HEADWATERS ECONOMICS

A Profile of Land Use

Selected Geographies:

Yellowstone County, MT

Benchmark Geographies:

U.S.

Produced by
Headwaters Economics'
Economic Profile System (EPS)
https://headwaterseconomics.org/eps
June 12, 2018

Land Use

Yellowstone County, MT

About the Economic Profile System (EPS)

EPS is a free web tool created by Headwaters Economics to build customized socioeconomic reports of U.S. counties, states, and regions. Reports can be easily created to compare or aggregate different areas. EPS uses published statistics from federal data sources, including the U.S. Census Bureau, Bureau of Economic Analysis, and Bureau of Labor Statistics.

The Bureau of Land Management and Forest Service have made significant financial and intellectual contributions to the operation and content of EPS.

See https://headwaterseconomics.org/eps for more information about the capabilities of EPS. For technical questions, contact Patty Gude at eps@headwaterseconomics.org or telephone 406-599-7425.

HEADWATERS ECONOMICS

headwaterseconomics.org

Headwaters Economics is an independent, nonprofit research group. Our mission is to improve community development and land management decisions.

NATIONAL SYSTEM OF PUBLIC LANDS
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

www.blm.gov

The Bureau of Land Management, an agency within the U.S. Department of Interior, administers 249.8 million acres of America's public lands, located primarily in western states. It is the mission of the Bureau of Land Management to sustain the health, diversity, and productivity of public lands for the use and enjoyment of present and future generations.

FOREST SERVICE
US
DEPARTMENT OF AGRICULTURE

www.fs.fed.us

The Forest Service, an agency of the U.S. Department of Agriculture, administers national forests and grasslands encompassing 193 million acres. The Forest Service's mission is to sustain the health, diversity, and productivity of the nation's forests and grasslands to meet the needs of present and future generations.

Land Use

Yellowstone County, MT

Table of Contents

Note to Users:

This is one of 14 reports that can be created and downloaded from EPS. Topics include land use, demographics, specific industry sectors, the role of non-labor income, the wildland-urban interface, the role of amenities in economic development, and payments to county governments from federal lands. The EPS reports are downloadable as Excel or PDF documents. See https://headwaterseconomics.org/eps.

Land Use

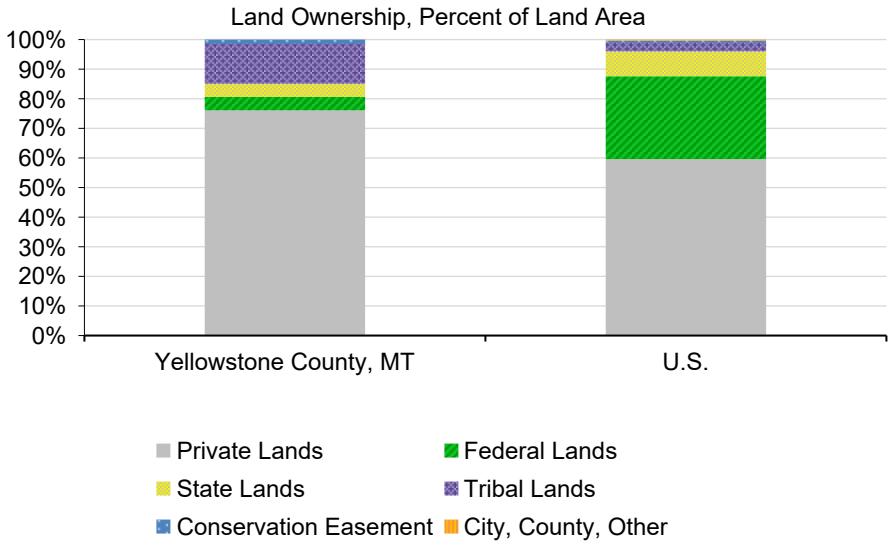
Yellowstone County, MT

Land Ownership

	Yellowstone County, MT	U.S.
Total Acres	1,695,290	2,301,106,907
Private Lands	1,309,636	1,383,075,581
Conservation Easement	25,990	19,026,854
Federal Lands	77,806	649,455,740
Forest Service	0	192,507,338
BLM	77,336	242,951,818
National Park Service	0	78,773,678
Military	0	22,945,136
Other Federal	470	112,277,770
State Lands	76,847	194,258,469
State Trust Lands*	72,255	46,116,200
Other State	4,592	148,142,269
Tribal Lands	231,001	66,666,114
City, County, Other	0	7,650,993
Percent of Total		
Private Lands	77.3%	60.1%
Conservation Easement	1.5%	0.8%
Federal Lands	4.6%	28.2%
Forest Service	0.0%	8.4%
BLM	4.6%	10.6%
National Park Service	0.0%	3.4%
Military	0.0%	1.0%
Other Federal	0.0%	4.9%
State Lands	4.5%	8.4%
State Trust Lands*	4.3%	2.0%
Other State	0.3%	6.4%
Tribal Lands	13.6%	2.9%
City, County, Other	0.0%	0.3%

