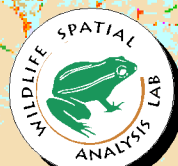
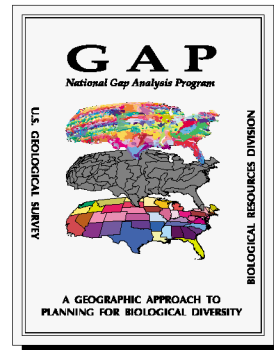


MONTANA Gap Analysis

Montana Land Cover Atlas



Wildlife Spatial Analysis Lab
Montana Cooperative Wildlife Research Unit
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COVER ILLUSTRATION :
Enlargement of statewide land cover
map for the Dillon, Montana area

MONTANA LAND COVER ATLAS

THE MONTANA GAP ANALYSIS PROJECT

30 September 1998

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The University of Montana, Missoula. viii + 50 pp.

Introduction

This atlas is a product of the Montana Gap Analysis project (MT-GAP). It is intended to serve as a reference to accompany and supplement the project's digital data in a geographic information system (GIS). We begin with a description of the land cover classification system that we used, followed by a brief overview of the mapping process. Then, for each cover type, we provide a statewide map of its distribution, a photograph, a descriptive summary of its size and spatial characteristics, and plant composition.

Much of the information contained in the atlas was obtained from a digital GIS database which is also available (see "How to obtain GAP data" below). Users are reminded that the digital source data were derived and assembled for the purpose of mapping land cover at relatively broad scales. Although the smallest mapping unit was 90 m² pixels, such small units are not visible on the atlas maps, nor should one assume that the digital data warrant use at such fine scale. Thematic map accuracy was calculated using fuzzy sets and a bootstrap procedure which allowed misclassification probabilities to be estimated at the location of each training data point. Absolute thematic accuracy for 45 cover types averaged 61.4%, ranging from 4.4% for Western Hemlock to 93.2% for Missouri Breaks; at the "acceptable" level, mean accuracy increased to nearly 89%.

Classification system

In 1991, at the outset of MT-GAP, there was no classification system for existing vegetation available for Montana, and by the time our land cover map was completed in 1997, we were aware of no complete list of alliance types for the state. Consequently, we followed the lead of neighbors in Wyoming (Merrill et al. 1996) and developed a classification based on the hierarchical design of Anderson et al. (1976). Land cover types were targeted and defined according to known occurrences in the state and from classifications used for GAP projects in both Idaho (Caicco et al. 1995) and Wyoming (Merrill et al. 1996). The final list of 50 land cover types is shown in Table 1.

Mapping methods

The 50 land cover types were mapped as follows. We developed a two-stage, digital process (Figure 1) to independently classify and label 33 Landsat TM scenes covering Montana. Using more than 23,000 ground reference data, nearly 4.4 million raster polygons were labeled to one of 94 land cover types. Upland cover types were mapped to a 2 ha minimum map unit (MMU) statewide. In eastern Montana, riparian and woody draw vegetation types were mapped to a 0.4 ha MMU, whereas in western Montana, a separate pixel classification was performed for riparian types. These independent classifications were edge-matched to create a virtually seamless raster database. From this, we created a statewide layer with a single attribute, land cover type. Recognizing that this dataset would be too large for predicting the statewide distributions of 425 terrestrial vertebrates, several additional steps were carried out to reduce the output file size, including 1) regrouping the 94 cover types to 50 types that were mapped more consistently across the state, and 2) resampling the 30 m grid to 90 m. The final land cover database has a variable MMU, ranging from 0.8 ha (one 90 m² pixel) for water, riparian, and woody draw cover types, to 100 ha (125 90 m² pixels) for clouds and cloud shadows. The intended MMU for all other cover types was 2 ha, the target of our final merge, but due to the resampling step, some upland types remain in the database as single 90 m² pixels. Most upland types, however, should occur in patches of 2.4 ha (three 90 m² pixels) or larger. More details about these methods can be found in the project final report (Redmond et al. 1998).

Table 1. The classification system used to map Montana's existing vegetation and land cover.

I. Urban and Agricultural Lands

- 1100 Urban or Developed Lands
- 2010 Agricultural Lands - Dry
- 2020 Agricultural Lands - Irrigated

II. Grasslands

herbaceous cover > 15%, shrub cover < 15%, and forest cover < 10%

- 3110 Altered Herbaceous
- 3130 Very Low Cover Grasslands
- 3150 Low / Moderate Cover Grasslands
- 3170 Moderate / High Cover Grasslands
- 3180 Montane Parklands & Subalpine Meadows

III. Shrublands

shrub cover (SC) > 15% and forest cover < 10%; except 3500 classes where SC = HC

- 3200 Mixed Mesic Shrubs
- 3300 Mixed Xeric Shrubs
- 3309 Silver Sage
- 3310 Salt-Desert Shrub / Dry Salt Flats
- 3350 Sagebrush
- 3510 Mesic Shrub - Grassland Associations
- 3520 Xeric Shrub - Grassland Associations

IV. Forest Lands

forest cover > 10%

- 4000 Low Density Xeric Forest
- 4140 Mixed Broadleaf Forest
- 4203 Lodgepole Pine
- 4205 Limber Pine
- 4206 Ponderosa Pine
- 4207 Grand Fir
- 4210 Western Red Cedar
- 4211 Western Hemlock
- 4212 Douglas-fir
- 4214 Rocky Mountain Juniper
- 4215 Western Larch
- 4216 Utah Juniper
- 4223 Douglas-fir / Lodgepole Pine
- 4260 Mixed Whitebark Pine Forest
- 4270 Mixed Subalpine Forest
- 4280 Mixed Mesic Forest
- 4290 Mixed Xeric Forest
- 4300 Mixed Broadleaf & Conifer Forest
- 4400 Standing Burnt Forest

V. Water

- 5000 Water

VI. Riparian Types

sites clearly associated with riparian areas or woody draws

- 6110 Conifer Riparian
- 6120 Broadleaf Riparian
- 6130 Mixed Broadleaf & Conifer Riparian
- 6200 Graminoid & Forb Riparian
- 6300 Shrub Riparian
- 6400 Mixed Riparian

VII. Barren Lands

sites with forest cover < 10%, shrub cover < 10%, and herbaceous cover < 10%

- 7300 Rock
- 7500 Mines, Quarries, Gravel Pits
- 7600 Badlands
- 7604 Missouri Breaks
- 7800 Mixed Barren Sites

VIII. Alpine

vegetated sites above treeline

- 8100 Alpine Meadows

IX. Perennial Snow and Ice

- 9100 Snowfields or Ice

X. Other

- 9800 Clouds
 - 9900 Cloud Shadows
-

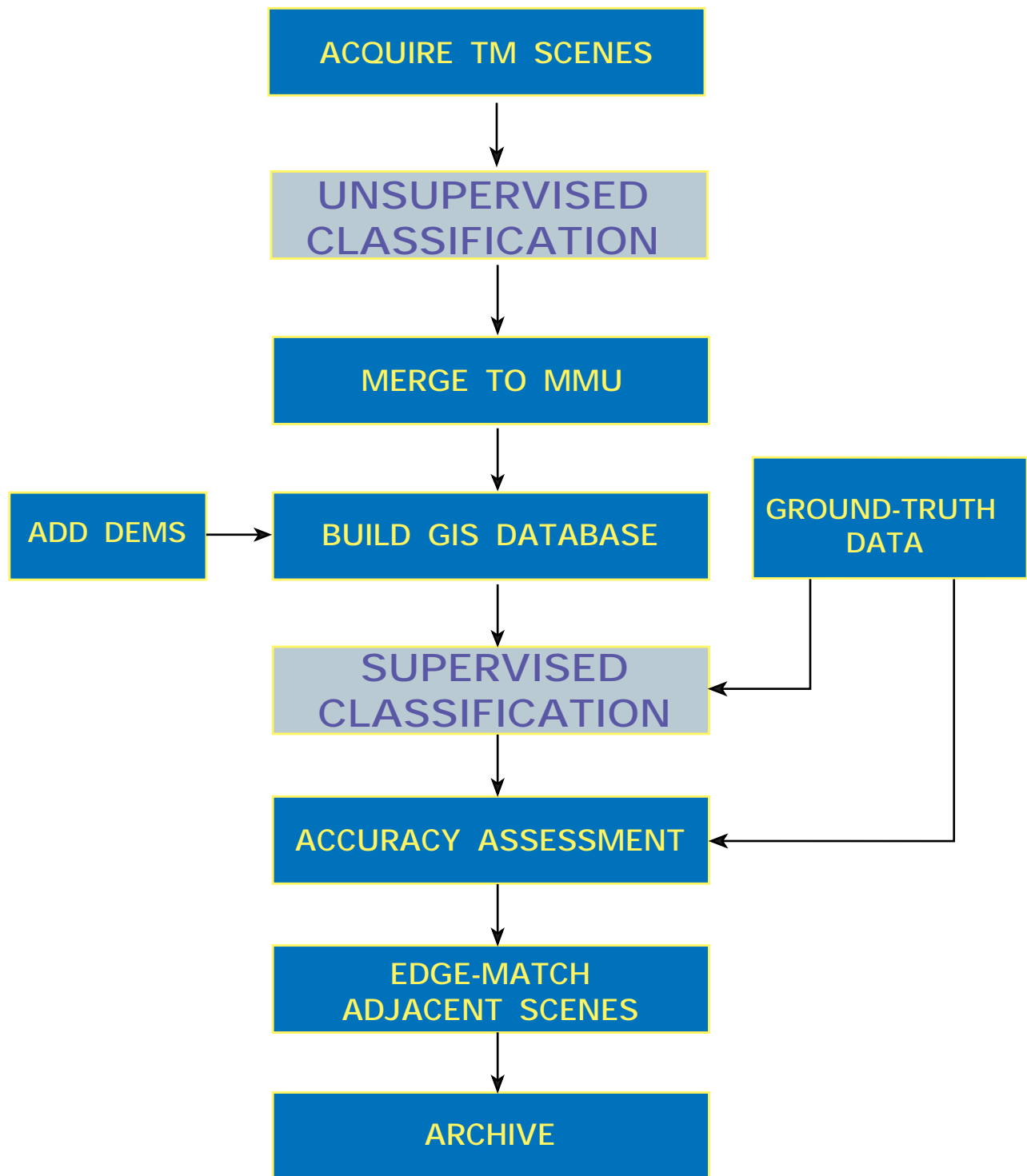


Figure 1. Overview of the two-stage digital process applied to 33 Landsat TM scenes for Montana.

How to obtain GAP data

It is the goal of the Gap Analysis Program and the USGS Biological Resources Division (BRD) to make the data and associated information as widely available as possible. Use of the data requires specialized geographic information system (GIS) software and substantial computing power. Additional information on how to obtain and use the data is provided below and on the GAP homepage:

<http://www.gap.uidaho.edu/gap>

Follow the links to “project information” and then to Montana or any other state of interest.

Official disclaimer for GAP data

Although these data have been processed successfully on a computer system at the BRD, no warranty expressed or implied is made regarding the accuracy or utility of the data on any other system or for general or scientific purposes. Also, the act of distribution does not constitute any such warranty. This disclaimer applies both to individual use of the data and aggregate use with other data. It is strongly recommended that these data are directly acquired from a BRD server [see above for approved data providers] and not indirectly through other sources which may have changed the data in some way. It is also strongly recommended that careful attention be paid to the content of the metadata file associated with these data. The Biological Resources Division is not liable for improper or incorrect use of the data described and/or contained herein.

These data were compiled with regard to the following standards. Please be aware of the limitations of the data. These data are meant to be used at a scale of 1:100,000 or smaller (such as 1:250,000 or 1:500,000) for the purpose of assessing the conservation status of vertebrate species and vegetation types over large geographic regions. The data may or may not have been assessed for statistical accuracy. Data evaluation and improvement may be ongoing. The Biological Resources Division makes no claim as to the data's suitability for other purposes. This is writable data which may have been altered from the original product if not obtained from a designated data distributor identified above.

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An effort of this magnitude is completed only with the input, support, and contributions of many people. We attempt to thank all contributors as best we can, and apologize for any omissions along the way. Despite the careful review of cover type distributions by knowledgeable scientists and managers in the state, the ultimate responsibility for the accuracy and utility of this atlas rests with the authors. We welcome any and all constructive feedback.

Several individuals were instrumental in getting the land cover mapping process off on the right track. First and foremost, we thank Joe Ball, Leader of the Montana Cooperative Wildlife Research Unit, without whose interest, commitment, support, and encouragement for seven “short” years, this project would not have succeeded. We also are grateful to Professor Steve Running (UM School of Forestry) for key insights, optimism, and encouragement, especially during the start-up phase. Ken Driese from the Wyoming Gap Analysis Project generously shared his knowledge and experience about methods and land cover classification systems. Wendel Hann from the Forest Service, Northern Regional Office had the vision and trust to support our early efforts, not only with much needed funds, but also with valuable field data. Ray Ford took an early interest in many challenges, both computational and administrative, that arise in a project of this scope; over the years he devised and recommended many elegant solutions. Moreover, he further inspired several graduate students in the UM Computer Science Department, notably Jin Guo and Steve Barsness, to develop newer and better “Merge” algorithms which ultimately contributed to the success of our digital mapping process.

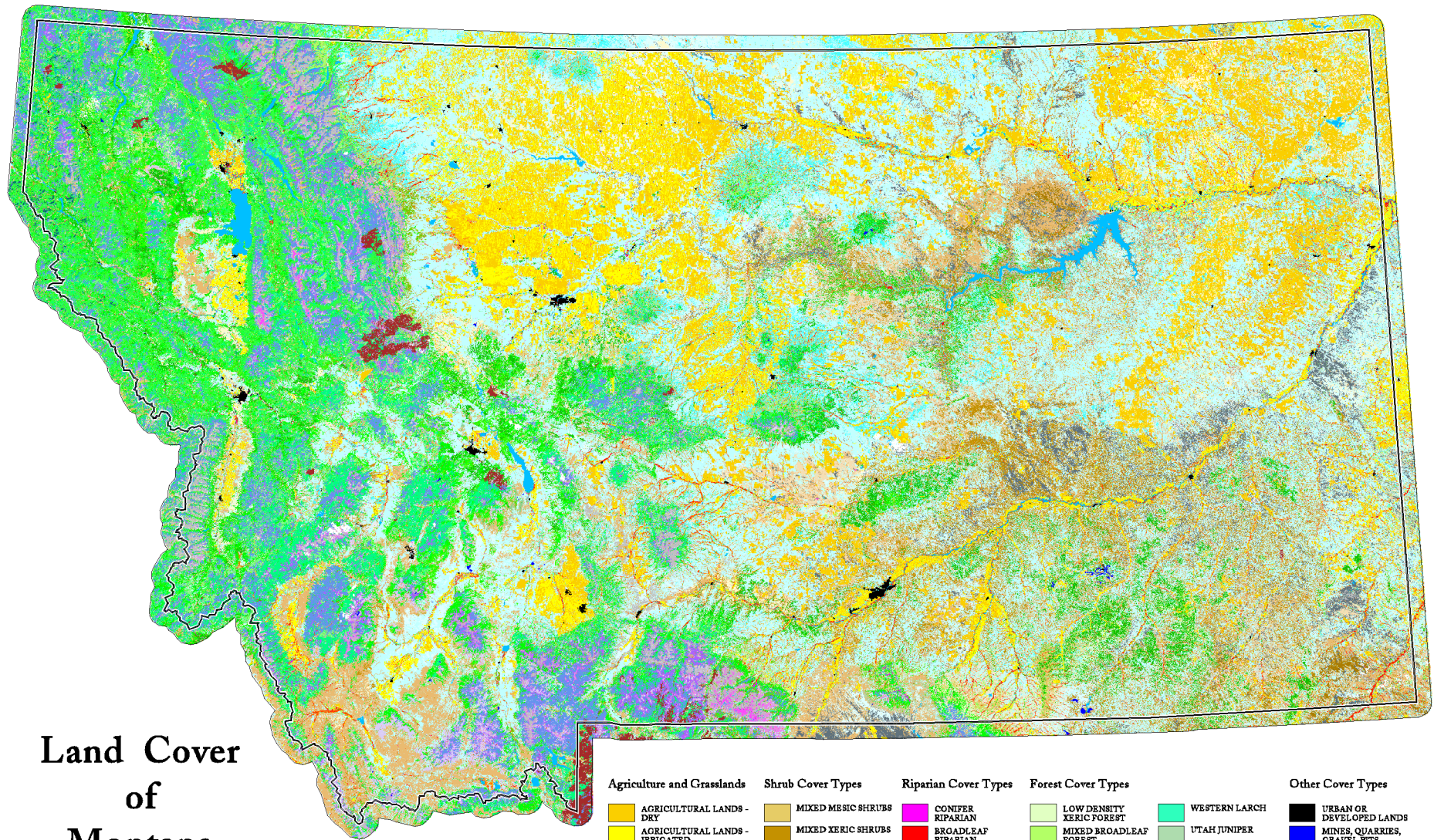
Classification and labeling of the 11 TM images in western Montana were funded by the Forest Service, Northern Region. Martin Prather provided the leadership and guidance to see it through to completion; he was assisted by three different Contracting Officers: Jim Hamilton, Roger Thomas, and Dallas Summerfield. Dave Atkins devoted nearly two years to managing the day-to-day interactions between our respective organizations. Further coordination between Forest Service field crews and this lab was provided by Kristen Loken, Marcy Mahr, and one of us (Fisher). The sometimes thankless job of data entry was carried out with care by Gerri Deleo and Pat Mikota. Field data then were processed, formatted, and transferred to us by Dave Browder, John Caratti, Mike Jensen, and Rosa Nygaard. Biophysical data related to landform boundaries in Montana were provided by John Nesser. Dick Roullier and Bill Tanke helped us acquire all 7.5 minute digital elevation models (DEMs) and Cartographic Feature Files for the state from the Forest Service Geomtronics Service Center. A number of other Forest Service personnel also deserve special mention: Art Zack (Idaho Panhandle), Pat Green (Nez Perce), Sonny Castille (Clearwater), Dan Leavell (Kootenai), Maria Mantas (Flathead), Nora Leetch (Lolo), Janet Johnson and Linda Pietarinen (Bitterroot), John Joy (Deer Lodge), Lee Harry and Dan Svoboda (Beaverhead), Lois Olsen (Helena), Tim Horn (Lewis and Clark), Julie Neff-Shea (Gallatin), and Jeff DiBenedetto (Custer).

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Land Cover of Montana



Agriculture and Grasslands

- AGRICULTURAL LANDS - DRY
- AGRICULTURAL LANDS - IRRIGATED
- ALTERED HERBACEOUS
- VERY LOW COVER GRASSLANDS
- LOW/MODERATE COVER GRASSLANDS
- MODERATE/HIGH COVER GRASSLANDS

Shrub Cover Types

- MIXED MESIC SHRUBS
- MIXED XERIC SHRUBS
- SILVER SAGE
- SALT-DESERT SHRUB/ DRY SALT FLATS
- SAGEBRUSH
- MESIC SHRUB-GRASS ASSOCIATIONS
- XERIC SHRUB-GRASS ASSOCIATIONS

Riparian Cover Types

- CONIFER RIPARIAN
- BROADLEAF RIPARIAN
- MIXED BROADLEAF/ CONIFER RIPARIAN
- SHRUB RIPARIAN
- MIXED RIPARIAN
- GRAMINOID & FORB RIPARIAN

Forest Cover Types

- LOW DENSITY XERIC FOREST
- MIXED BROADLEAF FOREST
- LODGEPOLE PINE
- LIMBER PINE
- PONDEROSA PINE
- GRAND FIR
- WESTERN RED CEDAR
- WESTERN HEMLOCK
- DOUGLAS-FIR
- ROCKY MTN. JUNIPER

- WESTERN LARCH
- UTAH JUNIPER
- DOUGLAS-FIR/ LODGEPOLE PINE
- MIXED WHITEBARK PINE FOREST
- MIXED SUBALPINE FOREST
- MIXED MESIC FOREST
- MIXED XERIC FOREST
- MIXED BROADLEAF/ CONIFER FOREST
- STANDING BURNT FOREST

Other Cover Types

- URBAN OR DEVELOPED LANDS
- MINES, QUARRIES, GRAVEL PITS
- ROCK
- BADLANDS
- MISSOURI BREAKS
- MIXED BARREN SITES
- MONTANE PARKLANDS/ SUBALPINE MEADOWS
- ALPINE MEADOWS
- SNOWFIELDS OR ICE
- WATER

Montana Land Cover Atlas

1100 Urban or Developed Lands

DOMINANT SPECIES

Homo sapiens

DESCRIPTION

Urban or developed lands.



TOTAL AREA

63,733 hectares

1,109 patches

0.17 % of state

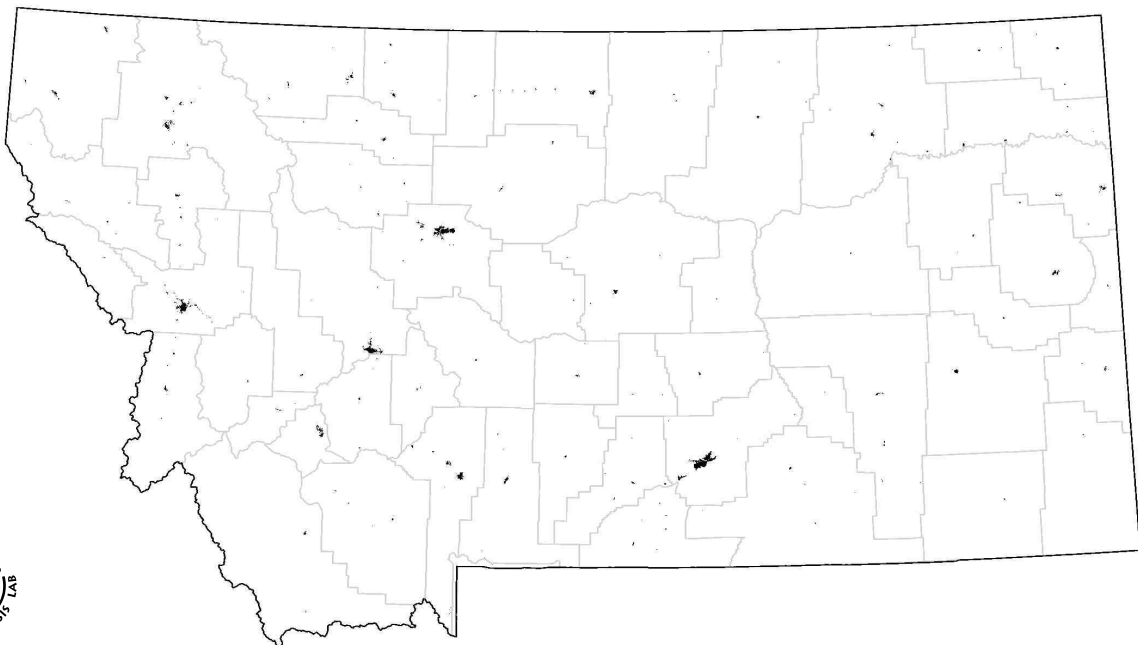
ELEVATION

562 - 2082 m range

1041 m mean

STATE RANGE

Towns, cities, or developed areas across Montana.



Montana Land Cover Atlas

2010 Agricultural Lands - Dry

DOMINANT SPECIES

Crop species
Hay



DESCRIPTION

Non-irrigated agricultural lands.

