

Component I: Ecotype Focus Areas of Greatest Conservation Need

“This is a strategy to focus resources and efforts toward geographical areas where they can benefit the largest number of species and communities in need of conservation.”

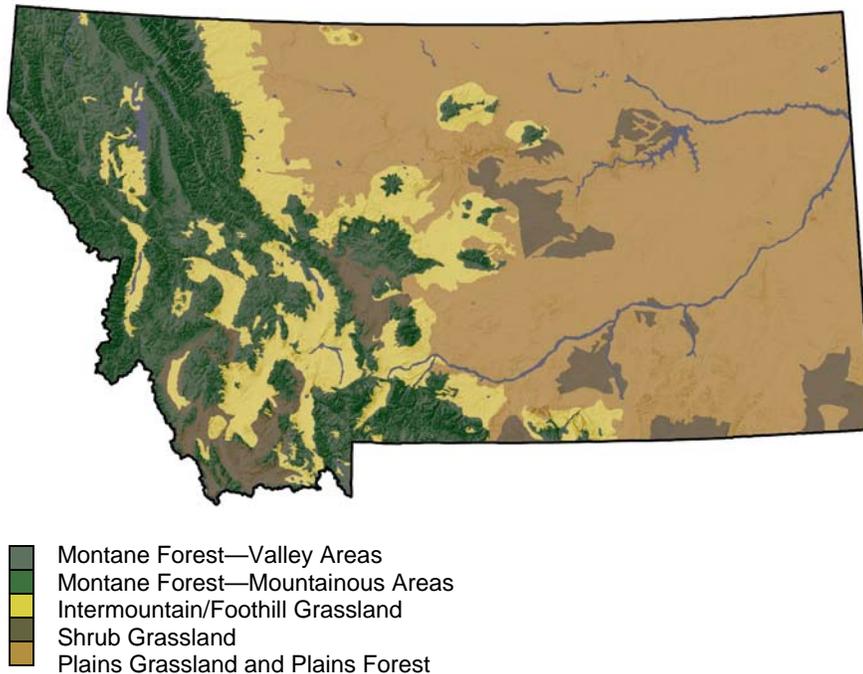


Figure 1. Ecotypes of Montana

Montana Fish, Wildlife & Parks (FWP) habitat programs currently use five ecotypes to describe the broad areas of Montana’s landscape that have similar characteristics: intermountain/foothill grassland, montane forest, plains grassland, plains forest, shrub grassland, and riparian (Montana Fish, Wildlife & Parks 1991). For the Strategy, we combined the plains grassland and plains forest into one ecotype. We also defined riparian as a community type instead of an ecotype since it occurs throughout all of the other ecotypes.

Within each of the ecotypes, Tier I (greatest need of conservation) geographic focus areas were identified for all terrestrial and aquatic areas of the state (Appendices H and I). Due to their biological characteristics, aquatic and terrestrial focus areas were identified separately to facilitate implementation of conservation strategies, with the understanding that overlap does exist. For example, there is a Tier I focus area for the terrestrial Bitterroot Valley and also a Tier I focus area for the Bitterroot River. Although these systems occur in the same geographic area, management and conservation efforts often occur separately.

Only the areas in greatest need of conservation are described in the body of the Strategy. These areas guide our attention to locations that offer some of the best opportunity to conserve Montana's community types and fish and wildlife species in greatest need of conservation. Because stewardship (federal, tribal, state, and private ownership) was considered when assessing areas in greatest conservation need, many of the areas identified as Tier I are located on private land. Much of this private land occurs in the eastern portion of Montana. Within each focus area description, the habitats and species of greatest conservation need are listed for each area along with conservation concerns and strategies. Montana Fish, Wildlife & Parks, along with other state and federal agencies, private organizations, and the public, should leverage existing programs to conserve these areas. Specific agencies, organizations, or individuals will be effective at implementing many of the conservation strategies. However, due to the large amount of private land, landowner based and collaborative projects also should be encouraged. Conservation efforts that are under way by various groups that address the conservation strategies should be supported. In some cases working groups might need to be initiated to begin addressing conservation concerns. A good model for how working groups could operate is the Blackfoot Challenge. The Blackfoot Challenge is a Montana group that coordinates management of the Blackfoot River, its tributaries, and adjacent lands. It is organized locally and known nationally as a model for preserving the rural character and natural beauty of a watershed and surrounding areas. Although its charter dates to 1993, Blackfoot landowners have played an instrumental stewardship role since the late 1970s—bringing conservation easement legislation, walk-in hunting areas, and recreation corridor management to Montana. The Blackfoot Challenge can be contacted at Blackfoot Challenge, PO Box 103, Ovando, MT 59854, 406-793-3900.

Many wide-ranging species depend upon habitat connectivity for the long-term health of their populations. Although some information about fish and wildlife corridors can be found, it is typically focused on a single species or a limited area such as the Greater Yellowstone Ecosystem (GYE). A statewide, mapable assessment of important linkage areas does exist (American Wildlands Corridors Map, 2003); however, conservation concerns such as habitat fragmentation and loss of connectivity occur at a wide variety of scales. Therefore, we did not address broad connectivity concerns in the initial assessment, but did so within each individual focus area and community type and for specific species. In the future, FWP and its partners should work to address concerns about the loss of important areas of fish and wildlife habitat connectivity.

Intermountain/Foothill Grassland Ecotype

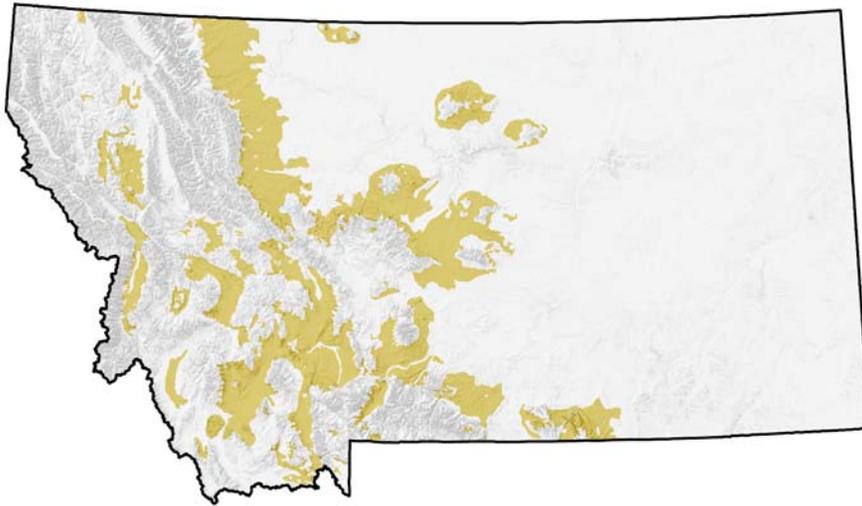


Figure 2. Intermountain/Foothill Grassland Ecotype

The intermountain/foothill grassland ecotype is a mosaic of private and public land that extends from the glaciated Flathead River Valley to the north, south to the Centennial Valley, and east to the Little Belt Foothills, where there remains some of Montana's most diverse fish and wildlife habitats. This western Montana ecotype harbors more wildlife communities than any other in Montana. It also harbors Montana's greatest concentration of human population in and near the towns of Kalispell, Missoula, Helena, and Bozeman. The attraction for wildlife and people is western Montana's broad, lush, and sweeping valleys cradled by the peaks of the Rocky Mountains. The intermountain/foothill grasslands are cut and formed by meandering rivers that create core riparian zones and wetland areas that often include glacial lakes and potholes that attract nesting waterbirds. Addressing the challenges that accompany the interface between human settlement and fish and wildlife and their habitats will be critical to the conservation of these areas.

Landscape Characteristics

The intermountain/foothill grassland ecotype includes 13,414,271 acres and represents 14.3 percent of Montana's land area. The intermountain/foothill grassland ecotype generally lies on level to moderate topography at valley bottoms or lower slopes of mountains, with the Flathead, Clark Fork, Bitterroot, Missouri, Big Hole, Beaverhead, Jefferson, Gallatin, Madison, Yellowstone, and Blackfoot rivers cutting through the ecotype. Elevations are lowest in some of the northwestern valley locations, in some cases below 3,000 feet. Elevations between 3,000 and 4,000 feet occur broadly in the Flathead/Mission and Tobacco valleys. The upper Townsend, Gallatin, and Blackfoot valleys, as well as much of the foothill region to the east of the mountains, are mostly between

4,000 and 5,000 feet. The Jefferson, Madison, Shields/Smith, Paradise, and Deerlodge valleys range from 4,500 to 5,500 feet. Due to glaciation, the northern part of the Flathead Basin contains hundreds of potholes, many of which retain water throughout the average summer.

Soils

Floors of the intermountain valleys of southwestern Montana are mostly composed of thousands of feet of tertiary valley fill deposited at the end of the first stage of mountain building. During the ice ages, the cordilleran ice sheet covered the northern part of the Flathead Basin at various times. Glacial Lake Missoula, formed from meltwater from this ice sheet, reached south into the Bitterroot Valley and west into what is now Washington. Sediments from this lake, plus outwash materials from the ice sheet, cover most of the valley bottoms of the southern part of the Flathead Basin (i.e., south Mission Valley and Hot Springs Valley). Lake sediments farther south (Missoula and Bitterroot valleys) apparently have been eroded away, exposing tertiary fill. The northern parts of the Flathead Basin as well as the Tobacco Valley are underlain by glacial till.

In some places the foothill areas are underlain by outwash from the adjacent mountains; however, more commonly the substrate is some form of sedimentary bedrock. The foothills along the eastern front (Bowman's Corner to the Canadian border), the area north and east of Livingston, and some of the area surrounding the Bears Paw and Little Rocky mountains is underlain by moderately hard sandstones and soft shales of the Cretaceous (beginning about 100 million years ago) Eagle to Willow Creek formations. Part of the foothill areas of these mountains also is composed of Cretaceous soft black marine shales (Colorado Group, Montana Group, Pierre Shale), Cretaceous soft sandstones, siltstones, and claystones (Fox Hills Sandstone, Kootenai Formation). Some of these sedimentary strata may be gently to steeply uplifted as a result of nearby mountain building.

Most of the soils in this ecotype (82 percent, 20,500 mi²) are described as well developed with dark topsoil horizons, clay "B" horizons, having a cool temperature regime, and occurring under semiarid to subhumid moisture conditions.

Climate

The climate of the intermountain/foothills grassland ecotype varies considerably from one end to the other; generally there is more resemblance to the climate of the plains grassland than to the adjacent mountains. The northwestern valleys are influenced more by Pacific storms in winter and have a more maritime climate than the more southerly valleys. Temperatures there tend to be milder during the winter, and there is a greater proportion of precipitation received

during the winter. Arctic climate outbreaks affect the entire ecotype, although to a lesser extent in the northern foothills.

Annual temperatures average 44 degrees F throughout much of the Gallatin, Townsend, Helena, northern Jefferson, Bitterroot, and Flathead/Mission valleys. In these valleys some areas may have average annual temperatures of 45 degrees F. The Blackfoot, Madison, Paradise, and Jefferson/Beaverhead valleys are about a degree colder because of elevation and/or topography that favor the formation of extreme temperature inversions even in summer. Foothill areas in central and southern Montana experience about the same average annual temperatures as the colder intermountain valleys. The coldest portion of the ecotype is the northern foothills along the eastern front. Some parts of this area sustain average temperatures of 39 to 40 degrees F.

Although maximum daily temperatures in the northwest valleys are similar to those in the Gallatin, Townsend, and Helena valleys, nighttime temperatures average about 5 degrees warmer in the former areas. This generates mean January daily temperatures ranging from 22 to 25 degrees F in the northwest and 20 to 23 degrees in the lower southwest valleys. Temperatures in the colder valleys of the southwest and west central areas range from 19 to 21 degrees F in January. In the foothill locations, January temperatures range from 15 to 22 degrees F.

Mean daily temperatures in July are highest in the Gallatin, Townsend, Helena, northern Jefferson, Bitterroot, and Mission valleys. In the warmest parts of these valleys, daily maximums range from 85 to 86 degrees F. In the Madison, Jefferson/Beaverhead, Paradise, and Flathead valleys and most of the foothill areas, maximum daily temperatures are about a degree lower. The coldest valleys in the extreme southwest and west central areas attain maximums from 80 to 82 degrees F. Highest July nighttime temperatures in the ecotype occur in the Helena and Townsend valleys where they range from 49 to 50 degrees F. The Gallatin Valley is about a degree cooler. A degree cooler than that are the nighttime temperatures in the lower Jefferson, Bitterroot, and Flathead/Mission valleys and most of the foothill region. Nighttime temperatures of 43 to 46 degrees F are experienced in the west-central and extreme southwestern valleys.

The protection afforded the intermountain valleys by the mountains is reflected by the generally much higher annual extreme minimum temperatures contrasted with most of the area to the east. The Mission and Bitterroot valleys are the only parts of Montana with significant areas in plant hardiness zone 5 (mean annual minimums in the minus teens). The remaining area of these valleys, along with the Jefferson/Beaverhead, Gallatin, Madison, Townsend, Helena, Deerlodge, Blackfoot, Missoula, and Tobacco valleys, are in hardiness zone 4B (mean annual minimums in the minus 21 to 25 degrees F range). The central and southern foothill area is mostly in zone 4A (mean annual minimums in the minus

26 to 30 degrees F range). The northern foothill region is partially in zone 3 (mean annual minimums from minus 31 to 40 degrees F range).

The highest annual extreme maximum temperatures occur in the Mission Valley, where much of the area reaches 98 to 99 degrees F on average each year. The Flathead, Missoula, part of the Deerlodge, the lower Jefferson, Gallatin, Townsend, and Helena valleys normally reach 95 to 97 degrees F. This is also the case for the southern and central foothill region.

The longest frost-free season exists in the lower Helena Valley, and across the central and southern foothill sections. Here the season ranges from 120 to 130 days. Lower portions of the Gallatin Valley, the Townsend Valley, and the Flathead/Mission Valley have frost-free seasons ranging from 100 to 125 days. Seasons in the Jefferson, Madison, Paradise, Bitterroot, and Missoula valleys last from 90 to 110 days. Other valleys and the northern foothill areas have seasons ranging from 70 to 100 days.

The intermountain valleys and foothills are basically semiarid, but considerably wetter than the plains grasslands. Mean annual precipitation overall is 15.4 inches. The foothill portion of the ecotype generally is wetter than the intermountain valley portion. Much larger expanses of area receiving more than 16 inches annually occur in the former than the latter area. Broad areas receiving between 10 and 12 inches are found in the Jefferson/Beaverhead Valley, while parts of the Jefferson/Beaverhead/Centennial and Helena valleys get less than 10 inches annually. The Blackfoot Valley and eastern portions of the Flathead/Mission Valley receive between 12 and 16 inches, while western parts of the Flathead/Mission Valley tend to be drier.

Reflecting the stronger maritime influence in the northwest, those valleys tend to receive a smaller proportion of their precipitation in the growing season than do the southwestern valleys and most of the foothill regions. The percentage of moisture falling in the growing season for the Flathead/Mission, Missoula, and Bitterroot valleys ranges from 37 to 45 percent, with a portion of the Mission Valley slightly higher than that. The extreme southwestern valleys (Jefferson/Beaverhead, Madison) and the northern and central foothill region collect 52 to 60 percent of the water during the growing season. Most other areas are in the range of 45 to 55 percent.

Anthropogenic Uses

The intermountain/foothill grassland ecotype is diverse both in land management and its uses by humans. Primary recreational activities include hiking, mountaineering, hunting, biking, snowmobiling, wildlife watching, and skiing. The primary industries in this ecotype are building/construction, farming, ranching, mining, and tourism. The breakdown of landowner stewardship for the intermountain/foothill grassland ecotype is as follows:

U.S. Federal Agencies: 1,007,758 acres, or 7.5% of total area, which include:

BLM: 494,520 acres, or 3.8% of total area

USFS: 408,403 acres, or 3.1% of total area

USFWS: 64,556 acres, 0.5% of total area

NPS: 18,286 acres, or 0.1% of total area

State Agencies: 892,545 acres, or 6.8% of total area

Tribal Lands: 1,091,650 acres, or 8.3% of total area

Private: 10,187,909 acres, or 77.2% of total area

City and County: 6,487 acres, or less than 0.1% of total area

Vegetation

Plant community composition is influenced primarily by the total annual precipitation, which ranges from 8 to more than 20 inches, yearly precipitation distribution, and soil characteristics. The yearly precipitation distribution and, to a certain extent, the total precipitation are related to general geographic location. Northern valleys and foothills tend to receive more total precipitation than more southern areas, while northwestern valleys have a more maritime (winter/spring wet) precipitation. This has an impact on the distribution of major grass species. Most of the potential natural grassland communities within this ecotype can be perceived as different combinations of six or seven major grass species accompanied by a number of subordinate grass and forb species.

Rough fescue (*Festuca scabrella*) extends southward into Montana from Canada, its center of distribution (Moss and Campbell 1947, Coupland and Brayshaw 1953, Tisdale 1947, Stickney 1960). Rough fescue is most abundant and widespread in northwestern Montana on both sides of the Continental Divide, declining southward and penetrating below the 46th parallel only in the Gravelly and Madison ranges. The easternmost occurrences are near Lewistown at the foot of the Judith Mountains.

Idaho fescue (*Festuca idahoensis*) occurs throughout the intermountain/foothill ecotype wherever moisture conditions are favorable, becoming at least a subordinate species at 15 inches of annual precipitation (Ross and Hunter 1976). As well as being a component of most rough fescue communities, Idaho fescue forms habitat types with bluebunch wheatgrass (*Agropyron spicatum*) in most of the medium elevations of southwestern Montana and with western thickspike wheatgrass (*Agropyron dasystachyum*) in foothill areas just east of the mountains where there is enough moisture (Mueggler et al 1980). Idaho fescue rarely occurs as the sole dominant grass. The two Idaho fescue habitat types usually contain prairie junegrass (*Koeleria cristata*) as a subordinate grass. Forbs commonly associated with Idaho fescue include silky lupine (*Lupinus sericeus*), arrowleaf balsamroot (*Balsamorhiza sagittata*), sticky geranium (*Geranium viscosissimum*), phlox (*Phlox kelseyi*), blanketflower (*Gaillardia aristata*), and pussytoes (*Antennaria microphylla*).

Bluebunch wheatgrass is the most widely spread major forage grass in Montana, occurring at least as a codominant on some sites statewide. In the intermountain/foothill grassland ecotype it is a dominant grass on all upland sites within the 10- to 14-inch precipitation zone (Ross et al 1976). On finely textured soils bluebunch grass forms plant communities where western wheatgrass and thickspike wheatgrass are codominants. Prairie junegrass is usually present and fairly abundant. Other common species include big sagebrush (*Artemisia tridentata* spp. *wyomingensis*), milkvetches (*Astragalus* spp.), biscuitroot (*Lomatium* spp.), sandberg bluegrass (*Poa sandbergii*), hairy goldenaster (*Chrysopsis villosa*), and green needlegrass (*Stipa viridula*). Sites with medium textured, well-drained, shallow soils support little western wheatgrass compared to the finer textured soils but more species like needle-and-thread (*Stipa comata*), sandberg bluegrass, and sometimes blue grama (*Bouteloua gracilis*) as codominants. Such sites occupy about 9 percent (2,325 miles²) of the ecotype. These communities may contain a variety of shrub species, but those in which shrubs are dominants are included in the shrub grassland ecotype. On sandy sites, bluebunch wheatgrass is a major vegetation constituent along with needle-and-thread, Indian ricegrass (*Oryzopsis hymenoides*), and sometimes prairie sandreed (*Calamovilfa longifolia*). Other species that may be found are aromatic sumac (*Rhus aromatica*), threadleaf sedge (*Carex filifolia*), and yucca (*Yucca glauca*). Within the 15- to 19-inch precipitation zone, bluebunch wheatgrass shares dominance with rough fescue in the northwestern and Idaho fescue in the southwestern and south-central areas of Montana.

