation Reserve Program (CRP), which accounted for the largest share of idle cropland. These 2012–17 changes were smaller than the changes observed from 2007 to 2012, when the MLU series reported a 41-million-acre increase in grassland pasture and range, a 39-million-acre decrease in forest-use land, and a 16-million-acre decrease in cropland. However, this decrease in cropland from 2007 to 2012 was largely driven by a 23-million-acre decrease in cropland pasture that was likely attributable to methodology changes implemented in the 2012 USDA, NASS' Census of Agriculture, rather than because of true land-use changes. Similarly, a significant portion of the corresponding increase in grassland pasture and range (and decrease in forest-use land) was the result of definitional changes made by USDA, Forest Service in 2012. These changes led to the exclusion of lands that had previously been classified as forest, as a large portion of forestland was reclassified as grassland pasture and range in the 2012 MLU. Given the relative consistency between data sources for 2012 and 2017 (relative to other recent MLU periods), these 2012–17 changes may not be uncharacteristic. The distribution of land held by Federal, State, local, and private entities has remained stable over the last decade, with more than 60 percent of U.S. land being privately owned. Since 2004, the acreage of foreign-owned agricultural land in the United States has doubled, with the largest source of growth being Canadian-held forestland in Maine. Ultimately, the factors that influence the appropriate balance between the private and social benefits derived from land-use decisions will vary from place to place, depending on the preferences and goals of landowners, government agencies, and other stakeholders.

Ongoing Challenges Associated With Comprehensive Land-Use Accounting

The MLU time series began in 1945 and it remains the longest running complete accounting of land use in the United States. As such, with each new edition, there is an inherent tension between improved accuracy and long-term consistency. Although improving the accuracy of the MLU series is a major priority, the MLU's greatest strength is in providing a consistent comparison of State-level and national-level land-use patterns across a time span of more than 70 years. The MLU series allows researchers, policymakers, and other stakeholders to get a high-level summary of how the land acreage devoted to various agricultural and nonagricultural land uses has changed relative to other uses across the short, medium, and long term. Therefore—except in cases where the accuracy of previous estimation procedures is in question—we do our best to calculate each component of each land-use category in the way the category has historically been calculated. In this way, land-use changes and trends reflect true land-use changes, rather than simply changes in methodology. This is not to imply that the accuracy of the underlying data has not improved, but rather that these improvements were undertaken by the organizations directly responsible for collecting these data (e.g., USDA, National Agricultural Statistics Service; USDA, Forest Service; U.S. Department of Commerce, Bureau of the Census).

[36] State-level estimates for all MLU categories are available in the Major Land Uses data series web page on the USDA, Economic Research Service website.

There are always challenges that can make year-to-year comparisons unreliable for a particular component of MLU categories (e.g., cropland pasture) across specific years. The primary reason for this challenge is methodological changes made by the data collectors and/or providers. Notable examples include changes in USDA, NASS' 2007 and 2012 Census of Agriculture method for collecting cropland pasture acreage data; changes in the U.S. Department of Commerce, Bureau of the Census's definition of urban areas in 2000; and the USDA, Forest Service's changes in 2012 to the in situ height requirement (13.1 to 16.4 feet) for what constitutes a tree in the Resources Planning Act (RPA) Assessment. In such cases, we do our best to provide the context needed to understand the impact of these changes on comparisons between specific years, indicating when observed changes are most likely an artifact of methodological changes rather than true land-use changes, where applicable.

Because the data used to form the MLU estimates are drawn from multiple sources across disparate agencies, another challenge arises from understanding what various data collection efforts actually measure. State-of-the-art capabilities for developing estimates of land cover at spatially disaggregated levels are provided by advances in GIS mapping techniques, increased availability of satellite imagery, and high-resolution aerial photography. However, the extent to which land cover corresponds to land use is often unclear. For example, the interpretation of satellite imagery or aerial photographs could result in residential land being classified as forest if the tree canopy cover obscures dwellings; the canopy could also easily obscure areas actually used for grazing purposes. Low-density, rural residential use is also difficult and costly to measure, as doing so can require a combination of sophisticated satellite imagery analysis and on-the-ground verification. Yet, low-density, rural housing is one of the leading causes of contemporary human-induced land-use change (Irwin & Bockstael, 2007; Irwin et al., 2009). Further research into the extent to which land cover corresponds with land use in different regions will improve our understanding of how and when land-use changes correspond with land cover changes.

