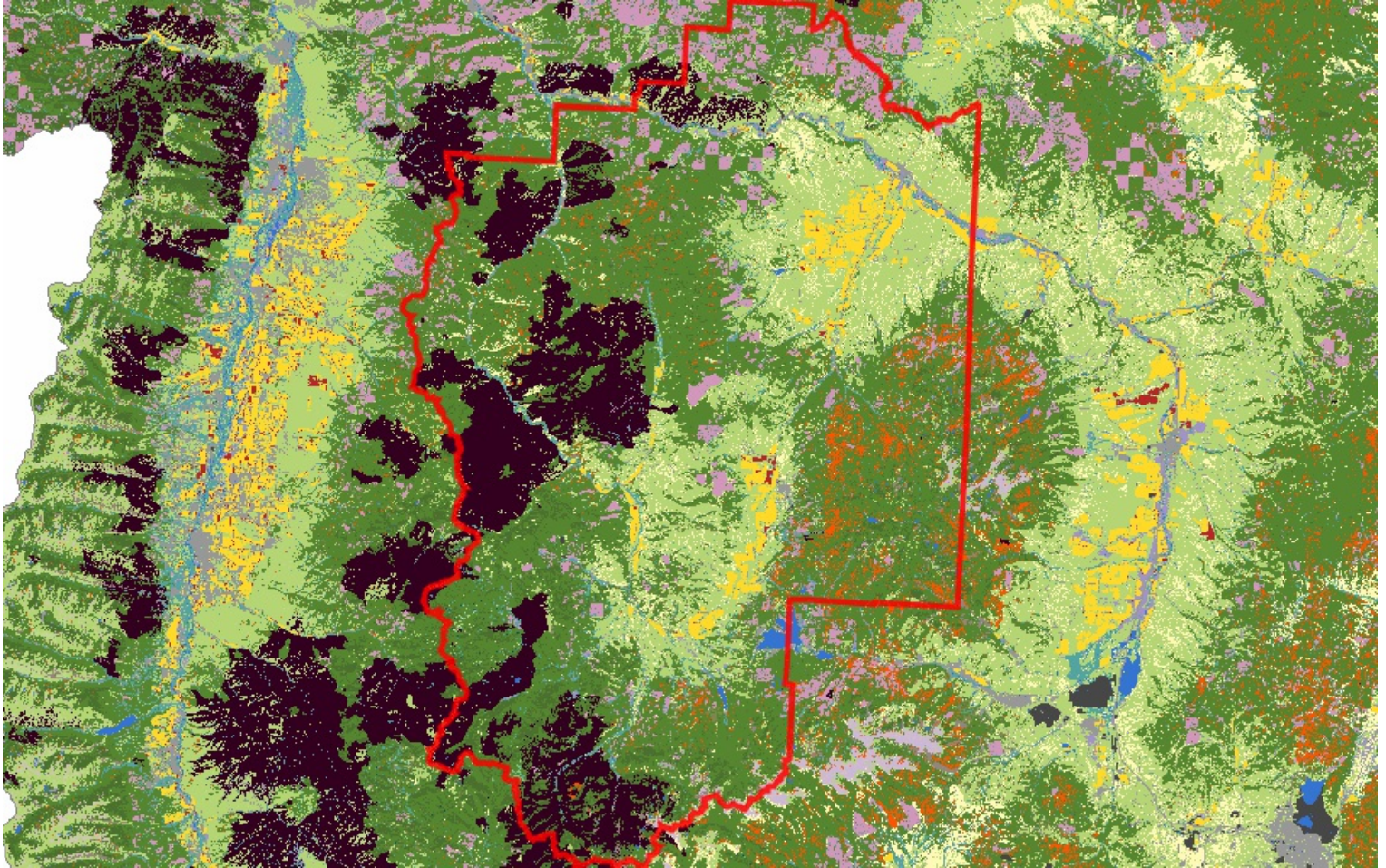




Land Cover

Summarized by: **Granite** (County)



20%
(218,563
Acres)

Forest and Woodland Systems

Conifer-dominated forest and woodland (xeric-mesic)