TOTAL AREA

3,632,611 hectares

96,092 patches

9.54 % of state

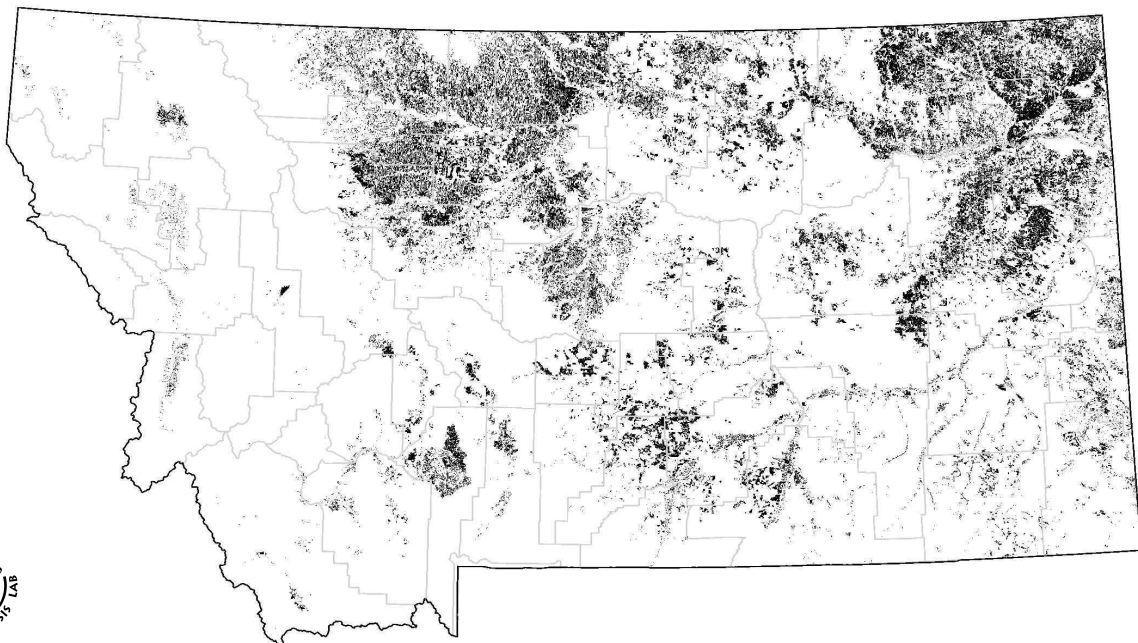
ELEVATION

517 - 2248 m range

936 m mean

STATE RANGE

Non-irrigated agricultural lands across the entire state.



Montana Land Cover Atlas

2020 Agricultural Lands - Irrigated

DOMINANT SPECIES

Crop species
Hay

DESCRIPTION

Irrigated agricultural lands primarily for crop or hay production.



TOTAL AREA

1,957,294 hectares

94,928 patches

5.14 % of state

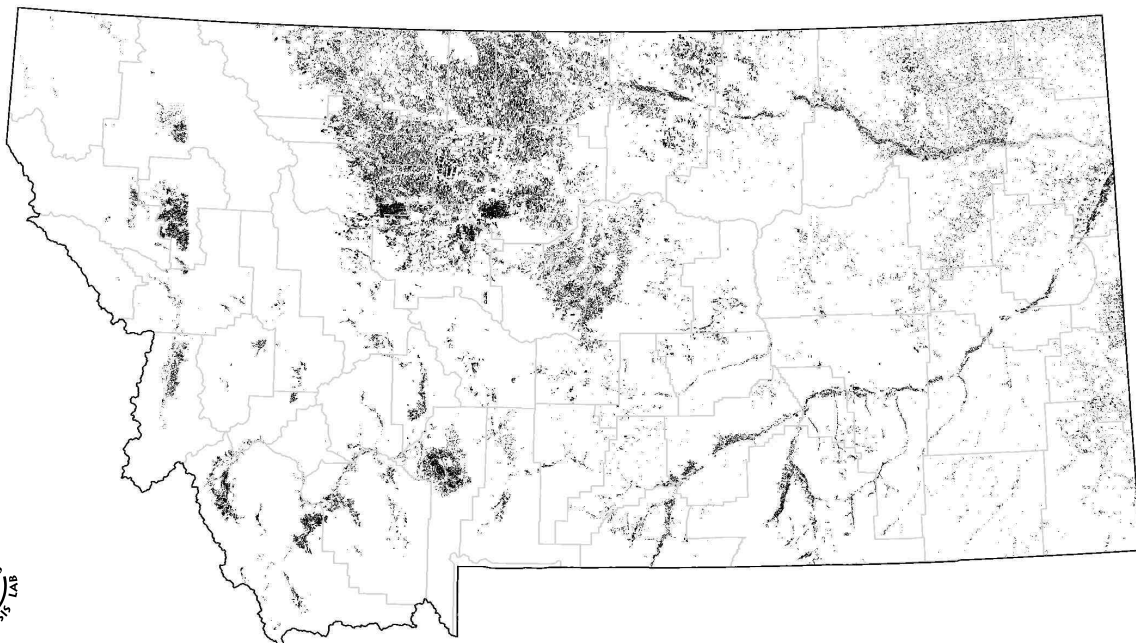
ELEVATION

520 - 2279 m range

1043 m mean

STATE RANGE

Irrigated agricultural lands across the entire state.



Montana Land Cover Atlas

3110 Altered Herbaceous

DOMINANT SPECIES

Bull Thistle (*Cirsium vulgare*)
Canada Thistle (*Cirsium arvense*)
Cheat Grass (*Bromus tectorum*)
Common Dandelion (*Taraxacum officinale*)
Crested Wheatgrass (*Agropyron cristatum*)
Japanese Brome (*Bromus japonicus*)
Leafy Spurge (*Euphorbia esula*)
Smooth Brome (*Bromus inermis*)
Spotted Knapweed (*Centaurea maculosa*)
St. John's-wort (*Hypericum perforatum*)
Western Ragweed (*Ambrosia spp*)
Yellow Sweet-clover (*Melilotus officinalis*)



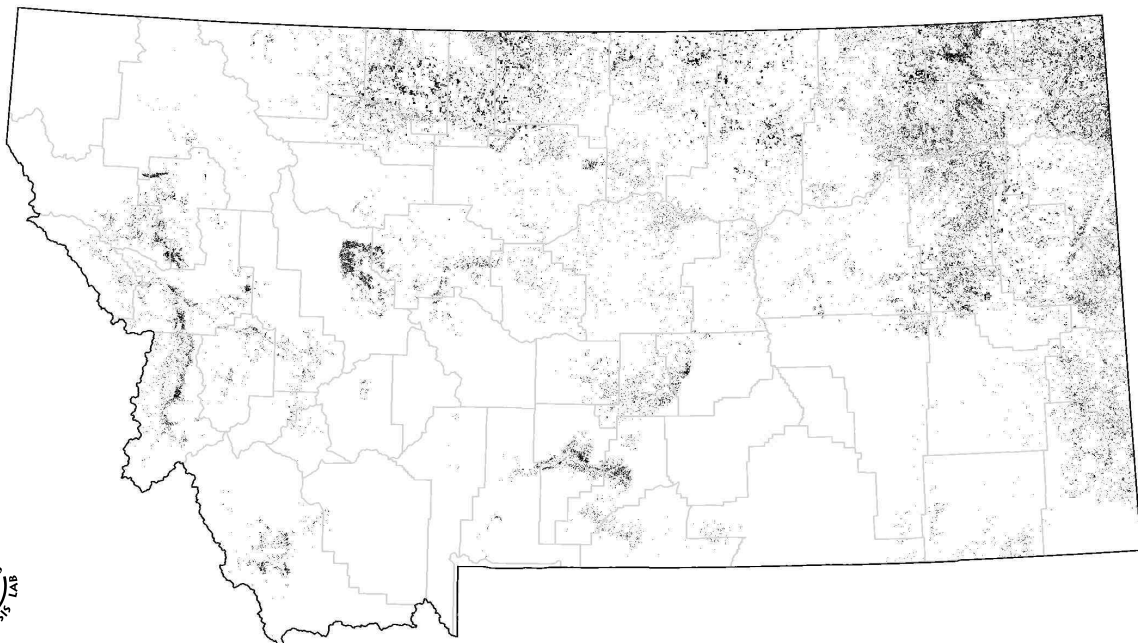
DESCRIPTION

Grasslands with 30% or more cover from the dominant species list. Total herbaceous cover ranges from 20-80%. Typically associated with disturbed lands and can have bare soil coverages from 10-50%. Includes CRP lands in central and eastern Montana..

TOTAL AREA	ELEVATION
1,014,946 hectares	532 - 2862 m range
109,396 patches	934 m mean
2.67 % of state	

STATE RANGE

Occurs across the state in low and high elevation areas. Usually found in smaller regions of 2-10 ha.



Montana Land Cover Atlas

3130 Very Low Cover Grasslands

DOMINANT SPECIES

Blue grama (*Bouteloua gracilis*)
Clubmoss (*Selaginella densa*)
Hairy grama (*Bouteloua hirsuta*)
Hood's Phlox (*Phylox hoodii*)
Missouri Goldenrod (*Solidago missouriense*)
Prairie June grass (*Koeleria pyramidata*)
Sandberg's bluegrass (*Poa sandbergii*)
Sun Sedge (*Carex heliophila*)
Threadleaf Sedge (*Carex filifolia*)



DESCRIPTION

Semi-desert grasslands with total grass cover from 10-30% cover. Dominated by short grasses and forbs. Typically has a high amount of bare soil (20-60% cover). Grasslands with production ranges of 50-300 lb/ac. Usually associated with alkaline soils and/or disturbed sites.

TOTAL AREA

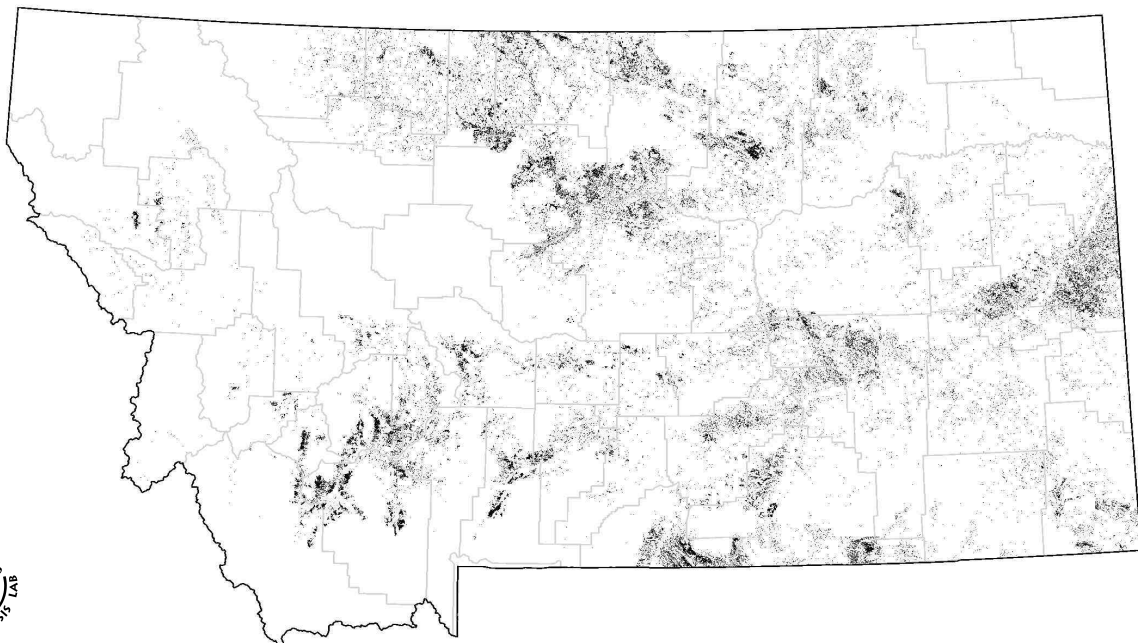
1,104,361 hectares
139,493 patches
2.90 % of state

ELEVATION

503 - 2800 m range
1065 m mean

STATE RANGE

Occurs primarily in central and eastern Montana valleys.



Montana Land Cover Atlas

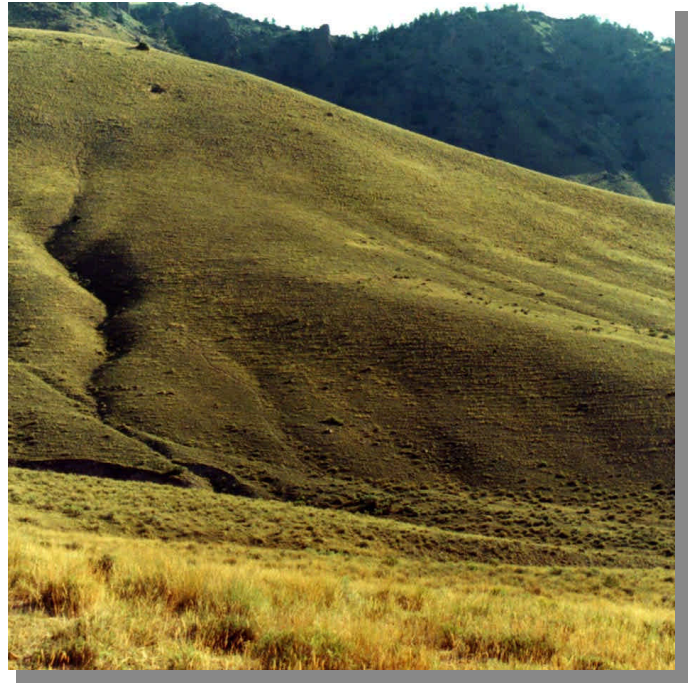
3150 Low / Moderate Cover Grasslands

DOMINANT SPECIES

Arrowleaf Balsamroot (*Balsamorhiza sagittata*)
Bluebunch Wheatgrass (*Agropyron spicatum*)
Blue Grama (*Bouteloua gracilis*)
Bluestem (*Andropogon spp.*)
Carex species (*Carex spp.*)
Green Needlegrass (*Stipa viridula*)
Idaho Fescue (*Festuca Idahoensis*)
Lupine (*Lupinus spp.*)
Needle & Thread grass (*Stipa comata*)
Rough Fescue (*Festuca scabrella*)
Timothy (*Poa pratensis*)
Western Wheatgrass (*Agropyron smithii*)

DESCRIPTION

Low to moderate cover grasslands with total grass cover from 20-70%. Dominated by short to medium height grasses and forbs. Grasslands with production ranges from 300-1800 lb/ac. Includes rangelands and non-irrigated pastures.



TOTAL AREA

10,427,464 hectares

432,016 patches

27.38 % of state

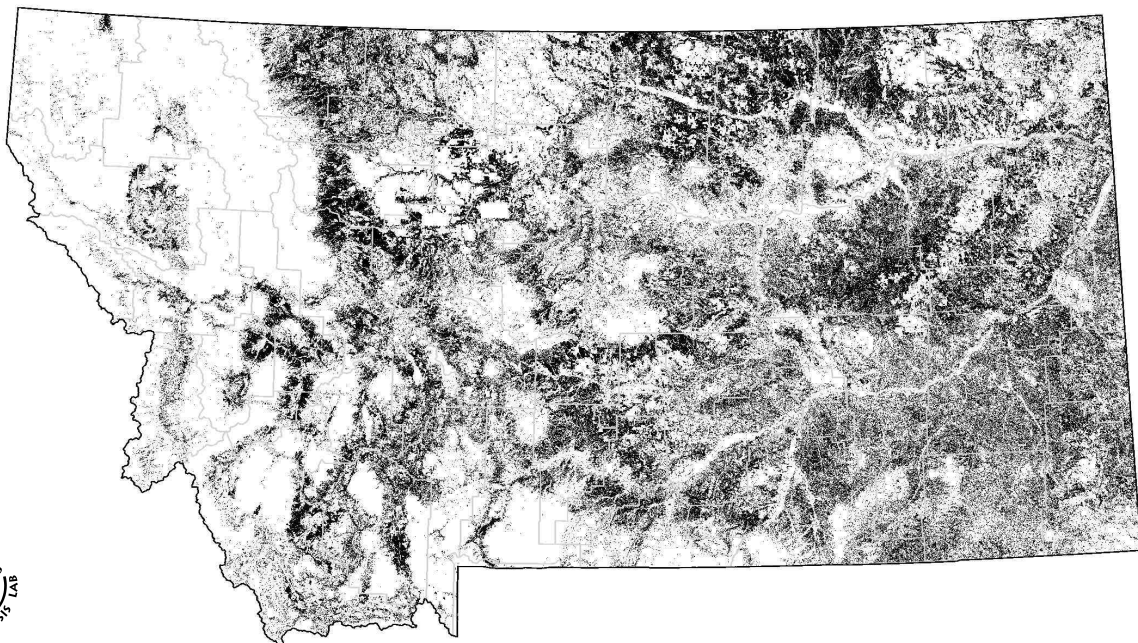
ELEVATION

311 - 3266 m range

1100 m mean

STATE RANGE

Occurs across the state in valleys and foothills. Occurs on middle to high elevation mountain slopes on south aspects.



Montana Land Cover Atlas

3170 Moderate / High Cover Grasslands

DOMINANT SPECIES

Bluebunch Wheatgrass (*Agropyron spicatum*)
Big Bluestem (*Andropogon gerardii*)
Carex species (*Carex spp.*)
Green Needlegrass (*Stipa viridula*)
Indian grass (*Sorghum nutans*)
Little Bluestem (*Andropogon scoparium*)
Needle & Thread grass (*Stipa comata*)
Prairie Sandreed (*Calamovilfa longifolia*)
Switchgrass (*Panicum virgotum*)
Timothy (*Poa pratensis*)
Western Wheatgrass (*Agropyron smithii*)



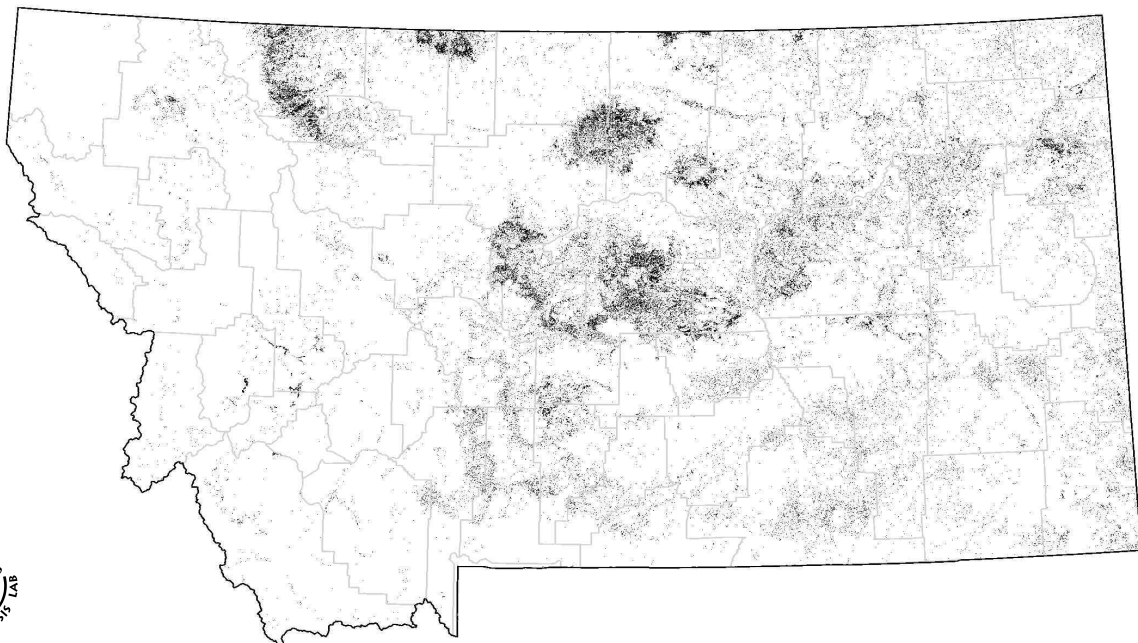
DESCRIPTION

Moderate to high cover grasslands with total grass cover from 50-100%. Dominated by medium to tall grasses in prairie areas. Grasslands with production ranges from 1000-7000 lb/ac. Associated with wet sites.

TOTAL AREA	ELEVATION
1,236,660 hectares	542 - 3071 m range
196,470 patches	1162 m mean
3.25 % of state	

STATE RANGE

Occurs primarily in central and eastern Montana valleys.



Montana Land Cover Atlas

3180 Montane Parklands & Subalpine Meadows

DOMINANT SPECIES

Arnica (*Arnica Spp.*)
Beargrass (*Xerophyllum tenax*)
Columbia Brome (*Bromus vulgaris*)
Elk Sedge (*Carex geyeri*)
Hood's Sedge (*Carex hoodii*)
Northwestern Sedge (*Carex concinnoides*)
Parry's Rush (*Juncus parryi*)
Pinegrass (*Calamagrostis rubescens*)
Ross Sedge (*Carex rossii*)
Smooth Woodrush (*Luzula hitchcockii*)
Subalpine Daisy (*Erigeron peregrinus*)



DESCRIPTION

Mid to upper elevation meadows within forests or at timberline. Total herbaceous cover ranges from 30-100%. Associated with moist sites in mountain areas.

TOTAL AREA

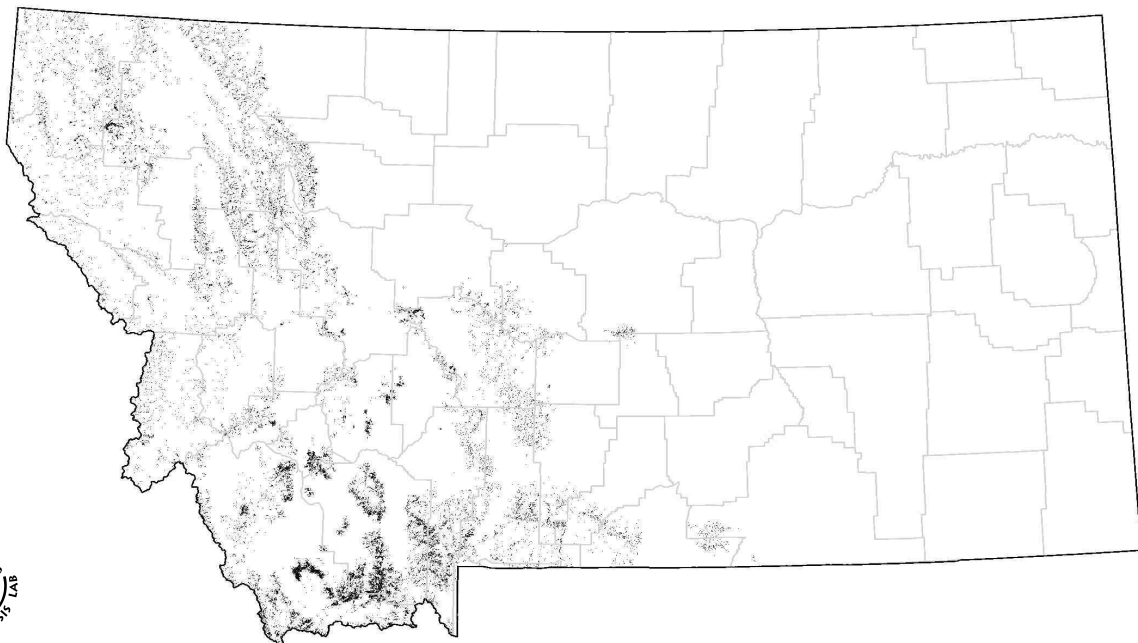
528,201 hectares
59,185 patches
1.39 % of state

ELEVATION

808 - 3384 m range
2186 m mean

STATE RANGE

Occurs across the state at mid to upper elevations in mountain areas.