Many factors impact land uses, including policy, socioeconomic, and environmental factors. Identifying which factors have 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. There is also a difference between satellite and survey data. Satellite data, aerial photography, and USDA's National Resources Inventory (NRI) (a survey covering 800,000 data points) collect data over time on land use and natural resource characteristics, but do not offer much information about the land operators or owners who make land-use decisions. Conversely, other data sources like the USDA's Census of Agriculture collect data on how land operators and owners use land. However, these data are generally 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. USDA, Economic Research Service (ERS) researchers have begun to combine administrative data sources, such as the USDA, Farm Service Agency's (FSA) Common Land Unit data, with other external sources to provide richer information on the drivers of land-use change. For example, common land unit data can be combined with farm program participation records and satellite-based imagery to provide evidence of the relationship between participation in Government programs and land-use outcomes.

As the historical record of satellite-based land-cover data grows, efforts to systematically identify inconsistencies between datasets that provide estimates of similar land use and land cover classes become more useful. One way to detect such inconsistencies would be to combine county-level estimates derived from the USDA, Forest Service's Forest Inventory and Analysis program and the USDA, Natural Resources Conservation Service's NRI and compare them with forest-cover estimates from satellite sources. Similar approaches could be applied to data from the USDA's Census of Agriculture to focus on the distinction between unused shrubland and land used for pasture. Such information could aid research efforts aimed at providing comprehensive land-use assessments. Maintaining updates to existing sources (such as USDA's NRI, and Census of Agriculture, as well as the U.S. Department of the Interior's U.S. Geological Survey National Land Cover Database) is vital for consistency in land-use measurement. Additionally, examining the potential of new and emerging sources, such as nighttime lighting data, can help improve our understanding of how land is used (Donaldson & Storeygard, 2016).

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Appendix A: Glossary

This glossary provides detailed definitions for the major land uses presented in the most recent Major Land Use (MLU) report and data series. For more information on which sources were used for each major land-use category, see appendix B, as well as the accompanying documentation for the latest report.

Major Land Use Categories and Sub-Components

Cropland: Total cropland is the sum of five components, including (1) cropland harvested (net of double cropping), (2) crop failure, (3) cultivated summer fallow, (4) cropland pasture, and (5) idle cropland. See below for definitions of each component.

Cropland used for crops: The sum of three of the cropland components, including (1) cropland harvested (net of double cropping), (2) crop failure, and (3) cultivated summer fallow (see definitions below). Represents the land used as an input for crop production.

Cropland harvested: Includes all 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. Also includes land used to produce Christmas trees. Cropland that was harvested more than once in a single year (i.e., double cropped) is only counted once. Represents the land area on which crops are grown.

Crop failure: The difference between the area planted, with the intention of harvesting and the area harvested. Thus, the acreage planted to cover crops and soil-improvement crops (not intended for harvest) is excluded from crop failure and is considered idle. Consists mainly of the acreage on which crops failed because of weather, insects, and diseases, and includes some land not harvested due to lack of labor, low market prices, or other factors.

Cultivated summer fallow: Cropland in subhumid areas of the West region 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 is a requirement for crop production in the drier cropland areas in 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. Occasionally referred to in this report simply as summer fallow, fallow, or fallowed.

Cropland pasture: Grazed land on which no crops were harvested this year but is considered to be in long-term crop rotation and/or could have been cropped without additional improvement. Cropland pastured before or after crops were harvested is included as cropland harvested and not cropland pasture. While the MLU's definition of cropland pasture has not changed, methodological changes in the 2007 and 2012 USDA, Censuses of Agriculture have led to a large portion of what had previously been classified as cropland pasture being reclassified as permanent grassland pasture and range.

Idle cropland: Includes land in cover and soil-improvement crops, as well as cropland on which no crops were planted. Also includes land enrolled in USDA, Farm Service Agency's Conservation Reserve Program (CRP), Wetlands Reserve Program (WRP), and Agricultural Conservation Easement Program Wetland Reserve Easements (ACEP-WRE), with CRP land used for emergency haying and grazing in that year excluded.