Rocky Mountain Lodgepole Pine Forest

This forested system is widespread in upper montane to subalpine zones of the Montana Rocky Mountains, and east into island ranges of north-central Montana and the Bighorn and Beartooth ranges of south-central Montana. These are montane to subalpine forests where the dominance of lodgepole pine (*Pinus contorta*) is related to fire history and topoedaphic conditions. In Montana, elevation ranges from 975 to 2,743 meters (3,200-9000 feet). These forests occur on flats to slopes of all degrees and aspect, as well as valley bottoms. Fire is frequent, and stand-replacing fires are common. Following stand-replacing fires, lodgepole pinewill rapidly colonize and develop into dense, even-aged stands. Most forests in this ecological system occur as early- to mid-successional forests persisting for 50-200 years on warmer, lower elevation forests, and 150-400 years in subalpine forests. They generally occur on dry to intermediate sites with a wide seasonal range of temperatures and long precipitation-free periods in summer. Snowfall is heavy and supplies the major source of soil water used for growth in early summer. Vigorous stands occur where the precipitation exceeds 533 millimeters (21 inches). These lodgepole forests are typically associated with rock types weathering to acidic substrates, such as granite and rhyolite. In west-central Montana ranges such the Big Belts and the Rocky Mountain Front, these forests are found on limestone substrates. These systems are especially well developed on the broad ridges and high valleys near and east of the Continental Divide. Succession proceeds at different rates, moving relatively quickly on low-elevation, mesic sites and particularly slowly in high-elevation forests such as those along the Continental Divide in Montana.



Grassland Systems Montane Grassland

14%
(153,445
Acres)

Rocky Mountain Lower Montane, Foothill, and Valley Grassland

This grassland system of the northern Rocky Mountains is found at lower montane to foothill elevations in mountains and valleys throughout Montana. These grasslands are floristically similar to Big Sagebrush Steppe but are defined by shorter summers, colder winters, and young soils derived from recent glacial and alluvial material. They are found at elevations from 548 - 1,650 meters (1,800-5,413 feet). In the lower montane zone, they range from small meadows to large open parks surrounded by conifers; below the lower treeline, they occur as extensive foothill and valley grasslands. Soils are relatively deep, fine-textured, often with coarse fragments, and non-saline. Microphytic crust may be present in high-quality occurrences. This system is typified by cool-season perennial bunch grasses and forbs (>25%) cover, with a sparse shrub cover (<10%). Rough fescue (*Festuca campestris*) is dominant in the northwestern portion of the state and Idaho fescue (*Festuca idahoensis*) is dominant or co-dominant throughout the range of the system. Bluebunch wheatgrass (*Pseudoroegneria spicata*) occurs as a co-dominant throughout the range as well, especially on xeric sites. Western wheatgrass (*Pascopyrum smithii*) is consistently present, often with appreciable coverage (>10%) in lower elevation occurrences in western Montana and virtually always present, with relatively high coverages (>25%), on the edge of the Northwestern Great Plains region. Species diversity ranges from a high of more than 50 per 400 square meter plot on mesic sites to 15 (or fewer) on xeric and disturbed sites. Most occurrences have at least 25 vascular species present. Farmland conversion, noxious species invasion, fire suppression, heavy grazing and oil and gas development are major threats to this system.



Recently Disturbed or Modified Recently burned

12%
(128,162
Acres)

Recently burned forest

Land cover is apparently modified by recent fires which have burned forest and woodland vegetation. Vegetation is a mixture of herbaceous, shrub, and tree species.



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

7% (73,125
Acres)

Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland

Engelmann spruce (*Picea engelmannii*) and subalpine fir (*Abies lasiocarpa*) make up a substantial part of the montane and lower subalpine forests of the Montana Rocky Mountains and mountain island ranges of north-central and west-central Montana. Spruce is usually associated with fir and occurs as either a climax co-dominant or as a persistent, long-lived seral species in most upper elevation fir habitat types. Dry to mesic spruce-dominated forests range from 884-1,585 meters (2,900-5,200 feet) west of the Continental Divide, and 1585-2,073 meters (5,200-6,800 feet) east of the Continental Divide in the northern and central portions of the state. This system can be found at elevations up to 2,896 meters (9,500 feet) in southwestern Montana. Forests are found on gentle to very steep mountain slopes, high-elevation ridge tops and upper slopes, plateau-like surfaces, basins, alluvial terraces, well-drained benches, and inactive stream terraces. Tree canopy characteristics are relatively uniform. In northern Montana, Engelmann spruce hybridizes with its boreal counterpart, white spruce (*Picea glauca*). Douglas-fir (*Pseudotsuga menziesii*), lodgepole pine (*Pinus contorta*), and western larch (*Larix occidentalis*) (west of the Continental Divide) are seral but often present in these forests. The understory is comprised of a mixture of shrubs, forbs and graminoids tolerant of warmer and drier soil conditions than those found on the more mesic to wet spruce-fir system. The drier occurrences of this system are especially common on steep slopes at upper elevations throughout the eastern Rocky Mountains, whereas the more mesic occurrences form substantial cover west of the Continental Divide in the Flathead, Lolo, Bitterroot and Kootenai river drainages.