* Most state trust lands are held in trust for designated beneficiaries, principally public schools. Managers may lease and sell these lands for a diverse range of uses to generate revenues for the beneficiaries.

- The U.S. has the largest share of federal public lands (28.2%), and Yellowstone County, MT has the smallest (4.6%).
- The U.S. has the largest share of state public lands (8.4%), and Yellowstone County, MT has the smallest (4.5%).
- Yellowstone County, MT has the largest share of private lands (77.3%), and the U.S. has the smallest (60.1%).



Data Sources: U.S. Geological Survey, Gap Analysis Program. 2016. Protected Areas Database of the United States (PADUS) version 1.4

Land Use

Yellowstone County, MT

Land Ownership

What do we measure on this page?

This page describes the share of the selected location that is private and the share that is managed by various public agencies.

The data presented in this report were calculated using Geographic Information System (GIS) tools. Two primary GIS datasets were used: U.S. Census Bureau's TIGER/Line County Boundaries[1] and U.S. Geological Survey's Protected Areas Database (PADUS).[2, 3]

Although every attempt was made to use the best available GIS land ownership dataset, the data sometimes have errors or become outdated. Please report any inaccuracies to eps@headwaterseconomics.org.

Why is it important?

Decisions made by public land managers may influence the local economy, particularly if public lands represent a large portion of the land base. Agency management actions that affect water quality, access to recreation, scenery (as well as other quality-of-life amenities), and the extent and type of resource extraction are particularly important in areas where much of the land is managed by public agencies.

Federal and state land managers, private land owners, and others are constrained in different ways by laws and regulations that dictate how different lands can be managed. Adjacency can offer challenges and opportunities.

In addition, where a large portion of land is owned and managed by federal agencies, local governments may rely heavily on federal PILT ("Payments in Lieu of Taxes") and revenue-sharing payments such as those from the Secure Rural Schools and Community Self-Determination Act or BLM Taylor Grazing Act.

The EPS Federal Land Payments report provides additional information about payments made to counties with federal public lands: https://headwaterseconomics.org/eps.

Land Use

Yellowstone County, MT

Types of U.S. Forest Service Lands

	Yellowstone County, MT	U.S.
Total Acres (2009)	1,695,290	2,301,106,907
Forest Service Lands	0	192,750,310
Unspecified Designated Area Type	0	146,630,207
National Wilderness	0	36,155,579
National Monument	0	3,661,327
National Recreation Area	0	2,950,660
National Game Refuge	0	1,198,099
National Wild River	0	568,059
National Recreation River	0	398,207
National Scenic River	0	289,617
National Scenic Area	0	230,459
Primitive Area	0	173,762
National Volcanic Monument	0	167,427
Special Management Area	0	164,707
Protection Area	0	45,051
Recreation Management Area	0	43,900
National Scenic and Wildlife Area	0	39,171
Scenic Recreation Area	0	12,645
National Botanical Area	0	8,256
National Scenic and Research Area	0	6,637
National Historic Area	0	6,540

Percent of Total

Forest Service Lands	0.0%	8.4%
Unspecified Designated Area Type	0.0%	6.4%
National Wilderness	0.0%	1.6%
National Monument	0.0%	0.2%
National Recreation Area	0.0%	0.1%
National Game Refuge	0.0%	0.1%
National Wild River	0.0%	0.0%
National Recreation River	0.0%	0.0%
National Scenic River	0.0%	0.0%
National Scenic Area	0.0%	0.0%
Primitive Area	0.0%	0.0%
National Volcanic Monument	0.0%	0.0%
Special Management Area	0.0%	0.0%
Protection Area	0.0%	0.0%
Recreation Management Area	0.0%	0.0%
National Scenic and Wildlife Area	0.0%	0.0%
Scenic Recreation Area	0.0%	0.0%
National Botanical Area	0.0%	0.0%
National Scenic and Research Area	0.0%	0.0%
National Historic Area	0.0%	0.0%

County specific acreages for Forest Service National Game Refuges are not available for the following states: Arkansas, Florida, Georgia, Louisiana, North Carolina, South Carolina, and Tennessee.