Grassland pasture and range: All open land used primarily for pasture and grazing (including shrub and brushland 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. Consists of private grazing land (not including cropland or forestland) and Federal grazing lands leased to the public. Also includes lands managed by the U.S. Department of the Interior, Bureau of Land Management, and nonforested lands managed by the U.S. Department of Agriculture, Forest Service.

Forest-use land: Land that serves commercial forest uses, as opposed to land that has forest cover but is used for other purposes. Thus, this land does not include forestland in parks, wildlife areas, or other special uses, which are included in the special uses category. This land is the sum of grazed forest and ungrazed forest-use land.

Grazed forest-use land: Non-Federal forestland that has grass or other forage growth, plus forested land that is leased out for grazing by the U.S. Department of Agriculture, Forest Service.

Ungrazed forest-use land: Forest-use land that is not used for grazing.

Special uses: Includes land in rural transportation, rural parks and wildlife areas, national defense and industrial areas, and farmsteads.

Rural transportation: Area covered by rural highways, roads, railways, and airports (excluding military bases).

Rural parks and wildlife: Areas in national and State park systems; designated areas owned by the USDA, Forest Service, and the U.S. Department of the Interior, Bureau of Land Management; and areas administered by the U.S. Department of the Interior, U.S. Fish and Wildlife Service and State wildlife agencies.

National defense and industrial: areas administered by the U.S. Department of Defense and the U.S. Department of Energy.

Farmsteads: Housing and roads on farms.

Urban areas: Urban areas in the Major Land Use (MLU) series follow the U.S. Department of Commerce, Bureau of the Census's (Census Bureau) urban-area definition. The Census Bureau compiles urban areas every 10 years, coincident with the Census Bureau's Census of Population. Census urban areas include densely populated areas with at least 50,000 people (or urbanized areas) and densely populated areas with 2,500–50,000 people (or 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" (U.S. Department of Commerce, Bureaus of the Census, 2010). In the 2000 Census, urban clusters replaced previous designations that were based on the boundaries of census-designated places. The 2000 Census's 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. For the MLU series, intercensus years are extrapolated.

Additional Terms and Sources

Forested land/forestland: Land at least 120 feet (37 meters) wide and at least 1 acre (0.4 hectare) in size with at least 10-percent cover (or equivalent stocking) by live trees including land that formerly had such tree cover and that will be naturally or artificially regenerated. Trees are woody plants having a more or less erect perennial stem(s) capable of achieving at least 3 inches (7.6 centimeters (cm)) in diameter at breast height, or 5 inches (12.7 cm) diameter at root collar and a height of 16.4 feet (5 meters) at maturity in situ. The definition here includes all areas recently having such conditions and currently regenerating or capable of attaining such condition in the near future. Forestland also includes transition zones, such as areas between forest and nonforest lands that have at least 10-percent cover (or equivalent stocking) with live trees and forest areas adjacent to urban and built-up lands. Unimproved roads and trails, streams, and clearings in forest areas are classified as forest if they are less than 120 feet (37 meters) wide or an acre (0.4 hectare) in size. Forestland does not include land that is predominantly under agricultural or urban land use. There are a number of components to total forestland, as defined in Oswalt et al. (2019), 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 use by statute or administrative regulation. Currently inaccessible and inoperable areas are included.

Reserved forestland: Forestland withdrawn from timber use through statute, administrative regulation, or designation without regard to productive status (Oswalt et al., 2014). Forested wilderness areas and parks are included in this category. The definition changed slightly in 1997. Before 1997, the reserved forestland definition depended on the timberland designation. Reserved timberland was classed as "productive reserved" forest, while nontimberland reserved forests were classified as "unproductive reserved" and included under the "other forest" land category (see below).

Other forestland: Forestland other than timberland and productive reserved forestland. It includes available forestland, which is incapable of annually producing 20 cubic feet (1.4 cubic meters) per acre (0.4 hectare) of industrial wood under natural conditions because of adverse site conditions, such as sterile soils, dry climate, poor drainage, high elevation, steepness, or rockiness.