Needle-and-thread grass occurs as a community type in some valleys in Montana's extreme southwest (Mueggler et al 1980). This type is found on well-drained, shallow soils that might be limy. Other species include western and thickspike wheatgrass, prairie junegrass, threadleaf sedge, and fringed sedge (*Carex crinita*).

Other sites within the intermountain/foothill grassland ecotype include saline lowlands that support major grasses such as basin wildrye (*Elymus cinereus*), Nuttall alkaligrass (*Puccinellia nuttalliana*), alkali cordgrass (*Spartina gracilis*), saltgrass (*Distichlis stricata*), alkali bluegrass (*Poa juncifolia*), kelsey phlox (*Phlox kelseyi*), and occasionally greasewood (*Sarcobatus vermiculatus*). Also found are subirrigated areas and wetlands that are often dominated by various species of willow (*Salix* spp.) and a variety of hydromorphic grasses, sedges, and rushes. These might include Canada reedgrass (*Calamagrostis Canadensis*), cattails (*Typha latifolia*), Baltic rush (*Juncus balticus*), and basin wildrye (*Leymus cinereus*).

Terrestrial Conservation Focus Areas in Greatest Need (Tier I)

Bitterroot/Frenchtown Valleys (406,859 acres)



Figure 3. Bitterroot/Frenchtown Valleys Focus Area

The Bitterroot/Frenchtown Valleys area is dominated by views of the jagged peaks of the Bitterroot Range to the west and the lower Sapphire Mountains to the east. The Bitterroot River bisects the valley floor from Idaho north to Missoula. The valleys are arid, flat, or gently rolling landscapes 2 to 15 miles wide. While the valleys support many habitats—from grassland and riparian to forest and sagebrush—most of the area is now in agricultural production. The rolling mountain foothills at the valley edges are important elk, white-tailed deer, and mule deer winter range. In the valley bottoms, the cottonwood riparian habitats are some of the most productive wildlife habitats in the state and are home to a wide variety of birds, mammals, reptiles, and amphibians.

Landscape Characteristics

This subsection contains intermountain valleys that formed in alluvium, outwash, and lacustrine sediments. Elevations range from 3,000 to 4,400 feet. Drainage density is slight. Wetlands occur along both the Clark Fork and Bitterroot rivers. Mean annual precipitation ranges from 11 to 25 inches, with about 40 to 60 percent falling as snow. The soil temperature and moisture regimes are frigid and typically ustic. Primary natural disturbances are flooding and fire, as seen by the dramatic effects of the forest fires in the area in 2000. Another important natural biotic disturbance is beaver activity in riparian and wetland areas. Land use is predominantly extensive urban/suburban development and agricultural activities.

The breakdown for land stewardship in the Bitterroot/Frenchtown Valleys area is as follows:

U.S. Federal Agencies: 42,935 acres, or 10.6% of total area, which include:
 USFS: 40,155 acres, or 9.9% of total area
 USFWS: 2,780 acres, or 0.7% of total area
 State Agencies: 14,147 acres, or 3.5% of total area
 Private: 348,727 acres, or 85.7% of total area

Associated Habitats

Habitat	Habitat Tier	Percentage of Area
Mixed Xeric Forest	III	3.57
Wetland and Riparian	I	3.72
Urban	III	3.73
Douglas Fir	II	4.48
Sagebrush	I	4.57
Agricultural Lands - Dry	III	5.73
Mixed Mesic Forest	II	6.05
Ponderosa Pine	II	6.65
Mixed Mesic Shrubs	II	8.52
Altered Herbaceous	II	10.17
Agricultural Lands - Irrigated	III	11.19
Low/Moderate Cover Grasslands	I	25.11

Note: A total of 93.5% of the Bitterroot/Frenchtown Valleys area is represented; 6.5% is made up of a combination of other habitat types.

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 340 terrestrial vertebrate species that are found within the Bitterroot/Frenchtown Valleys Focus Area. Tier I species are listed below. All associations can be found in Table 9.

Amphibians: Coeur d’ Alene Salamander, Western Toad, and Northern Leopard Frog

Birds: Common Loon, Trumpeter Swan, Harlequin Duck, Bald Eagle, Long-billed Curlew, Black Tern, Flammulated Owl, Black-backed Woodpecker, and Olive-sided Flycatcher

Mammals: Townsend’s Big-eared Bat, Northern Bog Lemming, Gray Wolf, and Grizzly Bear

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Habitat loss, degradation, and fragmentation, especially as a result of human population growth and development of transportation infrastructure	Support strategic conservation easements by conservation organizations and public agencies
	Identify and prioritize key wildlife linkage areas, and work with other state and federal agencies, conservation groups, and landowners to restore wildlife connectivity
	Support state/federal tax incentives that discourage habitat fragmentation
	Promote further development of county ordinances that help guide future residential and commercial development
Invasive and exotic plant and animal species	Participate in partnerships to develop and implement weed control strategies as well as invasive species management
Range and forest management practices	Support government and private conservation activities that encourage and support sustainable land management practices (example; rest and rotation schedules)
Streamside residential development	Develop statewide riparian best management principles

Central Montana Broad Valleys (2,604,058 acres)



Figure 4. Central Montana Broad Valleys Focus Area

These central valleys include the areas from Three Forks, where the Missouri River begins, north through the Helena Valley, as well as White Sulphur Springs, and south, on the east side of the Belt and Bridger mountains. The valleys are situated among the foothills of the Rocky Mountains where precipitation is reduced by the rain shadow effect. Low and moderate cover grasslands dominate the valley floors, and the dry environment highlights the importance of the riparian areas along the Missouri, Smith, and other rivers and streams. Higher elevations capture enough precipitation to support fir, spruce, and pine forests.

Landscape Characteristics

This subsection has broad intermontane valleys that formed in Tertiary sediments and Quaternary alluvial deposits derived from volcanic rocks, shale, and sandstone. Elevations range from 3,750 to 6,800 feet. Drainage density is low. Mean annual precipitation ranges from 10 to 25 inches, with about 30 percent falling as snow. The soil temperature and moisture regimes are frigid and aridic ustic. The primary natural disturbances are fire and flooding. Another important natural biotic disturbance is beaver activity in riparian areas. Land use is predominantly livestock grazing, crop production, and urban/suburban development. The breakdown for land stewardship in the Central Montana Broad Valleys area is as follows:

U.S. Federal Agencies:	101,375 acres, or 3.8% of total area, which include:
BLM:	67,460 acres, or 2.6% of total area
USFS:	21,313 acres, or 0.8% of total area
USFWS:	556 acres, or less than 0.1% of total area

State Agencies: 162,163 acres, or 6.2% of total area
 Private: 2,331,192 acres, or 89.5% of total area

Associated Habitats

Habitat	Habitat Tier	Percentage of Area
Moderate/High Cover Grasslands	I	2.19
Rock	III	3.83
Wetland and Riparian	I	5.24
Sagebrush	I	8.16
Very Low Cover Grasslands	I	8.45
Agricultural Lands - Irrigated	III	9.45
Agricultural Lands - Dry	III	11.08
Low/Moderate Cover Grasslands	I	38.26

Note: A total of 86.65% of the Central Montana Broad Valleys area is represented; 13.35% is made up of a combination of other habitat types.

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 318 terrestrial vertebrate species that are found within the Central Montana Broad Valleys Focus Area. Tier I species are listed below. All associations can be found in Table 10.

Amphibians: Western Toad and Northern Leopard Frog

Birds: Common Loon, Bald Eagle, Greater Sage-Grouse, Mountain Plover, Long-billed Curlew, Black Tern, and Burrowing Owl

Mammals: Townsend’s Big-eared Bat, Pallid Bat, Black-tailed Prairie Dog, Grizzly Bear, Canada Lynx, and American Bison

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Habitat loss, degradation, and fragmentation, especially as a result of human population growth	Support strategic conservation easements by conservation organizations and public agencies
	Support state/federal tax incentives that discourage habitat fragmentation
	Promote further development of county ordinances that help guide future residential and commercial development

	Identify and prioritize key wildlife linkage areas, and work with other state and federal agencies, conservation groups, and landowners to restore wildlife connectivity
Invasive and exotic plant species	Participate in partnerships to develop and implement weed control strategies
Range or forest management practices	Support government and private conservation activities that encourage and support sustainable land management practices (example; rest and rotation schedules)
Streamside residential development	Develop statewide riparian best management principles

References

The Nature Conservancy. 2000. Middle Rockies-Blue Mountains Ecoregional Conservation Plan. Prepared by the Middle Rockies-Blue Mountains Planning Team. 58 pp + appendices.

Deerlodge Valley (175,260 acres)



Figure 5. Deerlodge Valley Focus Area

One of several broad, intermountain valleys located in southwestern Montana, the north-flowing Clark Fork River bisects the Deerlodge Valley along an east-west axis. Cattle ranching and hay production are the chief agricultural activities. Native bunchgrasses occur on the valley foothills, which provide important elk and deer winter range and support other diverse nongame wildlife.

Landscape Characteristics

This subsection consists of an intermontane valley that formed in Tertiary sedimentary rocks and more recent stream deposits. Elevations range from 4,400 to 6,000 feet. Drainage density is moderate. Mean annual precipitation ranges from 11 to 16 inches, with about 20 percent falling as snow. The soil temperature and moisture regimes are frigid and aridic ustic. The primary natural disturbances are flooding and mass wasting. Another important natural biotic disturbance is beaver activity in riparian areas. Land use is predominantly agriculture, livestock grazing, and urban/suburban development. The breakdown for land stewardship in the Deerlodge Valley area is as follows:

U.S. Federal Agencies:	1,792 acres, or 1% of total area, which include:
BLM:	62 acres, or less than 0.1% of total area
NPS:	1,730 acres, or 0.9% of total area
State Agencies:	14,023 acres, or 8% of total area
Private:	159,445 acres, or 91% of total area

Associated Habitats

Habitat	Habitat Tier	Percentage of Area
Very Low Cover Grasslands	I	2.00
Mixed Barren Sites	III	2.14
Altered Herbaceous	II	3.22
Mixed Xeric Shrubs	I	4.70
Sagebrush	I	4.96
Moderate/High Cover Grasslands	I	5.37
Wetland and Riparian	I	6.14
Agricultural Lands - Irrigated	III	6.99
Mixed Mesic Shrubs	II	7.18
Low/Moderate Cover Grasslands	I	51.73

Note: A total of 94.42% of the Deerlodge Valley area is represented; 5.58% is made up of a combination of other habitat types.

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 259 terrestrial vertebrate species that are found within the Deerlodge Valley Focus Area. Tier I species are listed below. All associations can be found in Table 11.

Amphibians: Western Toad and Northern Leopard Frog

Birds: Common Loon, Trumpeter Swan, Harlequin Duck, Bald Eagle, Long-billed Curlew, and Black Tern

Mammals: Townsend's Big-eared Bat and Canada Lynx

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Habitat loss, degradation, and fragmentation, especially as a result of human population growth	Support conservation easements by conservation organizations or public agencies
	Support state/federal tax incentives that discourage habitat fragmentation
	Promote further development of county ordinances that help plan for and manage development
Invasive and exotic plant species	Participate in partnerships to develop and implement weed control strategies

Range or forest management practices	Support government and private conservation activities that encourage and support sustainable land management practices (example; rest and rotation schedules)
Streamside residential development	Develop statewide riparian best management principles

References

The Nature Conservancy. 2000. Middle Rockies-Blue Mountains Ecoregional Conservation Plan. Prepared by the Middle Rockies-Blue Mountains Planning Team. 58 pp. + appendices.

Flathead River Valley (1,586,787 acres)



Figure 6. Flathead River Valley Focus Area

The glaciated Flathead Valley of northwestern Montana lies among majestic mountain ranges and cradles the Flathead River. The primary stem of the Flathead River and the Stillwater and Tobacco rivers are among the major headwater rivers of the Columbia basin. The valley supports diverse wetland and aquatic communities including glacial lakes, ponds, spring creeks, riparian swamps, cottonwood forests, oxbow lakes, and Flathead Lake, the nation's largest natural freshwater lake west of the Mississippi. The northern and southern reaches of the valley still support intact palouse prairie habitats interspersed with wetlands and forest. This region historically has provided habitat for nesting, migrating, and wintering waterfowl and a range of habitats for upland game birds, raptors, shorebirds, colonial waterbirds, and other resident and migratory species. In particular, the region was an important historic northern leopard frog habitat and is the focus of northern leopard frog reintroduction efforts. It also contains important seasonal habitat for black bears, grizzly bears, mountain lions, elk, mule deer, and white-tailed deer. The rich resources of the valley floor—riparian/wetlands, grasslands, and foothills—are primarily in private ownership and are under extreme development pressure.

Landscape Characteristics

This subsection consists of an intermontane basin that formed in alluvium, glacial outwash, and lacustrine sediments underlain by argillite, siltite, and dolomite. Elevations range from 2,300 to 6,200 feet. Drainage density is low to moderate. Mean annual precipitation ranges from 14 to 25 inches, with about 50 percent falling as snow. The soil temperature and moisture regimes are frigid and typically xeric. The primary natural disturbances are fire and flooding. Another

important natural biotic disturbance is beaver activity in riparian and wetland areas. Land use is predominantly agriculture and timber harvest on public and to a greater degree private lands, as well as rural/suburban development. The breakdown for land stewardship in the Flathead River Valley area is as follows:

U.S. Federal Agencies: 132,943 acres, or 8.4% of total area, which include:
 USFS: 108,047 acres, or 6.8% of total area
 USFWS: 24,711 acres, or 1.6% of total area
 State Agencies: 98,904 acres, or 6.2% of total area
 Tribal Lands: 456,713 acres, or 28.8% of total area
 Private: 898,121 acres, or 56.6% of total area

Associated Habitats

Habitat	Habitat Tier	Percentage of Area
Lodgepole Pine	III	2.54
Wetland and Riparian	I	2.85
Mixed Mesic Shrubs	II	2.85
Ponderosa Pine	II	2.92
Mixed Xeric Forest	III	3.06
Agricultural Lands - Dry	III	3.40
Altered Herbaceous	II	4.22
Sagebrush	I	6.63
Douglas Fir	II	7.26
Water	III	9.29
Agricultural Lands - Irrigated	III	9.88
Low/Moderate Cover Grasslands	I	15.56
Mixed Mesic Forest	II	17.71

Note: A total of 88.16% of the Flathead River Valley area is represented; 11.84% is made up of a combination of other habitat types.

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 344 terrestrial vertebrate species that are found within the Flathead River Valley Focus Area. Tier I species are listed below. All associations can be found in Table 12.

Amphibians: Western Toad and Northern Leopard Frog

Birds: Common Loon, Trumpeter Swan, Bald Eagle, Columbia Sharp-tailed Grouse, Long-billed Curlew, Black Tern, Flammulated Owl, Black-backed Woodpecker, and Olive-sided Flycatcher

Mammals: Townsend's Big-eared Bat, Northern Bog Lemming, Grizzly Bear, Gray Wolf, and Canada Lynx

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Habitat fragmentation, especially as a result of human population growth/development and expansion of the transportation network	Support conservation easements and other methods that help protect critical habitat on private lands, including corporate forested lands
	Work with Montana Department of Transportation and Federal Highway Commission to effectively mitigate impacts of highway construction
	Identify and prioritize key wildlife linkage areas, and work with other state and federal agencies, conservation groups, and landowners to restore wildlife connectivity
	Support state/federal tax incentives that discourage habitat fragmentation
	Promote further development of county ordinances that help guide future residential and commercial development
Human/wildlife conflicts and related wildlife mortality	Public education regarding human/wildlife conflicts
	Work with Montana Department of Transportation and Federal Highway Commission to effectively mitigate impacts of highway construction
Range or forest management practices	Support government and private conservation activities that encourage and support sustainable land management practices (example; rest and rotation schedules)
Streamside residential development	Develop statewide riparian best management principles
Water quality degradation	Support watershed, riparian, and grassland restoration opportunities with Confederated Salish and Kootenai Tribes, Montana Department of Environmental Quality, U.S. Natural Resource Conservation, and Partners for Wildlife Program
Invasive or exotic plant species	Support efforts to eradicate exotic or invasive plant species when appropriate

Altered fire regimes	Work with coordinating agencies to mimic natural fire regimes
----------------------	---------------------------------------------------------------

References

Confederated Salish and Kootenai Tribes and Montana Fish, Wildlife & Parks. 2003. Flathead Subbasin Plan Assessment: Executive Summary. Northwest Power and Conservation Council. Portland, OR.

Kootenai Tribe of Idaho and Montana Fish, Wildlife & Parks. 2004. Public Review Draft Kootenai Subbasin Plan. Executive Summary. Report prepared for the Northwest Power and Conservation Council. Portland, OR.

The Nature Conservancy. 2004. Canadian Rocky Mountains Ecoregional Assessment. Four volumes, including Report, Appendices, Conservation Area Descriptions and Maps.

U.S. Fish and Wildlife Service. 2004. Conservation Focus Areas of the Great Divide: a vast region encompassing the Upper Missouri, Yellowstone and upper Columbia watersheds. Publisher: USFWS, Benton Lake Wildlife Refuge, Great Falls, MT. 77 pp.

Little Belt Foothills (839,541 acres)

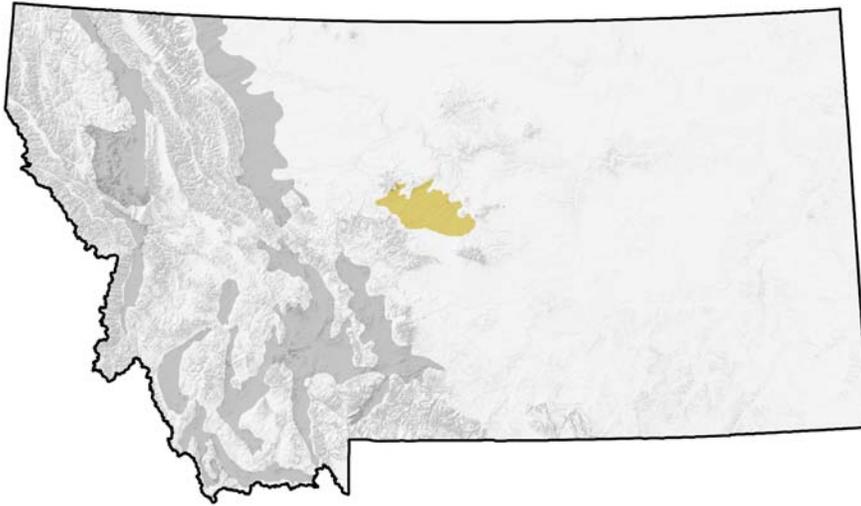


Figure 7. Little Belt Foothills Focus Area

The Little Belt Foothills area covers the Judith Basin, a large mountain foothill grassland community rimmed by the Little Belt, Highwood, Moccasin, and Big Snowy mountains. The Judith River, a tributary to the Missouri River, is the basin's primary drainage. Large, flat grassland benches define the high foothills. The lower elevations consist of rangeland interspersed with cropland, and sprawling terraces dominate the lower elevations. While about 30 percent of the landscape in the Judith Basin is farmed, the remaining areas support bunchgrass and sagebrush grasslands.

Landscape Characteristics

This subsection consists of foothills, terraces, and fans that formed in shale, siltstone, and terrace deposits. Elevations range from 3,500 to 5,000 feet. Drainage density is moderate. Mean annual precipitation ranges from 15 to 19 inches, with about 40 to 50 percent falling as snow. The soil temperature and moisture regimes are frigid and ustic. The primary natural disturbance is drought and fire. Other important natural biotic disturbances include beaver activity in riparian areas and prairie dog complexes in grassland areas. Land use is predominantly livestock grazing at higher elevations, with a combination of cropping and livestock grazing at lower elevations. The breakdown for land stewardship in the Little Belt Foothills area is as follows:

U.S. Federal Agencies:	16,309 acres, or 1.9% of total area, which include:
BLM:	15,197 acres, or 1.8% of total area
USFS:	1,112 acres, or 0.1% of total area
State Agencies:	77,159 acres, or 9.2% of total area
Private:	746,073 acres, or 88.9% of total area

Associated Habitats

Habitat	Habitat Tier	Percentage of Area
Mixed Mesic Shrubs	II	2.04
Very Low Cover Grasslands	I	2.36
Wetland and Riparian	I	7.34
Moderate/High Cover Grasslands	I	11.69
Agricultural Lands - Irrigated	III	18.99
Agricultural Lands - Dry	III	22.88
Low/Moderate Cover Grasslands	I	29.12

Note: A total of 94.42% of the Little Belt Foothills area is represented; 5.58% is made up of a combination of other habitat types.

