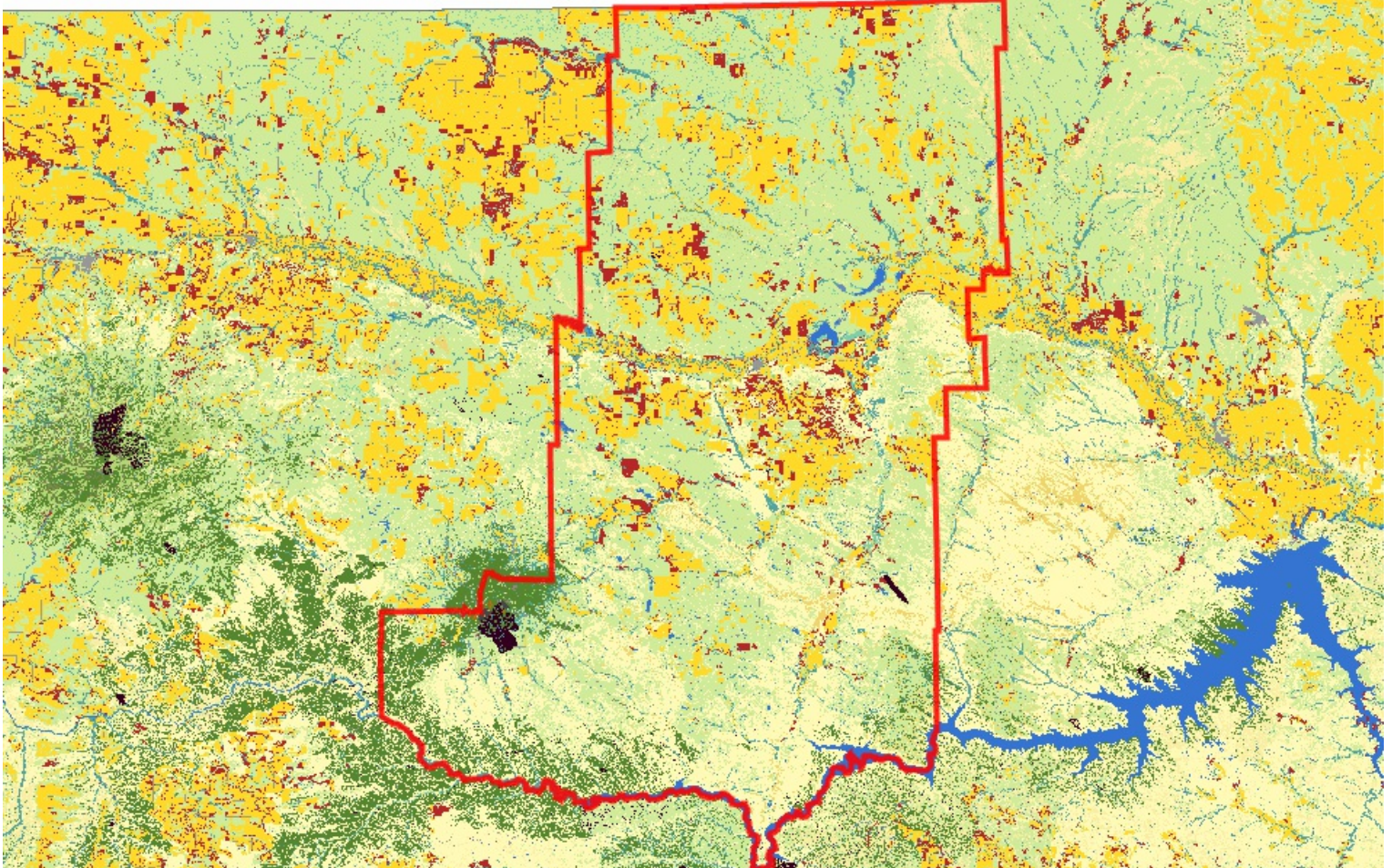




Land Cover

Summarized by: **Phillips** (County)