National Resources Inventory (NRI): 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. NRI covers privately owned land, Tribal and trust lands, and lands controlled by State and local governments in the 48 contiguous States and, as of 2017, Hawaii and U.S. Caribbean territories (Alaska is not included). The NRI survey is conducted in 5-year intervals between 1977 and 1997; since 2000, NRI data have been gathered annually on about 40,000 core segments and a rotating panel of roughly 31,000 segments. 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 has been supplemented by onsite verification and comparison against administrative data (USDA, NRCS, 2020a). See table 3 in the NRI report for margins of error associated with the NRI estimates. NRI defines the following land-cover and land-use categories as (USDA, NRCS, 2020a):

Cropland: Areas used for the production of adapted crops for harvest. Two subcategories of cropland are recognized: cultivated and noncultivated.

Pastureland: Land managed primarily for the production of introduced forage plants for livestock grazing. Pastureland cover may consist of a single species in a pure stand, a grass mixture, or a grass-legume mixture. Management usually consists of cultural treatments including fertilization, weed control, reseeding or renovation, and control of grazing.

Rangeland: Includes land on which the climax or potential plant cover is composed principally of native grasses, grass-like plants, forbs, or shrubs suitable for grazing and browsing, and introduced forage species that are managed like rangeland. This would include areas where introduced hardy and persistent grasses, such as crested wheatgrass, are planted and such practices as deferred grazing, burning, chaining, and rotational grazing are used with little or no chemicals or fertilizer being applied. Grasslands, savannas, many wetlands, some deserts and tundra are considered to be 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. Also included is land bearing evidence of natural regeneration of tree cover (cutover forest or abandoned farmland) and not currently developed for nonforest use. Ten-percent stocked forestland, when viewed from a vertical direction, equates to an aerial 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.

Developed land: 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 sites; public administrative sites; railroad yards; cemeteries; airports; golf courses; sanitary landfills; sewage treatment plants; water control structures and spillways; other land used for such purposes; small parks (less than 10 acres) within urban and built-up areas; and highways, railroads, and other transportation facilities if they are surrounded by urban areas. Also included are tracts of less than 10 acres that do not meet the above definition but are completely surrounded by urban and built-up land. Two size categories are recognized in NRI.

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

Small built-up areas: Includes developed tracts of between 0.25 and 10 acres.

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

Water areas: Includes water bodies and streams that are permanent open water.

Appendix B: Description and Primary Data Sources for Major Land Use Estimates

Land use	Short description (see glossary for more details)	Primary 2017 data sources
Cropland	Cropland used for crops, idle cropland, and cropland pasture.	
Cropland used for crops	Cropland harvested (net of double cropping), plus crop failure and cultivated summer fallow.	USDA, National Agricultural Statistics Service (2017a, 2018a, 2019).
Idle cropland	Idle cropland that is not enrolled in government programs. Also includes acreage that is enrolled in the Conservation Reserve Program (CRP), the Wetlands Reserve Program (WRP), or a Wetland Reserve Easement (WRE) under the Agricultural Conservation Easement Program (ACEP), minus any CRP land that was used for emergency haying or grazing.	USDA, National Agricultural Statistics Service (2019), USDA, Farm Service Agency (2021a, 2021b); and USDA, Natural Resources Conservation Service (2021, 2022).
Cropland pasture	Land that is used only for pasture that could have been cropped without additional improvement.	USDA, National Agricultural Statistics Service (2019)
Grassland pasture and range	Nonfederally owned lands that are suitable for livestock grazing, plus federally-owned nonforested land that is leased out for grazing by the USDA, Forest Service and the U.S. Department of the Interior, Bureau of Land Management.	USDA, Natural Resources Conservation Service (2020a, 2020b); USDA, National Agricultural Statistics Service (2019); USDA, Forest Service (2017a, 2017b, 2017c); U.S. Department of the Interior, Bureau of Land Management (2017, 2018).
Forest-use land	Forestland that is suitable for commercial purposes, such as timber production or grazing.	
Grazed forest-use	Nonfederally owned forestland that has grass or other forage growth, plus forestland that is leased out for grazing by the USDA, Forest Service.	USDA, National Agricultural Statistics Service (2019); USDA, Natural Resources Conservation Service (2020a); USDA, Forest Service (2017a, 2017b, 2017c).
Ungrazed forest-use	Ungrazed forestland that serves commercial purposes. Does not include forestland in parks, wilderness, or wildlife areas.	Oswalt, N.S., Smith, W.B., Miles, P.D., & Pugh, S.A. (2019). *Forest resources of the United States, 2017: A technical document supporting the Forest Service 2020 RPA Assessment* (Report No. General Technical Report WO-97). U.S. Department of Agriculture, Forest Service.
Special-use areas	Select rural land uses.	
Rural parks	Areas in national and State park systems.	U.S. Department of the Interior, National Park Service (2018); Smith, J., & Leung, Y.F. (2019). *Select metrics describing the operations of America's state park systems.* Utah State University, University Libraries.
Wilderness areas	Designated areas that are owned by USDA, Forest Service and U.S. Department of the Interior, Bureau of Land Management.	USDA, Forest Service (2017b); U.S. Department of the Interior, Bureau of Land Management (2018).