Data Sources: USDA, FS - Land Areas Report 2009, Oracle LAR Database

Types of U.S. Forest Service Lands

What do we measure on this page?

This page describes the acreage and share of different U.S. Forest Service land designations.

All acreages on this page were reported by the U.S. Forest Service's Land Areas Report.[4, 5] The total acreage of Forest Service land on this page may differ from that reported on previous pages because of differences in data sources.

Why is it important?

These data allow the user to see the range and scale of U.S. Forest Service land designations that may impact the economic value and uses of associated lands.

Land Use

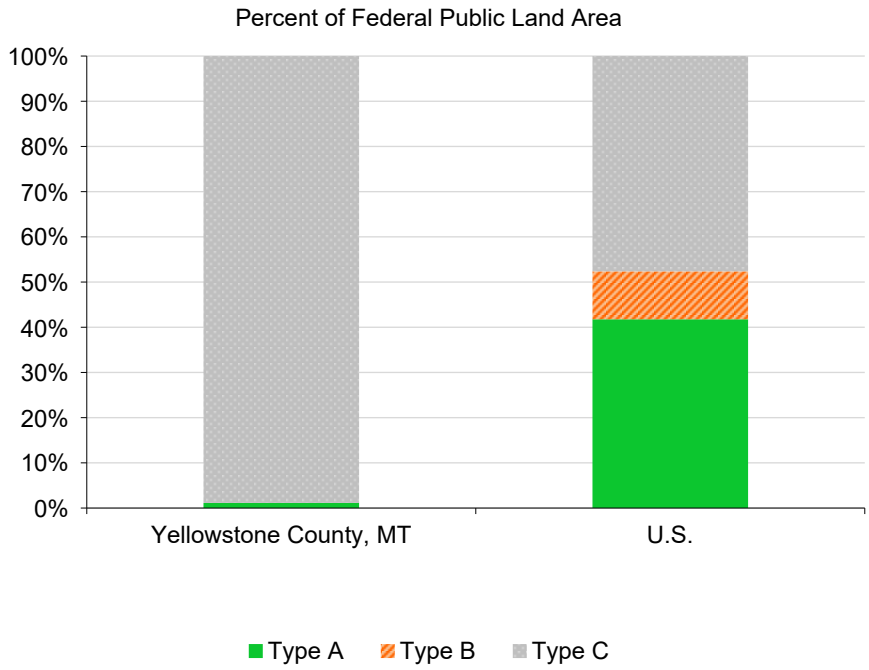
Yellowstone County, MT

Types of Federal Lands

	Yellowstone County, MT	U.S.
Total Acres of Type A, B, and C Lands	77,959	623,478,537
Type A	884	260,397,439
Type B	0	66,039,395
Type C	77,075	297,041,703
Percent of Total*		
Type A	1.1%	41.8%
Type B	0.0%	10.6%
Type C	98.9%	47.6%

* Percent of total federal lands classified as either Type A, B, or C.

- The U.S. has the largest share of Type A land (41.8%), and Yellowstone County, MT has the smallest (1.1%).
- The U.S. has the largest share of Type B land (10.6%), and Yellowstone County, MT has the smallest (0%).
- Yellowstone County, MT has the largest share of Type C land (98.9%), and the U.S. has the smallest (47.6%).



Type A lands include National Parks and Preserves (NPS), Wilderness (NPS, FWS, FS, BLM), National Conservation Areas (BLM), National Monuments, (NPS, FS, BLM), National Recreation Areas (NPS, FS, BLM), National Wild and Scenic Rivers (NPS, FS, BLM), Waterfowl Production Areas (FWS), Wildlife Management Areas (FWS), Research Natural Areas (FS, BLM), Areas of Critical Environmental Concern (BLM), and National Wildlife Refuges (FWS).

Type B lands include Wilderness Study Areas (NPS, FWS, FS, BLM), Inventoried Roadless Areas (FS).

Type C lands include Public Domain Lands (BLM), O&C Lands (BLM), National Forests and Grasslands (FS).

Data Sources: U.S. Geological Survey, Gap Analysis Program. 2016. Protected Areas Database of the United States (PADUS) version 1.4; Rasker, R. 2006. "An Exploration Into the Economic Impact of Industrial Development Versus Conservation on Western Public Lands." Society and Natural Resources. 19(3): 191-207.

Types of Federal Lands

What do we measure on this page?