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 288 terrestrial vertebrate species that are found within the Little Belt Foothills Focus Area. Tier I species are listed below. All associations can be found in Table 13.

Amphibians: Northern Leopard Frog

Reptiles: Western Hog-nosed Snake and Milksnake

Birds: Bald Eagle, Greater Sage-Grouse, Mountain Plover, Long-billed Curlew, Black Tern, and Burrowing Owl

Mammals: Townsend's Big-eared Bat, Black-tailed Prairie Dog, and Black-footed Ferret

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Range or forest management practices	Support government and private conservation activities that encourage and support sustainable land management practices (example; rest and rotation schedules)
Streamside residential development	Develop statewide riparian best management principles
Fragmentation and loss of native habitat as a result of conversion to cropland and human population growth/development	Government and private conservation programs/activities that encourage and support private land stewardship

	Encourage the conservation of natural rangeland communities through increased efforts to maintain ecological features (e.g., black-tailed prairie dog colonies) or processes (e.g., fire) on public lands
	Support state/federal tax incentives that discourage habitat fragmentation
	Identify and prioritize key wildlife linkage areas, and work with other state and federal agencies, conservation groups, and landowners to restore wildlife connectivity
Altered natural fire regime	Work with public and private efforts to restore natural fire regime to area
Invasive or exotic plant species	Cooperative efforts to reduce the abundance of invasive or exotic species

References

The Nature Conservancy. 1999. Ecoregional Conservation in the Northern Great Plains Steppe. Northern Great Plains Steppe Ecoregional Planning Team. 76 pp.

North Tobacco Root Mountains and Foothills (224,989 acres)



Figure 8. North Tobacco Root Mountains and Foothills Focus Area

The rugged peaks of the Tobacco Root Mountains, with their abundant high mountain lakes and small running stream systems, overlook this area. These mountains have seen extensive historical mining activity that has resulted in numerous roads. The foothills provide important elk and mule deer winter range and are dominated by sagebrush/grassland that has seen conversion from the spraying and burning of sagebrush. Along the Jefferson River there are productive cottonwood riparian habitats that support an abundance of wildlife species including whitetailed deer and recently introduced Merriam's turkeys. The valley bottom is home to extensive agricultural production of cattle and alfalfa and little or no grain production.

Landscape Characteristics

This subsection consists of complex faulted mountains and foothills that formed in gneiss, volcanic, and a variety of sedimentary bedrock. Elevations range from 4,200 to 8,000 feet. Drainage density is high. Mean annual precipitation ranges from 10 to 25 inches, with about 35 percent falling as snow. The soil temperature and moisture regimes are frigid (cryic at higher elevations) and aridic ustic. The primary natural disturbance is fire. Another important natural biotic disturbance is beaver activity in riparian areas. Land use is predominantly livestock grazing and timber harvest. The breakdown for land stewardship in the North Tobacco Root Mountains and Foothills area is as follows:

U.S. Federal Agencies:	32,309 acres, or 14.4% of total area, which include:
BLM:	17,544 acres, or 7.8% of total area
USFS:	14,765 acres, or 6.6% of total area
State Agencies:	20,695 acres, or 9.2% of total area

Private: 171,985 acres, or 76.4% of total area

Associated Habitats

Habitat	Habitat Tier	Percentage of Area
Wetland and Riparian	I	2.11
Agricultural Lands - Dry	III	3.29
Limber Pine	III	3.36
Agricultural Lands - Irrigated	III	3.83
Douglas Fir	II	5.01
Mixed Xeric Forest	III	7.42
Very Low Cover Grasslands	I	8.24
Sagebrush	I	11.88
Low/Moderate Cover Grasslands	I	50.44

Note: A total of 95.59% of the North Tobacco Root Mountains and Foothills area is represented; 4.41% is made up of a combination of other habitat types.

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 244 terrestrial vertebrate species that are found within the North Tobacco Root Mountains and Foothills Focus Area. Tier I species are listed below. All associations can be found in Table 14.

Amphibians: Western Toad

Birds: Flammulated Owl and Bald Eagle

Mammals: Townsend’s Big-eared Bat, Grizzly Bear, and Canada Lynx

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Habitat loss, degradation, and fragmentation, especially as a result of population growth/development	Support strategic conservation easements/protection by conservation organizations or public agencies by providing advice and technical assistance
	Promote and further develop county ordinances that help manage and plan for development
	Support state/federal tax incentives that discourage habitat fragmentation

	Identify and prioritize key wildlife linkage areas, and work with other state and federal agencies, conservation groups, and landowners to restore wildlife connectivity
Invasive or exotic plant species	Participate in partnerships to develop and implement weed control strategies
Range or forest management practices	Support government and private conservation activities that encourage and support sustainable land management practices (example; rest and rotation schedules)
Streamside residential development	Develop statewide riparian best management principles

References

The Nature Conservancy. 2000. Middle Rockies-Blue Mountains Ecoregional Conservation Plan. Prepared by the Middle Rockies-Blue Mountains Planning Team. 58 pp + appendices.

Rocky Mountain Front Foothills (2,018,789 acres)



Figure 9. Rocky Mountain Front Foothills Focus Area

The Rocky Mountain Front, extending from Alberta, Canada, south through Montana, marks the easternmost edge of the Bob Marshall Wilderness, where thrust-faulted mountains give way to rolling foothills and Great Plains grasslands. This variable landscape still offers glimpses of grizzly bears moving from high mountain fir and spruce forests to native prairie grasslands dotted with pothole marshes where migrating birds stage season after season. With the exception of bison, all of the native mammals that inhabited this land when Lewis and Clark passed through survive here.

Landscape Characteristics

This subsection consists of mountain front foothills, moraines, fans, and terraces that formed in calcareous shales overlain by till, outwash, alluvium, and terrace deposits. The landscape has been modified by glaciation. Elevations range from 3,400 to 8,500 feet. Drainage density is low to moderate. Mean annual precipitation ranges from 12 to 20 inches, with about half falling as snow. The soil temperature and moisture regimes are frigid and typic ustic. Chinook winds are frequent. The primary natural disturbance is fire. Another important natural biotic disturbance is beaver activity in riparian areas. Land use is predominantly livestock grazing. The breakdown for land stewardship in the Rocky Mountain Front Foothills area is as follows:

U.S. Federal Agencies:	33,421 acres, or 1.7% of total area, which include:
BLM:	9,019 acres, or 0.5% of total area
USFS:	4,819 acres, or 0.2% of total area
USFWS:	1,421 acres, or less than 0.1% of total area
State Agencies:	172,603 acres, or 8.5% of total area
Tribal Lands:	482,906 acres, or 23.9% of total area

Private: 1,329,427 acres, or 65.9% of total area

Associated Habitats

Habitat	Habitat Tier	Percent of Area
Limber Pine	III	2.02
Mixed Broadleaf Forest	I	2.13
Altered Herbaceous	II	3.77
Agricultural Lands - Dry	III	4.41
Agricultural Lands - Irrigated	III	5.96
Mixed Mesic Shrubs	II	6.13
Wetland and Riparian	I	6.47
Moderate/High Cover Grasslands	I	10.46
Low/Moderate Cover Grasslands	I	49.69

Note: A total of 91.03% of the Rocky Mountain Front Foothills area is represented; 8.97% is made up of a combination of other habitat types.

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 362 terrestrial vertebrate species that are found within the Rocky Mountain Front Foothills Focus Area. Tier I species are listed below. All associations can be found in Table 15.

Amphibians: Western Toad and Northern Leopard Frog

Reptiles: Western Hog-nosed Snake

Birds: Common Loon, Trumpeter Swan, Harlequin Duck, Bald Eagle, Piping Plover, Mountain Plover, Long-billed Curlew, Black Tern, Flammulated Owl, and Burrowing Owl

Mammals: Townsend’s Big-eared Bat, Black-tailed Prairie Dog, Northern Bog Lemming, Grizzly Bear, Canada Lynx, and American Bison

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Habitat fragmentation as a result of conversion of natural lands to agriculture and human population growth/development and energy exploration and development activities	Policy-based approaches that encourage the conservation of natural communities rather than support their conversion

	Increased efforts to maintain ecological features (e.g., black-tailed prairie dog colonies) or processes (e.g., fire) on public lands as they disappear from private lands
	Promote further development of county ordinances that help guide future residential and commercial development
	Identify and prioritize key wildlife linkage areas, and work with other state and federal agencies, conservation groups, and landowners to restore wildlife connectivity
Invasive or exotic plant species	Support cooperative efforts to eradicate or reduce the abundance of exotic or invasive plant species

References

The Nature Conservancy. 2005. Unpublished report.

The Nature Conservancy. 1999. Ecoregional Conservation in the Northern Great Plains Steppe. Northern Great Plains Steppe Ecoregional Planning Team. 76 pp.

U.S. Fish and Wildlife Service. 2004. Conservation Focus Areas of the Great Divide: a vast region encompassing the Upper Missouri, Yellowstone and upper Columbia watersheds. Publisher: USFWS, Benton Lake Wildlife Refuge, Great Falls, MT. 77 pp.

South Elkhorn Mountains (171,059 acres)



Figure 10. South Elkhorn Mountains Focus Area

The South Elkhorn Mountains area is a diverse landscape with vegetation and topography more typical of central Montana than the intermountain western portion of Montana. Sagebrush grasslands and broken and rough terrain are found throughout much of this area, although much of the southern portion has been converted to dryland grain and CRP grasslands. Mule deer and antelope are common throughout much of the South Elkhorn Mountains area, and greater sage-grouse were rumored to have been common prior to the loss of much of their primary sagebrush habitat. In the northern portion of this area, as the mountainous portion of the Elkhorn Mountains is approached, the common geologic formations are limestone ridges and outcrops. These ridges provide the environment for abundant stands of mountain mahogany, which among other things makes this area very attractive as mule deer winter range.

Landscape Characteristics

This subsection consists of mountains and foothills that formed in limestone, dolomite, argillite, andesite, sandstone, and quartzite. Elevations range from 4,500 to 7,500 feet. Drainage density is low. Mean annual precipitation ranges from 12 to 22 inches, with about 30 percent falling as snow. The soil temperature and moisture regimes are frigid (cryic at higher elevations) and aridic ustic. The primary natural disturbance is fire. Another important natural biotic disturbance is beaver activity in riparian areas. Land use is predominantly livestock grazing and timber harvest. The breakdown for land stewardship in the South Elkhorn Mountains area is as follows:

U.S. Federal Agencies:	71,105 acres, or 41.6% of total area, which include:
BLM:	8,494 acres, or 5% of total area

USFS: 22,610 acres, or 13.2% of total area
 State Agencies: 6,425 acres, or 3.7% of total area
 Private: 93,529 acres, or 54.7% of total area

Associated Habitats

Habitat	Habitat Tier	Percentage of Area
Lodgepole Pine	III	2.12
Montane Parkland and Subalpine Meadows	III	3.42
Rocky Mountain Juniper	III	7.41
Mixed Xeric Forest	III	7.54
Douglas Fir	II	8.17
Very Low Cover Grasslands	I	13.66
Sagebrush	I	22.13
Low/Moderate Cover Grasslands	I	28.70

Note: A total of 93.14% of the South Elkhorn Mountains area is represented; 6.86% is made up of a combination of other habitat types.

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 243 terrestrial vertebrate species that are found within the South Elkhorn Mountains Focus Area. Tier I species are listed below. All associations can be found in Table 16.

Amphibians: Western Toad and Northern Leopard Frog

Birds: Bald Eagle and Black-backed Woodpecker

Mammals: Townsend’s Big-eared Bat, Pallid Bat, Gray Wolf, and Canada Lynx

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Habitat loss, degradation, and fragmentation, especially as a result of human population growth	Support strategic conservation easements/protection by conservation organizations or public agencies by providing advice and technical assistance
	Support state/federal tax incentives that discourage habitat fragmentation
	Promote and further develop county ordinances that help plan for and manage development
	Support state/federal tax incentives that discourage habitat fragmentation

Range or forest management practices	Support government and private conservation activities that encourage and support sustainable land management practices (example; rest and rotation schedules)
Streamside residential development	Develop statewide riparian best management principles
Invasive or exotic plant species	Participate in partnerships to develop and implement weed control strategies

References

The Nature Conservancy. 2000. Middle Rockies-Blue Mountains Ecoregional Conservation Plan. Prepared by the Middle Rockies-Blue Mountains Planning Team. 58 pp + appendices.

Southwest Montana Intermontane Basins and Valleys (2,077,477 acres)



Figure 11. Southwest Montana Intermontane Basins and Valleys Focus Area

The area consists of valleys that are located between mountain ranges and typically follow major stream courses. Many small tributary mountain streams flow down the hillsides of these valleys and support wetlands, rivers such as the Red Rock, Madison, Jefferson, and Big Hole, and Red Rock Lakes. The vegetation is a mix of sagebrush grassland on the valley floor, and in the wet valley bottoms, riparian species like sedges and willows are common. Coniferous forest and aspen stands in the wetter microsites dominate the higher elevations. The coniferous forest and adjacent sagebrush communities provide winter habitats for mule deer and elk, while the riparian bottoms provide yearlong habitat for white-tailed deer. These intermountain basins and valleys are highly valued for residential development and are under the imminent threat of habitat fragmentation.

Landscape Characteristics

This subsection consists of intermontane basins and broad valleys that formed in alluvium, glacial deposits, and Tertiary volcanic materials. Elevations range from 4,700 to 7,600 feet. Drainage density is low. Mean annual precipitation ranges from 9 to 20 inches, with about 10 percent falling as snow. The soil temperature and moisture regimes are frigid and aridic ustic. Parts of the Red Rock Basin and Big Hole Valley have cryic temperature regimes. The primary natural disturbances are flooding and fire. Another important natural biotic disturbance is beaver activity in riparian areas. Land use is predominantly livestock grazing, agriculture, and urban/suburban development. The breakdown for land stewardship in the Southwest Montana Intermontane Basins and Valleys area is as follows:

U.S. Federal Agencies: 479,632 acres, or 23.1% of total area, which include:
 BLM: 344,156 acres, or 16.6% of total area
 USFS: 96,180 acres, or 4.6% of total area
 USFWS: 38,610 acres, or 1.9% of total area
 NPS: 680 acres, or less than 0.1% of total area
 State Agencies: 275,028 acres, or 13.2% of total area
 Private: 1,318,307 acres, or 63.5% of total area

Associated Habitats

Habitat	Habitat Tier	Percentage of Area
Very Low Cover Grasslands	I	5.19
Wetland and Riparian	I	6.94
Agricultural Lands - Irrigated	III	9.04
Sagebrush	I	30.19
Low/Moderate Cover Grasslands	I	31.81

Note: A total of 83.17% of the Southwest Montana Intermontane Basins and Valleys area is represented; 16.83% is made up of a combination of other habitat types.

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 296 terrestrial vertebrate species that are found within the Southwest Montana Intermontane Basins and Valleys Focus Area. Tier I species are listed below. All associations can be found in Table 17.

Amphibians: Western Toad

Birds: Common Loon, Trumpeter Swan, Bald Eagle, Greater Sage-Grouse, Long-billed Curlew, and Flammulated Owl

Mammals: Townsend’s Big-eared Bat, Pygmy Rabbit, Great Basin Pocket Mouse, Gray Wolf, Grizzly Bear, and Canada Lynx

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Habitat fragmentation and loss of connectivity as a result of human population growth/development	Identify and prioritize key wildlife linkage areas and work with other state and federal agencies, conservation groups, and landowners to restore wildlife connectivity

	Support strategic conservation easements/protection by conservation organizations or public agencies by providing advice and technical assistance
	Support state/federal tax incentives that discourage habitat fragmentation
	Participate in government and private conservation programs/activities that encourage and support private land stewardship
	Promote and further develop county ordinances that help plan for and manage development
	Support habitat-protecting conservation incentives directed at private landowners
	Manage for the sustainable use of recreational vehicles on public lands
Invasive or exotic plant species	Participate in partnerships to develop and implement weed control strategies, especially strategies that promote plant diversity
Altered fire regime	Work with public and private efforts to restore natural fire regimes to area
Range or forest management practices	Support government and private conservation activities that encourage and support sustainable land management practices (example; rest and rotation schedules)
Streamside residential development	Develop statewide riparian best management principles

References

Fargione, Joseph, Cynthia S. Brown, and David Tilman. 2003. Community assembly and invasion: an experimental test of neutral versus niche processes. *PNAS*. Vol. 100 (15):8916–8920.

Montana Partners for Fish & Wildlife. 2000. Centennial Valley. 4 pp. More information at <http://www.r6.fws/gpv/pfw/montana/mt3c.htm>.

The Nature Conservancy. 2005. Unpublished report.

The Nature Conservancy. 2000. Middle Rockies-Blue Mountains Ecoregional Conservation Plan. Prepared by the Middle Rockies-Blue Mountains Planning Team. 58 pp + appendices.

U.S. Fish and Wildlife Service. 2004. Conservation Focus Areas of the Great Divide: a vast region encompassing the Upper Missouri, Yellowstone and upper Columbia watersheds. Publisher: USFWS, Benton Lake Wildlife Refuge, Great Falls, MT. 77 pp.

Upper Yellowstone Valley (178,039 acres)



Figure 12. Upper Yellowstone Valley Focus Area

The Upper Yellowstone Valley area, south of Livingston, is better known to many as Paradise Valley. Bracketed by the Absaroka-Beartooth Wilderness on the east and the Gallatin Range on the west, the valley's grassland habitats are bisected by the Yellowstone River and its riparian areas and cottonwood stands. Several streams in the area harbor genetically pure populations of Yellowstone cutthroat trout. Much of the valley lies in the rain shadow of the mountains and is a wintering area for elk, bighorn sheep, and mule deer. The area supports grizzly bears, and there is an increasing wolf presence. Cradled within the Gallatin and Absaroka ranges are low-elevation meadows and limited juniper stands mixed with grasslands and sagebrush. Higher up are forests of aspen, pine, spruce, subalpine fir, and whitebark pine.

Landscape Characteristics

This valley consists of valley floor, terraces, toeslopes, and foothills that formed in alluvium and Tertiary sedimentary and volcanic rocks. Elevations range from 4,500 to 7,500 feet. Drainage density is moderate and wetlands are fairly common. Mean annual precipitation ranges from 15 to 40 inches, with about 55 percent falling as snow. The soil temperature and moisture regimes are frigid and aridic ustic. The primary natural disturbance is flooding. Another important natural biotic disturbance is beaver activity in riparian areas. Land use is predominantly recreational development, with some agriculture and livestock grazing. The breakdown for land stewardship in the Upper Yellowstone Valley area is as follows:

U.S. Federal Agencies:	18,656 acres, or 10.5% of total area, which include:
BLM:	1,668 acres, or 0.9% of total area

USFS: 16,988 acres, or 9.6% of total area
 State Agencies: 12,293 acres, or 7% of total area
 Private: 146,101 acres, or 82.1% of total area

Associated Habitats

Habitat	Habitat Tier	Percentage of Area
Mixed Broadleaf Forest	I	2.14
Mixed Xeric Forest	II	2.28
Moderate/High Cover Grasslands	I	2.28
Mixed Subalpine Forest	III	3.95
Agricultural Lands - Dry	III	3.98
Wetland and Riparian	I	4.57
Montane Parkland and Subalpine Meadows	III	5.00
Douglas Fir	II	5.17
Sagebrush	I	5.49
Agricultural Lands - Irrigated	III	7.15
Rock	III	7.87
Very Low Cover Grasslands	I	11.16
Low/Moderate Cover Grasslands	I	28.56

Note: A total of 89.61% of the Upper Yellowstone Valley area is represented; 10.39% is made up of a combination of other habitat types.