Land use	Short description (see glossary for more details)	Primary 2017 data sources
Special-use areas	Select rural land uses.	
Wildlife areas	Areas that are administered by the U.S. Department of the Interior, U.S. Fish and Wildlife Service and State wildlife agencies.	U.S. Department of the Interior, U.S. Geological Survey (2018).
Defense and industrial areas	Areas that are administered by the U.S. Department of Defense and U.S. Department of Energy.	U.S. Department of Defense (2018); U.S. Department of the Interior, U.S. Geological Survey (2018).
Rural transportation	Rural highways, roads, railways, and airports (excluding military bases).	U.S. Department of Transportation, Federal Highway Administration (2018); U.S. Department of Transportation, Bureau of Transportation Statistics (2017, 2021). Nonrural railways and airports were removed using the U.S. Department of Commerce, Bureau of the Census (2017) Urban Areas shapefile.
Farmsteads and farm roads	Housing and roads on farms.	USDA, National Agricultural Statistics Service (2019); U.S. Department of Commerce, Bureau of the Census (2014b).
Urban areas	Densely populated areas that have at least 2,500 people, as defined by the U.S. Department of Commerce, Bureau of the Census.	U.S. Department of Commerce, Bureau of the Census (2014a). Inter-census estimates are extrapolated.

Source: USDA, Economic Research Service compilation using USDA, National Agricultural Statistics Service, Acreage, Crop Production, 2017 Summary, and 2017 Census of Agriculture; USDA, Farm Service Agency, Conservation Reserve Program, Summary and Enrollment statistics, Fiscal Year 2017, and CRP Emergency Haying And Grazing Data, Fiscal Year 2017; USDA, Natural Resources Conservation Service, Summary Report: 2017 National Resources Inventory, 2017 National Resources Inventory, WRP Cumulative Agreement Data By State And Fiscal Year, and ACEP Cumulative Agreement Data By State And Fiscal Year; USDA, Forest Service (FS), Grazing Statistical Summary, Fiscal Year 2017, Land Areas of the National Forest System as of September 30, 2017, and USDA, FS Grazing Allotments; U.S. Department of Commerce, Bureau of the Census, 2010 Census of Population and Housing, Summary Population and Housing Characteristics, United States, 2013 American Housing Survey, and Census Urban Area National Topologically Integrated Geographic Encoding and Referencing (TIGER)/line shapefile; U.S. Department of Defense, Base structure Report Fiscal Year 2018 Baseline; U.S. Department of the Interior, Bureau of Land Management, Public Land Statistics 2017, and National Park Service Acreage Report: Calendar Year 2017; U.S. Department of the Interior, National Park Service, National Park Service Acreage Report: Calendar Year 2017; U.S. Department of Transportation, Bureau of Transportation Statistics, National Transportation Atlas Databases (NTAD), North American Rail Network (NARN) Dataset, and National Transportation Atlas Databases (NTAD), Aviation Facilities Dataset; U.S. Department of Transportation, Federal Highway Administration, Highway Statistics Series: Highway Statistics 2017; U.S. Department of the Interior, U.S. Geological Survey, Protected Areas Database of the United States (PAD-US); Oswalt, N.S., Smith, W.B., Miles, P.D., & Pugh, S.A. (2019). *Forest resources of the United States, 2017: A technical document supporting the Forest Service 2020 RPA Assessment* (Report No. General Technical Report WO-97). U.S. Department of Agriculture, Forest Service.; and Smith, J., & Leung, Y.F. (2019). *Select metrics describing the operations of America's state park systems.* Utah State University, University Libraries. Utah State University, University Libraries.