This page describes the acreage and share of federal public lands managed for various purposes under differing statutory authority. For purposes of this section, federal public lands have been defined as Type A, B, or C.[6, 7] Private lands and areas managed by state agencies and local government are not included in this classification.

Type A lands tend to have more managerial and commercial use restrictions than Type C lands, represent smaller proportions of total land management areas (except within Alaska), and have a designation status less easily changed than Type B lands. They may be described as areas having uncommon bio-physical and/or cultural character worth preserving.

Type B lands are similar to Type A lands in terms of activities allowed. They may be described as areas worth preserving that have limited development and motorized transportation.

Type C lands generally have no special designations. They represent the bulk of federal land management areas and may allow a wider range of uses or compatible activities including timber production, mining and energy development, grazing, recreation, and large-scale watershed projects and fire management options. Type C lands may be described as areas where the landscape may be altered within the objectives and guidelines of multiple use.

The classifications offered on this page are categories of relative degrees of management priority, categorized by land designation. Lands such as wilderness and national monuments, for example, are more likely to be managed for conservation and recreation, even though there may exist exceptions (e.g., a pre-existing mine in a wilderness area or oil and gas development in a national monument). Forest Service and BLM lands without designations are more likely to allow commercial activities such as mining and timber harvesting.

Why is it important?

Some types of federal lands, such as National Parks, National Monuments, and Wilderness, can be associated with above-average economic growth. These lands by themselves do not guarantee economic growth but when combined with other factors, such as an educated workforce and access to major markets via airports, they have been shown to be statistically significant predictors of growth.[8, 9, 10, 11]

The acreage in particular land types may not be the only indicator of quality. For example, Wild and Scenic Rivers may provide amenity values far greater than their land acreage would indicate.