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 264 terrestrial vertebrate species that are found within the Upper Yellowstone Valley Focus Area. Tier I species are listed below. All associations can be found in Table 18.

Amphibians: Western Toad and Northern Leopard Frog

Birds: Trumpeter Swan, Bald Eagle, Long-billed Curlew, and Black-backed Woodpecker

Mammals: Gray Wolf, Grizzly Bear, and Canada Lynx

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Recreational infrastructure development, especially road network development	Work with Montana Department of Transportation and Federal Highway Commission to effectively mitigate impacts of highway construction

Habitat loss and fragmentation, especially as a result of human population growth/development	Support strategic conservation easements/protection by conservation organizations or public agencies
	Support state/federal tax incentives that discourage habitat fragmentation
	Promote and further develop county ordinances that help plan for and manage development
	Support state/federal tax incentives that discourage habitat fragmentation
Invasive or exotic plant species	Support efforts to eradicate exotic or invasive plant species
Range or forest management practices	Support government and private conservation activities that encourage and support sustainable land management practices (example; rest and rotation schedules)
Streamside residential development	Develop statewide riparian best management principles

References

A Biological Conservation Assessment for the Utah-Wyoming Rocky Mountain Ecoregion: Report to The Nature Conservancy. 2001. R. Noss, G. Wuerthner, K. Vance-Borland, and C. Carroll. Conservation Science, Inc. 125 pp + Executive Summary and Appendix D.

Aquatic Conservation Focus Areas in Greatest Need (Tier I)

Big Hole River (153 River Miles)

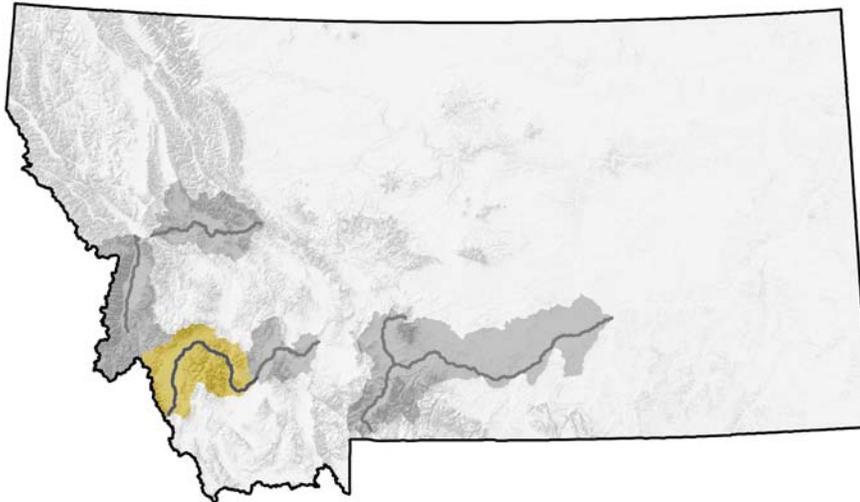


Figure 13. Big Hole River Focus Area

Originally named the Wisdom River by Meriwether Lewis, the Big Hole River and its tributaries start along the border of Montana and Idaho. Surrounded by hay meadows, the upper Big Hole separates the Bitterroot Range on the west from the Pioneer Mountains to the east. The middle section of the river runs through a length of gorge and then glides out through hay meadows once again, where it teams up with the Beaverhead River to create the Jefferson River.

Associated Habitats

Habitat Type	Habitat Tier	Acres	Miles
Intermountain Valley Rivers	II		153
Intermountain Valley Streams	II		967
Lowland Lakes	III	297	
Lowland Reservoirs	III	64	
Mountain Lakes	III	2,886	
Mountain Reservoirs	III	12	
Mountain Streams	I		2,929

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 19 aquatic species that are found within the Big Hole River Focus Area. Tier I species are listed below. All associations can be found in Table 19.

Invertebrates: Western Pearlshell

Fish: Westslope Cutthroat Trout, Lake Trout (native lakes), Arctic Grayling, and Burbot

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Diversion of water for irrigation ditches and livestock watering	Increased installation of stockwater wells in place of irrigation ditches
Entrainment of juvenile and adult fishes by irrigation diversion or other water intakes	Screening or modification of irrigation diversions or other water intakes in a manner that prevents entrainment of fishes
Riparian vegetation effected by range and forest management practices and streamside residential development (such activities destabilize streambanks, increase sediment inputs, reduced shading, and remove woody debris)	Support government and private conservation activities that encourage and support sustainable land management practices in riparian areas
	Develop statewide riparian best management principles
Culverts, dams, irrigation diversions, and other instream barriers that fully or partially impede fish movement and reduce connectivity of habitat	Removal or modification of barriers in a manner that restores fish passage
Modification and degradation of stream channels caused by various construction or land management practices	Restoration of stream channels, streambanks and riparian areas to a condition that simulates their natural form and function
Alterations of the quantity or timing of stream flows, causing dewatering or unnatural flow fluctuations that diminish the quantity or quality of essential habitats	Implementation of various water conservation or flow management practices that restore essential habitats, simulate the natural hydrograph and also protect instream flow
Invasive or exotic plant species	Participate in partnerships to develop and implement weed control strategies as well as invasive species management

References

Montana Partners for Fish & Wildlife. 2000. Big Hole River Watershed. 4 pp.
More information at <http://www.r6.fws/gpv/pfw/montana/mt3c.htm>.

Bitterroot River (84 River Miles)



Figure 14. Bitterroot River Focus Area

The Bitterroot River originates in the Anaconda-Pintler Wilderness and the Bitterroot Mountains in Montana. As the primary tributaries flow together near Conner, Montana, it continues north along U.S. Highway 93 for 85 miles to where it empties into the Clark Fork River near Missoula. To the west is the glacial Bitterroot Range, and to the east rises the smoother and drier Sapphire Mountains. Just west of the Bitterroot Range lies the Selway-Bitterroot Wilderness, which encompasses more than 2.15 million acres. The river is characterized by constantly shifting stream channels among extensive cottonwood and ponderosa pine bottomland.

Associated Habitats

Habitat Type	Habitat Tier	Acres	Miles
Intermountain Valley Rivers	II		84
Intermountain Valley Streams	II		325
Lowland Lakes	III	1,260	
Mountain Lakes	III	2,946	
Mountain Reservoirs	III	27	
Mountain Streams	I		3,304

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 21 aquatic species that are found within the Bitterroot River Focus Area. Tier I species are listed below. All associations can be found in Table 20.

Invertebrates: Western Pearlshell

Fish: Westslope Cutthroat Trout and Bull Trout

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Valley fragmentation as a result of human population growth	Pursue conservation easements within the valley
Presence of non-native aquatic species including warmwater fishes, bullfrogs, crayfish, and milfoil	Programs to control exotic species and promote natural habitats that support native species but not exotic species
Water quality problems due to municipal discharge, irrigation return water, and other sources	Work with municipal government and private landowners to reduce point source pollutants
Culverts, dams, irrigation diversions, and other instream barriers that fully or partially impede fish movement and reduce connectivity of habitat	Removal or modification of barriers in a manner that restores beneficial fish passage
Entrainment of juvenile and adult fishes by irrigation diversions or other water intakes	Screening or modification of irrigation diversions or other water intakes in a manner that prevents entrainment of fishes
Modification and degradation of stream channels caused by various construction or land management practices	Restoration of stream channels or streambanks to a condition that simulates their natural form and function
Riparian vegetation effected by range and forest management practices and streamside residential development (such activities destabilize streambanks, increase sediment inputs, reduced shading, and remove woody debris)	Support government and private conservation activities that encourage and support sustainable land management practices in riparian areas
	Modification of riparian management practices such that riparian vegetation is allowed to recover
	Develop statewide riparian best management principles

Alterations of the quantity or timing of stream flows, causing dewatering or unnatural flow fluctuations that diminish the quantity or quality of essential habitats	Implementation of various water conservation or flow management practices that restore essential habitats, simulate the natural hydrograph and also protect instream flows
----------------------------------------------------------------------------------------------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Blackfoot River (127 River Miles)

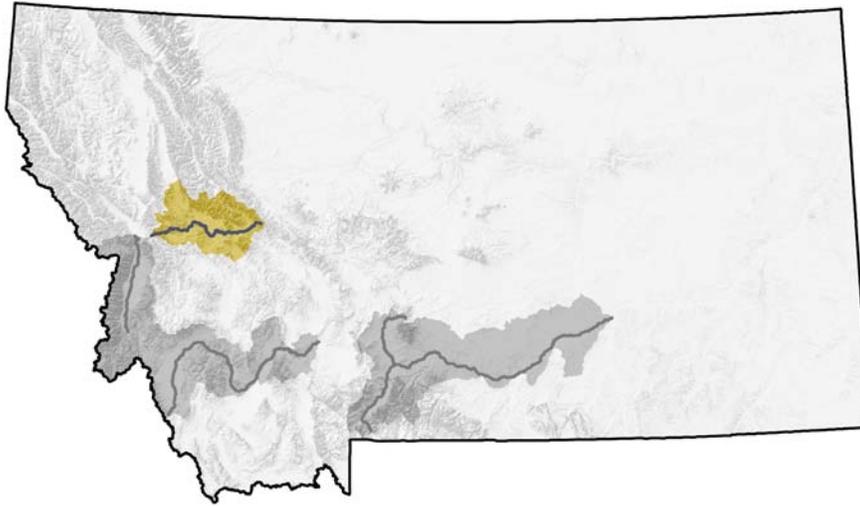


Figure 15. Blackfoot River Focus Area

The Blackfoot River begins at the junction of Beartrap and Anaconda creeks near the Continental Divide and flows west 132 miles to its mouth at Bonner, Montana. Near its headwaters, the Blackfoot River drops through glaciated high-alpine meadows and runs between steep, forested slopes. Above Lincoln, the river almost annually goes underground, then reappears below Lincoln and meanders through conifer forests and wetlands until it intersects with the North Fork of the Blackfoot River. For its remaining 52 miles, the Blackfoot levels out and moves through open ranch and timbered areas until it meets the Clark Fork River near Bonner. A free-flowing river, the Blackfoot is affected by the soon-to-be-removed Milltown Dam, which has blocked fish passage on the Clark Fork River since 1907.

Associated Habitats

Habitat Type	Habitat Tier	Acres	Miles
Intermountain Valley Rivers	II		127
Intermountain Valley Streams	II		316
Lowland Lakes	III	6,525	
Lowland Reservoirs	III	390	
Mountain Lakes	III	2,604	
Mountain Reservoirs	III	5	
Mountain Streams	I		3,207

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 23 aquatic species that are found within the Blackfoot River Focus Area. Tier I species are listed below. All associations can be found in Table 21.

Invertebrates: Western Pearlshell

Fish: Westslope Cutthroat Trout and Bull Trout

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Culverts, dams, irrigation diversions, and other instream barriers that fully or partially impede fish movement and reduce connectivity of habitat	Removal or modification of barriers in a manner that restores fish passage for fluvial native fish, including the Milltown Dam
Modification and degradation of stream channels caused by various construction or land management practices	Restoration of stream channels or streambanks to a condition that simulates their natural form and function
Riparian vegetation effected by range and forest management practices and streamside residential development (such activities destabilize streambanks, increase sediment inputs, reduced shading, and remove woody debris)	Support government and private conservation activities that encourage and support sustainable land management practices in riparian areas
	Modification of riparian management practices such that riparian vegetation is allowed to recover
	Develop statewide riparian best management principles
Entrainment of juvenile and adult fishes by irrigation diversions or other water intakes	Screening or modification of irrigation diversions or other water intakes in a manner that prevents entrainment of fishes

<p>Unnatural hydrograph and water temperatures associated with the presence and operations of large dams, as well as blockage of migratory corridors (These alterations of the quantity or timing of stream flows cause unnatural flow fluctuations that diminish the quantity or quality of essential habitats</p>	<p>Implementation of various water conservation or flow management practices that restore essential habitats, simulate the natural hydrograph and also protect instream flows</p>
<p>Water chemistry problems that arise due to hard rock mines in headwaters</p>	<p>Implementation of a comprehensive mine cleanup in the headwaters of the Blackfoot River upstream of Lincoln, Montana</p>

Jefferson River (77 River Miles)

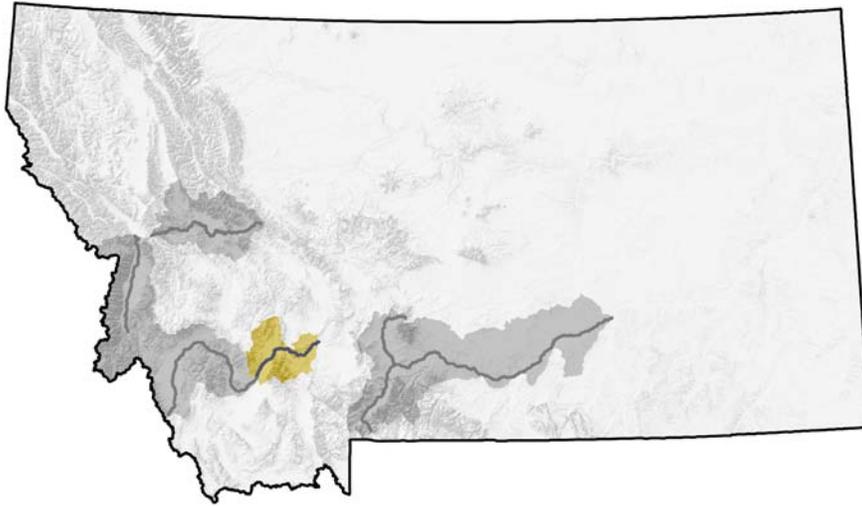


Figure 16. Jefferson River Focus Area

Lewis and Clark named this river after President Thomas Jefferson because it carried the greatest volume of water at that time compared to the nearby Madison and Gallatin rivers. The Jefferson River begins where the Big Hole and Beaverhead rivers intersect and flows north through agricultural areas and limestone cliffs, and into the cottonwood bottoms near Three Forks, where it meets the Madison and Gallatin rivers to form the Missouri River.

Associated Habitats

Habitat Type	Habitat Tier	Acres	Miles
Intermountain Valley Rivers	II		77
Intermountain Valley Streams	II		1,377
Lowland Lakes	III	214	
Lowland Reservoirs	III	715	
Mountain Lakes	III	627	
Mountain Reservoirs	III	609	
Mountain Streams	I		1,091

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 20 aquatic species that are found within the Jefferson River Focus Area. Tier I species are listed below. All associations can be found in Table 22.

Invertebrates: Western Pearshell

Fish: Westslope Cutthroat Trout and Burbot

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Culverts, dams, irrigation diversions, and other instream barriers that fully or partially impede fish movement and reduce habitat connectivity	Removal or modification of barriers in a manner that restores fish passage
Modification and degradation of stream channels caused by various construction or land management practices	Restoration of stream channels or streambanks to a condition that simulates their natural form and function
Riparian vegetation effected by range and forest management practices and streamside residential development (such activities destabilize streambanks, increase sediment inputs, reduced shading, and remove woody debris)	Support government and private conservation activities that encourage and support sustainable land management practices in riparian areas
	Modification of riparian management practices such that riparian vegetation is allowed to recover
	Develop statewide riparian best management principles
Entrainment of juvenile and adult fishes by irrigation diversions or other water intakes	Screening or modification of irrigation diversions or other water intakes in a manner that prevents entrainment of fishes
Alterations of the quantity or timing of stream flows causing dewatering, temperature change or unnatural flow fluctuations that diminish the quantity or quality of essential habitats	Implementation of various water conservation or flow management practices that restore essential habitats, help sustain lower temperatures, and simulate the natural hydrograph as well as protect instream flows

References

DNRC 2005. Canal Seepage Monitoring in the Upper Jefferson River Basin.

Land and Water Consulting, Inc. 2004. Aerial Photo Review and Field Source Assessment, 2004.

Land and Water Consulting, Inc. 2003. Jefferson River Water Quality Restoration Planning Areas. Watershed Characterization Report.

Land and Water Consulting, Inc. 2003. Jefferson River Water Quality Restoration Planning Areas. Water Quality Status Report.

McGuire, Daniel. 2004. Jefferson River Aquatic Macroinvertebrate Survey.

Montana Fish, Wildlife & Parks. 2004. Jefferson River fisheries information (1979–2004).

USDA. 1975. Hydrology of the Jefferson River drainage.

Upper Yellowstone River (272 River Miles)

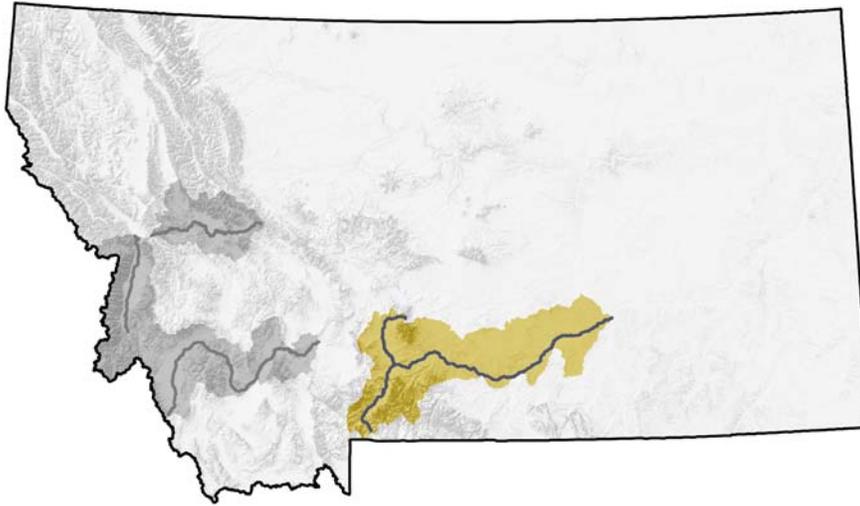


Figure 17. Upper Yellowstone River Focus Area

The Yellowstone River originates in Wyoming and flows through Yellowstone National Park before entering Montana near Gardiner. From the park boundary to Livingston, the river flows north through the Gardiner Basin and eventually enters the Paradise Valley, flanked by the Absarokee Mountains on the east and the Gallatin Range on the west. The river continues in a northeasterly direction from Livingston and meets up with the Missouri River just across the North Dakota border. The Yellowstone has survived as one of the last, large, free-flowing rivers in the continental United States. Lack of impoundments allows spring peak flows and fall and winter low flows that support a naturally unique and dynamic community. The Upper Yellowstone River supports clear, coldwater cutthroat trout fisheries in Yellowstone National Park to the warmwater habitats on the plains. The adjacent environments include cottonwood-willow bottomlands and broad low cover grasslands.

Associated Habitats

Habitat Type	Habitat Tier	Acres	Miles
Lowland Lakes	III	10,838	
Lowland Reservoirs	III	580	
Mixed Source Rivers (Intermountain and Prairie Flow)	II		259
Prairie Streams	I		5,378
Intermountain Valley Rivers	II		131
Intermountain Valley Streams	II		1,068
Mountain Lakes	III	1,893	

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 46 aquatic species that are found within the Upper Yellowstone River Focus Area. Tier I species are listed below. All associations can be found in Table 23.