Appendix C: Major Land Use (MLU) Regions and Land Areas

Regions and States	Land area (1,000 acres)	Percent of 48 States	Percent of U.S. total
Northeast	111,123	5.9	4.9
Maine	19,739	1.0	0.9
New Hampshire	5,730	0.3	0.3
Vermont	5,899	0.3	0.3
Massachusetts	4,992	0.3	0.2
Rhode Island	662	0.0	0.0
Connecticut	3,099	0.2	0.1
New York	30,161	1.6	1.3
New Jersey	4,707	0.2	0.2
Pennsylvania	28,635	1.5	1.3
Delaware	1,247	0.1	0.1
Maryland	6,213	0.3	0.3
District of Columbia	39	0.0	0.0
Lake States	121,807	6.4	5.4
Michigan	36,185	1.9	1.6
Wisconsin	34,661	1.8	1.5
Minnesota	50,961	2.7	2.3
Corn Belt	164,355	8.7	7.3
Ohio	26,151	1.4	1.2
Indiana	22,929	1.2	1.0
Illinois	35,532	1.9	1.6
Iowa	35,749	1.9	1.6
Missouri	43,995	2.3	1.9
Northern Plains	194,173	10.3	8.6
North Dakota	44,161	2.3	2.0
South Dakota	48,519	2.6	2.1
Nebraska	49,167	2.6	2.2
Kansas	52,326	2.8	2.3
Appalachian	123,435	6.5	5.5
Virginia	25,274	1.3	1.1
West Virginia	15,384	0.8	0.7
North Carolina	31,115	1.6	1.4
Kentucky	25,271	1.3	1.1
Tennessee	26,390	1.4	1.2
Southeast	122,780	6.5	5.4
South Carolina	19,239	1.0	0.9
Georgia	36,809	1.9	1.6
Florida	34,320	1.8	1.5
Alabama	32,413	1.7	1.4
Delta States	90,984	4.8	4.0
Mississippi	30,031	1.6	1.3
Arkansas	33,303	1.8	1.5
Louisiana	27,650	1.5	1.2

Regions and States	Land area (1,000 acres)	Percent of 48 States	Percent of U.S. total
Southern Plains	211,089	11.2	9.3
Oklahoma	43,901	2.3	1.9
Texas	167,188	8.8	7.4
Mountain	547,691	29.0	24.2
Montana	93,149	4.9	4.1
Idaho	52,892	2.8	2.3
Wyoming	62,140	3.3	2.7
Colorado	66,331	3.5	2.9
New Mexico	77,631	4.1	3.4
Arizona	72,700	3.8	3.2
Utah	52,589	2.8	2.3
Nevada	70,260	3.7	3.1
Pacific	203,663	10.8	9.0
Washington	42,532	2.2	1.9
Oregon	61,432	3.2	2.7
California	99,699	5.3	4.4
48 States	1,891,099	100	83.7
Far West	369,321	NA	16.3
Alaska	365,210	NA	16.2
Hawaii	4,110	NA	0.2
U.S. total	2,260,420	NA	100

NA = Not applicable.

Note: Distribution may not add to totals because of rounding. Regions are based on previous Major Land Use reports and historic USDA, National Agricultural Statistics Service (NASS) production regions.

Source: USDA, Economic Research Service based on land area data from U.S. Department of Commerce, Bureau of the Census, *2010 Census of Population and Housing summary population and housing characteristics, United States.*

Appendix D: Wording, Placement, and Reported Values for Cropland Pasture Question in the USDA, National Agricultural Statistics Service's Census of Agriculture, 2002–17

Year	Section	Wording	Acres reported (million acres)
1997	Cropland	Cropland used only for pasture or grazing (include rotation pasture and grazing land that could have been used for crops without additional improvements).	66.4
2002	Cropland	Cropland used only for pasture or grazing (include rotation pasture and grazing land that could have been used for crops without additional improvements).	60.6
2007	Pasture	Cropland used only for pasture or grazing (include rotation pasture and grazing land that could have been used for crops without additional improvements).	35.8
2012	Pasture	Other pasture and grazing land (including rotational pasture) that could have been used for crops without additional improvements.	12.8
2017	Pasture	Other pasture and grazing land (including rotational pasture) that could have been used for crops without additional improvements.	13.8

Source: USDA Economic Research Service using USDA, National Agricultural Statistics Service, 2002–2017 Census of Agriculture data.