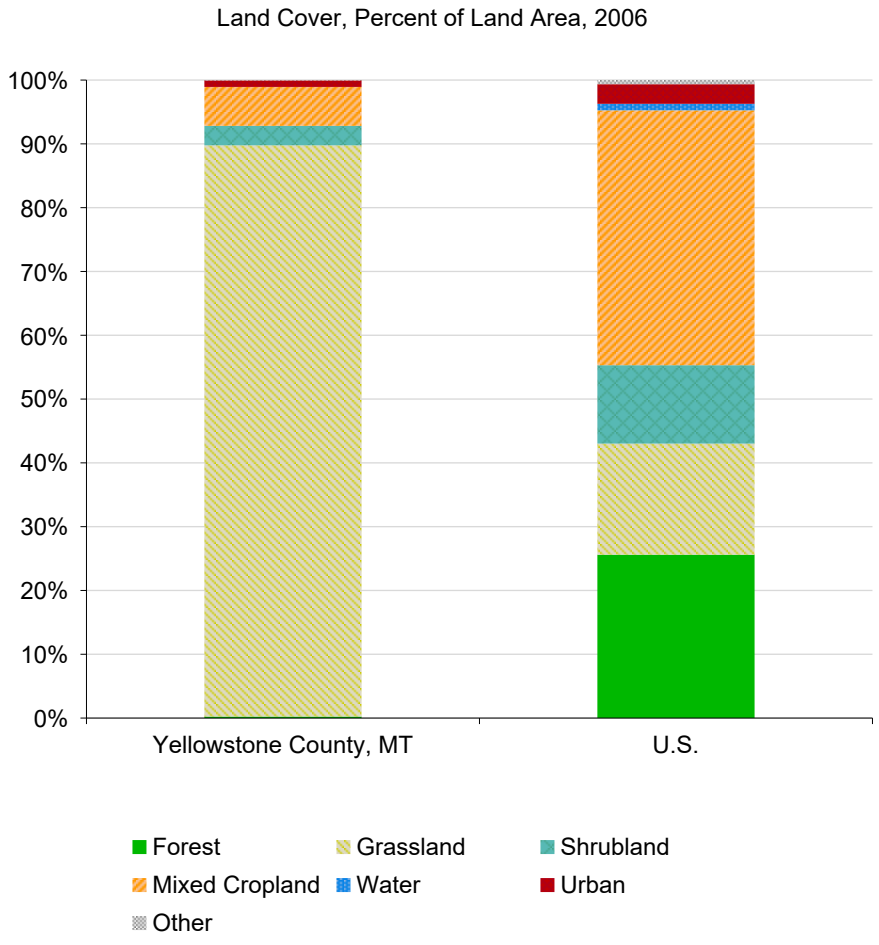
Land Use

Yellowstone County, MT

Forest, Grassland, and Other Land Cover

	Yellowstone County, MT	U.S.
Total Acres (2006)	1,695,290	2,301,106,907
Forest	3,951	575,276,727
Grassland	1,491,855	391,188,174
Shrubland	50,859	276,132,829
Mixed Cropland	101,717	897,431,694
Water	0	23,011,069
Urban	16,953	69,033,207
Other	988	14,643,750
Percent of Total		
Forest	0.2%	25.0%
Grassland	88.0%	17.0%
Shrubland	3.0%	12.0%
Mixed Cropland	6.0%	39.0%
Water	0.0%	1.0%
Urban	1.0%	3.0%
Other	0.1%	0.6%

- The U.S. has the largest share of forest cover (25%), and Yellowstone County, MT has the smallest (0.2%).
- Yellowstone County, MT has the largest share of grassland cover (88%), and the U.S. has the smallest (17%).
- The U.S. has the largest share of shrubland cover (12%), and Yellowstone County, MT has the smallest (3%).



Data Sources: NASA MODIS Land Cover Type Yearly L3 Global 1km MOD12Q1, 2006.

Forest, Grassland, and Other Land Cover

What do we measure on this page?

This page describes the acreage and share of various land cover types.

The National Land Cover Database (NLCD) was selected to describe cover types because it is publicly available and has a relatively small number of general classes that are easily summarized.[12]

NLCD is based primarily on a decision-tree classification of Landsat satellite data, and uses a 16-class land cover classification scheme that has been applied consistently across the United States.[13] These classes were summarized into seven classes as follows:

Forest: An aggregate of the following NLCD classes: Evergreen Forest, Deciduous Forest, and Mixed Forest.

Grassland: An aggregate of the following NLCD classes: Grasslands, Sedge, Lichens, and Moss.

Shrubland: An aggregate of the following NLCD classes: Dwarf Scrub and Shrub/Scrub.

Mixed Cropland: An aggregate of the following NLCD classes: Pasture/Hay and Cultivated Crops.

Water: The same in the original NLCD Open Water classification.

Urban: An aggregate of the four Developed classes within NLCD.

Other: An aggregate of the following NLCD classes: Barren Land, Perennial Ice/Snow, and the two Wetlands classifications.

Why is it important?

The mix of land cover influences a range of socioeconomic and natural factors, including potential and suitable economic activities, the availability of recreation opportunities, water storage, the potential for wildfire, and other cultural and economic factors.

For data on development in wildfire-prone areas, create an EPS Wildland-Urban Interface report at https://headwaterseconomics.org/eps.

Land Use

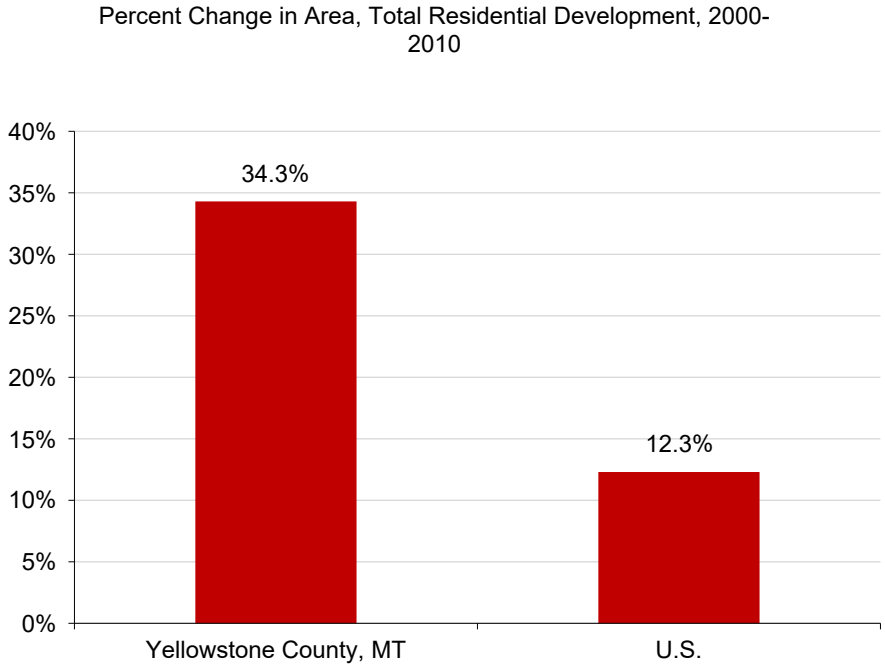
Yellowstone County, MT

Residential Development (Acres)