Fish: Yellowstone Cutthroat Trout, Burbot, and Sauger

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Dewatering as a result of water diversion	Work with public and private land owners to improve efficiency of water use in order to maximize water return
Water chemistry problems due to irrigation return water and the discharge of wastewater from coal bed methane operations, and other sources	Support cooperative efforts to minimize impacts of return water due to sedimentation, increased salinity and temperature alteration
Riprap and other streambank stabilization work	Work with new stabilization projects to reduce impacts and support efforts to restore existing rip-rap areas to natural condition
	Develop statewide riparian best management principles
Invasive non-native fish species	Programs to control exotic species and promote natural habitats that support native species but not exotic species
Entrainment of juvenile and adult fishes by irrigation diversions or other water intakes	Screening or modification of irrigation diversions or other water intakes in a manner that prevents entrainment of fishes
Riparian vegetation effected by range and forest management practices and streamside residential development (such activities destabilize streambanks, increase sediment inputs, reduced shading, and remove woody debris)	Support government and private conservation activities that encourage and support sustainable land management practices in riparian areas
Modification and degradation of stream channels caused by various construction or land management practices	Restoration of stream channels or streambanks to a condition that simulates their natural form and function

	Modification of riparian management practices such that riparian vegetation is allowed to recover
	Develop statewide riparian best management principles
Alterations of the quantity or timing of stream flows, causing dewatering or unnatural flow fluctuations that diminish the quantity or quality of essential habitats	Implementation of various water conservation or flow management practices that restore essential habitats, simulate the natural hydrograph and also protect instream flows
Culverts, dams, irrigation diversions, and other instream barriers that fully or partially impede fish movement and reduce connectivity of habitat	Removal or modification of barriers in a manner that restores fish passage

References

Hansen, A., J. Rotella, L. Klass, and D. Gyskiewicz. 2003. Riparian Habitat Dynamics and Wildlife Along the Upper Yellowstone River. Technical Report #1. Landscape Biodiversity Lab, Montana State University, Bozeman, MT. In cooperation with the Governor's Upper Yellowstone River Task Force.

U.S. Fish and Wildlife Service. 2004. Conservation Focus Areas of the Great Divide: a vast region encompassing the Upper Missouri, Yellowstone and upper Columbia watersheds. Publisher: USFWS, Benton Lake Wildlife Refuge, Great Falls, MT. 77 pp.

Montane Forest Ecotype



Figure 18. Montane Forest Ecotype

Montana's montane forests occur along the western third of the state, from the rugged peaks of the Purcell Mountains in northwestern Montana to the Beartooth Range near Yellowstone National Park. From the foothills to the summits, vast coniferous forests of larch, fir, hemlock, pine, and spruce trees characterize these areas. Such mountain forests also serve to protect the headwaters of Montana's rivers. Most of this ecotype is in public ownership through the U.S. Forest Service (USFS). Collaboration with the USFS will be critical to the conservation of these areas.

Landscape Characteristics

The montane forest ecotype includes 24,498,117 acres and represents 26 percent of Montana. This ecotype is mostly situated on mountain slopes, although a small portion is located in the valleys of extreme northwest Montana. Slopes are generally moderate to steep, often exceeding 45 degrees. All mountain ranges in Montana have at least some montane forest, as do the following major valley locations: lower Clark Fork, upper Flathead, Seeley/Swan, Kootenai, Bull River/Lake Creek, and Stillwater north of Whitefish. All are included in this ecotype.

The elevation range is the same as for the entire state (the highest and lowest elevation points in Montana are in this ecotype). The lowest elevation, 1,800 feet, occurs where the Kootenai River flows into Idaho. The highest elevation is 12,799 feet atop Granite Peak in the Beartooth Mountains. Both base elevations and mountaintop elevations are lowest in the northwest section of the ecotype and increase toward the south. Base elevations of almost 2,000 feet in the Libby, Troy, and Thompson Falls area increase to about 3,000 feet in the

Flathead/Mission Valleys and to more than 3,000 feet in the Missoula/Bitterroot Valleys. The highest base elevations west of the divide are generally about 4,500 feet along the east front and south as far as the upper Jefferson Valley. As the divide is approached from here, base elevations exceed 6,000 feet in the Big Hole and Centennial valleys. Generally, base elevations inside and outside of the mountain front as well as around the Little Belt, Big Snowy, Judith, and Crazy mountains are around 4,000 to 4,500 feet. Base elevations around the Highwood, Bears Paw, and Little Rocky mountains are about 3,000 to 3,500 feet.

Although summit elevations of mountains in the north are lower than those in the south (i.e., major mountain ranges in the north top out at 9,000 to 10,000 feet versus 10,500 to 12,800 feet in the south), base to summit relief is similar. High mountain ranges in all areas are 6,000 to 7,000 feet from base to summit and moderate mountain ranges 4,000 to 5,000 feet. Distances between mountain ranges are shorter in the north particularly, and west of the divide generally, than those in the southwest.

Since the end of the Precambrian time period (570 million years ago), there have been two major mountain building episodes in the region now occupied by the Northern Rockies. The first was a compression stage, resulting in folding and overthrusting of rock strata. Following this was a tension stage, where the region was pulled apart, causing rock segments to separate and tip at various angles. This stage is currently active.

During the Precambrian time period, sediments were deposited over a wide area in a sea extending from the Three Forks area north into Canada. These sediments form the belt series rocks found in the mountains of most of northwestern Montana. Most of the mountains in the southwest are composed of combinations of metamorphic, igneous, and Paleozoic/Mesozoic (deposited after 570 million years ago) rocks. Individual mountain ranges often have a core or central area of metamorphic or intrusive igneous rock partially surrounded by uplifted layers of sedimentary rock. Some mountain areas such as the Gallatin Range, the mountains around Wolf Creek, and the Bears Paw Mountains consist of extrusive igneous (lava flows) rock. Two very large areas of intrusive igneous rock (granite) occur between Helena and Twin Bridges and south from Hamilton toward Anaconda.

The topography of most of the higher mountain ranges was influenced by glaciation. Mountain glaciers created features including glacial troughs (U-shaped valleys), cirques, tarns (lakes in cirques), and sharp horns and walls. The mountains in the northwest corner were overridden by the cordilleran ice sheet, which tended to smooth off their tops. The northern end of the Mission Range is an example of this, whereas the southern end of this range is a prime example of mountain glaciation. Except for the Crazies and the Little Belts, the isolated mountain groups of central Montana did not experience mountain glaciation but may have been partially overridden by the Laurentide ice sheet.

Most of the mountain region has had anywhere from 10 to 45 centimeters of volcanic ash deposited on it. The heaviest deposits were in the extreme northwest. These deposits occurred during the time of the formation of the Cascade Mountains.

Soils

Most of the montane forest ecotype is overlain by soils that are classified as cool or cold (32 to 47 degrees F)—cool in the summer, cold in the winter, and moist most of the time. Such soils generally form under forest cover and have an organic duff layer (partially decomposed leaves, etc.) underlain by either a white leached layer or a brown clay layer. If the parent material is limestone, a calcareous layer may be present. Except for the limestone-derived soils, soils in this region are usually acidic.

Climate

Most of the climate discussion is based on information in Caprio and Nielsen (1992). The climate of the montane forest ecotype is ruled first by macroclimatic influences and then by elevation influences. The general climate of northwest mountain areas is maritime, whereas that of the mountains farther east and south is more continental, although mountain areas in general tend to be more maritime than their adjacent lowlands. Elevation affects both temperature and precipitation. A general rule of thumb is that temperature decreases about 6 degrees F for every 1,000-foot rise in elevation. This is a general rule and might not hold true in specific areas. Because of orographic effects, precipitation increases with increased elevation, so that in any specific area the higher elevations are wetter. However, due to macroclimatic differences, a given elevation in one part of the state will not receive the same amount of precipitation as another. The pattern of yearly distribution will also be different.

Mean yearly temperatures range from 39 to 40 degrees F at lower elevations in most of the mountains to about 30 degrees F at the highest elevations. The Beartooth Mountains and Plateau constitute a large and very high landmass with average annual temperatures as low as 20 degrees F. Throughout most of the mountain mass, January maximum daily temperatures are in the 22- to 25-degree F range. However, at the high elevations of mountains in southwestern and central Montana and Glacier National Park, these temperatures range from 8 to 19 degrees F. Some of the areas of northwestern Montana are warmer, with January maximum daily temperatures ranging from 28 to 30 degrees F. A similar pattern holds true for mean January nighttime minimums, except that the relative greater warmth of the northwestern mountains is more extreme. The mountains of almost the entire northwest corner exhibit January minimum temperatures in the 10- to 11-degree F range no matter what elevation. The mountains of the rest of Montana have January mean minimum temperatures ranging from 4 to 6 degrees F at lower elevations and 0 to minus 11 degrees F at the highest

elevations. The mean July daily temperatures at low elevations generally range from 58 to 60 degrees F, whereas at high elevations they range from 51 to 54 degrees F. The coldest places are the Beartooth Plateau and the mountains of Glacier National Park. Those mountains bordering or surrounded by the plains have the lowest mean annual extreme minimum temperatures. The two coldest mountain ranges in this regard, the Beartooths and Crazy's, experience annual minimum temperatures in the minus 41- to minus 45-degree F range. At the other extreme, the mountains of the northwest corner do not generally get colder than minus 27 degrees F at any elevation. Annual maximums range from 85 to 92 degrees F throughout most of the mountains. The frost-free season at most of the higher elevations ranges from 10 to 50 days annually. Lower elevations have frost-free seasons ranging from 50 to 90 days annually.

The montane forest ecotype is the wettest in the state. Closed canopy forests generally do not occur at less than 20 inches annual precipitation in western Montana. Within the ecotype the northwest is the wettest. A given precipitation level is reached at a much lower elevation in the northwest than in the south and east; in other words, it takes a lot more elevation to produce the same amount of precipitation in the southwest, south-central, and central mountains than it does in the northwest. In the southwest, only a few very small and scattered areas receive more than 60 inches of precipitation annually. These occur at elevations greater than 11,000 feet in the Beartooth, Crazy, and Madison mountains. In the northwest, such areas are relatively large and occur in most mountain areas higher than 7,000 feet. Higher parts of Glacier National Park, the Cabinet Mountains, the Mission Range, and the Swan Range are estimated to receive more than 120 inches annually.

Average annual precipitation for the ecotype as a whole is estimated to be around 37 inches. Some relatively small areas of the ecotype are in the 12- to 16-inch zone. While 52 percent of the area in the ecotype receives 20 to 40 inches, the remainder receives 40 to 60 inches (20 percent), 16 to 20 inches (15 percent), 60 to 100 inches (9 percent), 12 to 16 inches (3 percent), and 100 or more inches (1 percent). Yearly precipitation in the mountain areas has more precipitation in winter than summer, as opposed to adjacent lowlands. This effect is most extreme in the northwest corner, where the relatively higher winter precipitation extends even into low elevations. The lowest percentage of growing season precipitation in the state, 22 to 27 percent, occurs in a wide area around the Cabinet Mountains and in small areas in Glacier National Park and the Mission Range. Summer precipitation in the high southwestern mountains generally ranges from 32 to 35 percent of the total annual precipitation.

Snowfall ranges from 81 to 300 inches annually in most mountain areas depending on elevation, although parts of the Mission Range, the Swan Range, and Glacier National Park may get 1,000 inches in an average year. In most mountain areas, the ground will be covered with at least 1 inch of snow from 120

to 260 days in an average year. A large part of the Glacier National Park may have snow on the ground for more than 300 days.

Anthropogenic Uses

The montane forest ecotype is diverse both in land management and its uses by humans. Whether it is for natural resources or recreational activities, these areas have multiple opportunities for explorers and entrepreneurs. Primary activities include hiking, mountaineering, hunting, biking, snowmobiling, animal watching, and skiing. The primary industries in this ecotype are construction and the timber industry. The breakdown of landowner stewardship for the montane forest ecotype is as follows:

U.S. Federal Agencies:	17,405,054 acres, or 71.8% of total area, which include:
BLM:	648,466 acres, or 2.7% of total area
USFS:	15,586,235 acres, or 64.3% of total area
USFWS:	19,707 acres, or less than 0.1% of total area
NPS:	1,125,565 acres, or 4.6% of total area
State Agencies:	765,594 acres, or 3.2% of total area
Tribal Lands:	825,579 acres, or 3.4% of total area
Private:	5,231,777 acres, or 21.6% of total area
City and County:	6,795 acres, or less than 0.1 of total area

Vegetation

Vegetation community composition in the forested mountain areas of Montana is not affected by soil conditions except under a few conditions (Pfister et al. 1977). Forest vegetation patterns are influenced primarily by climate, topography, and species migration patterns. The factors mentioned above result in a great variation in forest species composition across the ecotype. Because of this, the vegetation of this ecotype will be described in general areas based on climate characteristics.

The area north of Missoula and west of the Continental Divide has the greatest variety of tree species. The macroclimate of the northwest forest is more maritime, generally resulting in an area less subject to cold arctic outbreaks in the winter, which receives more total precipitation and a higher proportion of precipitation in the winter. The climatic conditions create an area where potentially 100 percent of the land could be forested. Most valleys are forested, and except for the nonforested Flathead Basin, these are included in the montane forest ecotype. Climate, plus a greater proximity to the Pacific, results in a greater abundance of Pacific and intermountain flora and a greater variety of plant species than the remainder of Montana. Grand fir (*Abies grandis*), western hemlock (*Tsuga heterophylla*), western red cedar (*Thuja plicata*), mountain hemlock (*Tsuga mertensiana*), and western white pine (*Pinus monticola*) are trees essentially confined to the northwest forested area. Western hemlock and

white pine are limited primarily to the extreme northwest corner. Alpine larch (*Larix lyallii*) extends a very short distance into the northernmost part of the east-of-divide area, and western larch penetrates much of the west-central region (Arno 1979). As in other parts of Montana, individual tree species are adapted to certain elevation zones. The order of adaptation from lowest to highest elevation for trees in the northwest area has been determined by (Pfister et al. 1977). In those areas warm and dry enough that there is a lower timberline adjacent to grassland, ponderosa pine (*Pinus ponderosa*) dominates at the lowest forest elevations. The upper timberline at about 8,000 feet is formed by alpine larch, whitebark pine, and subalpine fir. Grand fir, western red cedar, both hemlocks, and alpine larch have very narrow zones of distribution. The other conifer species may occupy elevation zones thousands of feet wide and therefore occur together with numerous other species. Generally the tree species are considered climax dominants only in the lower part of their range and are seral in the upper parts; however, in the northwest area, western larch, lodgepole pine, and spruce are considered seral wherever they occur (Pfister et al. 1977).

Some of the understory species common in the northwest area of the montane forest ecotype are either absent or rare in other parts of the ecotype. These include devil's club (*Oplopanax horridum*), queencup beadle (*Disporum hookeri*), trefoil foamflower (*Tiarella trifoliata*), and wild sarsaparilla (*Aralia nudicaulis*). Heartleaf arnica (*Arnica cordifolia*), common juniper (*Juniperus communis*), and elk sedge (*Carex geyeri*) are rare in the northwest area but are widespread in other areas of the ecotype (Arno 1979). Understory species ubiquitous and relatively common in the northwest and throughout the montane forest ecotype include bluebunch wheatgrass, Idaho fescue, rough fescue, snowberry (*Symphoricarpos albus*), spirea (*Spirea betulifolia*), pinegrass (*Calamagrostis rubescens*), ninebark (*Physocarpus malvaceus*), twinflower (*Linnaea borealis*), huckleberry (*Vaccinium* spp.), and kinnikinnick (*Arctostaphylos uva-ursi*).

In the west-central area of the montane forest ecotype, the climate is drier, colder, and less maritime than the northwest, but is less continental than parts of the ecotype to the east and south. Western larch is common (although not necessarily widespread) in west-central and northwest areas but not throughout the ecotype. Western red cedar, grand fir, and alpine larch penetrate slightly into this area. The elevation ordering of tree species is similar to the northwest area except that grand fir, western red cedar, white pine, and hemlock are missing in most areas. Understory species shared with the northwest area but uncommon or missing to the east and south include smooth woodrush (*Luzula hitchcockii*), menziesia (*Menziesia ferruginia*), and beargrass (*Xerophyllum tenax*). In areas east of the Continental Divide, the ecotype is reduced to relatively isolated mountain islands surrounded by grassland or shrub grassland. Compared to the northwest and west-central areas, the overall climate in the east is colder, drier, and windier. This results in conditions unsuitable for several of the tree species found to the north and west. Although ponderosa pine is present in the plains

forests to the east (plains forest ecotype), it is generally absent throughout all but a small portion of this area of the montane forest ecotype. Apparently, the growing seasons coupled with high elevations limit the distribution of ponderosa pine. The most extensive areas of ponderosa pine just east of the divide are around Helena (Arno 1979). Douglas fir, lodgepole pine, and subalpine fir dominate forests throughout this area. Lodgepole pine is an extremely common seral species dominating much of the upper Douglas fir zone and the spruce fir zone. Only a very restricted area close to Yellowstone National Park is apparently climax lodgepole pine. Areas near the timberline commonly support subalpine fir and whitebark pine except on limestone substrates where whitebark pine is generally missing and often replaced by limber pine (*Pinus flexilis*). Alpine larch penetrates a small proportion of this area as well. Extensive amounts of the south-central area of the ecotype support spruce-dominated forests.

Terrestrial Conservation Focus Areas in Greatest Need (Tier I)

Mission/Swan Valley and Mountains (679,663 acres)



Figure 19. Mission/Swan Valley and Mountains Focus Area

This area is geologically similar to Glacier National Park, with the Swan Valley sandwiched in between the heavily glaciated ranges of the Mission and Swan mountains. The mountain ranges and a strong Pacific storm track produce an inland maritime climate over a topography ranging from alpine ridges, cirque headwalls, and cirque basins down to moraines, terraces, and creek and river bottoms. The area is heavily forested and has relatively fertile soils, most of which have a 6- to 12-inch-thick layer of volcanic ash immediately below the organic matter, a result of eruptions in the Cascade Range. The valley bottom, in addition to the riparian areas along streams and rivers, is composed of a wide array of wetlands such as fens/peatlands, marshes, vernal pools, ponds, and lakes, with the valley bottom area consisting of more than 15 percent wetlands (compared to the Montana average of less than 2 percent wetlands). The area currently provides critical habitat for wildlife such as the grizzly bear, lynx, bull trout, bald and golden eagle, peregrine falcon, common loon, northern goshawk, and wolverine. More common wildlife species include whitetail and mule deer, elk, mountain goat, moose, black bear, mountain lion, bobcat, and beaver, along with a host of other mammals, fish, waterfowl, raptors, and songbirds. The valley contains one of the highest concentrations of rare plant populations in the region, with most of them being associated with wetland habitats, such as the water howellia.

Landscape Characteristics

This area is a large intermontane valley with adjacent block-faulted mountains that formed in valley fill, till, and metasedimentary rock. Volcanic ash influences

most soils. Alpine glaciation has strongly shaped the landscape. Elevations range from 2,900 to 9,300 feet. Drainage density is moderate, and wetlands and lakes occur frequently in this subsection. Mean annual precipitation ranges from 20 to 110 inches, with about 80 percent falling as snow in the mountains. The soil temperature and moisture regimes are cryic and udic. The primary natural disturbances are fire, insects, and windthrow. Land use is predominantly resource management and outdoor recreation with rural and suburban development in the valleys. The breakdown for land stewardship in the Mission/Swan Valley and Mountains area is as follows:

U.S. Federal Agencies: 375,477 acres, or 55.2% of total area, which include:
 USFS: 373,870 acres, or 55% of total area
 USFWS: 1,606 acres, or 0.2% of total area
 State Agencies: 45,344 acres, or 6.7% of total area
 Tribal Lands: 99,089 acres, or 14.6% of total area
 Private: 159,136 acres, or 23.4% of total area

Associated Habitats

Habitat	Habitat Tier	Percentage of Area
Snowfields or Ice	II	2.09
Douglas Fir/Lodgepole Pine	III	2.36
Western Larch	III	2.55
Montane Parkland and Subalpine Meadow	III	4.16
Rock	III	4.38
Mixed Mesic Shrubs	II	5.21
Douglas Fir	II	10.12
Lodgepole Pine	III	10.61
Mixed Subalpine Forest	III	14.57
Mixed Mesic Forest	II	31.64

Note: A total of 87.68% of the Mission/Swan Valley and Mountains area is represented; 12.32% is made up of a combination of other habitat types.