6% (65,472
Acres)

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

Rocky Mountain Montane Douglas-fir Forest and Woodland

In Montana, this ecological system occurs on the east side of the Continental Divide, north to about the McDonald Pass area, and along the Rocky Mountain Front. This system is associated with a dry to submesic continental climate regime with annual precipitation ranging from 51 to 102 centimeters (20-40 inches), with a maximum in winter or late spring. Winter snowpacks typically melt off in early spring at lower elevations. Elevations range from valley bottoms to 1,980 meters (6500 feet) in northern Montana and up to 2,286 meters (7500 feet) on warm aspects in southern Montana. It occurs on north-facing aspects in most areas, and south-facing aspects at higher elevations. This is a Douglas-fir (*Pseudotsuga menziesii*) dominated system without any maritime floristic composition. Fire disturbance intervals are as infrequent as 500 years, and as a result, individual trees and forests can attain great age on some sites (500 to 1,500 years). In Montana, this system occurs from lower montane to lower subalpine environments and is prevalent on calcareous substrates. Common understory shrubs include common ninebark (*Physocarpus malvaceus*), common juniper (*Juniperus communis*), Rocky Mountain juniper (*Juniperus scopulorum*), birch-leaf spiraea (*Spiraea betulifolia*), snowberry (*Symphoricarpos* species), creeping Oregon grape (*Mahonia repens*) and Canadian buffaloberry (*Shepherdia canadensis*). The Douglas-fir/pinegrass (*Calamagrostis rubescens*) type is the most ubiquitous association found within this system in Montana.



5% (58,462 Acres)

Forest and Woodland Systems

Conifer-dominated forest and woodland (xeric-mesic)

Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest

This ecological system, composed of highly variable montane conifer forests, is found throughout Montana. It is associated with a submesic climate regime with annual precipitation ranging from 250 to 1,000 millimeters (10-39 inches), with most precipitation occurring during winter, and April through June. Winter snowpacks typically melt off in early spring at lower elevations. Elevations range from valley bottoms to 1,676 meters (5,500 feet) in northwestern Montana and up to 2,286 meters (7,500 feet) on warm aspects in southern Montana. In northwestern and west-central Montana, this ecosystem forms a forest belt on warm, dry to slightly moist sites. It generally occurs on gravelly soils with good aeration and drainage and a neutral to slightly acidic pH. In the western part of the state, it is seen mostly on well drained mountain slopes and valleys from lower treeline to up to 1,676 meters (5,500 feet). Immediately east of the Continental Divide, in north-central Montana, it occurs at montane elevations. Douglas-fir (*Pseudotsuga menziesii*) is the dominant conifer both as a seral and climax species. West of the Continental Divide, occurrences can be dominated by any combination of Douglas-fir and long-lived, seral western larch (*Larix occidentalis*), grand fir (*Abies grandis*), ponderosa pine (*Pinus ponderosa*) and lodgepole pine (*Pinus contorta*). Aspen (*Populus tremuloides*) and western white pine (*Pinus monticola*) have a minor status, with western white pine only in extreme western Montana. East of the Continental Divide, larch is absent and lodgepole pine is the co-dominant. Engelmann spruce (*Picea engelmannii*), white spruce, (*Picea glauca*) or their hybrid, become increasingly common towards the eastern edge of the Douglas-fir forest belt.