43%
(1,449,104
Acres)

Grassland Systems Lowland/Prairie Grassland

Great Plains Mixedgrass Prairie

The system covers much of the eastern two-thirds of Montana, occurring continuously for hundreds of square kilometers, interrupted only by wetland/riparian areas or sand prairies. Soils are primarily fine and medium-textured. The growing season averages 115 days, ranging from 100 days on the Canadian border to 130 days on the Wyoming border. Climate is typical of mid-continental regions with long severe winters and hot summers. Grasses typically comprise the greatest canopy cover, and western wheatgrass (*Pascopyrum smithii*) is usually dominant. Other species include thickspike wheatgrass (*Elymus lanceolatus*), green needlegrass (*Nassella viridula*), blue grama (*Bouteloua gracilis*), and needle and thread (*Hesperostipa comata*). Near the Canadian border in north-central Montana, this system grades into rough fescue (*Festuca campestris*) and Idaho fescue (*Festuca idahoensis*) grasslands. Remnants of shortbristle needle and thread (*Hesperostipa curtisetata*) dominated vegetation are found in northernmost Montana and North Dakota, and are associated with productive sites, now mostly converted to farmland. Forb diversity is typically high. In areas of southeastern and central Montana where sagebrush steppe borders the mixed grass prairie, common plant associations include Wyoming big sagebrush-western wheatgrass (*Artemisia tridentata* ssp. *wyomingensis*/ *Pascopyrum smithii*). Fire and grazing are the primary drivers of this system. Drought can also impact it, in general favoring the shortgrass component at the expense of the mid-height grasses. With intensive grazing, cool season exotics such as Kentucky bluegrass (*Poa pratensis*), smooth brome (*Bromus inermis*), and Japanese brome (*Bromus japonicus*) increase in dominance; both of these rhizomatous species have been shown to markedly decrease species diversity. Previously cultivated acres that have been re-vegetated with non-native plants have been transformed into associations such as Kentucky bluegrass (*Poa pratensis*)/western wheatgrass (*Pascopyrum smithii*) or into pure crested wheatgrass (*Agropyron cristatum*) stands.



21%
(694,919
Acres)

Shrubland, Steppe and Savanna Systems Sagebrush Steppe

Big Sagebrush Steppe

This widespread ecological system occurs throughout much of central Montana, and north and east onto the western fringe of the Great Plains. In central Montana, where this system occurs on both glaciated and non-glaciated landscapes, it differs slightly, with more summer rain than winter precipitation and more precipitation annually. Throughout its distribution, soils are typically deep and non-saline, often with a microphytic crust. This shrub-steppe is dominated by perennial grasses and forbs with greater than 25% cover. Overall shrub cover is less than 10 percent. In Montana and Wyoming, stands are more mesic, with more biomass of grass, and have less shrub diversity than stands farther to the west, and 50 to 90% of the occurrences are dominated by Wyoming big sagebrush with western wheatgrass (*Pascopyrum smithii*). Japanese brome (*Bromus japonicus*) and cheatgrass (*Bromus tectorum*) are indicators of disturbance, but cheatgrass is typically not as abundant as in the Intermountain West, possibly due to a colder climate. The natural fire regime of this ecological system maintains a patchy distribution of shrubs, preserving the steppe character. Shrubs may increase following heavy grazing and/or with fire suppression. In central and eastern Montana, complexes of prairie dog towns are common in this ecological system.



15%
(490,103
Acres)

Human Land Use Agriculture

Cultivated Crops

These areas used for the production of crops, such as corn, soybeans, small grains, sunflowers, vegetables, and cotton, typically on an annual cycle. Agricultural plant cover is variable depending on season and type of farming. Other areas include more stable land cover of orchards and vineyards.