Montana Land Cover Atlas

3200 Mixed Mesic Shrubs

DOMINANT SPECIES

Alder (*Alnus spp.*)
Buffalo Berry (*Shepherdia argentea*)
Ceanothus (*Ceanothus spp.*)
Huckleberry (*Vaccinium spp.*)
Labrador Tea (*Ledum glandulosum*)
Ninebark (*Physocarpus malvaceus*)
Pachistima (*Pachistima myrsinites*)
Mountain Heath (*Phyllodoce empetrifomis*)
Shiny-leaf Spiraea (*Spiraea betulifolia*)
Sumac (*Rhus spp.*)
Snowberry (*Symphoricarpos spp.*)
Western Serviceberry (*Amelanchier alnifolia*)
Whortleberry (*Vaccinium scoparium*)

DESCRIPTION

Shrublands where mesic shrubs are dominant, with shrub cover from 20-100%. Usually associated with moist sites. Associated grass and forbs species: arnica (*Arnica spp.*), beargrass (*Xerophyllum tenax*), elk sedge (*Carex geyeri*), pinegrass (*Calamagrostis rubescens*).



TOTAL AREA

949,873 hectares

172,497 patches

2.49 % of state

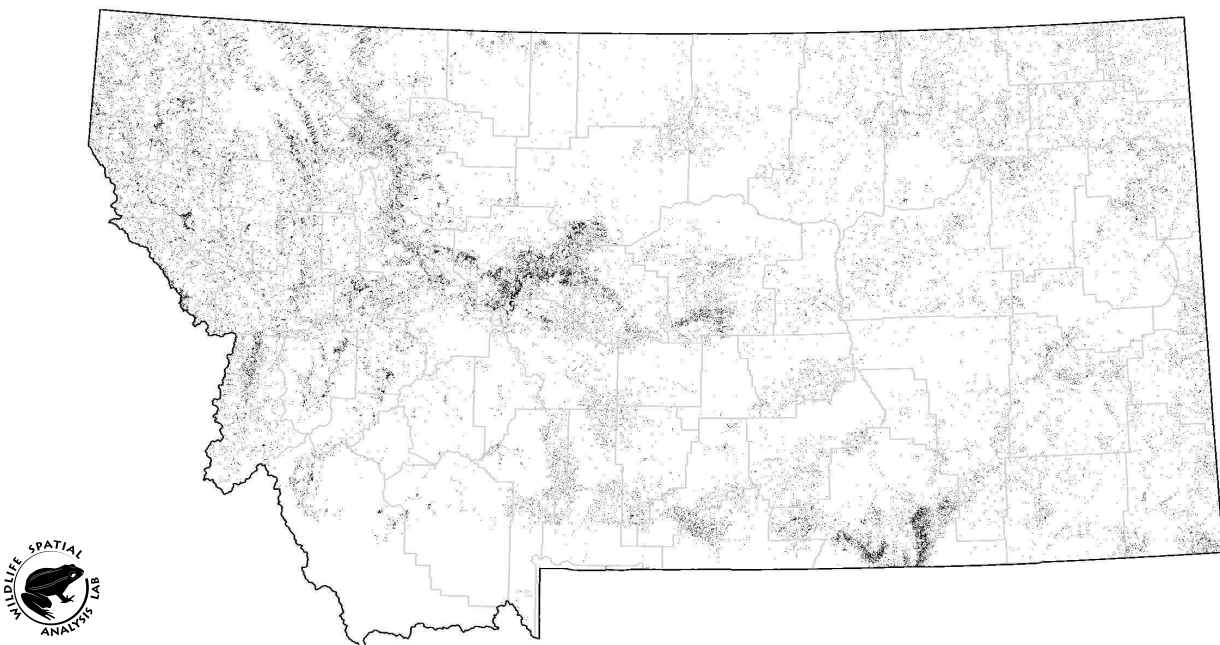
ELEVATION

528 - 3156 m range

1355 m mean

STATE RANGE

Occurs in mountain areas in western Montana and in draws or north slopes in eastern Montana.



Montana Land Cover Atlas

3300 Mixed Xeric Shrubs

DOMINANT SPECIES

Bitterbrush (*Purshia tridentata*)
Creeping Juniper (*Juniperus horizontalis*)
Greasewood (*Sarcobatus spp.*)
Mountain Mahogany (*Cercocarpus spp.*)
Rabbitbrush (*Chrysothamnus spp.*)
Shadscale (*Atriplex canescens*)

DESCRIPTION

Shrublands where mixed xeric shrubs are dominant, with shrub cover from 20-50%. Grass cover ranges from 5-40%. Associated with dry rocky sites. Associated grass and forb species: bluebunch wheatgrass (*Agropyron spicatum*), blue gamma (*Andropogon gracilis*), Idaho fescue (*Festuca idahoensis*), western wheatgrass (*Agropyron smithii*).



TOTAL AREA

1,227,852 hectares

184,013 patches

3.22 % of state

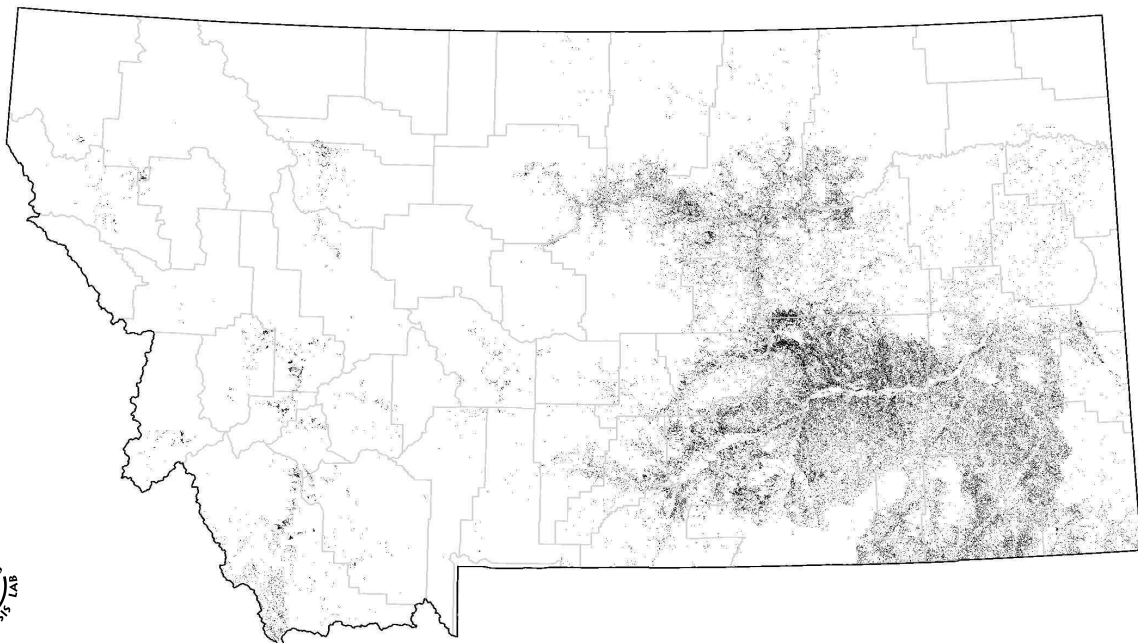
ELEVATION

573 - 3102 m range

984 m mean

STATE RANGE

Occurs across the state primarily in valleys and low elevation mountain slopes.



Montana Land Cover Atlas

3309 Silver Sage

DOMINANT SPECIES

Silver Sage (*Artemisia cana*)



DESCRIPTION

Shrublands dominated by silver sage (*Artemisia cana*) with cover from 20-50%. Found on moist sites near riparian areas. Associated grass and forb species: bluebunch wheatgrass (*Agropyron spicatum*), blue gamma (*Andropogon gracilis*), Idaho fescue (*Festuca idahoensis*), western wheatgrass (*Agropyron smithii*).

TOTAL AREA

73,334 hectares

20,022 patches

0.19 % of state

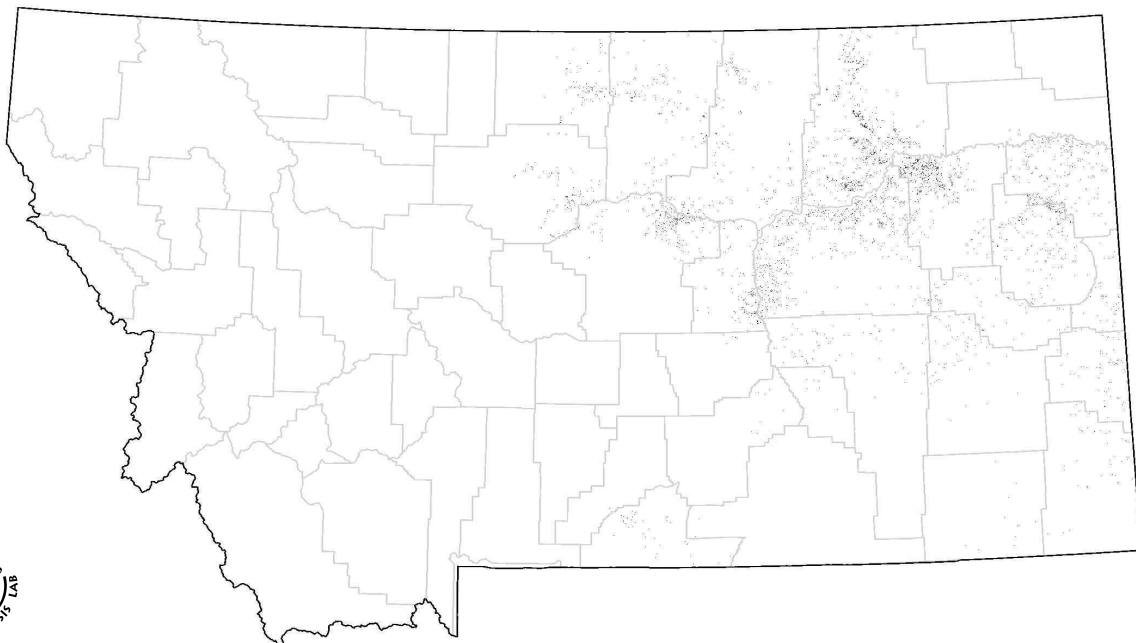
ELEVATION

573 - 1742 m range

796 m mean

STATE RANGE

Occurs primarily in northeastern Montana.

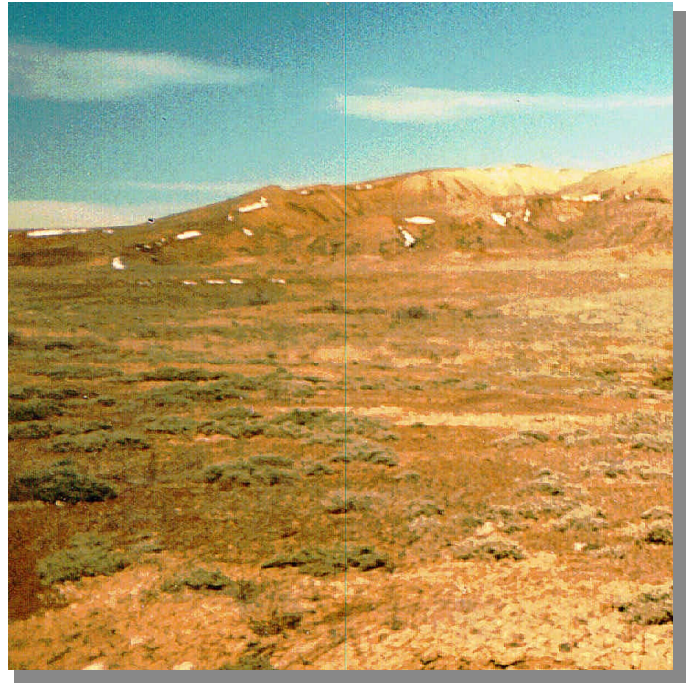


Montana Land Cover Atlas

3310 Salt-Desert Shrub / Dry Salt Flats

DOMINANT SPECIES

Saltsage (*Atriplex nuttallii*)



DESCRIPTION

Shrublands dominated by saltsage (*Atriplex nuttallii*) with 10-40% cover. Usually associated with alkaline sites or blowouts. Found in dry, sandy, or saline-seep areas. Associated grass and forb species: blue grama I (*Bouteloua gracilis*), hairy grama (*Bouteloua hirsuta*), Sandberg's bluegrass (*Poa sandbergii*), threadleaf sedge (*Carex filifolia*).

TOTAL AREA

131,141 hectares

22,824 patches

0.34 % of state

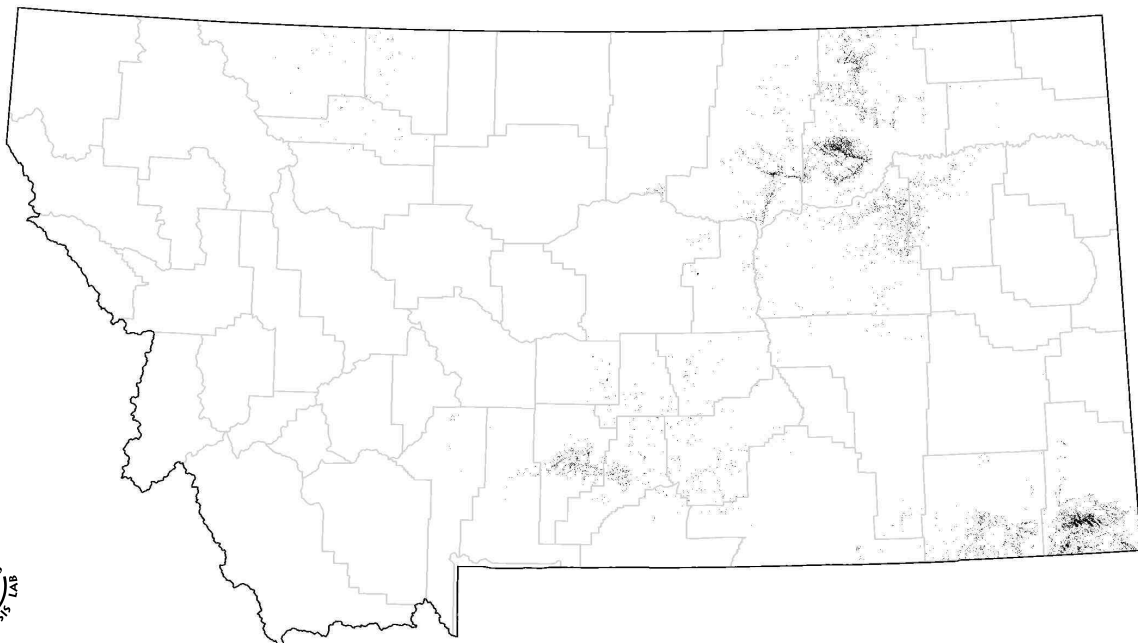
ELEVATION

542 - 1964 m range

952 m mean

STATE RANGE

Occurs primarily in eastern and southeastern Montana.



Montana Land Cover Atlas

3350 Sagebrush

DOMINANT SPECIES

Basin Big Sagebrush (*Artemisia tridentata*)
Black Sagebrush Steppe (*Artemisia nova*)
Mountain Big Sage (*Artemisia vaseyana*)
Wyoming Big Sage (*Artemisia wyomingensis*)



DESCRIPTION

Shrublands dominated by sagebrush (*Artemisia spp.*) with 20-80% cover. Associated grass and forb species: bluebunch wheatgrass (*Agropyron spicatum*), blue gamma (*Andropogon gracilis*), Idaho fescue (*Festuca idahoensis*), western wheatgrass (*Agropyron smithii*).

TOTAL AREA

2,145,574 hectares

220,288 patches

5.63 % of state

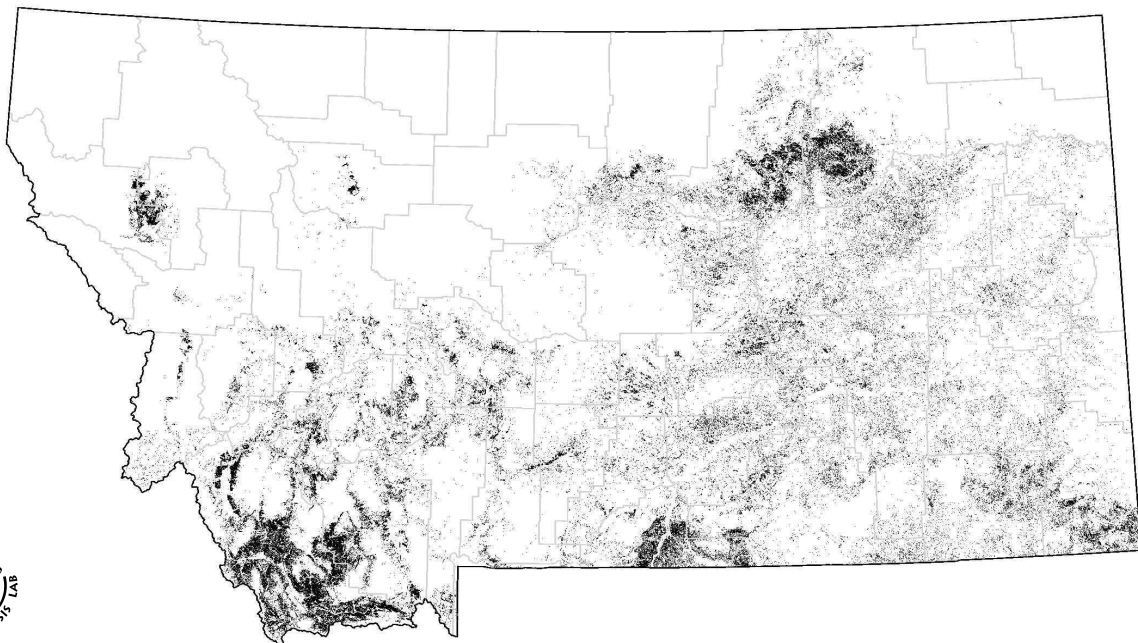
ELEVATION

465 - 3417 m range

1351 m mean

STATE RANGE

Occurs across the state, primarily in valleys. Occasionally occurs on low-mid elevation mountain slopes.



Montana Land Cover Atlas

3510 Mesic Shrub - Grassland Associations

DOMINANT SPECIES

Grass:

Bluebunch Wheatgrass (*Agropyron spicatum*)

Bluestem (*Andropogon spp.*)

Fescue (*Festuca spp.*)

Needle & Thread grass (*Stipa comata*)

Threadleaf Sedge (*Carex filifolia*)

Western Wheatgrass (*Agropyron smithii*)

Shrubs:

Buffalo Berry (*Shepherdia argentea*)

Snowberry (*Symphoricarpos spp.*)

Sumac (*Rhus spp.*)



DESCRIPTION

Mesic shrub-grassland associations with codominance between the shrub and grass species. Shrub and grass cover ranges from 10-50%. Found on moist sites usually between pure grass or shrub dominated regions.

TOTAL AREA

280,075 hectares

64,714 patches

0.74 % of state

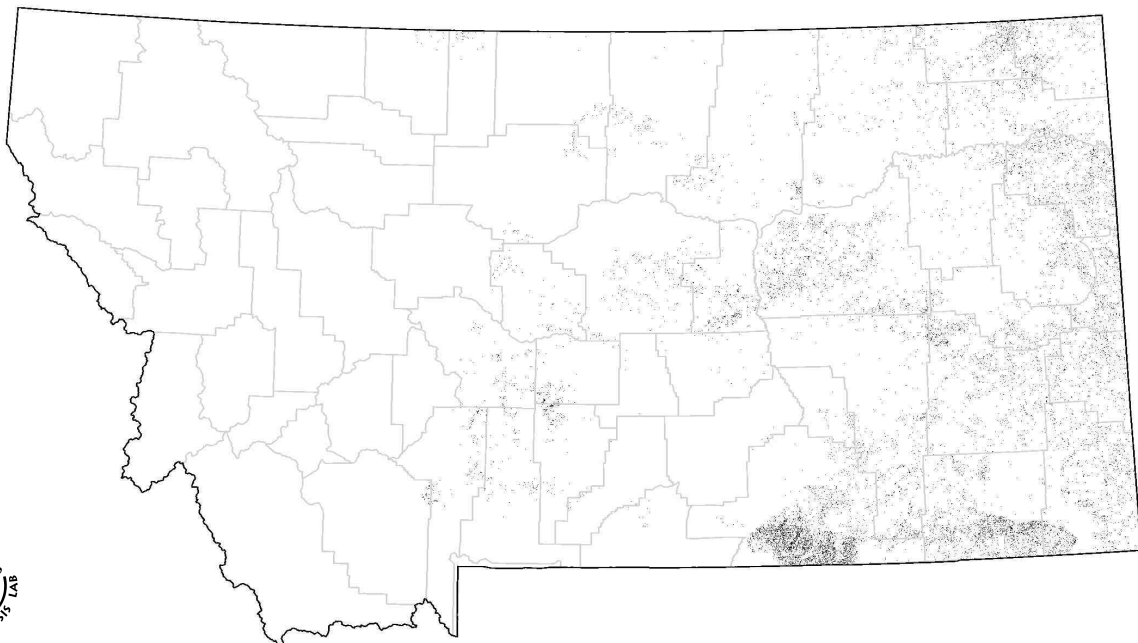
ELEVATION

573 - 2424 m range

1043 m mean

STATE RANGE

Occurs primarily in central and eastern Montana valleys and some low mountain slopes.



Montana Land Cover Atlas

3520 Xeric Shrub - Grassland Associations

DOMINANT SPECIES

Grass:

Blue grama (*Bouteloua gracilis*)

Bluebunch Wheatgrass (*Agropyron spicatum*)

Bluestem (*Andropogon spp.*)

Fescue (*Festuca spp.*)

Needle & Thread grass (*Stipa comata*)

Western Wheatgrass (*Agropyron smithii*)

Shrubs:

Rabbitbrush (*chrysothamnus spp.*)

Sagebrush (*Artemisia spp.*)



DESCRIPTION

Xeric shrub-grassland associations with codominance between the shrub and grass species. Shrub and grass cover ranges from 10-50%. Found on dry sites in valleys and is usually between grass dominated and shrub dominated regions.

TOTAL AREA

524,061 hectares

79,041 patches

1.38 % of state

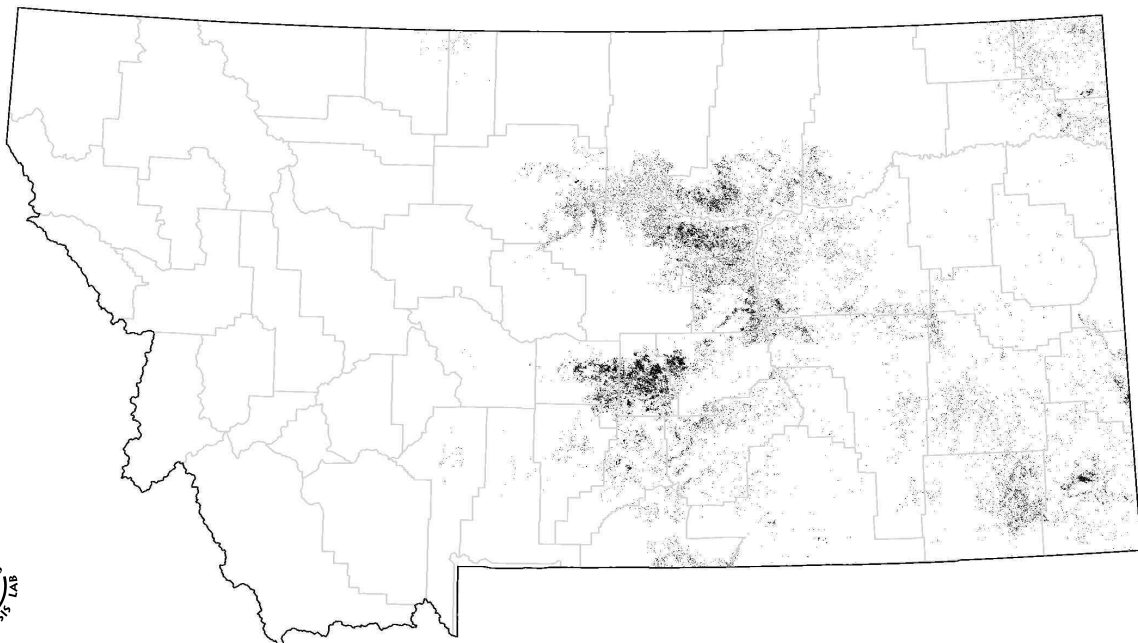
ELEVATION

571 - 2438 m range

997 m mean

STATE RANGE

Occurs primarily in central and eastern Montana valleys and some low mountain slopes.