5% (54,322 Acres)

Forest and Woodland Systems

Conifer-dominated forest and woodland (mesic-wet)

Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland

These forests are similar to Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland (4242), but occur in locations with cold-air drainage or ponding, or where snowpacks linger late into the summer, such as north-facing slopes and high-elevation ravines. They are distinguished by their occurrence on mesic to wet microsites within the matrix of the drier (and warmer) subalpine spruce-fir or lodgepole pine forests. The microsites include north-facing slopes, swales or ravines, toeslopes, cold pockets, and other locations where available soil moisture is higher or lasts longer into the growing season. This system can extend down in elevation below the subalpine zone in places where cold-air ponding occurs, especially on north and east aspects. Elevations range from 884 to 1,981 meters (2,900-6,500 feet) west of the Continental Divide, and 1,585 to 2,682 meters (5,200-8,800 feet) east of the Continental Divide. Spruce is usually associated with subalpine fir and occurs either as a climax co-dominant or as a persistent, long-lived seral species in most upper elevation subalpine fir stands. Mountain hemlock (*Tsuga mertensiana*) occurs as small patches within the matrix of this mesic spruce-fir system, but only in the most maritime of environments of northwestern Montana, in the coldest and wettest sites. The shrub understory contains many ericaceous species such as rusty leaf menziesia (*Menziesia ferruginea*), dwarf huckleberry (*Vaccinium caespitosum*), mountain huckleberry (*Vaccinium membranaceum*), bilberry (*Vaccinium myrtillus*), grouse whortleberry (*Vaccinium scoparium*), pink mountain heath (*Phyllodoce empetriformis*), black twinberry honeysuckle (*Lonicera involucrata*), gooseberry (*Ribes* species) and thimbleberry (*Rubus parviflorus*). The herbaceous understory contains mesic forbs, graminoids, and ferns and fern allies on the wettest sites. Moss cover is often high. Stand-replacing fires are less common in mesic spruce-fir forests than in dry-mesic forests.



4% (43,270 Acres)

Shrubland, Steppe and Savanna Systems

Sagebrush Steppe

Montane Sagebrush Steppe

This system dominates the montane and subalpine landscape of southwestern Montana from valley bottoms to subalpine ridges and is found as far north as Glacier National Park. It can also be seen in the island mountain ranges of the north-central and south-central portions of the state. It primarily occurs on deep-soiled to stony flats, ridges, nearly flat ridgetops, and mountain slopes. In general, this system occurs in areas of gentle topography, fine soils, subsurface moisture or mesic conditions, within zones of higher precipitation and areas of snow accumulation. It occurs on all slopes and aspects, variable substrates and all soil types. The shrub component of this system is generally dominated by mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*). Other co-dominant shrubs include silver sagebrush (*Artemisia cana* ssp. *viscidula*), subalpine big sagebrush (*Artemisia tridentata* ssp. *spiciformis*), three tip sagebrush (*Artemisia tripartita* ssp. *tripartita*) and antelope bitterbrush (*Purshia tridentata*). Little sagebrush (*Artemisia arbuscula* ssp. *arbuscula*) shrublands are only found in southwestern Montana on sites with a perched water table. Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) sites may be included within this system if occurrences are at montane elevations, and are associated with montane graminoids such as Idaho fescue (*Festuca idahoensis*), spike fescue (*Leucopoa kingii*), or poverty oatgrass (*Danthonia intermedia*). In areas where sage has been eliminated by human activities like burning, disking or poisoning, other shrubs may be dominant, especially rubber rabbitbrush (*Ericameria nauseosa*), and green rabbitbrush (*Chrysothamnus viscidiflorus*). Because of the mesic site conditions, most occurrences support a diverse herbaceous undergrowth of grasses and forbs. Shrub canopy cover is extremely variable, ranging from 10 percent to as high as 40 or 50 percent.