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 246 terrestrial vertebrate species that are found within the Mission/Swan Valley and Mountains Focus Area. Tier I species are listed below. All associations can be found in Table 24.

Amphibians: Western Toad

Birds: Common Loon, Trumpeter Swan, Harlequin Duck, Bald Eagle, Flammulated Owl, Black-backed Woodpecker, and Olive-sided Flycatcher

Mammals: Townsend’s Big-eared Bat, Hoary Marmot, Northern Bog Lemming, Gray Wolf, Grizzly Bear, and Canada Lynx

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Habitat fragmentation and loss of connectivity, especially as a result of human population growth/development and related transportation network	Support strategic conservation easements by conservation organizations and public agencies
	Promote further development of county ordinances that help guide future residential and commercial development
	Identify and prioritize key wildlife linkage areas, and work with other state and federal agencies, conservation groups, and landowners to restore wildlife connectivity
	Work with Montana Department of Transportation and Federal Highway Commission to effectively mitigate impacts of highway construction
Range or forest management practices	Support government and private conservation activities that encourage and support sustainable land management practices (example; rest and rotation schedules)
Streamside residential development	Develop statewide riparian best management principles
Invasive or exotic plant species	Participate in partnerships to develop and implement weed control strategies
Human/wildlife conflicts and related wildlife mortality	Public education regarding human/wildlife conflicts
	Work with Montana Department of Transportation and Federal Highway Commission to effectively mitigate impacts of highway construction
Altered fire regimes	Work with coordinating agencies to mimic natural fire regimes

References

The Nature Conservancy. 2004. Canadian Rocky Mountains Ecoregional Assessment. Four volumes, including Report, Appendices, Conservation Area Descriptions, and Maps.

U.S. Fish and Wildlife Service. 2004. Conservation Focus Areas of the Great Divide: a vast region encompassing the Upper Missouri, Yellowstone and upper Columbia watersheds. Publisher: USFWS, Benton Lake Wildlife Refuge, Great Falls, MT. 77 pp.

Aquatic Conservation Focus Areas in Greatest Need (Tier I)

Lower Clark Fork (149 River Miles)



Figure 20. Lower Clark Fork River Focus Area

The Lower Clark Fork River originates at the confluence of the Clark Fork River and the Flathead River near the town of Paradise and continues to the Idaho border. The Lower Clark Fork River is bordered on the south by the Bitterroot Mountains and on the north by the Cabinet Mountains. At the point where the Lower Clark Fork leaves Montana, it is the largest river in Montana based on mean annual discharge. Average annual precipitation in the Lower Clark Fork drainage is quite high in comparison to other portions of Montana due to a significant maritime influence. Relatively wet and warm winter conditions commonly lead to rain-on-snow events that significantly affect the hydrology of tributaries to the Lower Clark Fork River by increasing the frequency of high flow. The Clark Fork River has been substantially altered by the construction of the Thompson Falls, Noxon Rapids, and Cabinet Gorge hydroelectric dams. These dams currently impound approximately 63 miles of the river within Montana.

Associated Habitats

Habitat Type	Habitat Tier	Acres	Miles
Intermountain Valley Rivers	II		149
Lowland Lakes	III	812	
Lowland Reservoirs	III	11,637	
Mountain Lakes	III	3,607	
Mountain Streams	I		2,053

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 27 aquatic species that are found within the Lower Clark Fork River Focus Area. Tier I species are listed below. All associations can be found in Table 25.

Invertebrates: Western Pearlshell

Fish: Westslope Cutthroat Trout and Bull Trout

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Culverts, dams, irrigation diversions, and other instream barriers that fully or partially impede fish movement and reduce connectivity of habitat	Removal or modification of barriers in a manner that restores fish passage to ensure full migratory movement
Modification and degradation of stream channels caused by various construction or land management practices	Restoration of stream channels or streambanks to a condition that simulates their natural form and function
Riparian vegetation effected by range and forest management practices and streamside residential development (such activities destabilize streambanks, increase sediment inputs, reduced shading, and remove woody debris)	Support government and private conservation activities that encourage and support sustainable land management practices in riparian areas
	Modification of riparian management practices such that riparian vegetation is allowed to recover
	Develop statewide riparian best management principles
Entrainment of juvenile and adult fishes by irrigation diversions or other water intakes	Screening or modification of irrigation diversions or other water intakes in a manner that prevents entrainment of fishes
Alterations of the quantity or timing of stream flows, causing dewatering or unnatural flow fluctuations that diminish the quantity or quality of essential habitats	Implementation of various water conservation or flow management practices that restore essential habitats and simulate the natural hydrograph
Water chemistry problems that arise due to municipal discharge, irrigation return water, and other sources	Work with municipal government and private landowners to reduce point source pollutants

Unnatural hydrograph and water temperatures associated with the presence and operations of large dams	Work with appropriate authorities to restore hydrograph that mimics the natural regime
Non-native fish species	Support activities to promote natural habitats that support native species
Misidentification of fish species by anglers	Increase efforts to educate anglers on the identification of fish species

References

The Nature Conservancy. 2004. Canadian Rocky Mountains Ecoregional Assessment. Four volumes including Report, Appendices, Conservation Area Descriptions, and Maps.

Middle Clark Fork (119 River Miles)



Figure 21. Middle Clark Fork River Focus Area

The Middle Clark Fork River extends about 115 river miles from Milltown Dam in Bonner, Montana, to its confluence with the Flathead River, and is entirely free flowing. The Milltown Dam is scheduled to be removed in the near future. The river's drainage is mountainous and covered with the large forested tracts of the Lolo National Forest and private timberlands, broken by grazing and cropland areas in the lower valleys down to the Thompson Falls Dam. Through the broad Missoula Valley, the Middle Clark Fork is a sinuous river with frequent side channels, wide floodplains, and cottonwood-willow bottoms. The river then transitions into the Alberton Gorge whitewater area and becomes an entrenched single channel as it proceeds toward Thompson Falls. Major tributary systems such as Rattlesnake Creek and Fish Creek drain premier roadless wildlands including the Rattlesnake Wilderness and proposed Great Burn Wilderness along the Montana-Idaho divide. This river supports an excellent coldwater trout fishery including fluvial populations of native westslope cutthroat trout and bull trout. Because the Middle Clark Fork receives the waters of the Blackfoot, Bitterroot, and upper Clark Fork basins, it is known as a steady and productive system that supports a consistent fishery.

Associated Habitats

Habitat Type	Habitat Tier	Acres	Miles
Intermountain Valley Rivers	II		119
Intermountain Valley Streams	II		113
Lowland Lakes	III	546	
Lowland Reservoirs	III	9	

Mountain Lakes	III	1,168	
Mountain Streams	I		2,080

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 20 aquatic species that are found within the Middle Clark Fork Focus Area. Tier I species are listed below. All associations can be found in Table 26.

Invertebrates: Western Pearlshell

Fish: Westslope Cutthroat Trout and Bull Trout

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Culverts, dams, irrigation diversions, and other instream barriers that fully or partially impede fish movement and reduce connectivity of habitat	Removal or modification of barriers in a manner that restores fish passage to ensure full migratory movement
Modification and degradation of stream channels caused by various construction or land management practices	Restoration of stream channels or streambanks to a condition that simulates their natural form and function
Riparian vegetation effected by range and forest management practices and streamside residential development (such activities destabilize streambanks, increase sediment inputs, reduced shading, and remove woody debris)	Support government and private conservation activities that encourage and support sustainable land management practices in riparian areas
	Modification of riparian management practices such that riparian vegetation is allowed to recover
	Develop statewide riparian best management principles
	Conservation easements and cooperative efforts to address human population growth and related impacts
Entrainment of juvenile and adult fishes by irrigation diversions or other water intakes	Screening or modification of irrigation diversions or other water intakes in a manner that prevents entrainment of fishes

Alterations of the quantity or timing of stream flows, causing dewatering or unnatural flow fluctuations that diminish the quantity or quality of essential habitats	Implementation of various water conservation or flow management practices that restore essential habitats and simulate the natural hydrograph
	To the extent feasible, operate dams to mimic a more natural hydrograph on the main channel of rivers and ensure a more natural thermal regime
Water chemistry problems that arise due to municipal discharge, irrigation return water, and other sources	Work with municipal government and private landowners to reduce point source pollutants
Unnatural hydrograph and water temperatures associated with the presence and operations of large dams	Work with appropriate authorities to restore hydrograph that mimics the natural regime
Non-native fish species	Support activities to promote natural habitats that support native species
Misidentification of fish species by anglers	Increase efforts to educate anglers on the identification of fish species
Riprap and other streambank stabilization work	Work with new stabilization projects to reduce impacts and support efforts to restore existing rip-rap areas to natural condition
	Develop statewide riparian best management principles
Whirling disease	Continue efforts to minimize impact of whirling disease on native fish populations
Degradation of habitat by unmanaged recreation use	Increase current efforts to improve river recreation management practices

References

The Nature Conservancy. 2004. Canadian Rocky Mountains Ecoregional Assessment. Four volumes including Report, Appendices, Conservation Area Descriptions, and Maps.

U.S. Fish and Wildlife Service. 2004. Conservation Focus Areas of the Great Divide: a vast region encompassing the Upper Missouri, Yellowstone and upper Columbia watersheds. Publisher: USFWS, Benton Lake Wildlife Refuge, Great Falls, MT. 77 pp.

Plains Grassland and Plains Forest Ecotype



Figure 22. Plains Grassland and Plains Forest Ecotype

Montana's high eastern plains, part of America's Great Plains, are generally found on high, rolling land and on some scattered hills and in wide river valleys. Some of the rivers in this region, particularly the warmwater sections of the Yellowstone and Missouri in eastern Montana, harbor the most diverse communities of fish in the state. It's a rather harsh environment, with short, hot summers and long, cold winters that bring fewer than 15 inches of precipitation a year. In this environment, the protection offered by woody draws and the unique badlands or "breaks" provide important pockets of habitat and protection for wildlife.

In addition, Montana's unique prairie forests, found in the blistered "island" mountain ranges east of the Rocky Mountains, provide a higher elevation relief where precipitation is sufficient to create closed-canopy forests of Great Plains ponderosa pine and various hardwoods. Although these forests are not islands in the true sense, they are a unique part of the plains landscape.

Grassland

Landscape Characteristics

The plains grassland and plains forest ecotype includes 43,918,691 acres and represents 46.7 percent of Montana. Elevations at the western and southern edges of the plains grassland and plains forest ecotype range between 3,500 and 4,000 feet. Elevations decrease gradually toward the northeast, where the lowest point, 1,900 feet, as the Missouri River exits Montana, is reached. Broad areas less than 2,500 feet lie near the lower Missouri and Yellowstone rivers. For the most part the land is flat or rolling. Steeper dissected topography is found in

various badland areas of the east and southeast and in river breaks areas near the Missouri and Yellowstone and some major tributaries. Two major rivers, the Missouri and the Yellowstone, cross the entire ecotype. Flowing into these rivers are various large tributaries including the Milk, Marias, Powder, Tongue, Bighorn, and Musselshell rivers, all crossing many miles of the plains grassland.

Most of the area north of the Missouri and a little of it to the south, was overridden by the continental glaciers, creating topography that is somewhat smoother and flatter than the plains to the south. Exceptions to this are areas near some of the major rivers where erosion following glaciation dissected the land. Glaciated plains tend to have a relatively large number of small, poorly drained depressions, some of which form potholes or small lakes.

Soils

All soils in the plains grassland ecotype are classified as cool (average annual temperature ranging between 32 and 47 degrees F). Much of the soil in the glaciated plains (approximately north of the Missouri River) part of the ecotype contains large amounts of salt and may also be alkaline. Such soils may be medium textured with distinct topsoil horizons, or they may be heavy clay soils without horizons. The second-largest category of soils in the ecotype includes those that have light-colored topsoil layers and are not particularly saline or alkaline. These soils may or may not have lime layers. Places with somewhat higher effective precipitation (due to greater precipitation and or/ lower evaporation) have dark, well-developed topsoil horizons with a distinct clay layer just beneath that. These tend to be the most fertile and most easily tilled soils in the ecotype.

Climate

The climate of the plains grassland ecotype can be generally characterized as semiarid—cold in winter, warm in summer, and highly variable compared to the remainder of Montana. During much of the winter, Canadian high pressure pushes cold air south over the region. This type of weather pattern produces extremely low temperatures that may persist for days or weeks at a time, as well as low precipitation since moisture-producing weather systems are subsequently routed south. During the summer, low pressure caused by high temperatures may draw moisture in from the Gulf of Mexico. The area is mostly outside of the primary track of Pacific moisture-producing storms except for a period during late spring to early summer.

Mean annual temperatures range from 38 degrees F in some areas in the extreme northeast to 48 degrees F at some places south of the Yellowstone River. The mean for the ecotype is somewhere around 43 to 44 degrees F. Mean January temperatures vary from 2 degrees F in the northeast to 21 degrees F in the south. Mean July temperatures range from 63 to 72 degrees F. The highest

temperatures are along the Yellowstone River, whereas the lowest are in the northwest where the ecotype abuts the intermountain /foothill grassland ecotype. Minimum yearly temperatures upon which plant hardiness zones are based range from minus 38 degrees F in the northeast to minus 24 degrees F in the south. The boundary between hardiness zones 3 and 4 (mean minimum yearly temperatures in the minus 30s and minus 20s respectively) follows a line going approximately from the southeastern corner of Montana to the Sweetgrass Hills. There is no zone 5 in this ecotype. Mean annual maximum temperatures range from 104 degrees F along the lower Yellowstone River to 95 degrees F at the highest elevations of the ecotype in the northwest.

Average annual precipitation in the ecotype ranges from 10 inches in a wide band along most of the highline and a south-central area to 16 inches in some scattered eastern and southern areas. The average for the ecotype is from 12 to 14 inches. Except for some widely scattered isolated areas, the eastern portion of the ecotype tends to receive a greater proportion of its precipitation in the April 1 to July 31 (growing season) period than the west. Except for an area in the northwest, western areas near the mountains receive less than 55 percent of the precipitation in the April to August period, while most areas in the east receive more than 60 percent.

Snowfall ranges from 21 to 40 inches throughout most of the area. The higher snowfalls occur in the portions of the ecotype closest to the mountains. A few isolated areas in the extreme east get less than 20 inches of snow per year. The mean number of days per year when there is at least 1 inch of snow on the ground increases from the western and southern edges of the ecotype to the northeast. The areas with the least number of days of snow cover are in the Chinook zone, where extremely strong and persistent winds during the winter either sublimate or melt the snow. Mean wind speeds vary from 11 to 13 miles per hour over most of the ecotype. Days with snow cover range from less than 60 to more than 120 across the ecotype.

Anthropogenic Uses

The plains grassland ecotype encompasses the largest area in Montana. Recreational activities include hunting, fishing, and snowmobiling. Major industries includes ranching and farming, which produce some of the largest wheat and cattle yields in the country. The breakdown of landowner stewardship for the plains grassland ecotype is as follows:

U.S. Federal Agencies:	6,081,573 acres, or 13.8% of total area, which include:
BLM:	5,083,576 acres, or 11.6% of total area
USFS:	142,889 acres, or 0.3% of total area
USFWS:	716,050 acres, or 1.6% of total area
NPS:	556 acres, or less than 0.1% of total area
State Agencies:	2,886,994 acres, or 6.6% of total area

Tribal Lands:	2,532,892 acres, or 5.8% of total area
Private:	32,190,791 acres, or 73.7% of total area
City and County:	3,027 acres, or less than 0.1% of total area

Vegetation

On the semiarid plains grasslands, vegetation communities and soil characteristics are strongly associated. The rather uniform climatic conditions across the area dictate that differences in plant community composition are primarily due to the variations in available water-holding capacity of the soils. Soils are organized into categories that reflect annual precipitation as well as water-holding capacity. These categories, called ecological sites, are grouped on the basis of parameters such as texture, slope topographic position, and chemical characteristics. Most of the ecotype is within the 10- to 14-inch precipitation zone, and therefore, textural/topographic/chemical characteristics are the primary regulators of plant community composition.

Within the ecotype there is a relatively small number of grass species that occur as dominants throughout the area. Some of these are found in various amounts in nearly all the communities, whereas others are more specialized and occur only under certain conditions. Other major changes in the grassland communities occur with human management because of differing responses of species to management treatments. In addition to dry land farming, which totally removes native vegetation, range management practices impact native species.

Vegetation found throughout the ecotype includes western wheatgrass (*Agropyron smithii*), needle-and-thread (*Stipa comata*), bluebunch wheatgrass (*Agropyron spicatum*), blue grama (*Bouteloua gracilis*), prairie junegrass (*Koeleria macrantha*), green needlegrass (*Stipa viridula*), thickspike wheatgrass (*Agropyron dasystachyum*), fringed sage (*Artemisia frigida*), and dense clubmoss (*Selaginella densa*). Other widespread species common in certain conditions include little bluestem (*Andropogon scoparius*), prairie sandreed (*Calamovilfa longifolia*), silver sage (*Artemisia cana*), sun-sedge (*Carex stenophylla*), and threadleaf sedge (*Carex filifolia*). Most other grasses and grasslike plants are only minor community components or are dominants in very restricted areas (Ross and Hunter 1976).

In terms of biomass, forbs in plains grassland communities tend to be highly subordinate in most conditions. Certain subshrubs, including fringed sage, broom snakeweed (*Gutierrezia sarothrae*), and prickly pear (*Opuntia polyacantha*) may become dominant members of some communities following overgrazing. Varying amounts of shrubs occur throughout the plains grasslands. However, the areas where shrubs contribute a large and consistent proportion of the biomass have been included in the shrub grassland ecotype.

Patterns of species dispersal and precipitation distribution influence the distribution of some species throughout the ecotype. The bluestems (warm-season grasses) originated farther east in the plains region of the United States and generally do not penetrate much beyond the eastern third of Montana with its more continental pattern of precipitation distribution. Bluebunch wheatgrass originated in the intermountain region of the United States (Barker and Whitman 1988), where spring and winter are wet and summers are dry. Although it is abundant on most sites in the western part of the ecotype, it becomes progressively less abundant and more restricted toward the east. Western wheatgrass, another important plains species, decreases toward the west. The plains grassland ecotype is a zone where mixed prairie species meet some of the Pacific/intermountain bunchgrasses, although the area is primarily dominated by the former (Wright and Wright 1948).

Coarse-textured sandy soils (2 percent of the ecotype) have not had time to form soil cover. Widespread species favored by coarse-textured soils include needle-and-thread, little bluestem, silver sage, and threadleaf sedge (Ross and Hunter 1976) (Hansen et al. 1988). Some other species whose distribution in Montana is mostly restricted to, rather than just favored by, sandy soils, include sand and big bluestems (*Andropogon hallii*, *A. gerardi*), prairie sandreed, Indian ricegrass (*Oryzopsis hymenoides*), sideoats grama (*Bouteloua curtipendula*), and yucca glauca.

Medium-textured soils, described as silty, occupy the greatest (more than 70 percent) range within the ecotype. Silty soils have a good combination of relatively high water-holding capacity as well as high permeability and infiltration rates. Potential natural communities in medium-textured soils in the 10- to 14-inch precipitation zone are dominated by western wheatgrass and needle-and-thread. However, blue grama can become abundant enough during drought periods to become dominant on many sites. This suggests that plant communities in the northern Great Plains with its extreme and variable climate are not static but vary greatly over time. Culwell et al. (1986) sampled grasslands in extreme eastern Montana dominated by western wheatgrass, blue grama, and threadleaf sedge. Western wheatgrass and green needlegrass constitute most coverage with run-in moisture such as swales and footslopes. Bluebunch wheatgrass is a dominant in western areas with western wheatgrass and needle-and-thread becoming much less abundant. Subdominant grasses include prairie junegrass, blue grama, sun sedge, and sometimes thickspike wheatgrass. Plains reedgrass (*Calamagrostis montanensis*) and plains muhly (*Muhlenbergia cuspidate*) may be locally dominant in some western areas. Little bluestem is locally dominant in some areas mostly in the east. The most important forb genera include *Lomatium* and *Astragalus*. In addition to the common species of the rest of the plains grassland, the areas receiving between 15 and 19 inches of annual precipitation allows the establishment of some species for which the surrounding areas are too dry. These include big bluestem (*Andropogon gerardii*) and Idaho fescue (*Festuca idahoensis*). Some plant communities on medium-

textured soils have been altered by cultivation or long periods of heavy grazing. Heavy grazing increases blue grama, fringed sage, clubmoss, prairie junegrass, and cheatgrass (*Bromus tectorum*) at the expense of wheatgrass and sometimes needle-and-thread.