	Yellowstone County, MT	U.S.
Total Private Land, Acres (2000-2010)	1,309,636	1,383,075,581
Total Residential, 2000	54,064	190,918,648
Urban/Suburban, 2000	15,774	31,001,465
Exurban, 2000	38,290	159,917,167
Total Residential, 2010	72,619	214,475,717
Urban/Suburban, 2010	18,629	37,816,640
Exurban, 2010	53,990	176,659,056
Percent Change in Total Residential	34.3%	12.3%
Percent of Total*		
Total Residential, 2000	4.1%	13.8%
Urban/Suburban, 2000	1.2%	2.2%
Exurban, 2000	2.9%	11.6%
Total Residential, 2010	5.5%	15.5%
Urban/Suburban, 2010	1.4%	2.7%
Exurban, 2010	4.1%	12.8%

* The percentages in this table represent the percent of private land developed at various housing densities, and should not sum to 100%.

- From 2000 to 2010, Yellowstone County, MT had the largest percent change in residential development (34.3%), and the U.S. had the smallest (12.3%).



Data Sources: Theobald, DM. 2013. Land use classes for ICLUS/SERGoM v2013. Unpublished report, Colorado State University.

Residential Development (Acres)

What do we measure on this page?

This page describes the area (in acres) used for housing and the rate at which this area is growing.

Comparisons in development patterns are made between 2000 and 2010. The data can also be used to draw comparisons between locations. These are the latest published data available from the Decennial Census.

Statistics are provided for residential areas developed at relatively high densities (urban/suburban areas where the average residential lot sizes are less than 1.7 acres) and those developed at relatively low densities (exurban areas where the average lot sizes are between 1.7 and 40 acres). Urban/suburban areas, as shown here, combine “urban” housing densities (less than 0.25 acres per unit) and “suburban” housing densities (0.25–1.7 acres per unit). Urban and suburban are represented in one class because they often represent a small proportion of the land area within counties. Lot sizes greater than 40 acres are more typical of working agricultural landscapes and are not considered residential, and therefore are not discussed here.

Locations with a large percent change in the area of residential development often have experienced significant in-migration from more urbanized areas. Counties with a small percent change either experienced little growth or were already highly urbanized in 2000.[14]

Why is it important?

In the past decade, the conversion of open space and agricultural land to residential development has continued at a rapid pace in many parts of the U.S. The popularity of exurban lot sizes in much of the country has exacerbated this trend. Low-density development results in a larger area of land converted to residential development.[15]

This pattern of development reflects several factors, including demographic trends, the increasingly "footloose" nature of economic activity, the availability and price of land, and preferences for homes on larger lots. Development patterns can affect resident’s quality of life and safety, and impact protected areas as development increasingly pushes up against public land boundaries.[16] Human-wildlife conflicts and wildfire threats may become more serious issues as development continues. In addition, there may be new demands for recreation opportunities and concern about commodity uses of the landscape.

For data on development in wildfire-prone areas, create an EPS Wildland-Urban Interface report at https://headwaterseconomics.org/eps.

Land Use

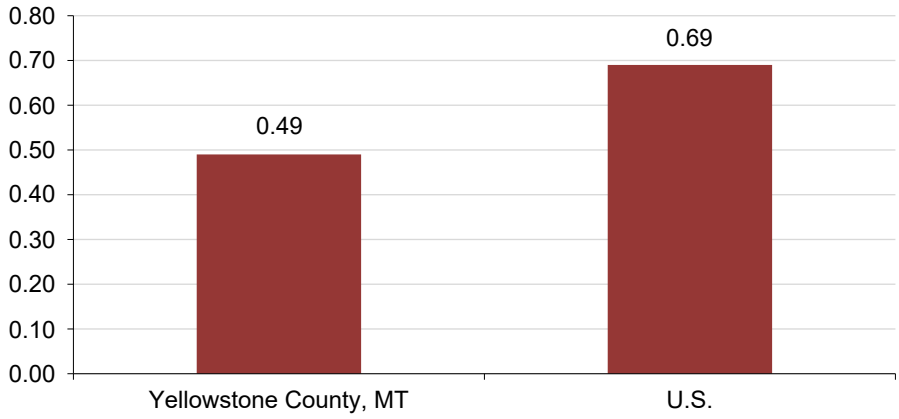
Yellowstone County, MT

Residential Development (Population Density)