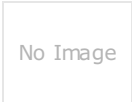
Grassland Systems

Montane Grassland

3% (34,979 Acres)

Rocky Mountain Subalpine-Upper Montane Grassland

These lush grassland systems are found in upper montane to subalpine, high-elevation zones, and are shaped by short summers, cold winters, and young soils derived from recent glacial and alluvial material. In subalpine settings, dry grasslands may occur as small meadows or large open parks surrounded by higher elevational forests, but typically will have no tree cover within them. In general, soil textures are much finer, and soils are often deeper than in the neighboring forests. Most precipitation occurs as heavy snowpack in the mountains with spring and early summer rains. This system is composed of bunch grass species, with a diversity of cool season forbs. It is similar to the Rocky Mountain Lower Montane, Foothill and Valley Grassland ecological system, but is found at higher elevations and has additional floristic components with more subalpine taxa. In Montana, this system generally occurs as two plant communities: a rough fescue-Idaho fescue (*Festuca campestris*-*Festuca idahoensis*) association occurring on moister sites, such as the north and east-facing slopes and benches in the mountains; and the Idaho Fescue-bluebunch wheatgrass (*Festuca idahoensis*-*Pseudoroegneria spicata*) association occurring on drier sites, such as ridges, hilltops, and south and west facing slopes and benches. At elevations greater than 2286 meters (7,500 feet), Idaho fescue becomes dominant, sometimes associated with slender wheatgrass (*Elymus trachycaulus*), or in certain areas, tufted hairgrass (*Deschampsia cespitosa*). Noxious species invasion, fire suppression, heavy grazing, and oil and gas development are major threats to this system.



Recently Disturbed or Modified

Recently burned

3% (30,973 Acres)

Post-Fire Recovery



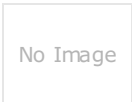
Human Land Use

Agriculture

3% (29,155 Acres)

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.



Recently Disturbed or Modified

Insect-Killed Forest

2% (25,910 Acres)

Insect-Killed Forest



Forest and Woodland Systems

Conifer-dominated forest and woodland (xeric-mesic)

2% (25,773 Acres)

Rocky Mountain Ponderosa Pine Woodland and Savanna

This system occurs on warm, dry, exposed sites in the foothills of the Rocky Mountains in west-central and central Montana, at the ecotone between grasslands or shrublands and more mesic coniferous forests. Elevations range from 1,066 to 1,676 meters (3,500-5,500 feet), with higher elevation examples mostly confined to central Montana. Occurrences are found on all slopes and aspects; however, moderately steep to very steep slopes or ridgetops are most common. True savanna types are infrequent; the system is more characteristically an open forest with a grassy understory. In the western part of the state, this system is seen mostly on dry slopes in the rainshadow of the Bitterroot Mountains. East of the Continental Divide, it is most widespread around Helena and Lewistown, although it occurs throughout mountain ranges as far east as the Little Rocky and Bearpaw Mountains. Ponderosa pine (*Pinus ponderosa*) is the dominant conifer. Douglas-fir (*Pseudotsuga menziesii*) and western larch (*Larix occidentalis*) may be present in the tree canopy in the more western areas, but are usually absent. In central Montana, limber pine (*Pinus flexilis*) and horizontal juniper (*Juniperus horizontalis*) are frequently components. Although the understory of ponderosa pine forests is often shrubby in other states, in Montana, habitats are mostly dominated by graminoids, although bitterbrush (*Purshia tridentata*), white snowberry (*Symphoricarpos albus*), and skunkbrush (*Rhus trilobata*) occur in forests on benchlands and rocky slopes in the central portion of the state. Understory vegetation is more typically grasses and forbs that resprout following low to moderate intensity surface fires. Prolonged drought, beetle kill and exotic invasion are rapidly changing the dynamics of this system.



Wetland and Riparian Systems
Floodplain and Riparian

2% (24,622 Acres)

Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland

This ecological system is found throughout the Rocky Mountain and Colorado Plateau regions. In Montana, sites occur at elevations of 609-1,219 meters (2,000-4,000 feet) west of the Continental Divide. East of the Continental Divide, this system ranges up to 1,676 meters (5,500 feet). It generally comprises a mosaic of multiple communities that are tree-dominated with a diverse shrub component. It is dependent on a natural hydrologic regime with annual to episodic flooding, so it is usually found within the flood zone of rivers, on islands, sand or cobble bars, and along streambanks. It can form large, wide occurrences on mid-channel islands in larger rivers, or narrow bands on small, rocky canyon tributaries and well-drained benches. It is also typically found in backwater channels and other perennially wet but less scoured sites, such as floodplains, swales and irrigation ditches. In some locations, occurrences extend into moderately high intermountain basins where the adjacent vegetation is sage steppe. Black cottonwood (*Populus balsamifera* ssp. *trichocarpa*) is the key indicator species. Other dominant trees may include boxelder maple (*Acer negundo*), narrowleaf cottonwood (*Populus angustifolia*), eastern cottonwood (*Populus deltoides*), Douglas-fir (*Pseudotsuga menziesii*), peachleaf willow (*Salix amygdaloides*), or Rocky Mountain juniper (*Juniperus scopulorum*). Dominant shrubs include Rocky Mountain maple (*Acer glabrum*), thinleaf alder (*Alnus incana*), river birch (*Betula occidentalis*), redbud (*Cornus sericea*), hawthorne (*Crataegus* species), chokecherry (*Prunus virginiana*), skunkbush sumac (*Rhus trilobata*), willows (*Salix* species), rose (*Rosa* species), silver buffaloberry (*Shepherdia argentea*), or snowberry (*Symphoricarpos* species).



Recently Disturbed or Modified
Harvested Forest

2% (23,056 Acres)

Harvested forest-tree regeneration

Land cover has been modified by logging. New growth is primarily trees.

Additional Limited Land Cover

- 1% (15,000 Acres) [Other Roads](#)
- 1% (14,682 Acres) [Rocky Mountain Subalpine-Montane Mesic Meadow](#)
- 1% (12,863 Acres) [Harvested forest-grass regeneration](#)
- 1% (11,206 Acres) [Aspen Forest and Woodland](#)
- 1% (10,354 Acres) [Harvested forest-shrub regeneration](#)
- 1% (8,633 Acres) [Rocky Mountain Montane-Foothill Deciduous Shrubland](#)
- <1% (5,492 Acres) [Burned Sagebrush](#)
- <1% (5,404 Acres) [Rocky Mountain Cliff, Canyon and Massive Bedrock](#)
- <1% (4,846 Acres) [Alpine-Montane Wet Meadow](#)
- <1% (3,927 Acres) [Open Water](#)
- <1% (3,868 Acres) [Recently burned grassland](#)
- <1% (3,423 Acres) [Rocky Mountain Subalpine Deciduous Shrubland](#)
- <1% (3,112 Acres) [Rocky Mountain Subalpine Woodland and Parkland](#)
- <1% (1,621 Acres) [Alpine Turf](#)
- <1% (1,564 Acres) [Developed, Open Space](#)
- <1% (1,560 Acres) [Low Intensity Residential](#)
- <1% (1,334 Acres) [Interstate](#)
- <1% (1,315 Acres) [Recently burned shrubland](#)
- <1% (1,218 Acres) [Pasture/Hay](#)
- <1% (1,093 Acres) [Introduced Upland Vegetation - Annual and Biennial Forbland](#)
- <1% (862 Acres) [Railroad](#)
- <1% (782 Acres) [Mountain Mahogany Woodland and Shrubland](#)
- <1% (740 Acres) [Major Roads](#)
- <1% (599 Acres) [Rocky Mountain Subalpine-Montane Fen](#)
- <1% (559 Acres) [Alpine Fell-Field](#)
- <1% (514 Acres) [Alpine Bedrock and Scree](#)
- <1% (490 Acres) [Quarries, Strip Mines and Gravel Pits](#)
- <1% (246 Acres) [Rocky Mountain Foothill Limber Pine - Juniper Woodland](#)
- <1% (233 Acres) [Commercial / Industrial](#)
- <1% (208 Acres) [Alpine Dwarf-Shrubland](#)
- <1% (167 Acres) [Aspen and Mixed Conifer Forest](#)
- <1% (155 Acres) [Rocky Mountain Conifer Swamp](#)
- <1% (145 Acres) [Emergent Marsh](#)
- <1% (134 Acres) [High Intensity Residential](#)

- <1% (79 Acres) ■ [Rocky Mountain Wooded Vernal Pool](#)
- <1% (13 Acres) ■ [Rocky Mountain Poor Site Lodgepole Pine Forest](#)
- <1% (10 Acres) ■ [Rocky Mountain Mesic Montane Mixed Conifer Forest](#)
- <1% (2 Acres) ■ [Low Sagebrush Shrubland](#)
- <1% (0 Acres) ■ [Glacier and Ice Field](#)

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.