Fine-textured soil constitutes a little more than 18 percent of the ecotype and is less favorable to species like needle-and-thread, prairie junegrass, and blue grama, although they will likely persist if adequate topsoil exists and is maintained. The finest textured soils with little or no topsoil support mostly western wheatgrass, green needlegrass, thickspike wheatgrass, and bluebunch wheatgrass in central and western parts of the ecotype (Ross and Hunter 1976). The heaviest clay soils are also usually saline and possibly alkaline. Species not adapted to such conditions are prevented from establishing and are replaced by facultative or obligate halophytes such as western wheatgrass, saltgrass (*Distichlis stricta*), green needlegrass, Nuttall saltbush (*Atriplex nuttallii*), and greasewood (*Sarcobatus vermiculatus*). In low-lying areas, species favored by periodic flooding occur. These include Nuttall alkaligrass (*Puccinellia nuttalliana*) and alkali cordgrass (*Spartina gracilis*). Areas of fine-textured soils in the plains that receive greater (15 to 19 inches) precipitation than the rest of the area share many of the dominant species as the adjacent foothill regions as well as those of the rest of the plains ecotype. These foothill species include bluebunch wheatgrass and Idaho fescue. Big bluestem occurs in the easternmost areas.

Topographically complex areas in the plains grassland ecotype include the river breaks and badlands areas, which are difficult to categorize vegetationally. Bluebunch wheatgrass and western wheatgrass tend to be dominant grasses in most areas. Little bluestem, prairie sandreed, needle-and-thread, and green needlegrass may be locally abundant. Shrubs and conifers may be locally important, especially in the breaks. Common shrubs include big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), rubber rabbitbrush (*Chrysothamnus nauseosus*), aromatic (skunkbush) sumac (*Rhus aromatica*), snowberry (*Symphoricarpos occidentalis*), and Nuttall saltbush. Draws in the extreme eastern part of the ecotype provide habitat for certain woody species not normally found elsewhere except in the Midwest. The tree most commonly encountered is green ash (*Fraxinus pennsylvanica*). Quaking aspen (*Populus tremuloides*) is occasionally found, and bur oak (*Quercus macrocarpa*) occurs in drainages of the extreme southeast (Hansen et al. 1988). Chokecherry and snowberry are shrubs commonly found in these situations. Relatively small timber stands are found scattered throughout most of the breaks area. Both ponderosa pine (*Pinus ponderosa*) and Douglas-fir (*Pseudotsuga menziesii*) occur in these stands as far east as 108.5 degrees longitude; east of this point Douglas-fir drops out. The occurrence of these conifer species in the breaks is due to topographic conditions since the area does not receive any more precipitation than the surrounding plains. A typical timber stand in the breaks forms a closed canopy consisting of ponderosa pine and Douglas-fir. The

understory shrub component is composed of some or all of the following: snowberry, aromatic sumac, chokecherry (*Prunus virginiana*), rose (*Rosa nutkana*), and Rocky Mountain juniper (*Juniperus scopulorum*). Frequent stand-replacing fires in the area result in communities composed of these shrub species but minus the tree overstory. Forbs and grasses include western yarrow (*Achillea millefolium*), aster (*Aster falcatus*), rose pussytoes (*Antennaria microphylla*), bluebunch wheatgrass, and plains muhly (*Muhlenbergia cuspidate*).

Forest

Landscape Characteristics

The plains forest ecotype includes 3,266,564 acres and represents 3.5 percent of Montana. Forested areas in the plains generally occupy higher areas that represent erosional remnants of resistant rock layers, particularly the Arikaree Formation near Ekalaka. These rock layers are younger than the layers supporting the surrounding grasslands (Ross et al. 1955). The stands of plains forest are located on hilly regions, mostly in the southern half of the plains portion of Montana. These hilly regions may be enough higher than surrounding grasslands, such that there is increased annual precipitation capable of supporting forests. Such hilly topography may also create topoedaphic conditions suitable for the establishment of tree cover. The difference in elevation between the forested hills and the adjacent grasslands is not great, generally in the neighborhood of a few hundred feet to at most 2,000 feet. Elevation differences much greater than this would generally result in a montane forest site. The forests of the Chalk Buttes, Longpines, and area near Hammond result from hills and/or buttes rising several hundred feet above base elevations of about 3,200 to 3,500 feet. The large forested area just east of Ashland occupies hills rising from low elevations of about 3,000 feet near the Tongue River to approximately 4,400 feet. The extensive forested region extending from near Custer through Lame Deer to Birney ranges in elevation from 4,000 to 5,000 feet. The lowest elevation of the Bull Mountains forested area is roughly 3,000 feet at points along the Musselshell River. Highest elevations are a little more than 4,000 feet. Most of the other scattered plains forest stands are due to elevation rises of a few to several hundred feet (e.g., east of Miles City, south of Rosebud, and north of Rapelje), topoedaphic effects (e.g., along the Yellowstone River near Columbus), or proximity to mountain areas (e.g., Longpines and Chalk Buttes).

Soils

The largest single category (80 percent) of soils occurring within the plains forest ecotype is described as having a relatively light-colored, thin topsoil horizon. Lime layers may be present if the parent material is calcareous. On the wettest sites (2.5 percent), the soil characteristics of montane forests are found. These tend to be acid with a duff layer (partially decomposed leaves, etc.) on top and a reddish brown clay layer beneath that. The remaining major category of soils is

the one where shale is the parent material.

Climate

The overall climate of the plains forest ecotype is determined by the same factors as the plains grassland, except that elevations of this ecotype are higher. These higher elevations have the effect of lowering temperatures and increasing yearly precipitation, allowing the establishment of forest.

Mean annual temperatures in the areas of plains forests generally are about 1 to 2 degrees F lower than the adjacent grasslands. In most cases this means temperatures from 43 to 44 degrees F. Since most of these are in the southern or western parts of the state, their annual temperatures are several degrees higher than at lower elevations in the northeast. January temperatures generally are 1 to 2 degrees lower than the surrounding grasslands, while July temperatures may be 3 to 4 degrees lower. This suggests that the slight differences in elevation have more effect on summer temperatures than winter temperatures.

Total annual precipitation over the entire ecotype averages approximately 14.5 inches. Some of the wettest areas receive more than 20 inches of annual precipitation. There does not appear to be any difference in the proportion of precipitation received during the growing season as compared to the adjacent lower elevation grasslands. Depending on exact location, May or June is the wettest month of the year and February is the driest.

The average frost-free season is typically shorter than that of the adjacent plains grasslands due to higher elevations and the reduction of overall temperatures. The frost-free season ranges from 90 to 115 days.

Anthropogenic

The plains forest ecotype is the smallest in landmass of the five major ecotypes. Recreational opportunities abound in these large pockets of forest. Activities include hiking, biking, snowmobiling, hunting, cross-country skiing, and wildlife watching. The primary industries in the area are livestock grazing, mining, and some timber extraction. The breakdown of landowner stewardship for the plains forest ecotype is as follows:

U.S. Federal Agencies:	547,647 acres, or 17.9% of total area, which include:
BLM:	156,850 acres, or 5.1% of total area
USFS:	390,797 acres, or 12.8% of total area
State Agencies:	155,059 acres, or 5.1% of total area
Tribal Lands:	285,716 acres, or 9.4% of total area
Private:	2,222,219 acres, 72.7% of total area

Vegetation

The plains forest ecotype occupies 4,610 square miles. The ecotype was intended to include only areas with relatively large contiguous tracts of potential forestland. The Missouri breaks woodlands are included with the plains grassland ecotype described earlier in this document. Because the plains forest areas are somewhat higher in elevation than the surrounding plains grassland, precipitation conditions (a combination of higher total amounts plus a favorable growing season wet moisture distribution) favor the establishment of a closed canopy forest.

Great Plains ponderosa pine (*Pinus ponderosa* var. *scopulorum*) is the sole conifer forming the plains forest ecotype, although various hardwood tree species (e.g., American elm [*Ulmus Americana*], green ash [*Fraxinus pennsylvanica*], American plum, [*Prunus Americana*], and bur oak [*Quercus macrocarpa*]) occur along some of the draws and ravines. In contrast to the ponderosa pine west of the Continental Divide, this variety tends to be shorter. Maximum tree heights range from 35 to 60 feet in dry situations and as much as 95 feet where there is more moisture (Arno 1979). Microclimatic conditions may be favorable in some places for Douglas-fir (*Pseudotsuga menziessi*), to establish, but apparently seed sources are too distant. The drier forests tend to be relatively open and support mostly grass understories. Grasses commonly found in these situations include little bluestem (*Andropogon scoparius*), big bluestem (*Andropogon gerardii*), bluebunch wheatgrass (*Agropyron spicatum*), blue grama (*Bouteloua gracilis*), and threadleaf sedge (*Carex filifolia*). Moist forests contain understory species common to montane forests to the west. Species include Canada buffaloberry (*Shepherdia canadensis*), kinnikinnick (*Arctostaphylos uvaursi*), Oregon grape (*Mahonia repens*), twinflower (*Linnaea borealis*), heartleaf arnica (*Arnica cordifolia*), fairy bells (*Disporum trachycarpum*), wintergreen (*Pyrola secunda*), and false Solomon's seal (*Smilacina stellata*).

Terrestrial Conservation Focus Areas in Greatest Need (Tier I)

Missouri Coteau (5,278,913 acres)



Figure 23. Missouri Coteau Focus Area

The Missouri Coteau area represents part of the large continental prairie grassland and pothole habitat that occurs in eastern Montana. This portion of Montana's prairie pothole country contains the highest density of natural wetlands. In most years springtime finds this area dotted with small wetlands. These shallow wetlands shine amongst the small glacial hilltops that are covered with short- to mid-grass prairie species. The density of wetlands on the landscape are unique to Montana, leading to diverse wildlife and vegetative species. This is the main portion of Montana that is considered to be part of the North American duck factory, the other being areas north of Chinook.

Landscape Characteristics

This area consists of hummocky plains, outwash and stream terraces, fans, and floodplains that formed in thin glacial till and river sediments that lie over shale, siltstone, and sandstone. Moraines, kames, kettles, and small lakes also occur. Elevations range from 1,650 to 3,050 feet. Drainage density is moderate. Mean annual precipitation ranges from 12 to 15 inches, with about 20 percent falling as snow. The soil temperature and moisture regimes are frigid and udic. Primary natural disturbances include extended droughts, insects, and severe storms. Another important natural disturbance regime is prairie dog complexes. Land use is predominantly wheat farming and range and pasture lands. The breakdown for land stewardship in the Missouri Coteau area is as follows:

U.S. Federal Agencies:	147,337 acres, or 2.8% of total area, which include:
BLM:	117,375 acres, or 2.2% of total area

USFWS:	29,900 acres, or 0.6% of total area
NPS:	62 acres, or less than 0.1% of total area
State Agencies:	386,782 acres, or 7.3% of total area
Tribal Lands:	691,154 acres, or 13.1% of total area
Private:	4,040,173 acres, or 76.5% of total area
County and City:	62 acres, or less than 0.1% of total area

Associated Habitats

Habitat	Habitat Tier	Percentage of Area
Moderate/High Cover Grasslands	I	3.57
Agricultural Lands - Irrigated	III	5.39
Wetland and Riparian	I	6.13
Altered Herbaceous	II	12.69
Low/Moderate Cover Grasslands	I	27.71
Agricultural Lands - Dry	III	36.19

Note: A total of 91.69% of the Missouri Coteau area is represented; 8.31% is made up of a combination of other habitat types.

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 318 terrestrial vertebrate species that are found within the Missouri Coteau Focus Area. Tier I species are listed below. All associations can be found in Table 27.

Amphibians: Northern Leopard Frog

Reptiles: Snapping Turtle, Spiny Softshell, Western Hog-nosed Snake, and Smooth Greensnake

Birds: Common Loon, Trumpeter Swan, Bald Eagle, Yellow Rail, Whooping Crane, Piping Plover, Long-billed Curlew, Interior Least Tern, Black Tern, Burrowing Owl, Sedge Wren, and Nelson’s Sharp-tailed Sparrow

Mammals: Townsend’s Big-eared Bat and Meadow Jumping Mouse

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Loss of habitat due to conversion of native prairie to small grain crops	Policy-based approaches that encourage the conservation of natural communities, rather than support their conversion

	Support public and private conservation programs/activities that encourage and support private land use stewardship
	Increased cooperative efforts to maintain ecological features or processes on public, private, and tribal lands
Drainage of natural wetlands	Participate in government and private conservation partnerships to reduce the loss of wetland habitat and restore lost wetlands
Invasive or exotic plant species	Cooperative efforts to reduce the abundance of exotic plant species
Disruption of natural disturbance processes, especially fire	Work with other agencies, tribes and private organizations to restore the natural disturbance processes
Fragmentation of habitat due to fossil fuel exploration and development activities	Work with corporations, land owners and other agencies to reduce impacts of exploration
	Education and research on fossil fuel development and its impacts on natural landscape

References

The Nature Conservancy. 2005. Unpublished report.

The Nature Conservancy. 1999. Ecoregional Conservation in the Northern Great Plains Steppe. Northern Great Plains Steppe Ecoregional Planning Team. 76 pp.

U.S. Fish and Wildlife Service. 2004. Conservation Focus Areas of the Great Divide: a vast region encompassing the Upper Missouri, Yellowstone and upper Columbia watersheds. Publisher: USFWS, Benton Lake Wildlife Refuge, Great Falls, MT. 77 pp.

Montana Sedimentary Plains (13,828,142 acres)



Figure 24. Montana Sedimentary Plains Focus Area

The gently sloping to rolling Montana Sedimentary Plains area contains scattered buttes and badlands. It sits on heavy clay soils and consists of mostly dry shrublands and mixed-grass prairies. It receives very little precipitation and is interspersed with woody draws that contain ponderosa pine, juniper, and snowberry. Agricultural practices can be found throughout the area that support many dryland native wildlife species such as antelope, mule deer, and greater sage-grouse.

Landscape Characteristics

This area includes plains and hills formed in residuum and alluvium from shale and sandstone. Some lacustrine sediments also occur. Elevations range from 2,100 to 4,150 feet. Drainage density is moderate. Mean annual precipitation ranges from 10 to 14 inches, with about 30 percent falling as snow. Soil temperature and moisture regimes are frigid and arctic ustic. The primary natural disturbances are fire and drought. Other important natural biotic disturbances include beaver activity in riparian areas and prairie dog complexes in grassland areas. Land use is predominantly livestock grazing with a small amount of dryland farming. The breakdown for land stewardship in the Montana Sedimentary Plains area is as follows:

U.S. Federal Agencies:	1,617,799 acres, or 11.7% of total area, which include:
BLM:	1,414,184 acres, or 10.2% of total area
USFS:	134,240 acres, or 1% of total area
USFWS:	10,934 acres, or less than 0.1% of total area
NPS:	680 acres, or less than 0.1% of total area
State Agencies:	792,405 acres, or 5.7% of total area

Tribal Lands: 566,427 acres, or 4.1% of total area
 Private: 10,822,908 acres, or 78.3% of total area
 County and City: 1,050 acres, or less than 0.1% of total area

Associated Habitats

Habitat	Habitat Tier	Percentage of Area
Xeric Shrub Grassland Associations	I	2.31
Moderate/High Cover Grasslands	I	2.42
Very Low Cover Grasslands	I	2.71
Agricultural Lands - Irrigated	III	2.86
Ponderosa Pine	II	4.52
Wetland and Riparian	I	4.64
Badlands	II	4.66
Sagebrush	I	6.77
Agricultural Lands - Dry	III	9.06
Mixed Xeric Shrubs	I	10.47
Low/Moderate Cover Grasslands	I	41.13

Note: A total of 91.54% of the Montana Sedimentary Plains area is represented; 8.46% is made up of a combination of other habitat types.

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 346 terrestrial vertebrate species that are found within the Montana Sedimentary Plains Focus Area. Tier I species are listed below. All associations can be found in Table 28.

Amphibians: Northern Leopard Frog

Reptiles: Snapping Turtle, Spiny Softshell, Western Hog-nosed Snake, and Milksnake

Birds: Common Loon, Bald Eagle, Greater Sage-Grouse, Whooping Crane, Mountain Plover, Long-billed Curlew, Interior Least Tern, Black Tern, and Burrowing Owl

Mammals: Spotted Bat, Townsend’s Big-eared Bat, Black-tailed Prairie Dog, Meadow Jumping Mouse, Black-footed Ferret, Canada Lynx, and American Bison

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Loss of habitat as a result of conversion of native prairie to agriculture	Policy-based approaches that encourage the conservation of natural communities, rather than support their conversion
	Support public and private conservation programs/activities that encourage and support private land use stewardship
	Increased cooperative efforts to maintain ecological features or processes on public, private, and tribal lands
Fragmentation of habitat due to fossil fuel exploration and development activities	Education and research on fossil fuel development and its impacts on natural landscape
	Work with corporations, land owners and other agencies to reduce impacts of exploration
Invasive or exotic plant species	Cooperative efforts to reduce the abundance of exotic plant species
Range or forest management practices	Support government and private conservation activities that encourage and support sustainable land management practices (example; rest and rotation schedules)
Streamside residential development	Develop statewide riparian best management principles
Disruption of natural disturbance processes, especially fire	Work with other agencies, tribes and private organizations to restore the natural disturbance processes

References

The Nature Conservancy. 2005. Unpublished report.

The Nature Conservancy. 1999. Ecoregional Conservation in the Northern Great Plains Steppe. Northern Great Plains Steppe Ecoregional Planning Team. 76 pp.

U.S. Fish and Wildlife Service. 2004. Conservation Focus Areas of the Great Divide: a vast region encompassing the Upper Missouri, Yellowstone and upper Columbia watersheds. Publisher: USFWS, Benton Lake Wildlife Refuge, Great Falls, MT. 77 pp.

Aquatic Conservation Focus Areas in Greatest Need (Tier I)

Lower Missouri River (175 River Miles)



Figure 25. Lower Missouri River Focus Area

The Lower Missouri River area consists of badlands, breaks, coulees, and gently rolling hills. The river runs approximately 180 river miles from Fort Peck Dam to the North Dakota border. The section of river from the dam to the town of Wolf Point is uncharacteristically cool and clear, as water discharged from the bottom of the reservoir is devoid of sediment and very cold. Along with many native fish species, this area is occupied by non-native trout species. Even with flows from the Milk River, this section does not return to warmwater habitat until it reaches the town of Wolf Point, approximately 70 river miles downstream. From here to the North Dakota border the Missouri remains warm, with warmwater tributaries like the Poplar River, Red Water River, and Big Muddy Creek. The adjacent land along the Lower Missouri is primarily cottonwood-willow bottomlands and irrigated cropland. As with the area immediately below Fort Peck Dam, this area supports paddlefish, pallid sturgeon, shovelnose sturgeon, sauger, goldeye, and blue sucker, along with many other native fish species.

Associated Habitats

Habitat Type	Habitat Tier	Acres	Miles
Lowland Lakes	III	3,021	
Lowland Reservoirs	III	374	
Mixed Source Rivers (Intermountain and Prairie Flow)	II		175
Prairie Streams	I		3,228

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 55 aquatic species that are found within the Lower Missouri River Focus Area. Tier I species are listed below. All associations can be found in Table 29.