Montana Land Cover Atlas

4000 Low Density Xeric Forest

DOMINANT SPECIES

Trees:

Douglas-fir (*Pseudotsuga menziesii*)
Limber Pine (*Pinus flexilis*)
Ponderosa Pine (*Pinus ponderosa*)
Rocky Mountain Juniper (*Juniperus scopulorum*)
Utah Juniper (*Juniperus osteosperma*)

Grass:

Bluebunch Wheatgrass (*Agropyron spicatum*)
Blue Grama (*Bouteloua gracilis*)
Bluestem (*Andropogon spp.*)
Green Needlegrass (*Stipa viridula*)
Idaho Fescue (*Festuca Idahoensis*)
Needle & Thread grass (*Stipa comata*)



DESCRIPTION

Low density xeric forests that occur on the edge of grasslands. Tree cover ranges from 5-20% and typically has a grass understory. Regions can have tree and grass patches mixed together, with trees being the dominant feature in the region.

TOTAL AREA

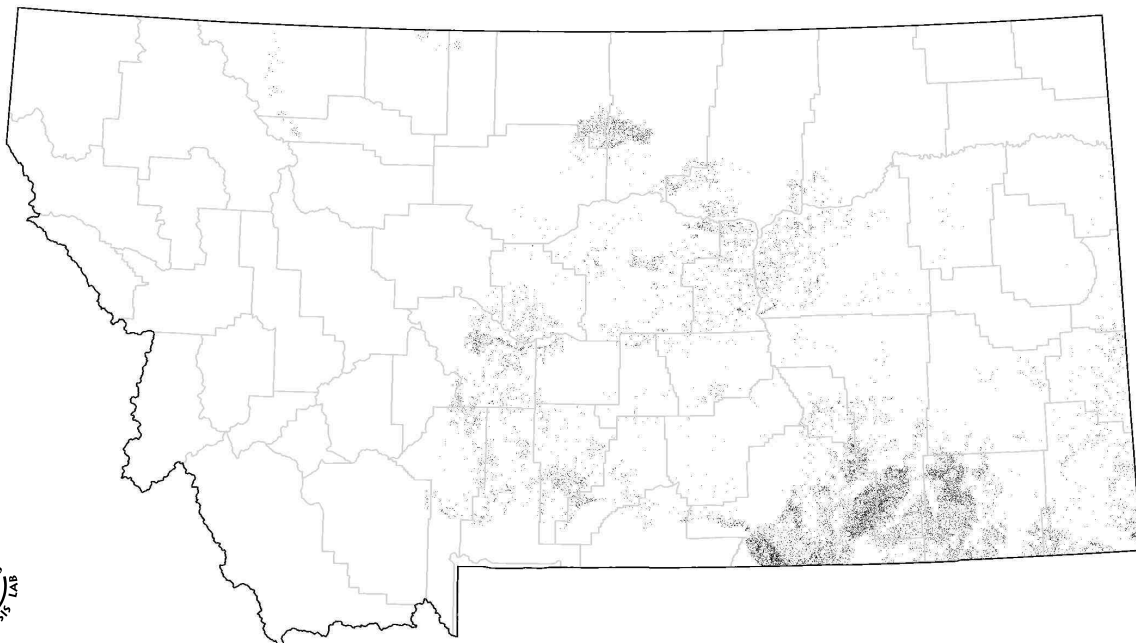
286,187 hectares
63,913 patches
0.75 % of state

ELEVATION

577 - 2893 m range
1293 m mean

STATE RANGE

Occurs primarily in eastern Montana in low hills near grasslands.



Montana Land Cover Atlas

4140 Mixed Broadleaf Forest

DOMINANT SPECIES

Aspen (*Populus tremuloides*)
Basswood (*Tilia americana*)
Birch (*Betula spp.*)
Bur Oak (*Quercus macrocarpa*)
Green Ash (*Fraxinus pennsylvanica*)
Plains Cottonwood (*Populus deltoides*)



DESCRIPTION

Multiple species broadleaf forest with total tree cover of 20-80%. Broadleaf tree species dominate the tree cover (greater than 75% of total tree cover). Aspen stands are included within this cover type. Associated shrub species: alder (*Alnus spp.*), huckleberry (*Vaccinium spp.*), service berry (*Amelanchier alnifolia*), snowberry (*Symphoricarpos spp.*).

TOTAL AREA

357,539 hectares

72,262 patches

0.94 % of state

ELEVATION

542 - 2942 m range

1354 m mean

STATE RANGE

Occurs across the state, primarily in moist forest areas or near riparian areas or woody draws.



Montana Land Cover Atlas

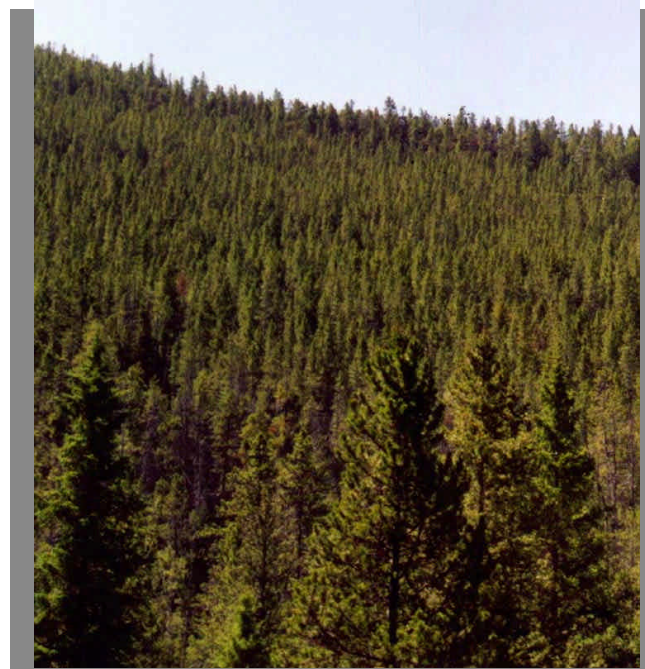
4203 Lodgepole Pine

DOMINANT SPECIES

Lodgepole Pine (*Pinus contorta*)

DESCRIPTION

Conifer forest dominated by lodgepole pine (*Pinus contorta*) with 20-100% cover. Associated shrub species: huckleberry (*Vaccinium spp.*), Oregon grape (*Berberis repens*), shiny-leaf spirea (*Spiraea betulifolia*), whortleberry (*Vaccinium scoparium*). Associated grass and forb species: arnica (*Arnica spp.*), beargrass (*Xerophyllum tenax*), pinegrass (*Calamagrostis rubescens*).



TOTAL AREA

1,286,156 hectares

98,028 patches

3.38 % of state

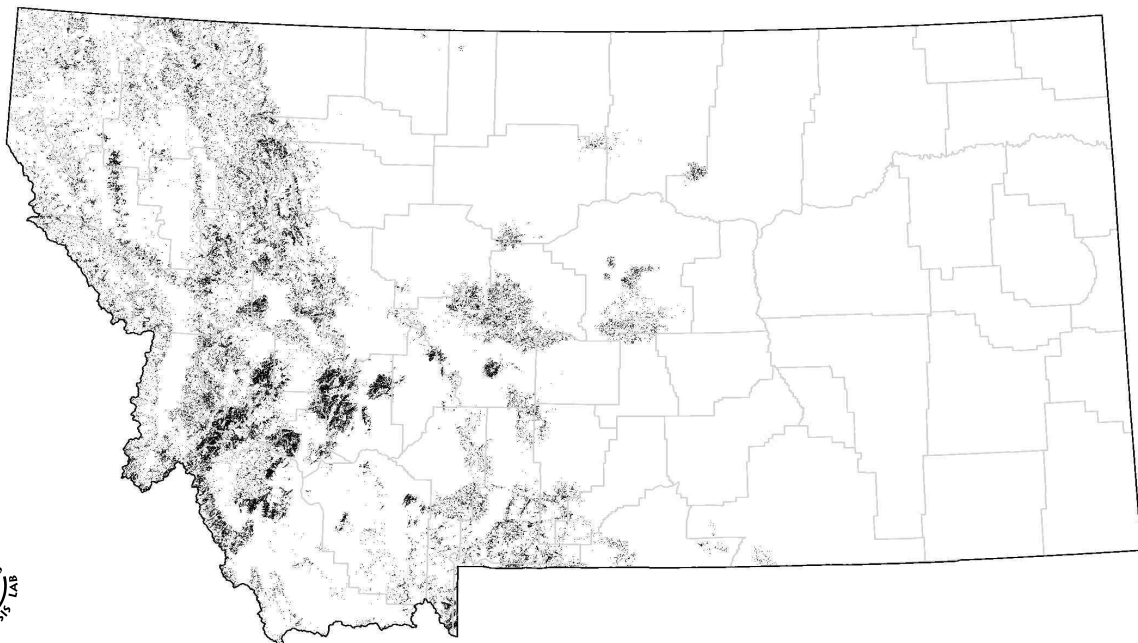
ELEVATION

550 - 3196 m range

1940 m mean

STATE RANGE

Occurs across the state in mountainous regions, primarily in western and south-central Montana. Limited to cooler, mid-high elevation forest sites.



Montana Land Cover Atlas

4205 Limber Pine

DOMINANT SPECIES

Limber Pine (*Pinus flexilis*)



DESCRIPTION

Conifer forest dominated by limber pine (*Pinus flexilis*) with 20-50% cover. Associated shrub species: big sagebrush (*Artemisia tridentata*), juniper (*Juniperus spp.*), rabbitbrush (*Chrysothamnus spp.*). Associated grass and forb species: bluebunch wheatgrass (*Agropyron spicatum*), blue grama (*Bouteloua gracilis*), Idaho fescue (*Festuca idahoensis*).

TOTAL AREA

120,372 hectares

22,148 patches

0.32 % of state

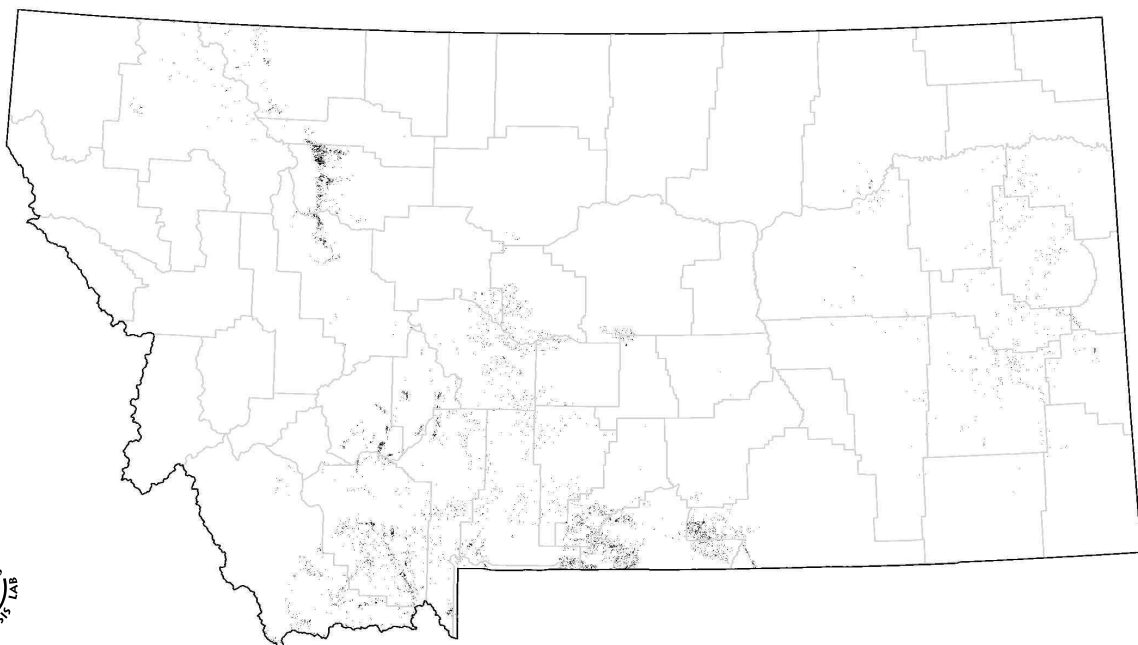
ELEVATION

622 - 3351 m range

1842 m mean

STATE RANGE

Occurs in lower elevations of central Montana. Occurs at higher elevations on limestone soils in central and eastern Montana. Limited to dry forest sites.



Montana Land Cover Atlas

4206 Ponderosa Pine

DOMINANT SPECIES

Ponderosa Pine (*Pinus ponderosa*)



DESCRIPTION

Conifer forest dominated by ponderosa pine (*Pinus ponderosa*) with 20-80% cover. Associated shrub species: big sagebrush (*Artemisia tridentata*), ninebark (*Physocarpus malvaceus*), snowberry (*Symphoricarpos spp.*). Associated grass and forb species: bluebunch wheatgrass (*Agropyron spictatum*), blue grama (*Bouteloua gracilis*), Idaho fescue (*Festuca idahoensis*).

TOTAL AREA

1,066,130 hectares

127,272 patches

2.80 % of state

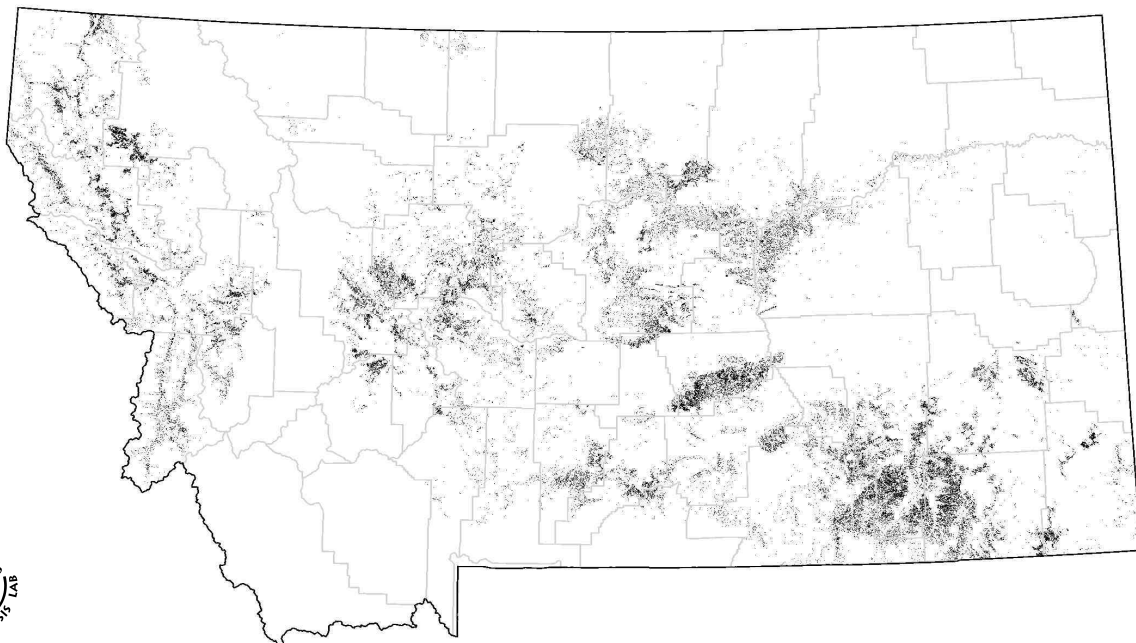
ELEVATION

549 - 2353 m range

1192 m mean

STATE RANGE

Occurs across the state except in northeastern Montana. Limited to lower elevation, dry forest sites.



Montana Land Cover Atlas

4207 Grand Fir

DOMINANT SPECIES

Grand Fir (*Abies grandis*)



DESCRIPTION

Conifer forest dominated by grand fir (*Abies grandis*) with 20-100% cover. Associated shrub species: huckleberry (*Vaccinium spp.*), mountain lover (*Pachistima myrsinites*), thimbleberry (*Rubus parviflorum*), twin flower (*Linnaea borealis*). Associated grass and forb species: queens cup beadlily (*Clintonia uniflora*).

TOTAL AREA

22,017 hectares

3,328 patches

0.06 % of state

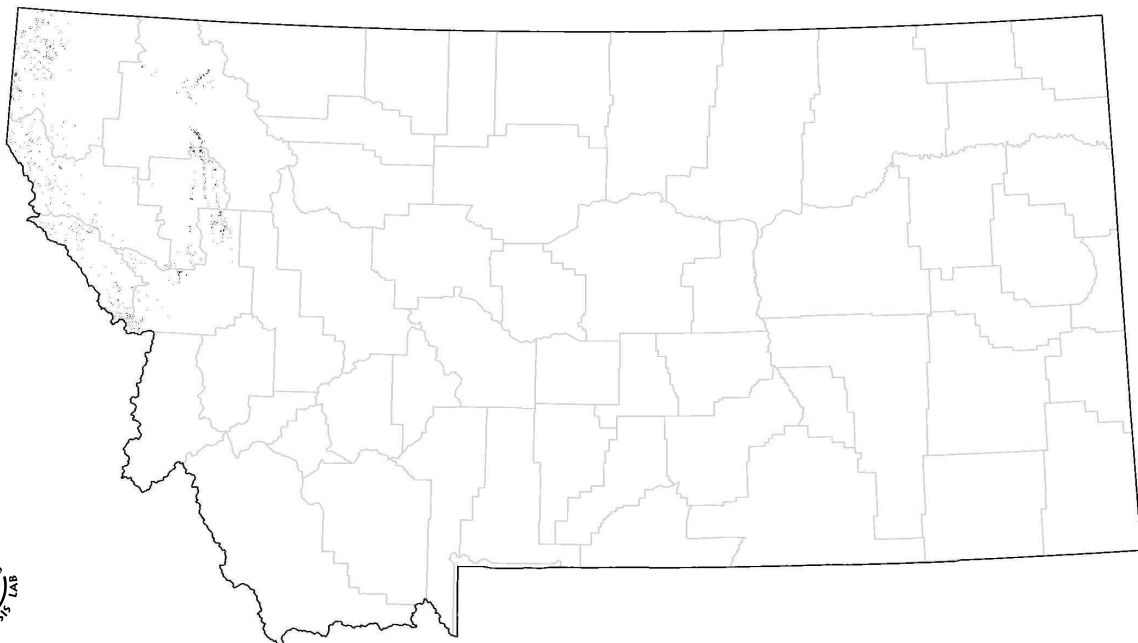
ELEVATION

664 - 2012 m range

1232 m mean

STATE RANGE

Occurs only in western Montana. Usually located near or in riparian areas at low elevation forest sites.



Montana Land Cover Atlas

4210 Western Red Cedar

DOMINANT SPECIES

Western Red Cedar (*Thuja plicata*)



DESCRIPTION

Conifer forest dominated by western red cedar (*Thuja plicata*) with 20-100% cover. Associated shrub species: bunchberry (*Cornus canadensis*), thimbleberry (*Rubus parviflorum*) twin flower (*Linnaea borealis*). Associated grass and forb species: queens cup beadlily (*Clintonia uniflora*).

TOTAL AREA

36,339 hectares

4,551 patches

0.10 % of state

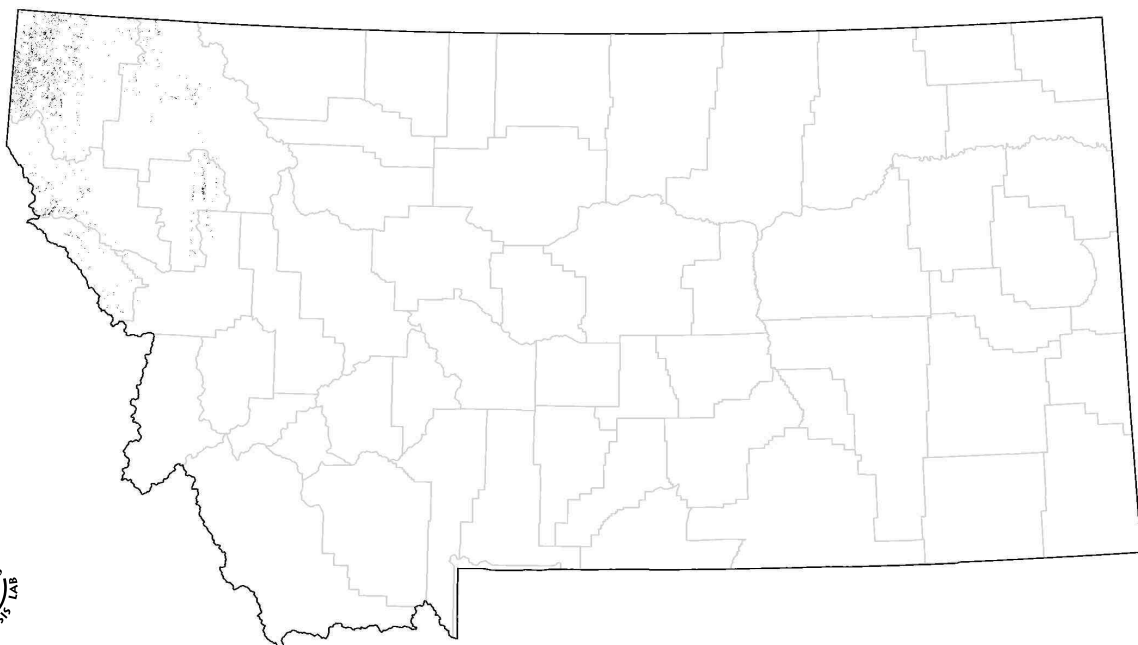
ELEVATION

551 - 1925 m range

1172 m mean

STATE RANGE

Occurs only in western Montana. Usually located near or in riparian areas at low elevation forest sites.



Montana Land Cover Atlas

4211 Western Hemlock

DOMINANT SPECIES

Western Hemlock (*Tsuga heterophylla*)



DESCRIPTION

Conifer forest dominated by western hemlock (*Tsuga heterophylla*) with 20-100% cover. Associated shrub species: bunchberry (*Cornus canadensis*), thimbleberry (*Rubus parviflorum*) twin flower (*Linnaea borealis*). Associated grass and forb species: queens cup beadlily (*Clintonia uniflora*).