4%
(133,252
Acres)

Recently Disturbed or Modified Introduced Vegetation

Introduced Upland Vegetation - Annual and Biennial Forbland

Land cover is significantly altered/disturbed by introduced annual and biennial forbs. Natural vegetation types are no longer recognizable. Typical species that dominate these areas are knapweed, oxeye daisy, Canada thistle, leafy spurge, pepperweed, and yellow sweetclover.



2% (74,353
Acres)

Wetland and Riparian Systems Floodplain and Riparian

Great Plains Riparian

This system is associated with perennial to intermittent or ephemeral streams throughout the northwestern Great Plains. In Montana, it occurs along smaller tributaries of the Yellowstone and Missouri rivers, as well as tributaries to the large floodplain rivers that feed them (e.g. the Milk, Marias, Musselshell, Powder, Clark's Fork Yellowstone, Tongue, etc). In areas adjacent to the mountain ranges of central and southeastern Montana, and near the Rocky Mountain Front, it grades into Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland systems. This system is found on alluvial soils in highly variable landscape settings, from confined, deep cut ravines to wide, braided streambeds. Channel migration occurs in less-confined areas, but within a more narrow range than would occur in broad, alluvial floodplains. Typically, the rivers are wadeable by mid-summer.

The primary inputs of water to these systems include groundwater discharge, overland flow, and subsurface interflow from the adjacent upland. Flooding is the key ecosystem process, creating suitable sites for seed dispersal and seedling establishment, and controlling vegetation succession. Communities within this system range from riparian forests and shrublands to tallgrass wet meadows and gravel/sand flats. Dominant species are similar to those found in the Great Plains Floodplain System. In the western part of the system's range in Montana, the dominant overstory species is black cottonwood (*Populus balsamifera ssp. trichocarpa*) with narrowleaf cottonwood (*Populus angustifolia*) and Plains cottonwood (*Populus deltoides*) occurring as co-dominants in the riparian/floodplain interface near the mountains. Further east, narrowleaf cottonwood and Plains cottonwood become dominant. In wetter systems, the understory is typically willow (*Salix spp.*) and redosier dogwood (*Cornus stolonifera*) with graminoids such as western wheatgrass (*Pascopyrum smithii*) and forbs like American licorice (*Glycyrrhiza lepidota*). In areas where the channel is incised, the understory may be dominated by big sagebrush (*Artemisia tridentata*) or silver sagebrush (*Artemisia cana*). Like floodplain systems, riparian systems are often subjected to overgrazing and/or agriculture and can be heavily degraded, with salt cedar (*Tamarix ramosissima*) and Russian olive (*Eleagnus angustifolia*) replacing native woody vegetation and regrowth. Groundwater depletion and lack of fire have resulted in additional species changes.



2% (64,704
Acres)

Forest and Woodland Systems Conifer-dominated forest and woodland (xeric-mesic)

Great Plains Ponderosa Pine Woodland and Savanna

These ponderosa pine (*Pinus ponderosa*) occurrences differ from the Rocky Mountain Ponderosa Pine Woodland and Savanna systems in that they are typically found within the matrix of the Great Plains grassland systems. They are often surrounded by mixed-grass prairie, in places where available soil moisture is higher or soils are more coarse and rocky. Elevation ranges from 1,189 meters (3,900 feet) in southeastern Montana to 1,646 m (5,400 feet) in north-central Montana. Occurrences are usually on east- and north-facing aspects. These woodlands can be physiognomically variable, ranging from very sparse patches of trees on drier sites, to nearly closed-canopy forest stands on north slopes or in draws where available soil moisture is higher.