	Yellowstone County, MT	U.S.
Residential Acres/Person, 2000	0.42	0.67
Residential Acres/Person, 2010	0.49	0.69
Change in Residential Acres/Person, 2000-2010*	0.07	0.02
Private Acres/Person, 2010	8.82	4.43

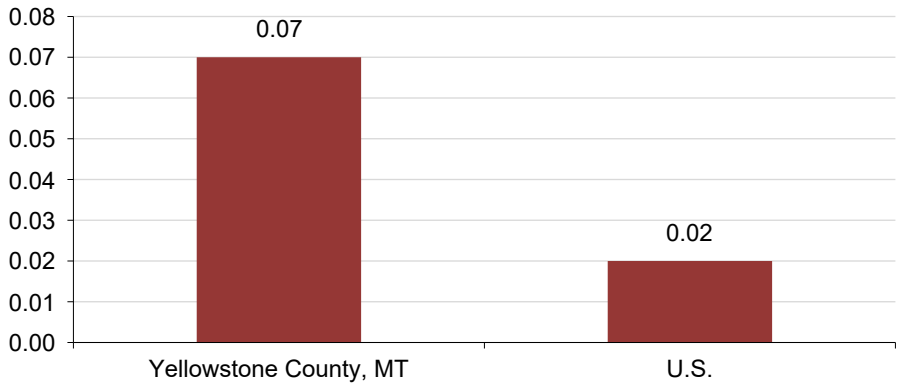
- In 2010, Yellowstone County, MT had the largest average acreage in residential development per person (8.82 acres), and the U.S. had the smallest (4.43 acres).

Average Residential Acres per Person, 2010



- From 2000 to 2010, Yellowstone County, MT had the largest change in average acreage in residential development per person (0.07 acres), and the U.S. had the smallest (0.02 acres).

Change in Average Residential Acres per Person, 2000-2010



Data Sources: Theobald, DM. 2013. Land use classes for ICLUS/SERGoM v2013. Unpublished report, Colorado State University.

Residential Development (Population Density)

What do we measure on this page?

This page describes the degree to which development patterns have changed (becoming more or less dense) between 2000 and 2010.

Per capita consumption of land used for housing is a measure of the pattern of development (i.e., denser or more sprawling). Comparisons in development patterns are made between 2000 and 2010. The data can also be used to draw comparisons between locations. These are the latest published data available from the Decennial Census.

Land consumption is expressed as the average number of acres that each person uses for housing (the average lot size) within a selected location. Importantly, these figures refer only to residential development and do not include farms or ranches greater than 40 acres. Population density is also displayed as the acres of private land per person.

Areas with negative values of change in residential acres/person were more densely developed in 2010 than in 2000. Large positive values of change indicate that an area was substantially more sprawling in 2010 than it was in 2000. It is important to note that a small change does not indicate that the selected location is not sprawling, but rather that the pattern of development has not changed substantially over the time period.

Why is it important?

Outside of urban areas, large lot development has increased since the 1970s in many parts of the country.

Population growth is a metric often used to describe human impacts. However, in most locations land consumption is outpacing population growth. In these areas, land consumption (the area of land used for residential development) is strongly related to the loss of natural areas and impacts on ecological processes. Impacts include changes in ecosystem structure; effects on crucial wildlife habitat; and exposure to humans through hunting, exotic species, and disease.[15]

The pattern of land consumption in 2010 shown in the top graph (*Average Residential Acres per Person*) is equally important as the change in land consumption shown in the bottom graph (*Change in Average Residential Acres per Person*). Locations where the average number of residential acres per person is greater than one acre have considerable sprawling development.

Land Use

Yellowstone County, MT

Data Sources & Methods

The EPS Land Use report uses national data sources to represent land cover and residential development. In an effort to report more accurate statistics for land ownership, a compilation of state-level data was used. All the data in this report were the result of calculations made in Geographic Information Systems (GIS). The contact information for databases used in this profile is:

- **TIGER/Line County Boundaries**
  Bureau of the Census, U.S. Department of Commerce
  https://www.census.gov/geo/maps-data/data/tiger.html
- **Protected Areas Database**
  U.S. Geological Survey, Gap Analysis Program
  https://gapanalysis.usgs.gov/padus/
- **Developed Areas**
  Theobald, DM. 2013. Land use classes for ICLUS/SERGoM v2013.
  Unpublished report, Colorado State University.
- **National Land Cover Database**
  Multi-Resolution Land Characteristics Consortium
  https://www.mrlc.gov/
- **USDA Forest Service**
  Land Areas Report, Oracle LAR Database
  https://www.fs.fed.us/land/staff/lar-index.shtml

EPS core approaches
EPS is designed to focus on long-term trends across a range of important measures. Trend analysis provides a more comprehensive view of changes than spot data for select years. We encourage users to focus on major trends rather than absolute numbers. EPS displays detailed industry-level data to show changes in the composition of the economy over time and the mix of industries at points in time. EPS employs cross-sectional benchmarking—comparing smaller areas such as counties to larger regions, states, and the nation—to give a sense of relative performance. EPS allows users to aggregate data for multiple locations to allow for more sophisticated cross-sectional comparisons.