TOTAL AREA

20,940 hectares

1,990 patches

0.05 % of state

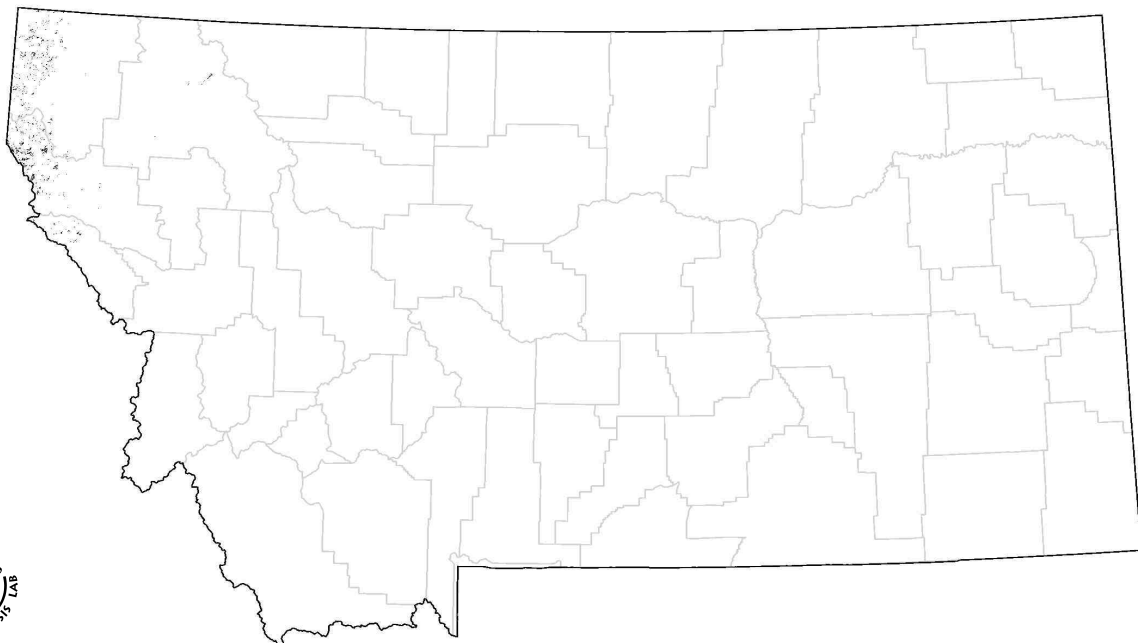
ELEVATION

689 - 1968 m range

1253 m mean

STATE RANGE

Occurs only in western Montana. Usually located near or in riparian areas at low elevation forested sites.



Montana Land Cover Atlas

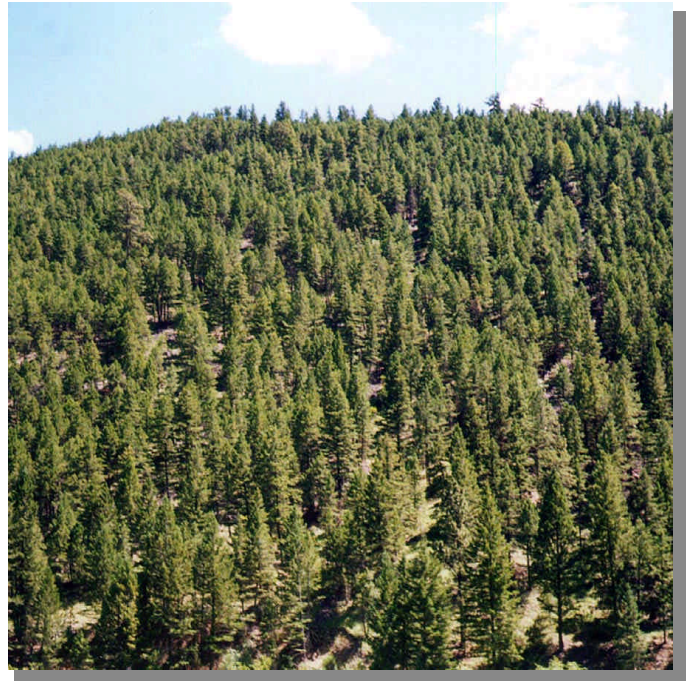
4212 Douglas-fir

DOMINANT SPECIES

Douglas-fir (*Pseudotsuga menziesii*)

DESCRIPTION

Conifer forest dominated by Douglas-fir (*Pseudotsuga menziesii*) with 20-90% cover. Associated shrub species: ninebark (*Physocarpus malvaceus*), shiny-leaf spiraea (*Spiraea betulifolia*) snowberry (*Symphoricarpos spp.*). Associated grass and forb species: bluebunch wheatgrass (*Agropyron spicatum*), Idaho fescue (*Festuca idahoensis*), pinegrass (*Calamagrostis rubescens*).



TOTAL AREA

1,329,994 hectares

139,735 patches

3.49 % of state

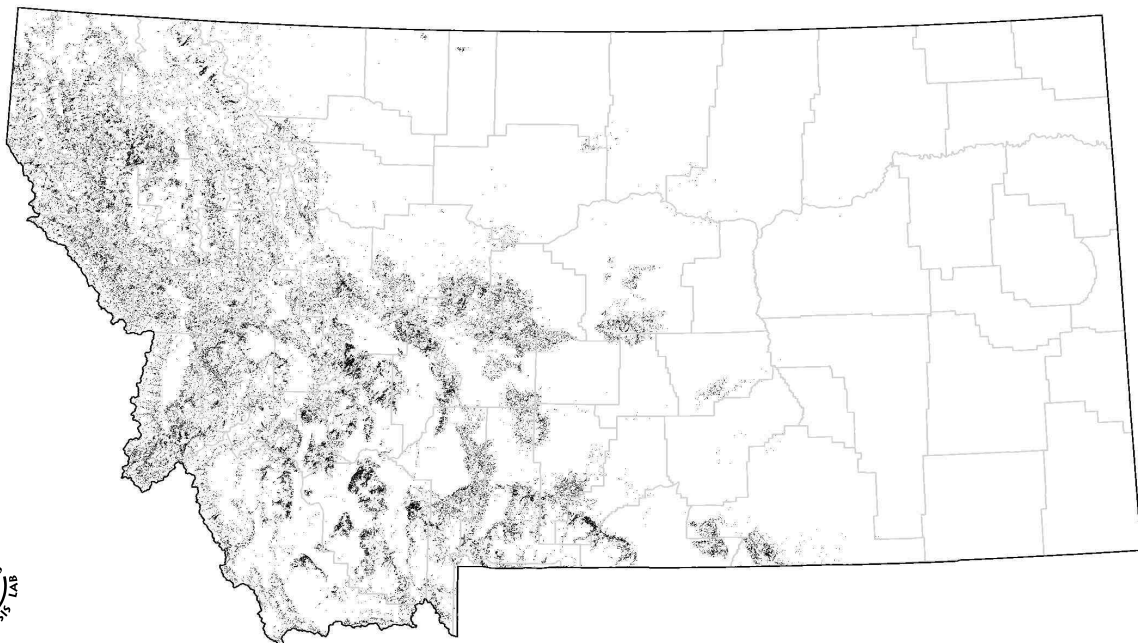
ELEVATION

549 - 3140 m range

1715 m mean

STATE RANGE

Occurs across the state except in northeastern Montana. Primarily located in western and south-central Montana.



Montana Land Cover Atlas

4214 Rocky Mountain Juniper

DOMINANT SPECIES

Rocky Mountain Juniper (*Juniperus scopularium*)



DESCRIPTION

Conifer forest dominated by Rocky Mountain juniper (*Juniperus scopularium*) with 20-50% cover. Associated shrub species: big sagebrush (*Artemisia tridentata*), snowberry (*Symphoricarpos spp.*). Associated grass and forb species: bluebunch wheatgrass (*Agropyron spicatum*), blue grama (*Bouteloua gracilis*), Idaho fescue (*Festuca idahoensis*).

TOTAL AREA

80,379 hectares

17,669 patches

0.21 % of state

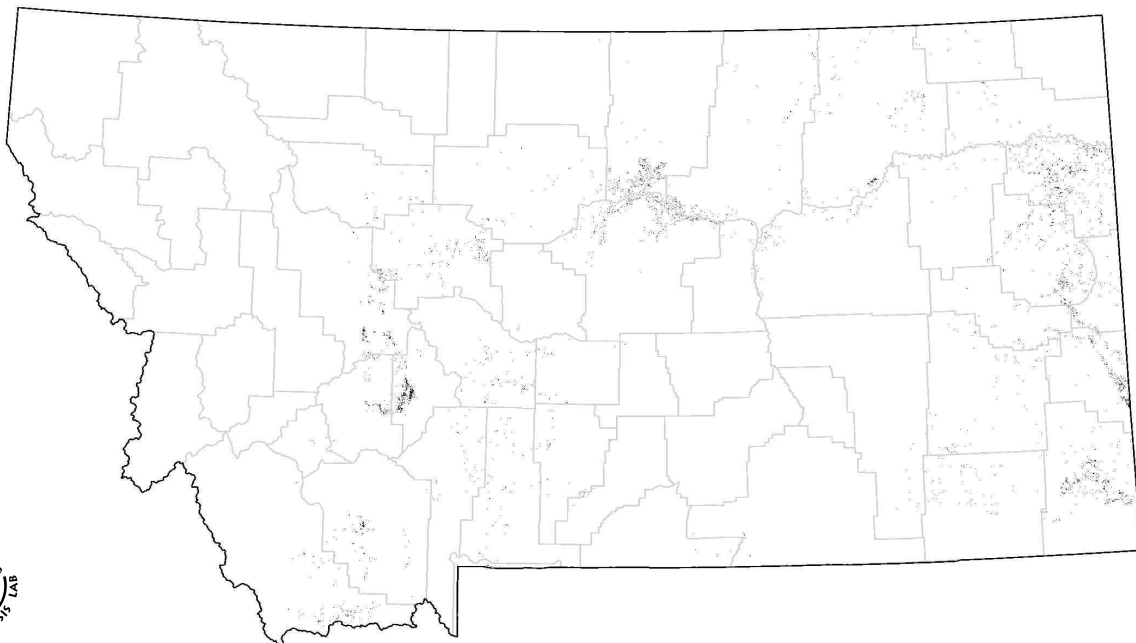
ELEVATION

569 - 2461 m range

1085 m mean

STATE RANGE

Occurs primarily in central and eastern Montana in dry forest sites.



Montana Land Cover Atlas

4215 Western Larch

DOMINANT SPECIES

Western Larch (*Larix occidentalis*)



DESCRIPTION

Conifer forest dominated by western larch (*Larix occidentalis*) with 20-100% cover. Associated shrub species: huckleberry (*Vaccinium spp.*), shiny-leaf spirea (*Spiraea betulifolia*), thimbleberry (*Rubus parviflorum*), twin flower (*Linnaea borealis*). Associated grass and forb species: arnica (*Arnica spp.*), pinegrass (*Calamagrostis rubescens*).

TOTAL AREA

90,437 hectares

13,652 patches

0.24 % of state

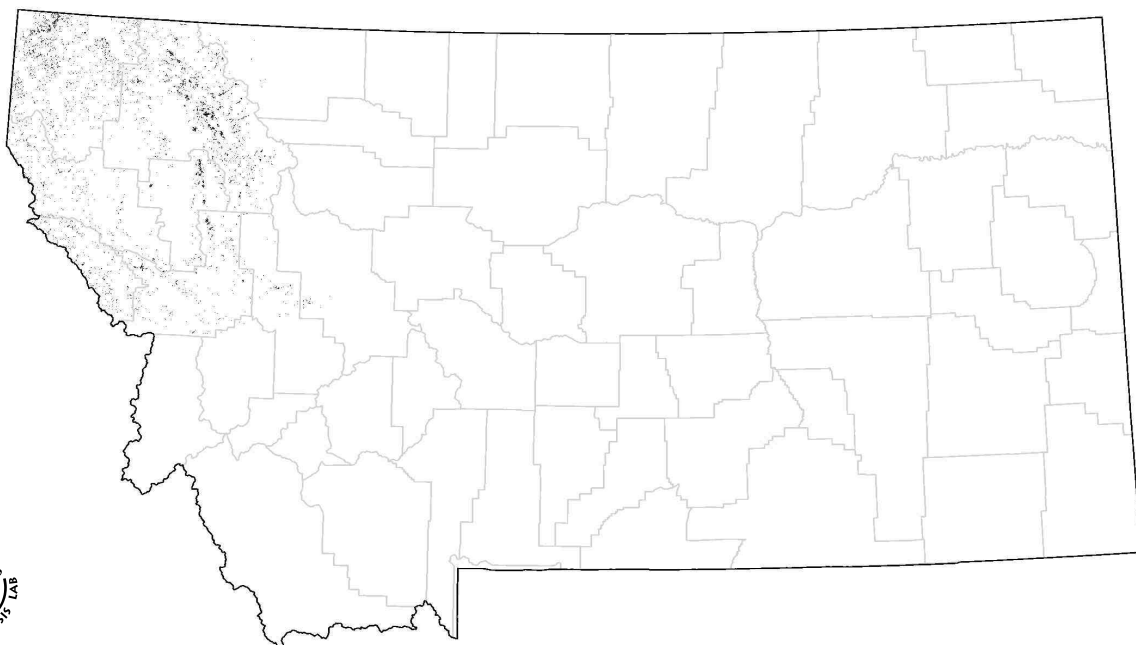
ELEVATION

635 - 2236 m range

1376 m mean

STATE RANGE

Occurs only in western Montana in moist sites. Generally limited to north, east or northwest aspects.



Montana Land Cover Atlas

4216 Utah Juniper

DOMINANT SPECIES

Utah Juniper (*Juniperus osteosperma*)

DESCRIPTION

Conifer forest dominated by Utah juniper (*Juniperus osteosperma*) with 20-50% cover. Associated shrub species: big sagebrush (*Artemisia tridentata*), snowberry (*Symphoricarpos spp.*). Associated grass and forb species: bluebunch wheatgrass (*Agropyron spicatum*), blue grama (*Bouteloua gracilis*), Idaho fescue (*Festuca idahoensis*).



TOTAL AREA

14,843 hectares

2,686 patches

0.04 % of state

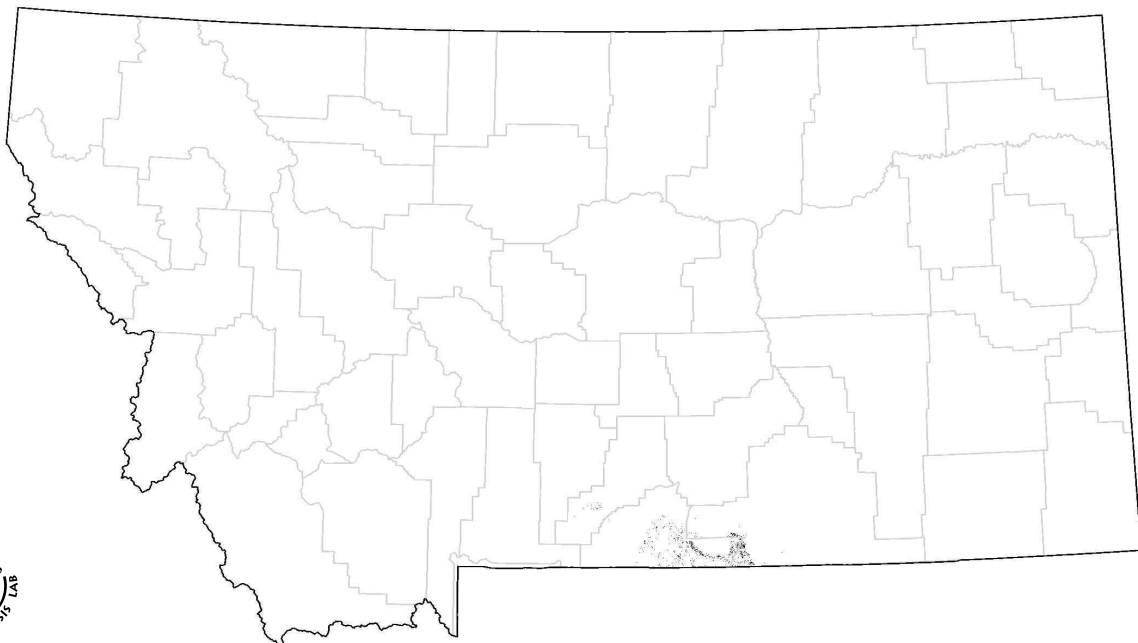
ELEVATION

1082 - 2695 m range

1452 m mean

STATE RANGE

Occurs primarily in central and eastern Montana in dry forest sites.



Montana Land Cover Atlas

4223 Douglas-fir / Lodgepole Pine

DOMINANT SPECIES

Douglas-fir (*Pseudotsuga menziesii*)
Lodgepole Pine (*Pinus contorta*)



DESCRIPTION

Conifer forest with codominance of Douglas-fir (*Pseudotsuga menziesii*) and lodgepole pine (*Pinus contorta*) with cover from 40-90%. Associated shrub species: huckleberry (*Vaccinium spp.*), Oregon grape (*Berberis repens*), shiny-leaf spirea (*Spiraea betulifolia*), whortleberry (*Vaccinium scoparium*). Associated grass and forb species: pinegrass (*Calamagrostis rubescens*).

TOTAL AREA

451,332 hectares

50,494 patches

1.19 % of state

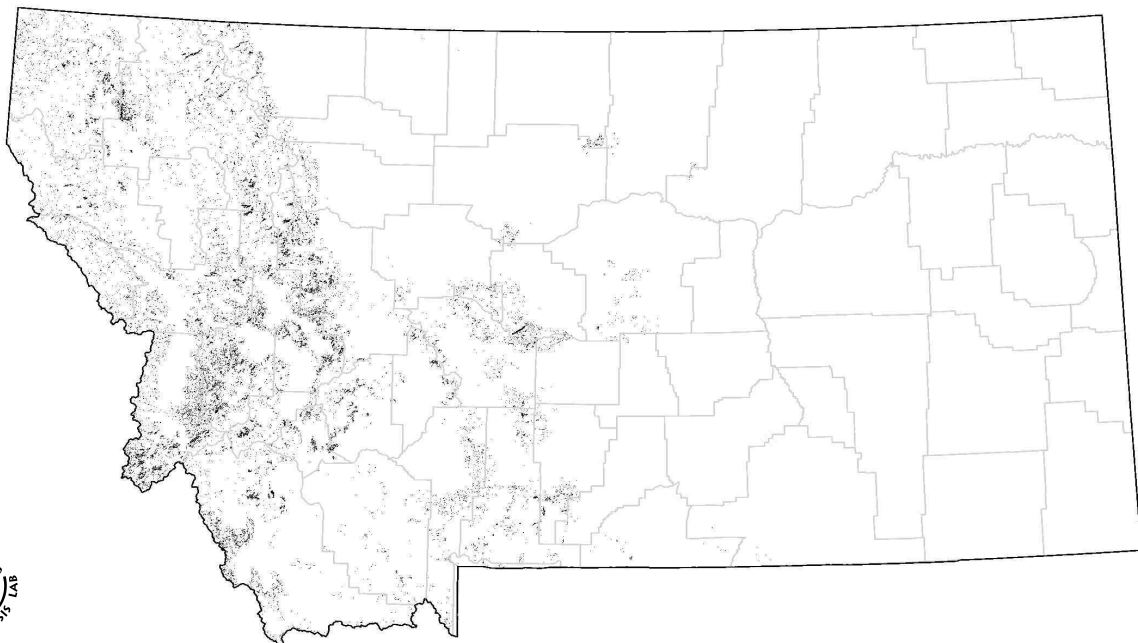
ELEVATION

559 - 3031 m range

1823 m mean

STATE RANGE

Occurs in western and south-central Montana on mid-upper elevation slopes.



Montana Land Cover Atlas

4260 Mixed Whitebark Pine Forest

DOMINANT SPECIES

Whitebark Pine (*Pinus albicaulis*)
Engelmann Spruce (*Picea engelmannii*)
Lodgepole Pine (*Pinus contorta*)
Subalpine Fir (*Abies lasiocarpa*)



DESCRIPTION

Mixed conifer forest with greater than 10% whitebark pine (*Pinus albicaulis*) cover with total tree cover from 20-80%. Associated shrub species: huckleberry (*Vaccinium spp.*), mountain heath (*Phyllodoce glanduliflora*), whortleberry (*Vaccinium scoparium*). Associated grass and forb species: beargrass (*Xerophyllum tenax*), smooth woodrush (*Luzula hitchcockii*).

TOTAL AREA

394,340 hectares

38,963 patches

1.04 % of state

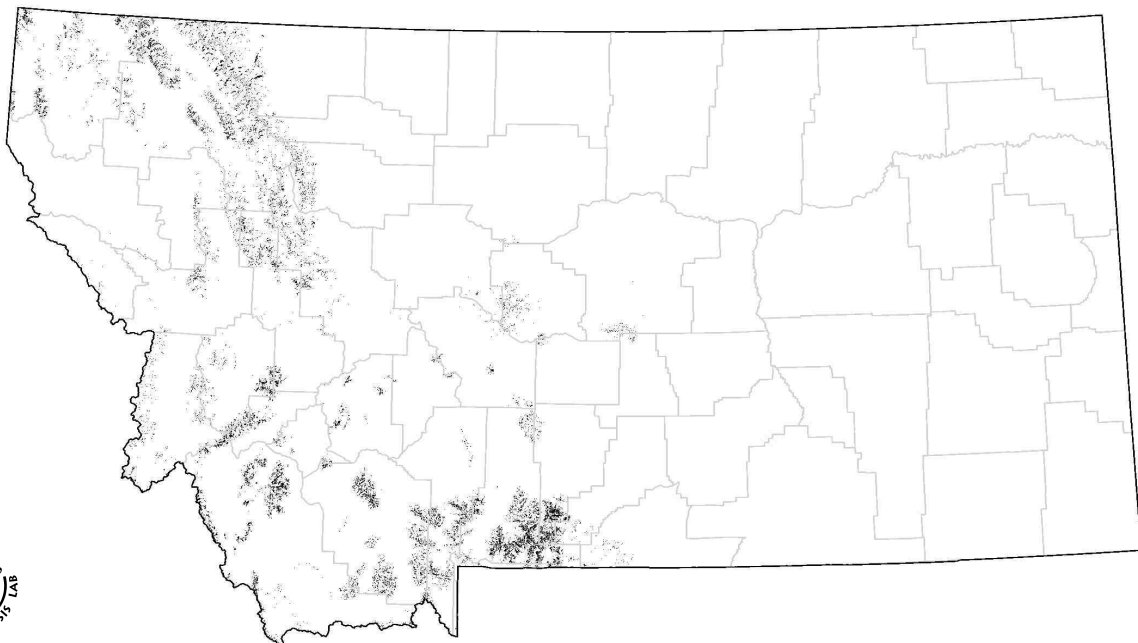
ELEVATION

1073 - 3365 m range

2373 m mean

STATE RANGE

Occurs in high elevation forest stands at or near tree line in western and south-central Montana.