Forest and Woodland Systems
Conifer-dominated forest and woodland (xeric-mesic)

2% (53,789 Acres)

Rocky Mountain Foothill Woodland-Steppe Transition

This inland Pacific Northwest ecological system occurs in the foothills of the Montana Rocky Mountains, where it forms a broad ecotone between true forests and true steppe, shrublands, or grasslands, typically on warm, dry, exposed sites too droughty to support a closed tree canopy. This is not a fire-maintained system. The "steppe" character results from a climate-edaphic interaction that results in a graminoid-dominated landscape with widely scattered trees; even in the absence of fire, a "woodland" or "forest" structure will not be obtained. Occurrences are found on all slopes and aspects; however, moderately steep to very steep slopes or ridgetops on southerly or western aspects are most common. They can be found on glacial till, glacio-fluvial sand and gravel, dune, basaltic rubble, colluvium, deep loess or volcanic ash-derived soils, with characteristic features of good aeration and drainage, coarse texture, and an abundance of mineral material. Ponderosa pine (*Pinus ponderosa*) or Douglas-fir (*Pseudotsuga menziesii*) are the predominant conifers. Limber pine (*Pinus flexilis*) may be present in some occurrences. In fire-protected transition areas with big sagebrush steppe systems, antelope bitterbrush (*Purshia tridentata*), Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), big sagebrush (*Artemisia tridentata* ssp. *tridentata*), and three-tip sagebrush (*Artemisia tripartita*) may be common. Deciduous shrubs such as common ninebark (*Physocarpus malvaceus*), commonsnowberry (*Symphoricarpos albus*), or birch leaf spiraea (*Spiraea betulifolia*) may be abundant in occurrences west of the Continental Divide. Important grass species include bluebunch wheatgrass (*Pseudoroegneria spicata*), Sandberg's bluegrass (*Poa secunda*), needle and thread (*Hesperostipa comata*), needlegrass (*Achnatherum* species), and bottlebrush squirreltail (*Elymus elymoides*). This system is very similar to Northern Rocky Mountain Ponderosa Pine Woodland and Savanna, but with more widely scattered trees.

Additional Limited Land Cover

- 1% (47,511 Acres) ■ [Open Water](#)
- 1% (45,645 Acres) ■ [Great Plains Badlands](#)
- 1% (45,514 Acres) ■ [Mat Saltbush Shrubland](#)
- 1% (36,614 Acres) ■ [Greasewood Flat](#)
- 1% (21,478 Acres) ■ [Great Plains Sand Prairie](#)
- 1% (19,713 Acres) ■ [Other Roads](#)
- 1% (18,983 Acres) ■ [Pasture/Hay](#)
- 1% (18,471 Acres) ■ [Rocky Mountain Lodgepole Pine Forest](#)
- 1% (17,345 Acres) ■ [Great Plains Floodplain](#)
- 1% (17,121 Acres) ■ [Great Plains Shrubland](#)
- <1% (14,224 Acres) ■ [Great Plains Prairie Pothole](#)
- <1% (10,152 Acres) ■ [Great Plains Saline Depression Wetland](#)
- <1% (8,475 Acres) ■ [Great Plains Open Freshwater Depression Wetland](#)
- <1% (5,985 Acres) ■ [Shale Badland](#)
- <1% (5,716 Acres) ■ [Emergent Marsh](#)
- <1% (5,320 Acres) ■ [Recently burned forest](#)
- <1% (4,852 Acres) ■ [Recently burned grassland](#)
- <1% (4,768 Acres) ■ [Great Plains Closed Depressional Wetland](#)
- <1% (4,122 Acres) ■ [Great Plains Wooded Draw and Ravine](#)
- <1% (3,132 Acres) ■ [Major Roads](#)
- <1% (2,643 Acres) ■ [Rocky Mountain Lower Montane, Foothill, and Valley Grassland](#)
- <1% (1,324 Acres) ■ [Low Intensity Residential](#)
- <1% (1,299 Acres) ■ [Developed, Open Space](#)
- <1% (1,289 Acres) ■ [Quarries, Strip Mines and Gravel Pits](#)
- <1% (1,265 Acres) ■ [Rocky Mountain Subalpine-Montane Riparian Shrubland](#)
- <1% (1,125 Acres) ■ [Introduced Riparian and Wetland Vegetation](#)
- <1% (1,059 Acres) ■ [Post-Fire Recovery](#)
- <1% (995 Acres) ■ [Rocky Mountain Montane-Foothill Deciduous Shrubland](#)
- <1% (975 Acres) ■ [Burned Sagebrush](#)
- <1% (752 Acres) ■ [Railroad](#)
- <1% (700 Acres) ■ [Great Plains Cliff and Outcrop](#)
- <1% (673 Acres) ■ [Rocky Mountain Foothill Limber Pine - Juniper Woodland](#)
- <1% (586 Acres) ■ [Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland](#)
- <1% (506 Acres) ■ [Commercial / Industrial](#)
- <1% (421 Acres) ■ [Insect-Killed Forest](#)
- <1% (407 Acres) ■ [Rocky Mountain Cliff, Canyon and Massive Bedrock](#)
- <1% (399 Acres) ■ [Gas and Gas Storage](#)