Endnotes

1 - U.S. Census Bureau TIGER/Line Boundaries are available at https://census.gov/geo/maps-data/data/tiger-line.html.

2 - The U.S. Geological Survey Protected Aeas Database (PADUS) is available at https://gapanalysis.usgs.gov/padus/.

3 - If accurate measurements of water surface area are needed, the U.S. Geological Survey's national hydrography dataset can be used: https://nhd.usgs.gov/.

4 - A copy of the most recent Forest Service Land Areas Report, including detailed tables, is available at https://www.fs.fed.us/land/staff/lar-index.shtml.

5 - U.S. Forest Service Land Areas Report definitions of terms are available at https://www.fs.fed.us/land/staff/lar/definitions_of_terms.htm.

6 - The definitions of land classifications (Type A, B, and C) are not legal or agency-approved, and are provided only for comparative purposes.

7 - Land defined as either Type A, B, or C includes areas managed by the National Park Service, the Forest Service, the Bureau of Land Management, or the Fish and Wildlife Service. Lands administered by other federal agencies (including the Army Corps of Engineers, Bureau of Reclamation, Department of Agriculture, Department of Defense, Department of Energy, and Department of Transportation) were not classified into Type A, B, or C. Therefore, the total acreage of Type A, B, and C lands may not add to the Total Federal Land Area reported on page 1 of this report.

8 - Studies, articles, and literature reviews on the economic contribution of protected public lands are available at https://headwaterseconomics.org/public-lands/public-lands-research/.

9 - An annotated bibliography of studies on the economic contributions of public lands can be found at https://headwaterseconomics.org/wp-content/uploads/Annotated_Bib_Value_Public_Lands.pdf.

10 - For an analysis on the effect of wilderness designations on local economies, in particular on resource-based industries, see Duffy-Deno KT. 1998. The Effect of Federal Wilderness on County Growth in the Intermountain Western United States. Journal of Regional Science 38(1):109-136. For the results of a national survey of residents in counties with Wilderness, see Rudzitis G and Johansen HE. 1991. How Important is Wilderness? Results from a United States Survey. Environmental Management 15(2):227-233.

11 - For analysis of the role of transportation in high-amenity areas, see Rasker R, Gude PH, Gude JA, and van den Noort J. 2009. The Economic Importance of Air Travel in High-Amenity Rural Areas. Journal of Rural Studies 25(2009):343-353.

Endnotes (cont.)

12 - Land cover data is available from many sources. Other commonly used datasets in the United States are the U.S. Geological Survey's National Land Cover Dataset and state and regional GAP datasets available from the U.S. Geological Survey's National Biological Information Infrastructure. Information about these and many other land cover datasets can be viewed at https://landcover.usgs.gov/landcoverdata.php.

13 - For more information about the National Land Cover Database, see https://www.mrlc.gov/.

14 - For an overview of past national land-use trends, see Brown DG, Johnson KM, Loveland TR, and Theobald DM. 2005. Rural land-use trends in the conterminous United States, 1950–2000. Ecological Applications 15(6):1851–1863; Theobald DM. 2005. Landscape Patterns of Exurban Growth in the USA from 1980 to 2020. Ecology and Society 10(1):32.

15 - The following paper provides an overview of the ecological effects of residential development: Hansen AJ, Knight R, Marzluff J, Powell S, Brown K, Hernandez P, and Jones K. 2005. Effects of exurban development on biodiversity: patterns, mechanisms, research needs. Ecological Applications 15(6):1893-1905.

16 - The following papers focus on the effects of land-use change on nearby protected landscapes: Hansen AJ and DeFries R. 2007. Ecological mechanisms linking protected areas to surrounding lands. Ecological Applications 17(4):974-988; and Gude PH, Hansen AJ, Rasker R, Maxwell B. 2006. Rates and Drivers of Rural Residential Development in the Greater Yellowstone. Landscape and Urban Planning 77:131-151.