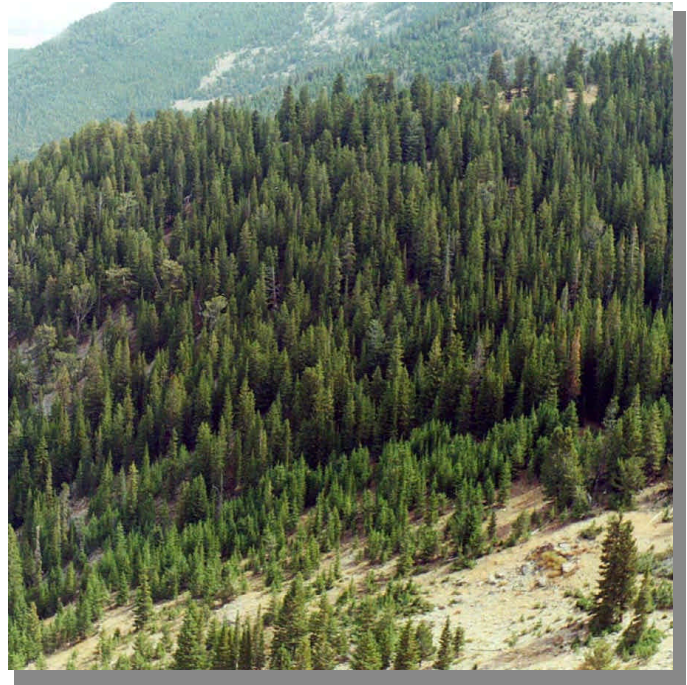


Montana Land Cover Atlas

4270 Mixed Subalpine Forest

DOMINANT SPECIES

Subalpine Fir (*Abies lasiocarpa*)
Douglas-fir (*Pseudotsuga menziesii*)
Engelmann Spruce (*Picea engelmannii*)
Lodgepole Pine (*Pinus contorta*)



DESCRIPTION

Mixed conifer forest with greater than 10% subalpine fir (*Abies lasiocarpa*) cover with total tree cover from 20-80%. Associated shrub species: huckleberry (*Vaccinium spp.*), menziesia (*Menziesia ferruginea*), whortleberry (*Vaccinium scoparium*). Associated grass and forb species: arnica (*Arnica spp.*), beargrass (*Xerophyllum tenax*), elk sedge (*Carex geyeri*).

TOTAL AREA

1,582,611 hectares

83,658 patches

4.16 % of state

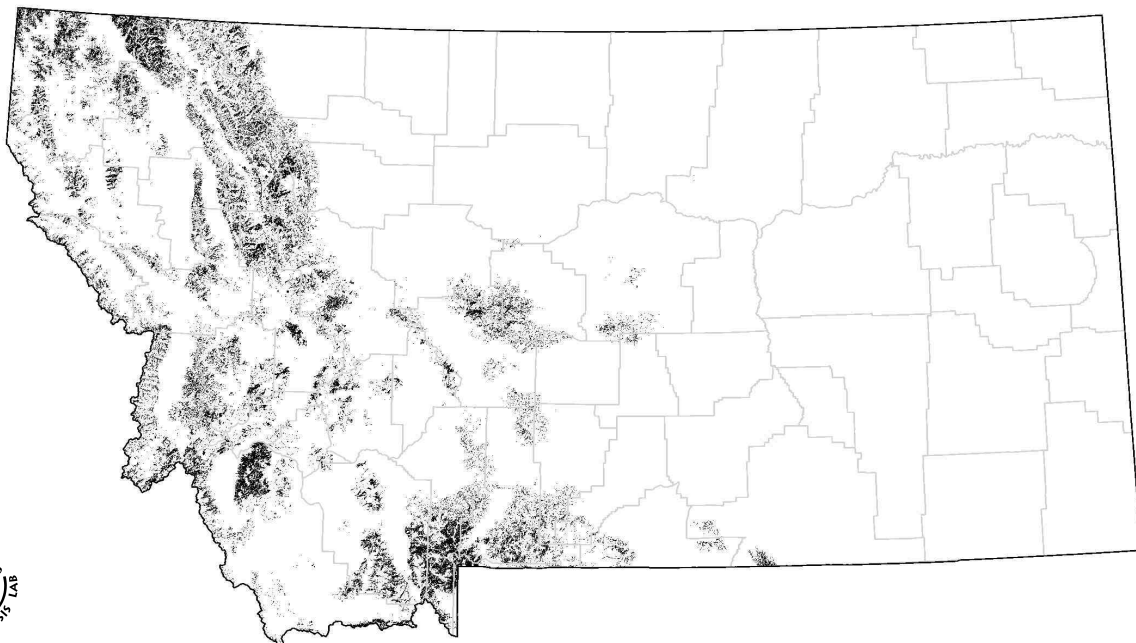
ELEVATION

751 - 3327 m range

2020 m mean

STATE RANGE

Occurs in mid-high elevation forest stands in western and south-central Montana. Primarily located on north, east, and northwest aspects.

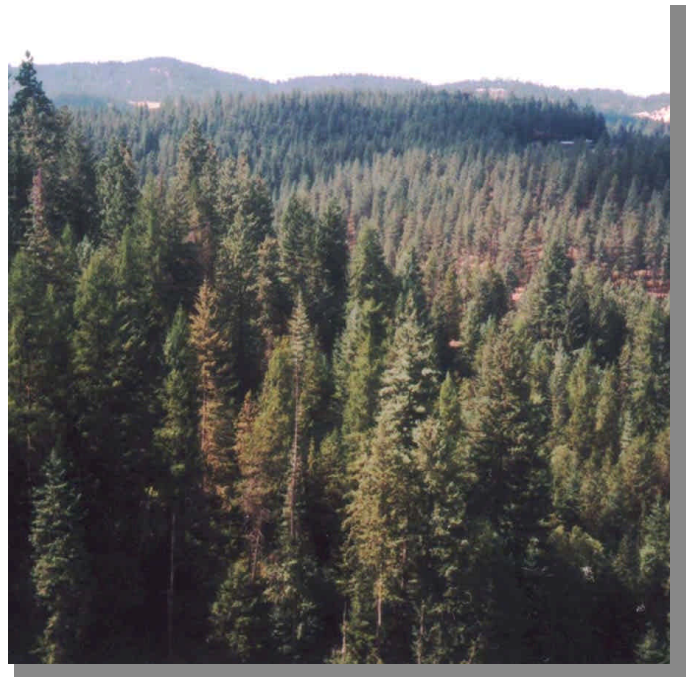


Montana Land Cover Atlas

4280 Mixed Mesic Forest

DOMINANT SPECIES

Douglas-fir (*Pseudotsuga menziesii*)
Engelmann Spruce (*Picea engelmannii*)
Grand Fir (*Abies grandis*)
Ponderosa Pine (*Pinus ponderosa*)
Western Larch (*Larix occidentalis*)
Western Hemlock (*Tsuga heterophylla*)
Western Red Cedar (*Thuja plicata*)



DESCRIPTION

Mixed mesic conifer forests with total tree cover from 20-100%. Associated shrub species: huckleberry (*Vaccinium spp.*), menziesia (*Menziesia ferruginea*), shiny-leaf spirea (*Spiraea betulifolia*), thimbleberry (*Rubus parviflorum*), twin flower (*Linnaea borealis*). Associated grass and forb species: arnica (*Arnica spp.*), pinegrass (*Calamagrostis rubescens*).

TOTAL AREA

1,227,309 hectares

62,871 patches

3.22 % of state

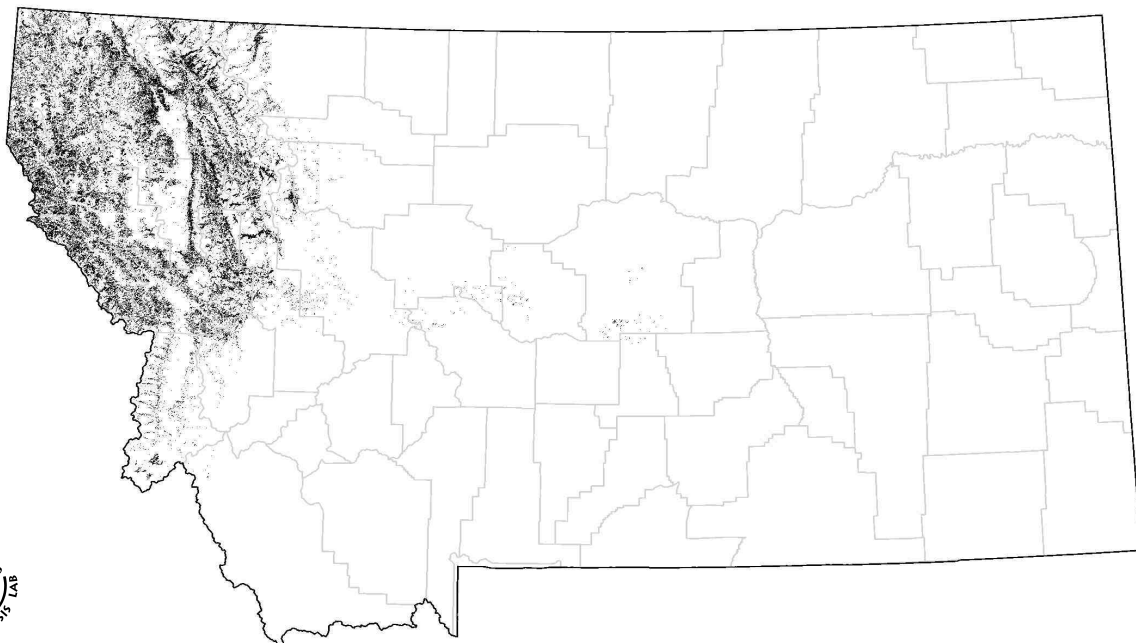
ELEVATION

549 - 2625 m range

1353 m mean

STATE RANGE

Occurs in low-mid elevation forest stands in western Montana. Located primarily on moist forest sites, on north, east, or northwest aspects.



Montana Land Cover Atlas

4290 Mixed Xeric Forest

DOMINANT SPECIES

Douglas-fir (*Pseudotsuga menziesii*)
Ponderosa Pine (*Pinus ponderosa*)
Rocky Mountain Juniper (*Juniperus scopularium*)



DESCRIPTION

Mixed xeric conifer forests with total tree cover from 20-100%. Predominately Douglas-fir (*Pseudotsuga menziesii*) and ponderosa pine (*Pinus ponderosa*) stands. Associated shrub species: ninebark (*Physocarpus malvaceus*), shiny-leaf spirea (*Spiraea betulifolia*) snowberry (*Symphoricarpos spp.*).

TOTAL AREA

542,049 hectares

79,625 patches

1.42 % of state

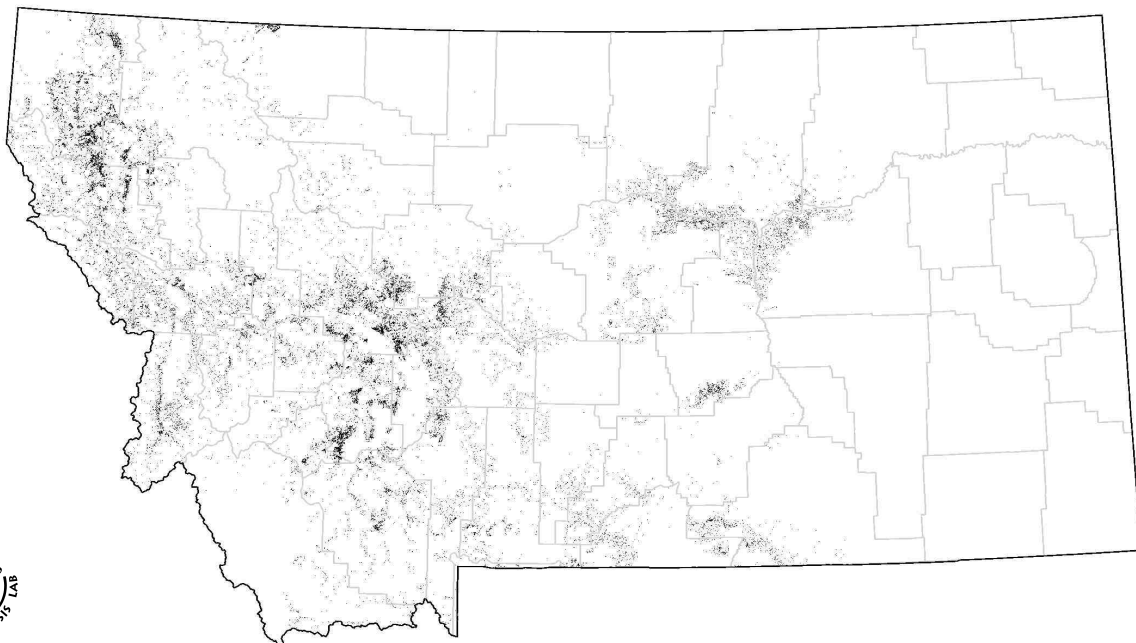
ELEVATION

552 - 3250 m range

1462 m mean

STATE RANGE

Occurs in low-mid elevation forest stands in western Montana. Located primarily on dry forest sites.



Montana Land Cover Atlas

4300 Mixed Broadleaf & Conifer Forest

DOMINANT SPECIES

Aspen (*Populus tremuloides*)
Birch (*Betula spp.*)
Grand Fir (*Abies grandis*)
Douglas-fir (*Pseudotsuga menziesii*)
Engelmann Spruce (*Picea engelmannii*)
Subalpine Fir (*Abies lasiocarpa*)
Western Larch (*Larix occidentalis*)
Western Hemlock (*Tsuga heterophylla*)
Western Red Cedar (*Thuja plicata*)



DESCRIPTION

Mixed broadleaf and conifer forests with equal dominance of broadleaf and conifer species. Total tree cover from 30-100%. Associated shrub species: alder (*Alnus spp.*), huckleberry (*Vaccinium spp.*), mountain-lover (*Pachistima myrsinites*), serviceberry (*Amelanchier alnifolia*), snowberry (*Symphoricarpos spp.*), thimbleberry (*Rubus parviflorum*).

TOTAL AREA

99,843 hectares

23,137 patches

0.26 % of state

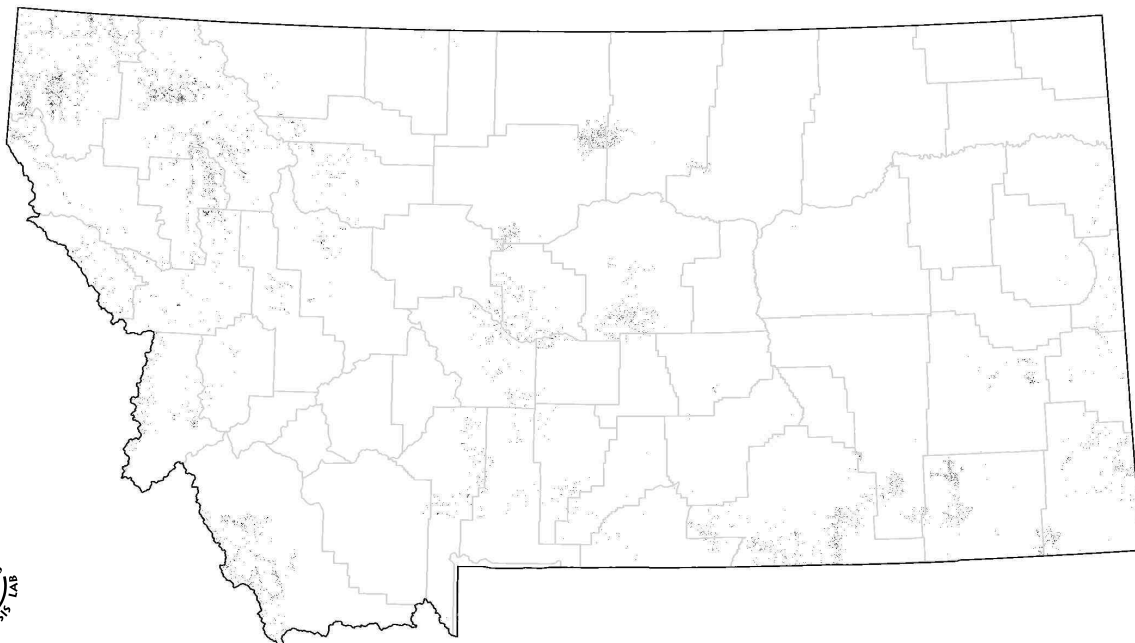
ELEVATION

552 - 2777 m range

1417 m mean

STATE RANGE

Occurs across the state, primarily in moist forest areas or near riparian areas or woody draws.



Montana Land Cover Atlas

4400 Standing Burnt Forest

DOMINANT SPECIES

Grass and Forbs:

Fireweed (*Epilobium latifolium*)

Pinegrass (*Calamagrostis rubescens*)

Elk Sedge (*Carex geyeri*)

Shrubs:

Ceanothus (*Ceanothus spp.*)

Kinnikinnick (*Arctostaphylos uva-ursi*)

Ninebark (*Physocarpus malvaceus*)

Oregon Grape (*Berberis repens*)



DESCRIPTION

Forest fire sites with standing burnt trees still present. Based on sites that burned within 5 years from the imagery sample date. Standing burnt trees are a dominant feature of the site.

TOTAL AREA

139,261 hectares

3,431 patches

0.37 % of state

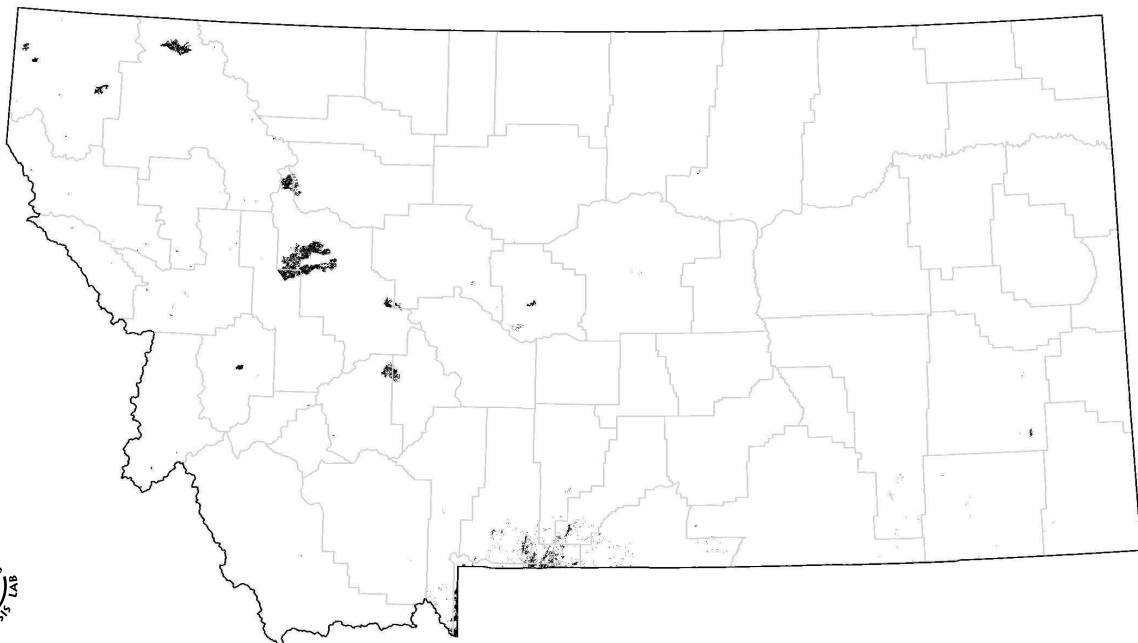
ELEVATION

719 - 3617 m range

1965 m mean

STATE RANGE

Occurs across the state in forested areas.



Montana Land Cover Atlas

5000 Water

DOMINANT SPECIES

No dominant species

DESCRIPTION

Rivers, lakes, and reservoirs.



TOTAL AREA

398,405 hectares

42,576 patches

1.05 % of state

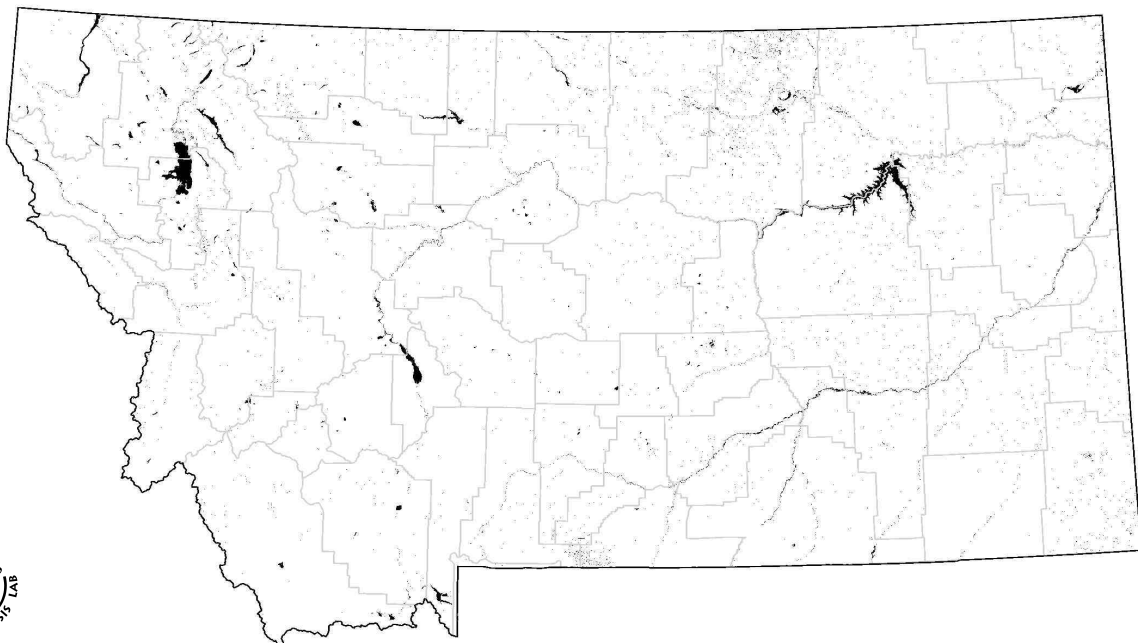
ELEVATION

537 - 3383 m range

957 m mean

STATE RANGE

Occurs across the state.



Montana Land Cover Atlas

6110 Conifer Riparian

DOMINANT SPECIES

Douglas-fir (*Pseudotsuga menziesii*)
Engelmann Spruce (*Picea engelmannii*)
Grand Fir (*Abies grandis*)
Subalpine Fir (*Abies lasiocarpa*)
Western Hemlock (*Tsuga heterophylla*)
Western Red Cedar (*Thuja plicata*)



DESCRIPTION

Riparian areas dominated by conifer forest, with total tree cover from 20-100%. Associated shrub species: alder (*Alnus spp*), bunchberry (*Cornus canadensis*), serviceberry (*Amelanchier alnifolia*), thimbleberry (*Rubus parviflorum*) twin flower (*Linnaea borealis*). Associated grass and forb species: queens cup beadlily (*Clintonia uniflora*).

TOTAL AREA

85,004 hectares

71,033 patches

0.22 % of state

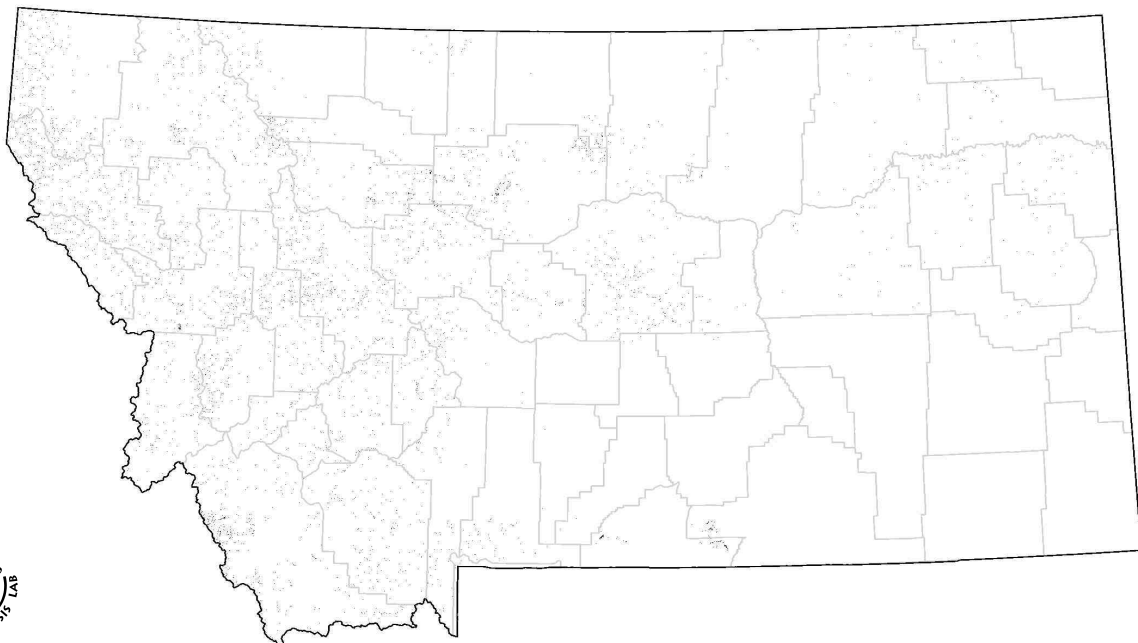
ELEVATION

555 - 2989 m range

1426 m mean

STATE RANGE

Occurs in riparian areas in western and south-central Montana.