- <1% (382 Acres) ■ [Aspen and Mixed Conifer Forest](#)
- <1% (378 Acres) ■ [Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest](#)
- <1% (305 Acres) ■ [Recently burned shrubland](#)
- <1% (207 Acres) ■ [Rocky Mountain Poor Site Lodgepole Pine Forest](#)
- <1% (95 Acres) ■ [High Intensity Residential](#)
- <1% (49 Acres) ■ [Aspen Forest and Woodland](#)
- <1% (0 Acres) ■ [Rocky Mountain Ponderosa Pine Woodland and Savanna](#)

Introduction to Land Cover

Land Use/Land Cover is one of 15 [Montana Spatial Data Infrastructure](#) framework layers considered vital for making statewide maps of Montana and understanding its geography. The layer records all Montana natural vegetation, land cover and land use, classified from satellite and aerial imagery, mapped at a scale of 1:100000, and interpreted with supporting ground-level data. The baseline map is adapted from the Northwest ReGAP (NWGAP) project land cover classification, which used 30m resolution multi-spectral Landsat imagery acquired between 1999 and 2001. Vegetation classes were drawn from the Ecological System Classification developed by NatureServe (Comer et al. 2003). The land cover classes were developed by Anderson et al. (1976). The NWGAP effort encompasses 12 map zones. Montana overlaps seven of these zones. The two NWGAP teams responsible for the initial land cover mapping effort in Montana were Sanborn and NWGAP at the University of Idaho. Both Sanborn and NWGAP employed a similar modeling approach in which Classification and Regression Tree (CART) models were applied to Landsat ETM+ scenes. The Spatial Analysis Lab within the Montana Natural Heritage Program was responsible for developing a seamless Montana land cover map with a consistent statewide legend from these two separate products. Additionally, the Montana land cover layer incorporates several other land cover and land use products (e.g., MSDI Structures and Transportation themes and the Montana Department of Revenue Final Land Unit classification) and reclassifications based on plot-level data and the latest NAIP imagery to improve accuracy and enhance the usability of the theme. Updates are done as partner support and funding allow, or when other MSDI datasets can be incorporated. Recent updates include fire perimeters and agricultural land use (annually), energy developments such as wind, oil and gas installations (2014), roads, structures and other impervious surfaces (various years): and local updates/improvements to specific ecological systems (e.g., central Montana grassland and sagebrush ecosystems). Current and previous versions of the Land Use/Land Cover layer with full metadata are available for download at the Montana State Library's [Geographic Information Clearinghouse](#).

Within the report area you have requested, land cover is summarized by acres of Level 1, Level 2, and Level 3 Ecological Systems.

Literature Cited

- Anderson, J.R. E.E. Hardy, J.T. Roach, and R.E. Witmer. 1976. A land use and land cover classification system for use with remote sensor data. U.S. Geological Survey Professional Paper 964.
- Comer, P., D. Faber-Langendoen, R. Evans, S. Gawler, C. Josse, G. Kittel, S. Menard, M. Pyne, M. Reid, K. Schulz, K. Snow, and J. Teague. 2003. Ecological systems of the United States: A working classification of U.S. terrestrial systems. NatureServe, Arlington, VA.