Montana Land Cover Atlas

6120 Broadleaf Riparian

DOMINANT SPECIES

Aspen (*Populus tremuloides*)
Basswood (*Tilia americana*)
Birch (*Betula spp.*)
Black Cottonwood (*Populus trichocarpa*)
Bur Oak (*Quercus macrocarpa*)
Green Ash (*Fraxinus pennsylvanica*)
Plains Cottonwood (*Populus deltoides*)

DESCRIPTION

Riparian areas dominated by broadleaf forest, with total tree cover from 20-100%. Associated shrub species: alder (*Alnus spp.*), bunchberry (*Cornus canadensis*), serviceberry (*Amelanchier alnifolia*), thimbleberry (*Rubus parviflorum*), willow (*Salix spp.*). Associated grass and forb species: queens cup beadleily (*Clintonia uniflora*), carex (*Carex spp.*).



TOTAL AREA

198,372 hectares

91,838 patches

0.52 % of state

ELEVATION

486 - 2893 m range

1101 m mean

STATE RANGE

Occurs in riparian areas across Montana.



Montana Land Cover Atlas

6130 Mixed Broadleaf & Conifer Riparian

DOMINANT SPECIES

Aspen (*Populus tremuloides*)
 Birch (*Betula spp.*)
 Black Cottonwood (*Populus trichocarpa*)
 Grand Fir (*Abies grandis*)
 Douglas-fir (*Pseudotsuga menziesii*)
 Engelmann Spruce (*Picea engelmannii*)
 Subalpine Fir (*Abies lasiocarpa*)
 Western Larch (*Larix occidentalis*)
 Western Hemlock (*Tsuga heterophylla*)
 Western Red Cedar (*Thuja plicata*)



DESCRIPTION

Riparian areas dominated by mixed broadleaf and conifer forest, with total tree cover from 20-100%. Associated shrub species: alder (*Alnus spp.*), bunchberry (*Cornus canadensis*), serviceberry (*Amelanchier alnifolia*), thimbleberry (*Rubus parviflorum*), willow (*Salix spp.*). Associated grass and forb species: queens cup beadlily (*Clintonia uniflora*), carex (*Carex spp.*).

TOTAL AREA

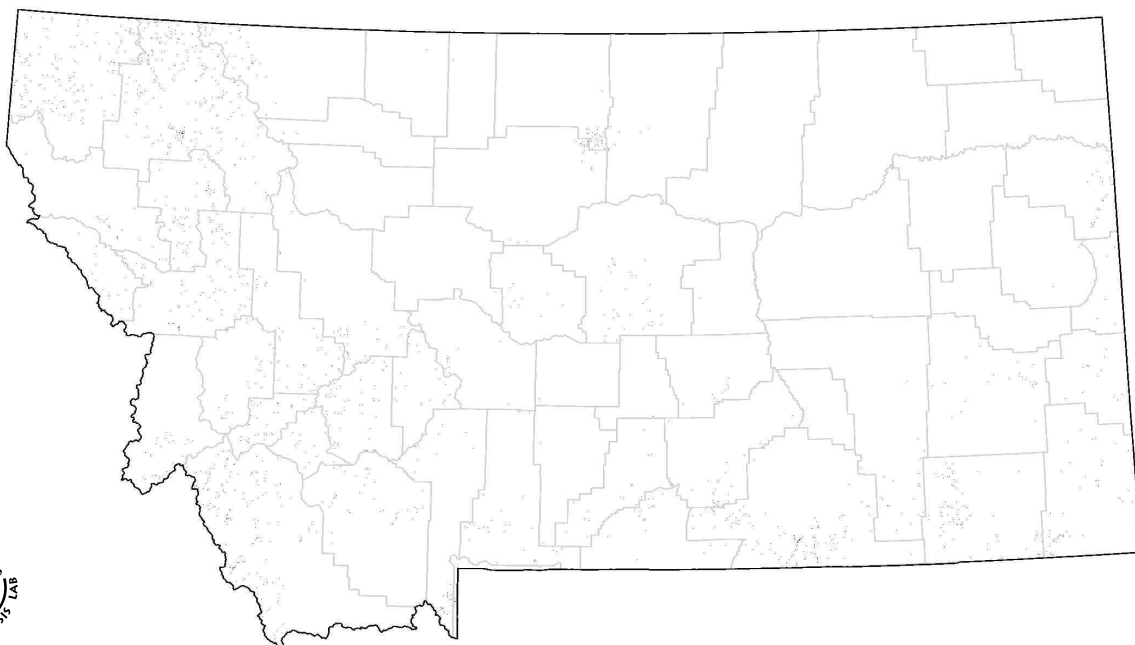
34,932 hectares
 29,923 patches
 0.09 % of state

ELEVATION

550 - 2935 m range
 1404 m mean

STATE RANGE

Occurs in riparian areas in western and south-central Montana.



Montana Land Cover Atlas

6200 Graminoid & Forb Riparian

DOMINANT SPECIES

Baltic Rush (*Juncus balticus*)
Bluejoint Reedgrass (*Calamagrostis canadensis*)
Bog Sedge (*Carex rostrata*)
Cinquefoil (*Potentilla spp*)
Cattails (*Typha spp*)
Lake Sedge (*Carex lacustris*)
Maritime Sedge (*Carex incurviformis*)
Northern Reedgrass (*Calamagrostis inexpensa*)
Rushes (*Juncus spp*)
Saxifrage (*Saxifraga spp*)
Sedges (*Carex spp*)
Tufted Hairgrass (*Deschampsia cespitosa*)



DESCRIPTION

Riparian areas dominated by herbaceous species, with total herbaceous cover 30-100%. Riparian areas with tree and shrub cover less than 15%. Standing water may be present in the riparian area (cattail marshes).

TOTAL AREA

702,574 hectares

281,322 patches

1.84 % of state

ELEVATION

524 - 3155 m range

1075 m mean

STATE RANGE

Occurs in riparian areas across the state.



Montana Land Cover Atlas

6300 Shrub Riparian

DOMINANT SPECIES

Alder (*Alnus spp*)
Black Hawthorn (*Crataegus douglasii*)
Bog Birch (*Betula glandulosa*)
Currant (*Ribes spp*)
Red-osier Dogwood (*Corus stolonifera*)
Rose (*Rosa spp*)
Shrubby Cinquefoil (*Potentilla fruticosa*)
Snowberry (*Symphoricarpos spp*)
Thimbleberry (*Rubus parviflorum*)
Twin-berry (*Lonicera involucrata*)
Utah Honeysuckle (*Lonicera spp*)
Water Birch (*Betula occidentalis*)
Willows (*Salix spp*)



DESCRIPTION

Riparian areas dominated by shrubs, with total shrub cover from 20-100%. Tree cover is less than 15% and shrubs dominate over the herbaceous species. Standing water may be present in the riparian area (willow marshes).

TOTAL AREA

363,596 hectares

200,240 patches

0.95 % of state

ELEVATION

549 - 3016 m range

1179 m mean

STATE RANGE

Occurs in riparian areas across the state.



Montana Land Cover Atlas

6400 Mixed Riparian

DOMINANT SPECIES

Grass species (*see 6200 code species*)

Shrub species (*see 6300 code species*)



DESCRIPTION

Riparian areas dominated by a mix of shrub and herbaceous species, with codominance of shrub and grass species present. Tree cover is less than 15%.

TOTAL AREA

122,662 hectares

88,540 patches

0.32 % of state

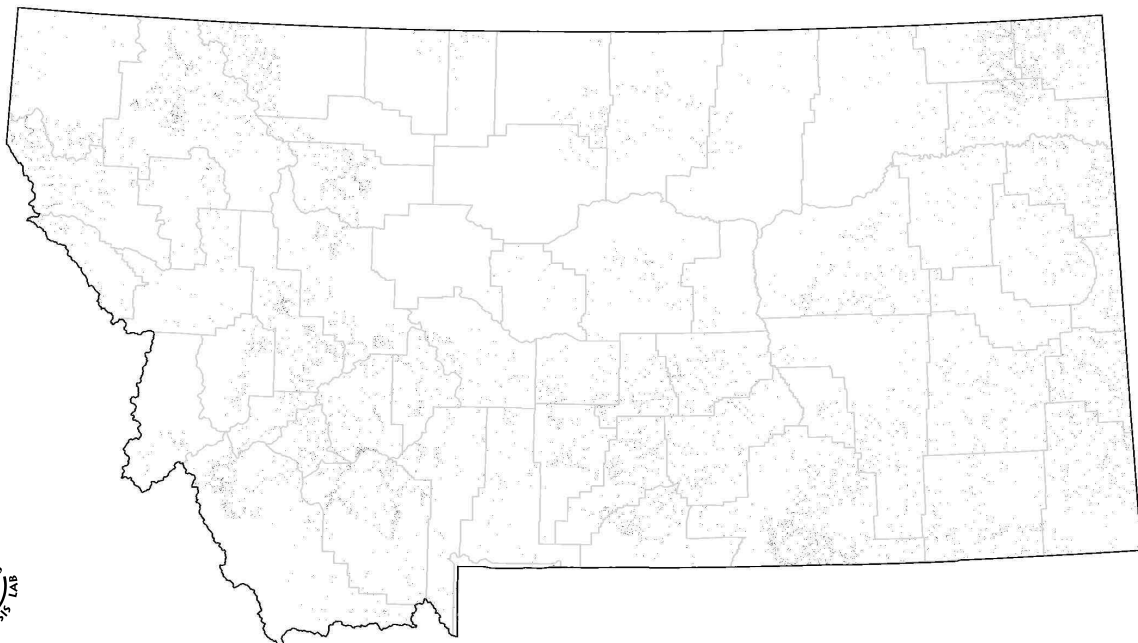
ELEVATION

552 - 3195 m range

1209 m mean

STATE RANGE

Occurs in riparian areas across the state.



Montana Land Cover Atlas

7300 Rock

DOMINANT SPECIES

No dominant species

DESCRIPTION

Exposed rock, cliffs, talus slopes, or scree fields.



TOTAL AREA

591,067 hectares

55,313 patches

1.55 % of state

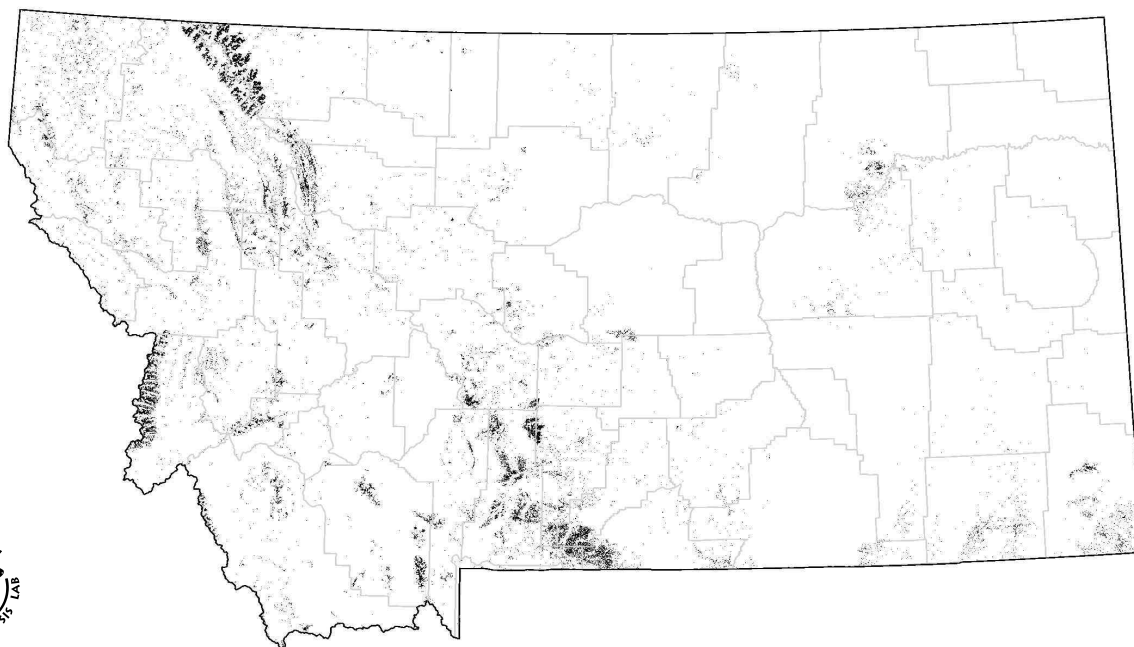
ELEVATION

602 - 3875 m range

2123 m mean

STATE RANGE

Occurs across the state.



Montana Land Cover Atlas

7500 Mines, Quarries, Gravel Pits

DOMINANT SPECIES

No dominant species

DESCRIPTION

Mines, quarries or gravel pits.



TOTAL AREA

11,921 hectares

477 patches

0.03 % of state

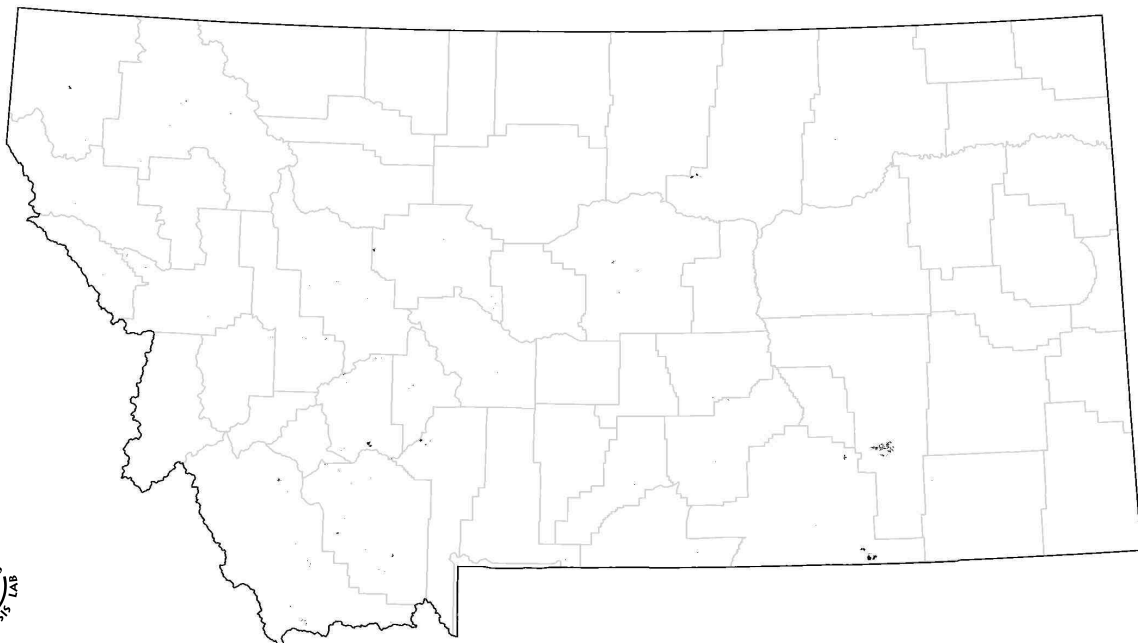
ELEVATION

640 - 3238 m range

1390 m mean

STATE RANGE

Occurs across the state.

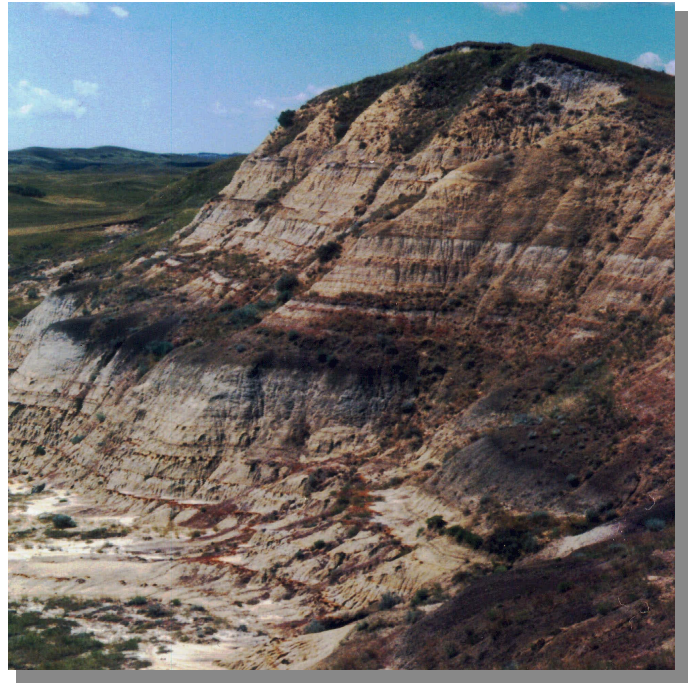


Montana Land Cover Atlas

7600 Badlands

DOMINANT SPECIES

Blue grama (*Bouteloua gracilis*)
Clubmoss (*Selaginella densa*)
Hairy grama (*Bouteloua hirsuta*)
Hood's Phlox (*Phylox hoodii*)
Prairie June grass (*Koeleria pyramidata*)
Greasewood (*Sarcobatus spp.*)
Rabbitbrush (*Chrysothamnus spp.*)
Shadscale (*Atriplex canescens*)
Wyoming Big Sagebrush (*Artemisia tridentata*)



DESCRIPTION

Badlands where bare soil or rock is the dominant cover with some grass and shrub species present. Regions may have patches of grass or shrubs within them, but total is less than 10%. Regions may have some trees present with total cover less than 10%.

TOTAL AREA

749,602 hectares

106,929 patches

1.97 % of state

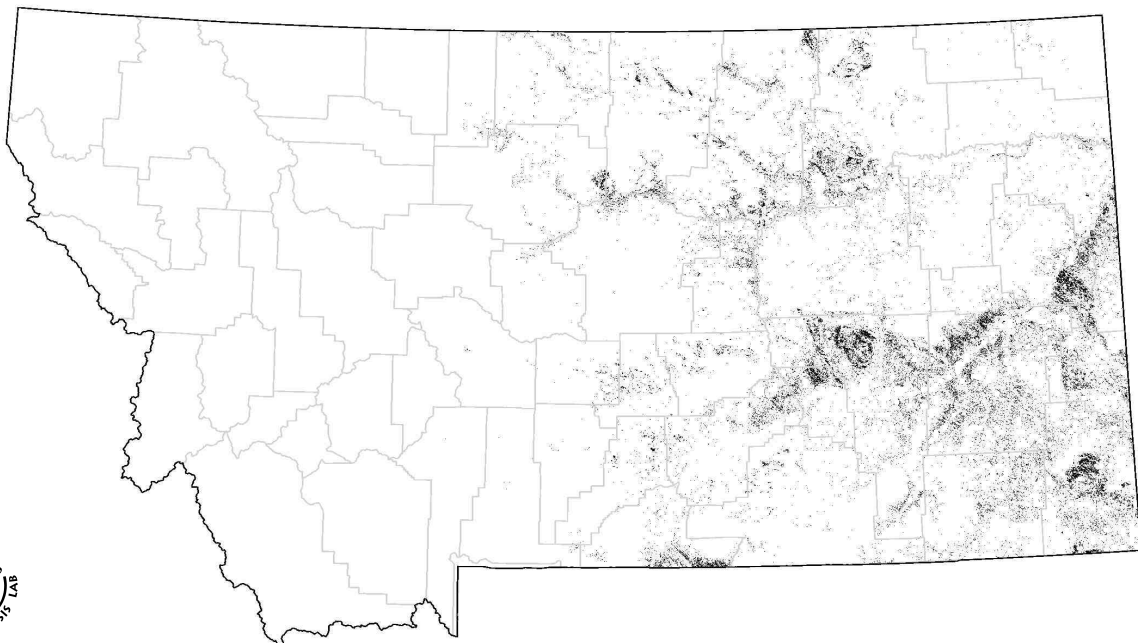
ELEVATION

358 - 3784 m range

897 m mean

STATE RANGE

Occurs primarily in central and eastern Montana.



Montana Land Cover Atlas

7604 Missouri Breaks

DOMINANT SPECIES

Blue grama (*Bouteloua gracilis*)
Clubmoss (*Selaginella densa*)
Hairy grama (*Bouteloua hirsuta*)
Prairie June grass (*Koeleria pyramidata*)
Greasewood (*Sarcobatus spp.*)
Rabbitbrush (*Chrysothamnus spp.*)
Shadscale (*Atriplex canescens*)
Wyoming Big Sagebrush (*Artemisia tridentata*)
Ponderosa Pine (*Pinus Ponderosa*)



DESCRIPTION

Badlands where bare soil or rock is the dominant cover with some grass or shrubs present. May have patches of ponderosa pine (*Ponderosa pinus*) throughout the region. Grass, shrub, and tree cover are less than 10%.

TOTAL AREA

69,175 hectares

13,487 patches

0.18 % of state

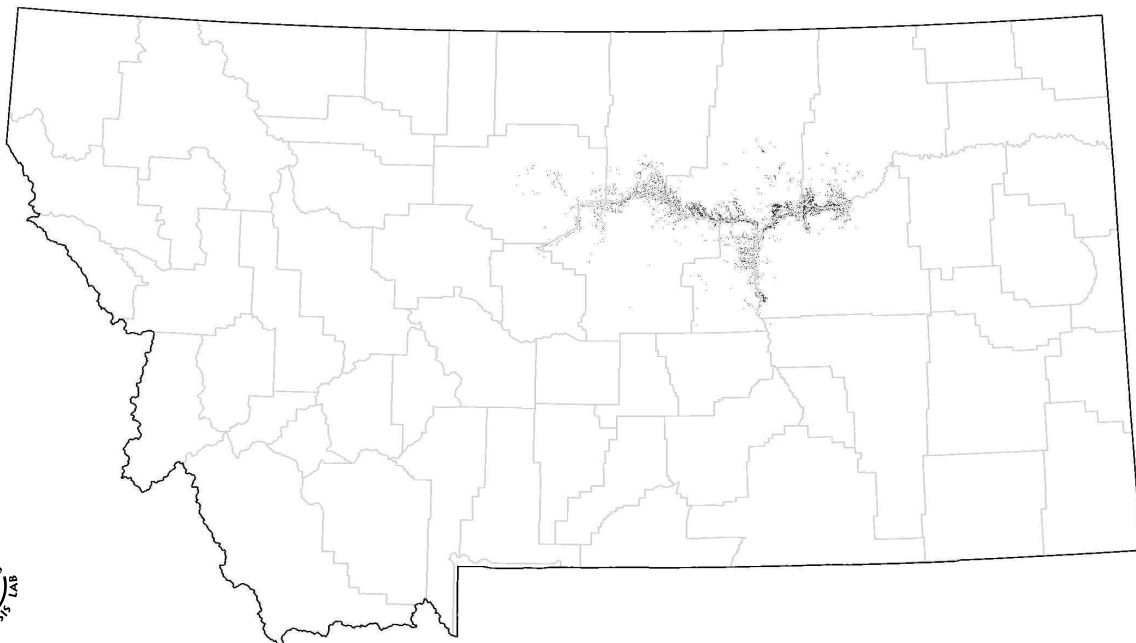
ELEVATION

677 - 1636 m range

807 m mean

STATE RANGE

Occurs between Fort Benton in the west and Fort Peck in the east, paralleling the Missouri River.



Montana Land Cover Atlas

7800 Mixed Barren Sites

DOMINANT SPECIES

No dominant species

DESCRIPTION

Barren sites where live vegetation has less than 10% canopy cover.



TOTAL AREA

197,051 hectares

38,597 patches

0.52 % of state

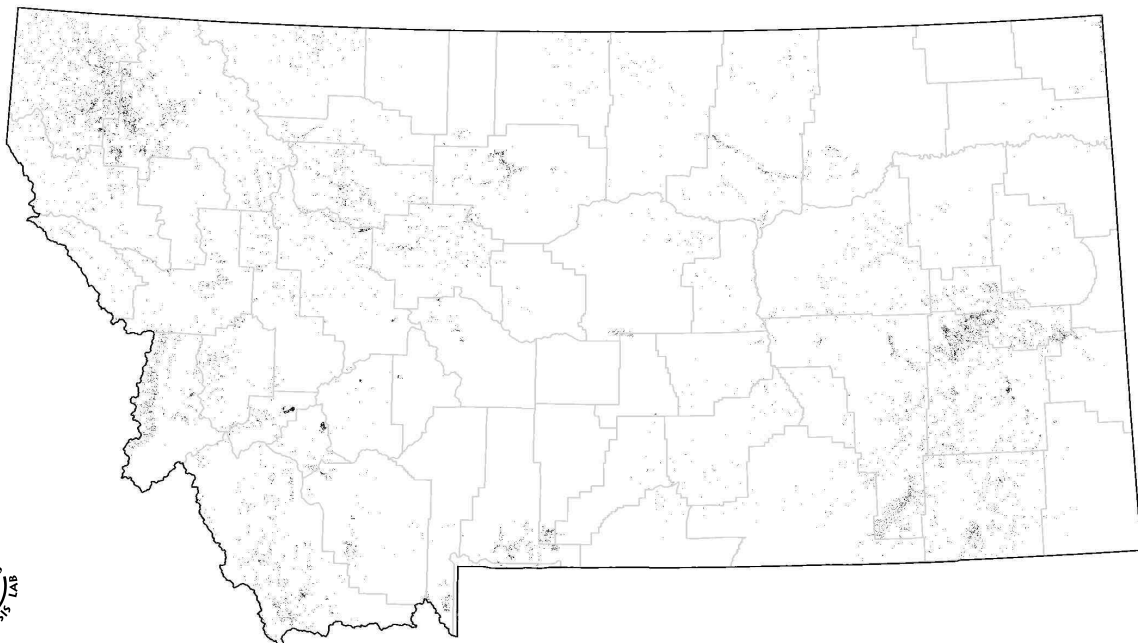
ELEVATION

561 - 3251 m range

1397 m mean

STATE RANGE

Occurs across the state.



Montana Land Cover Atlas

8100 Alpine Meadows

DOMINANT SPECIES

American Bistort (*Polygonum bistortoides*)
Bellard's Kobresia (*Kobresia myosuroides*)
Curly Sedge (*Carex rupestris*)
Hood's Sedge (*Carex hoodii*)
Northwestern Sedge (*Carex concinnoides*)
Parry's Rush (*Juncus parryi*)
Pinegrass (*Calamagrostis rubescens*)
Purple Saxifrage (*Saxifraga oppositifolia*)
Ross' Avens (*Geum rossii*)
Ross Sedge (*Carex rossii*)
Smooth Woodrush (*Luzula hitchcockii*)
Tufted Hair grass (*Deschampsia caespitosa*)

DESCRIPTION

Alpine meadows or alpine tundra regions above treeline. Windswept areas on mountain tops with low growing forbs, sedges, or cushion plants.



TOTAL AREA

54,664 hectares

6,495 patches

0.14 % of state

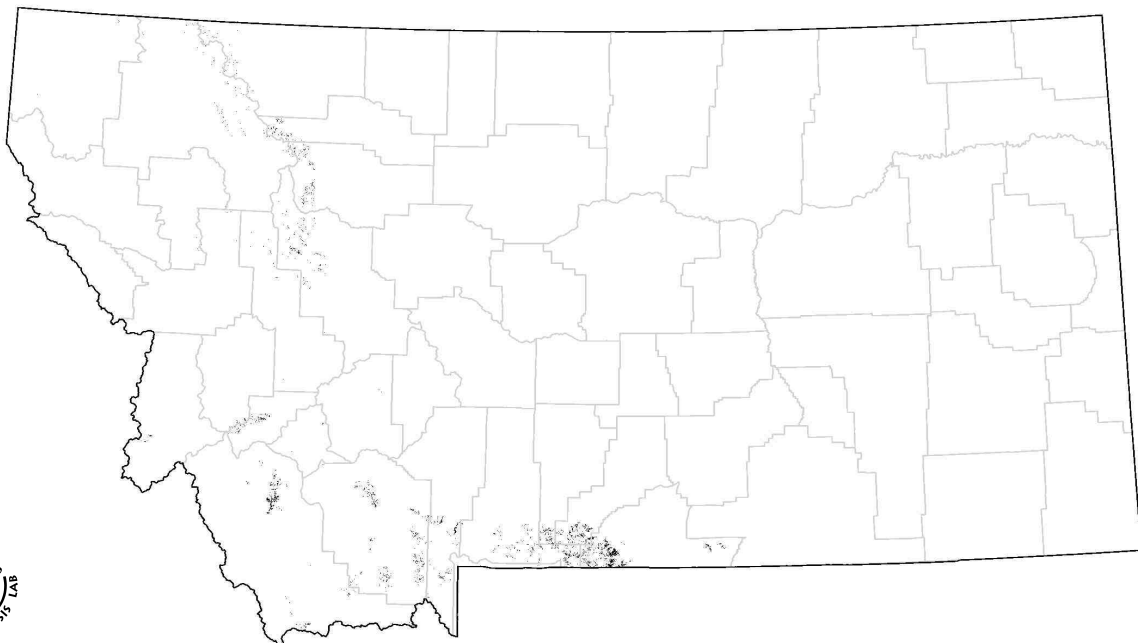
ELEVATION

1627 - 3606 m range

2833 m mean

STATE RANGE

Occurs in high elevation mountain ranges across Montana.



Montana Land Cover Atlas

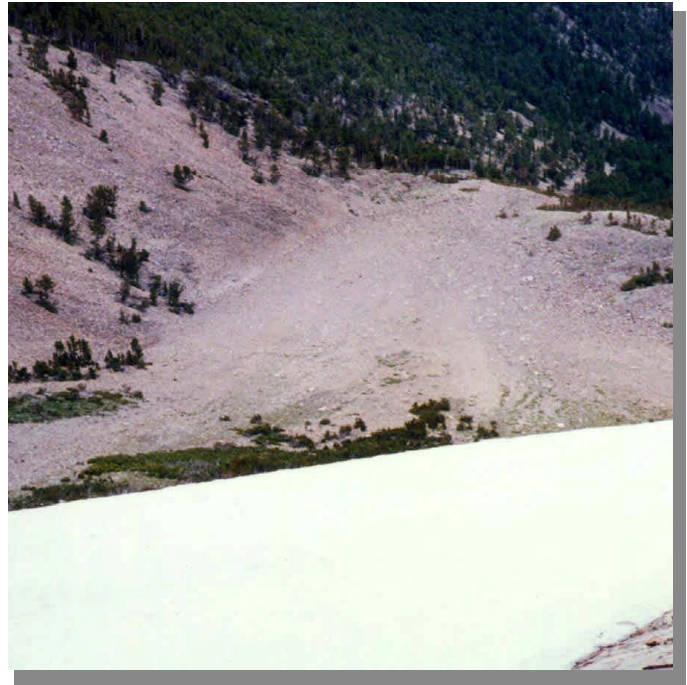
9100 Snowfields or Ice

DOMINANT SPECIES

No dominant species

DESCRIPTION

Snow or Ice is the dominant cover present.



TOTAL AREA

27,076 hectares

2,157 patches

0.07 % of state

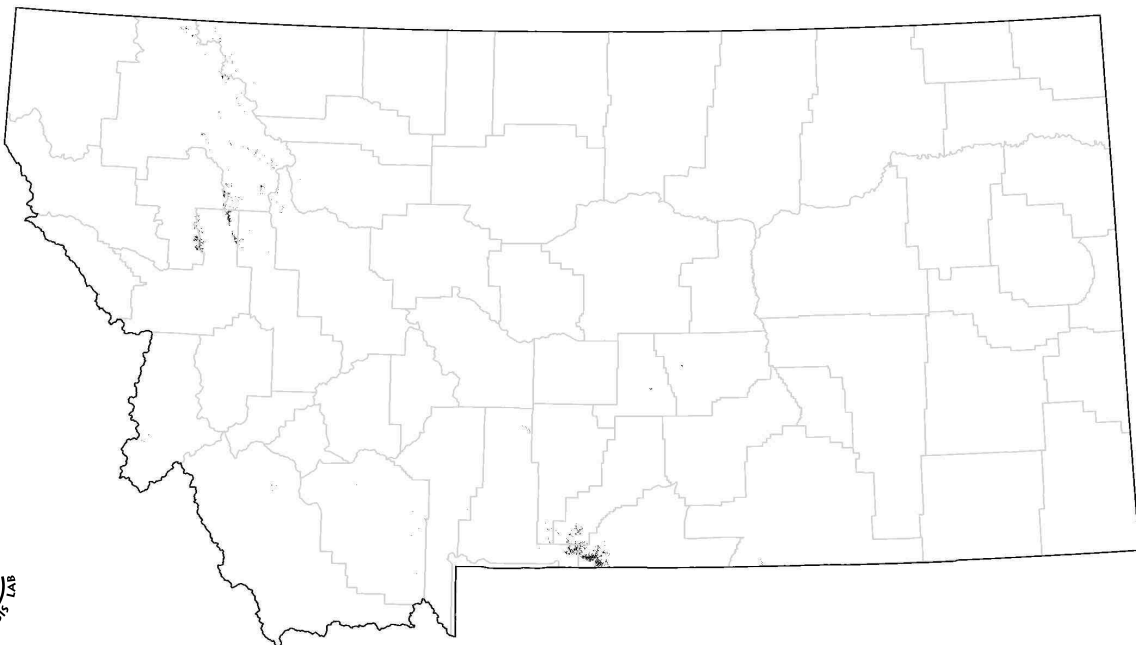
ELEVATION

1091 - 3861 m range

2828 m mean

STATE RANGE

Occurs on mountain tops.



Montana Land Cover Atlas

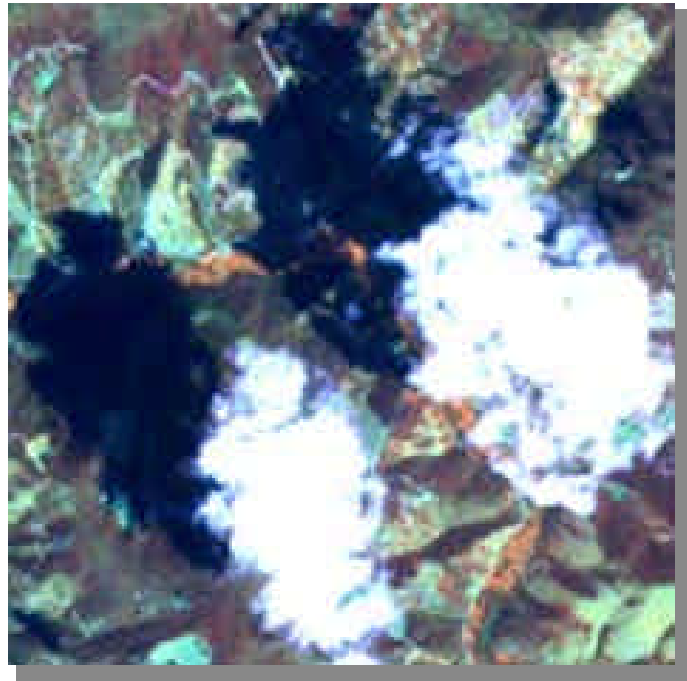
9800 Clouds

DOMINANT SPECIES

No dominant species

DESCRIPTION

Clouds are the dominant cover



TOTAL AREA

18,172 hectares

138 patches

0.05 % of state

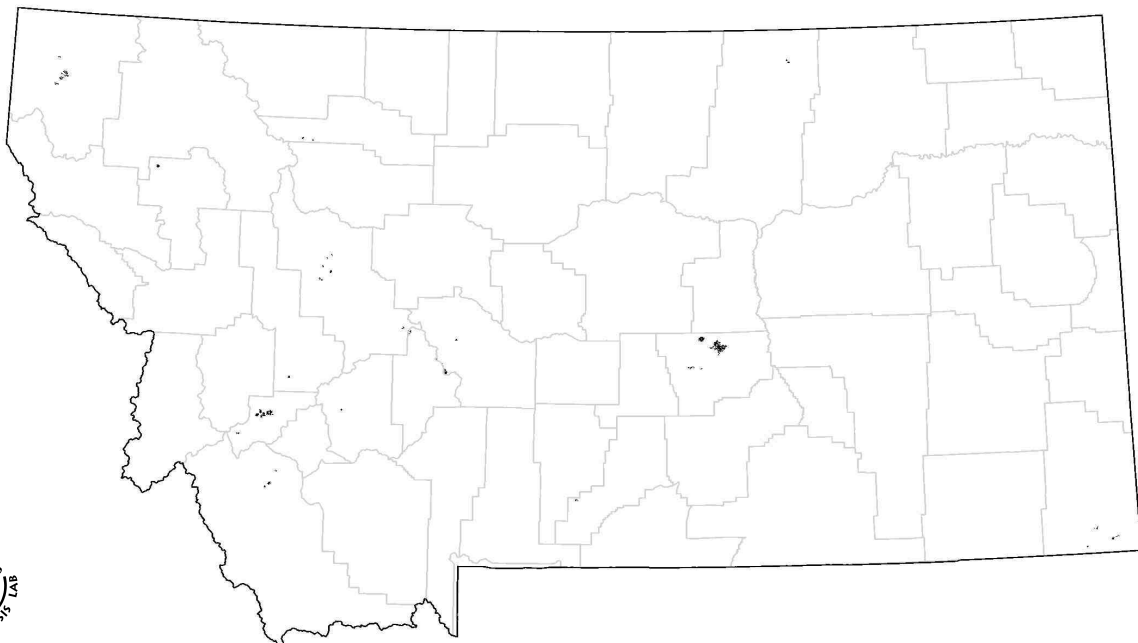
ELEVATION

683 - 3083 m range

1622 m mean

STATE RANGE

Limited to cloud regions in the satellite imagery that could not be avoided or merged out.



Montana Land Cover Atlas

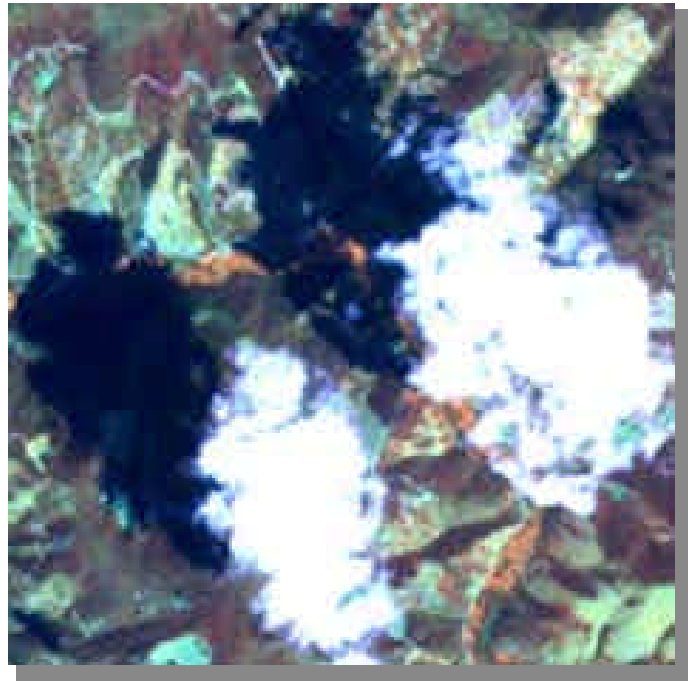
9900 Cloud Shadows

DOMINANT SPECIES

No dominant species

DESCRIPTION

Cloud shadows are the dominant cover.



TOTAL AREA

12,345 hectares

137 patches

0.03 % of state

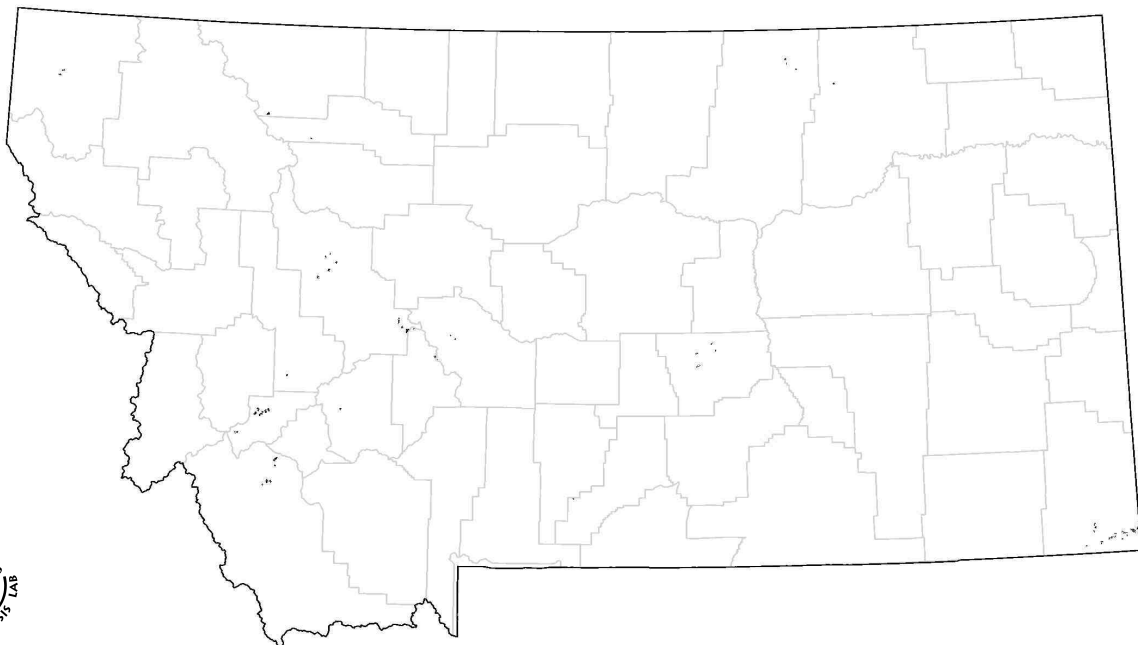
ELEVATION

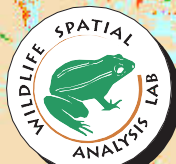
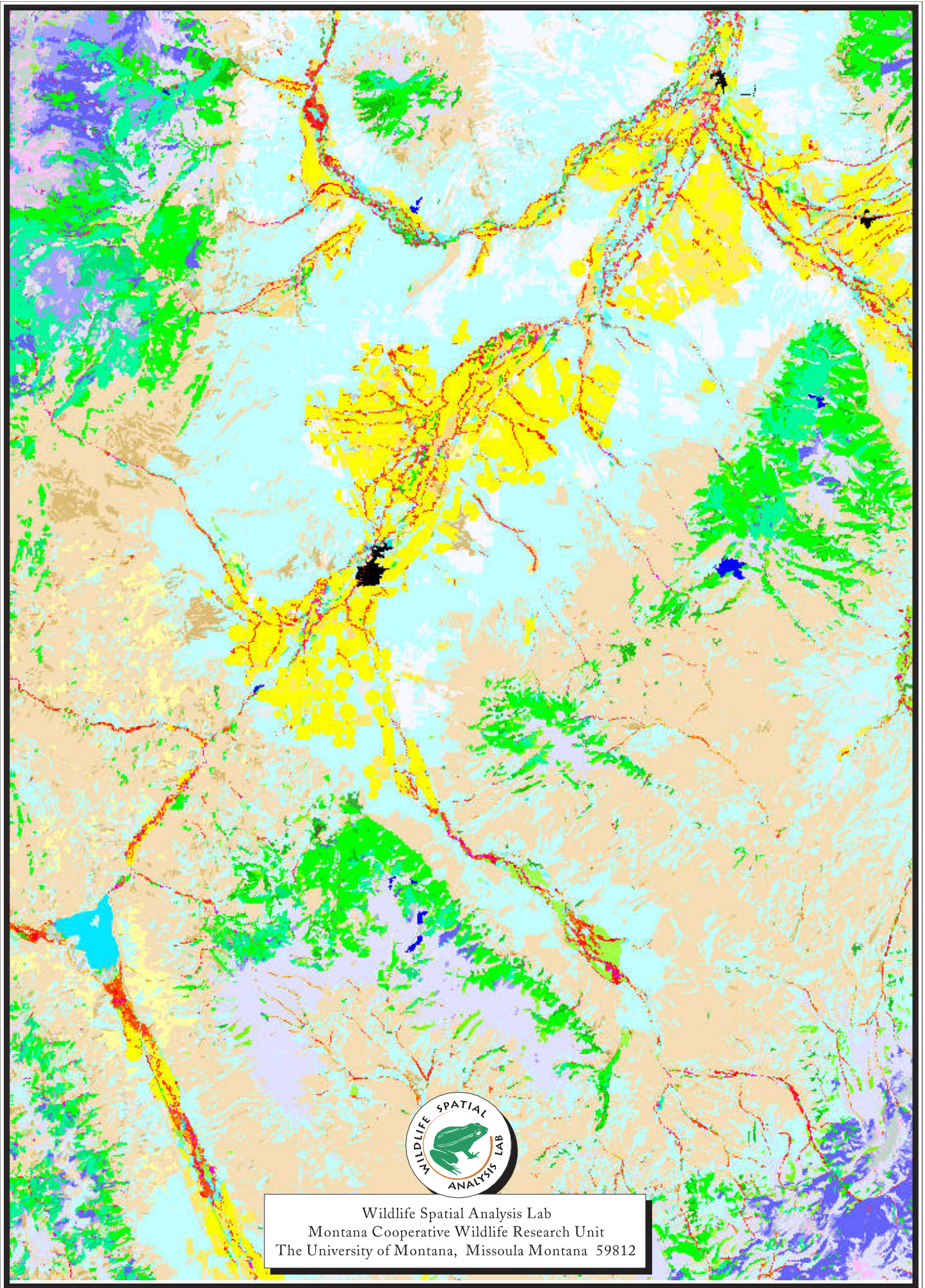
735 - 3115 m range

1725 m mean

STATE RANGE

Limited to cloud shadow regions in the satellite imagery that could not be avoided or merged out.





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