Fish: Pallid Sturgeon, Paddlefish, Shortnose Gar, Sturgeon Chub, Sicklefin Chub, Pearl Dace, Blue Sucker, Burbot, and Sauger

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Culverts, dams, irrigation diversions, and other instream barriers that fully or partially impede fish movement and reduce connectivity of habitat	Removal or modification of barriers in a manner that restores fish passage to ensure full migratory movement
Modification and degradation of stream channels caused by various construction or land management practices	Restoration of stream channels or streambanks to a condition that simulates their natural form and function
Riparian vegetation effected by range and forest management practices and streamside residential development (such activities destabilize streambanks, increase sediment inputs, reduced shading, and remove woody debris)	Support government and private conservation activities that encourage and support sustainable land management practices in riparian areas
	Modification of riparian management practices such that riparian vegetation is allowed to recover
	Develop statewide riparian best management principles
Entrainment of juvenile and adult fishes by irrigation diversions or other water intakes	Screening or modification of irrigation diversions or other water intakes in a manner that prevents entrainment of fishes
Alterations of the quantity or timing of stream flows, causing dewatering or unnatural flow fluctuations that diminish the quantity or quality of essential habitats	Implementation of various water conservation or flow management practices that restore essential habitats and simulate the natural hydrograph
Water chemistry problems that arise due to municipal discharge, irrigation return water, and other sources	Work with municipal government and private landowners to reduce point source pollutants

Unnatural hydrograph and water temperatures associated with the presence and operations of large dams	Work with appropriate authorities to restore hydrograph that mimics the natural regime
Non-native fish species	Support activities to promote natural habitats that support native species

Lower Yellowstone River (278 River Miles)



Figure 26. Lower Yellowstone River Focus Area

The French used the term *Roche Jaune*, meaning “yellow rock,” to describe the lower section of the Yellowstone River, which is lined with trees and meanders through yellow bluffs and rimrocks on its journey toward North Dakota. This reach of the river cuts through a country of plateaus and wind-carved sandstone. By the time the Yellowstone reaches the mouth of the Bighorn River, it has turned from a crystal clear, cold mountain stream into a warm plains river. As it flows north and east, it picks up strength from the Powder and Tongue rivers. In the Lower Yellowstone are found species such as sauger, burbot, and paddlefish.

Associated Habitats

Habitat Type	Habitat Tier	Acres	Miles
Lowland Lakes	III	6,577	
Lowland Reservoirs	III	1,119	
Mixed Source Rivers (Intermountain and Prairie Flow)	II		278
Mountain Lakes	III	251	
Mountain Reservoirs	III	177	
Prairie Streams	I		11,326

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 65 aquatic species that are found within the Lower Yellowstone River Focus Area. Tier I species are listed below. All associations can be found in Table 30.

Fish: Pallid Sturgeon, Paddlefish, Shortnose Gar, Sturgeon Chub, Sicklefin Chub, Pearl Dace, Blue Sucker, Burbot, and Sauger

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Dewatering as a result of water diversion	Work with public and private land owners to improve efficiency of water use in order to maximize water return
	Protect instream flow reservations
Water chemistry problems due to irrigation return water and the discharge of wastewater from coal bed methane operations, and other sources	Support cooperative efforts to minimize impacts of return water due to sedimentation, increased salinity and temperature alteration
Riprap and other streambank stabilization work	Work with new stabilization projects to reduce impacts and support efforts to restore existing rip-rap areas to natural condition
	Develop statewide riparian best management principles
Invasive non-native fish species	Programs to control invasive species and promote natural habitats that support native species
Entrainment of juvenile and adult fishes by irrigation diversions or other water intakes	Screening or modification of irrigation diversions or other water intakes in a manner that prevents entrainment of fishes
Riparian vegetation effected by range and forest management practices and streamside residential development (such activities destabilize streambanks, increase sediment inputs, reduced shading, and remove woody debris)	Support government and private conservation activities that encourage and support sustainable land management practices in riparian areas
Modification and degradation of stream channels caused by various construction or land management practices	Restoration of stream channels or streambanks to a condition that simulates their natural form and function

	Modification of riparian management practices such that riparian vegetation is allowed to recover
	Develop statewide riparian best management principles
Alterations of the quantity or timing of stream flows, causing dewatering or unnatural flow fluctuations that diminish the quantity or quality of essential habitats	Implementation of various water conservation or flow management practices that restore essential habitats, simulate the natural hydrograph and also protect instream flows
Culverts, dams, irrigation diversions, and other instream barriers that fully or partially impede fish movement and reduce connectivity of habitat	Removal or modification of barriers in a manner that restores fish passage

Powder River (220 River Miles)



Figure 27. Powder River Focus Area

The Powder River, a warm prairie river, originates along the eastern slopes of the Bighorn Mountains in Wyoming. Flowing 220 miles to reach the Yellowstone River, the Powder is aptly named, as it is rich in sediment load. A major spawning tributary for native fishes found in the Yellowstone system, the Powder River provides spawning and nursery habitat for sauger, shovelnose sturgeon, channel catfish, and many cyprinid minnow species. The flow regime of this river system can fluctuate from more than 2,000 cfs during the March spring snowmelt period to less than 5 cfs during the hot summer days of August. Fish in this prairie river system have evolved to utilize the Powder during periods of high flow. Sauger tagged in the Yellowstone River have been recaptured in Clear Creek, a headwater tributary to the Powder, equating to more than 220 miles of travel.

Associated Habitats

Habitat Type	Habitat Tier	Acres	Miles
Lowland Lakes	III	926	
Lowland Reservoirs	III	80	
Prairie Rivers	II		220
Prairie Streams	I		3,703

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 38 aquatic species that are found within the Powder River Focus Area. Tier I species are listed below. All associations can be found in Table 31.

Fish: Sturgeon Chub, Burbot, and Sauger

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Dewatering as a result of water diversion	Work with public and private land owners to improve efficiency of water use in order to maximize water return
	Protect instream flow reservations
Water chemistry problems due to irrigation return water and the discharge of wastewater from coal bed methane operations, and other sources	Support cooperative efforts to minimize impacts of return water due to sedimentation, increased salinity and temperature alteration
	Careful study waters entering the Powder River as a result of coal bed methane development in both Montana and Wyoming
Riprap and other streambank stabilization work	Work with new stabilization projects to reduce impacts and support efforts to restore existing rip-rap areas to natural condition
	Develop statewide riparian best management principles
Invasive non-native fish species	Programs to control invasive species and promote natural habitats that support native species
Entrainment of juvenile and adult fishes by irrigation diversions or other water intakes	Screening or modification of irrigation diversions or other water intakes in a manner that prevents entrainment of fishes
Riparian vegetation effected by range and forest management practices and streamside residential development (such activities destabilize streambanks, increase sediment inputs, reduced shading, and remove woody debris)	Support government and private conservation activities that encourage and support sustainable land management practices in riparian areas
Modification and degradation of stream channels caused by various construction or land management practices	Restoration of stream channels or streambanks to a condition that simulates their natural form and function
	Modification of riparian management practices such that riparian vegetation is allowed to recover

	Develop statewide riparian best management principles
Alterations of the quantity or timing of stream flows, causing dewatering or unnatural flow fluctuations that diminish the quantity or quality of essential habitats	Implementation of various water conservation or flow management practices that restore essential habitats, simulate the natural hydrograph and also protect instream flows
Culverts, dams, irrigation diversions, and other instream barriers that fully or partially impede fish movement and reduce connectivity of habitat	Removal or modification of barriers in a manner that restores fish passage

Tongue River (221 River Miles)



Figure 28. Tongue River Focus Area

The headwaters of the Tongue River rise in the Bighorn Mountains of Wyoming. From these sources the river flows northeast to its confluence with the Yellowstone River at Miles City. A major spawning tributary for native fishes found in the Yellowstone system, the Tongue River provides spawning and nursery habitat for sauger, shovelnose sturgeon, channel catfish, and many cyprinid minnow species. The 3,500-acre Tongue River Dam controls the river's flow in Montana. Above the reservoir, the river meanders through a broad open valley. Here its main features are turbid water, slow velocity gravel and mud bottoms, and warm water temperatures. Downstream from the dam, the river flows for 10 miles through a narrow, restrictive canyon with increasing gradient and accompanying cooler water temperatures and gravel bottoms. The Tongue River again becomes a slow, meandering valley stream for its last 179 miles.

Associated Habitats

Habitat Type	Habitat Tier	Acres	Miles
Lowland Lakes	III	665	
Lowland Reservoirs	III	2,176	
Mountain Lakes	III	54	
Prairie Rivers	II		221
Prairie Streams	I		4,843

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 49 aquatic species that are found within the Tongue River Focus Area. Tier I species are listed below. All associations can be found in Table 32.

Fish: Paddlefish, Sturgeon Chub, Blue Sucker, Burbot, and Sauger

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Dewatering as a result of water diversion	Work with public and private land owners to improve efficiency of water use in order to maximize water return
	Protect instream flow reservations
Water chemistry problems due to irrigation return water and the discharge of wastewater from coal bed methane operations, and other sources	Support cooperative efforts to minimize impacts of return water due to sedimentation, increased salinity and temperature alteration
	Careful study waters entering the Tongue River as a result of coal bed methane development in both Montana and Wyoming
Entrainment of juvenile and adult fishes by irrigation diversions or other water intakes	Screening or modification of irrigation diversions or other water intakes in a manner that prevents entrainment of fishes
Riparian vegetation effected by range and forest management practices and streamside residential development (such activities destabilize streambanks, increase sediment inputs, reduced shading, and remove woody debris)	Support government and private conservation activities that encourage and support sustainable land management practices in riparian areas
Modification and degradation of stream channels caused by various construction or land management practices	Restoration of stream channels or streambanks to a condition that simulates their natural form and function
	Modification of riparian management practices such that riparian vegetation is allowed to recover
	Develop statewide riparian best management principles

Alterations of the quantity or timing of stream flows, causing dewatering or unnatural flow fluctuations that diminish the quantity or quality of essential habitats	Implementation of various water conservation or flow management practices that restore essential habitats, simulate the natural hydrograph and also protect instream flows
Culverts, dams, irrigation diversions, and other instream barriers that fully or partially impede fish movement and reduce connectivity of habitat	Removal or modification of barriers in a manner that restores fish passage
Loss of species (mountain whitefish and mountain sucker) below Tongue River Dam due to de-watering and drought	Support cooperative efforts to increase water flow and reduce barriers to migration specifically affecting these species

Shrub Grassland Ecotype



Figure 29. Shrub Grassland Ecotype

Montana's important, yet sporadic, shrub grasslands are found across the southern half of Montana in high-elevation valleys and along grassy slopes. The junipers and sagebrushes that characterize these generally dry slopes occupy only 8 percent of Montana. Typically interspersed with low-cover grasslands, the shrub grassland ecotype offers a unique transition area that supports many of Montana's species of greatest conservation need. More than half of Montana's shrub grasslands are privately owned. Increasingly, the high and flat benches that traditionally provided grazing lands for wildlife and livestock are prized for residential development because of their easy access with 100-mile views. In the coming years, long-term partnerships with landowners will be a crucial component of shrub grassland conservation.

Landscape Characteristics

The shrub grassland ecotype includes 7,240,566 acres and represents 7.7 percent of Montana. The southwestern segment of the shrub grassland ecotype is situated in high mountain valleys and on nonforested mountain slopes at elevations from 5,500 feet to 8,000 feet. Slopes vary from nearly level in valleys to sometimes more than 45 degrees on some mountainsides. Mountain valleys and drainages associated with this segment include the Centennial, Big Hole, upper Beaverhead, and the valley between the Butte Highlands and Fleecer Mountain. Shrub grasslands are found on slopes of the Centennial, Snowcrest, Beaverhead, Pintler, Highland, Ruby, south Bitterroot, Tendoy, and Tobacco Root mountains. A segment of shrub grassland occupies the valleys of the upper Shields and Smith rivers at elevations from 4,500 to 6,500 feet. These slopes are predominantly level or gently sloped. Other areas of shrub grassland are found in the north-central and southern plains region on mostly level or gentle slopes,

although where this ecotype occupies dissected river breaks, slopes can be locally steep. Major drainages where these shrub grasslands are located include the Clark Fork of the Yellowstone, upper Tongue, upper Powder, Bighorn, Musselshell, Milk, central Missouri, and Missouri rivers above Fort Peck Dam, and Dry Creek. Most are located in elevations ranging from 2,000 to 3,500 feet.

Soils

Land occupied by this ecotype in the southwest is geologically the same as the adjacent grasslands or forest. Shrub grasslands in the plains dominated by Wyoming big sagebrush most commonly occur on Cretaceous shales (Colorado Shale, Montane Group, and Pierre Shale) in the sedimentary plains area. Other shrub grasslands occupy a variety of geological substrates. Very little shrub grassland is found in the glaciated plains.

As well as being highly variable in terms of vegetation composition, geographic location, and geology, the shrub grassland ecotype is variable in terms of soil characteristics. Most of the major soil categories found in Montana, except for those of alpine and subalpine situations, are represented in this ecotype (Montagne et al. 1978).

Climate

Mean annual temperature in the intermountain/foothill segment of the ecotype varies from 36 to 40 degrees F. In the plains shrub grasslands, mean annual temperatures range from 43 to 45 degrees F.

Because this ecotype occurs as widely separated segments across most of the southern half of the state, temperatures at a given time of year vary broadly. Due to the relatively high elevations where shrub grassland is found in the intermountain region, January daily temperatures are comparatively cold for that part of the state (12 to 19 degrees F). January temperatures in the plains segments are typical for whichever area of the state they are in and range from 10 to 20 degrees F. July daily temperatures in the southwest segment range from 57 to 63 degrees F, and on the plains they vary from 64 to 66 degrees F. Mean annual extreme minimum temperatures across the ecotype vary from minus 24 to minus 31 degrees F, putting most of the area into the cold side of plant hardiness zone 4. Mean annual maximum temperatures may be anywhere from less than 85 degrees F in the southwest to over 102 degrees F in the southeast.

Average length of time without frost is shortest in the southwest and may only be 30 days in some places. The frost-free period is the greatest in those segments near the lower Yellowstone and Missouri rivers, where it may range from 115 to 130 days.

The percentage of precipitation received during the growing season is highly variable within the southwest segment, ranging from 35 to 60 percent depending on the shrub and grassland. The shrub and grassland around White Sulphur Springs receives 40 to 45 percent of its moisture in the growing season. In other segments of the shrub grassland ecotype, 50 to 62 percent of moisture falls during the growing season.

Snowfall for the shrub grassland areas in or near the mountains, except for the segment south of the Pryor Mountains, generally ranges from 31 to 90 inches each year. Mean number of days with snow cover in these areas varies from 90 to 160 days. An area of shrub grassland south of the Pryor Mountains averages less than 30 inches of mean annual snowfall and generally has snow on the ground for less than 60 days. The other areas generally average between 20 and 50 inches of snowfall with 60 to 100 days of snow cover.

Anthropogenic Uses

The shrub grassland ecotype is some of the most undeveloped habitat in the state. Recreationalists and agriculturalists enjoy and appreciate it. The breakdown of land stewardship for the shrub grassland ecotype is as follows:

U.S. Federal Agencies:	1,851,561 acres, or 25.7% of total area, which include:
BLM:	1,574,556 acres, or 21.8% of total area
USFS:	228,634 acres, or 3.2% of total area
USFWS:	42,008 acres, or 0.6% of total area
NPS:	1,977 acres, or less than 0.1% of total area
State Agencies:	668,049 acres, or 9.2% of total area
Tribal Lands:	260,264 acres, or 3.6% of total area
Private:	4,431,526 acres, or 61.5% of total area

Vegetation

In areas of the shrub grassland ecotype that has fine-textured soils and receives 10 to 14 inches of annual precipitation, the predominant species of vegetation is the big sagebrush (*Artemisia tridentata* ssp). Big sagebrush-dominated communities in this area normally are found on fine-textured to very fine textured soils. Such areas are estimated to cover 65 percent of the ecotype. Where there is more available moisture due to run-in or a high water table, silver sagebrush (*Artemisia cana*) or greasewood (*Sarcobatus vermiculatus*) may be abundant. Silver sagebrush is favored by medium-textured nonsaline soils; greasewood is usually found on dense clay saline and/or alkaline soils. Silver sagebrush bottomlands in Theodore Roosevelt National Park described by Hansen et al. (1988) are probably similar to such communities in eastern Montana. Dominant species in these areas are silver sagebrush, western wheatgrass (*Agropyron smithii*), and green needlegrass (*Stipa viridula*). The dominant understory species under big sagebrush in eastern areas are western wheatgrass, prairie junegrass

(*Koeleria macrantha*), and green needlegrass. Other common species include Nuttall saltbush (*Atriplex nuttallii*), bluebunch wheatgrass (*Agropyron spicatum*), and various milkvetches (*Astragalus* spp.). In the west, dominant grasses are bluebunch wheatgrass, western wheatgrass, and prairie junegrass. Common forbes are milkvetches, American vetch (*Vicia Americana*), and biscuitroot (*Lomatium* spp.).

Where big sagebrush is the dominant species on silty soils in the 10- to 14-inch precipitation zone, the most abundant grasses are needle-and-thread (*Stipa comata*) and western wheatgrass in the east and bluebunch wheatgrass in the west (Ross et al. 1976) (Mueuggler et al. 1980). On limy, shallow, and very shallow soils, bluebunch wheatgrass is typically dominant. Communities containing both low sagebrush (*Artemisia arbuscula*) and big sagebrush are found in some areas of extreme southwest Montana east of the Continental Divide. These sites are often on limestone. Subdominant grasses include prairie junegrass and sandberg bluegrass (*Poa secunda*). Common forbs are hood's plox (*Phlox hoodii*) and blue flax (*Linum perenne*). Curleaf mountain mahogany (*Cercocarpus ledifolius*) is another shrub restricted to the extreme southwestern part of the state. A bitterbrush (*Purshia tridentata*)/bluebunch wheatgrass habitat type is recognized west of the divide, and an aromatic sumac (*Rhus aromatica*)/bluebunch wheatgrass type occurs in south-central Montana. Other shrubs such as big sagebrush, rubber rabbitbrush (*Chrysothamnus nauseosus*), and Rocky Mountain juniper (*Juniperus scopulorum*) may be an important component of these habitat types. Finally, on saline lowlands, a greasewood/western wheatgrass habitat is recognized, and on uplands a greasewood/basin wildrye (*Elymus cinereus*) type.

The areas of the shrub grassland ecotype where annual precipitation is from 15 to 19 inches are usually higher in elevation than those with annual precipitation between 10 to 14 inches. The most abundant shrub species is generally mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), although there may be some Wyoming big sagebrush, rubber rabbitbrush, and bitterbrush. Where these shrub grasslands occur in southwestern Montana, bluebunch wheatgrass is still an important grass species as in the 10- to 14-inch precipitation areas, but Idaho fescue is considered to be dominant. North of the 46th parallel, Idaho fescue is replaced by rough fescue (*Festuca scabrella*) as the dominant grass. These sites generally have more abundant and diverse forbs than the drier areas. In the higher precipitation areas that are well drained, typically with steep slopes, coarse-textured shallow soils, and often southerly exposures, the most abundant species is generally bitterbrush. West of the divide and north of the 47th parallel, rough fescue is the most productive grass. South of that Idaho fescue or Idaho fescue and bluebunch wheatgrass are the most productive. On some sites mountain big sagebrush may be as abundant as bitterbrush. Arrowleaf balsamroot (*Balsamorhiza sagittata*) and silky lupine (*Lupinus sericeus*) are very common both north and south of the 47th parallel.

Terrestrial Conservation Focus Areas in Greatest Need (Tier I)

Bighorn Intermontane Basin (290,287 acres)



Figure 30. Bighorn Intermontane Basin Focus Area

The Bighorn Intermontain Basin area protrudes across Montana's border from Wyoming and sits in the rain shadow of the Beartooth Range. The area is home to a very diverse wildlife community and represents a limited geographic area at the end of its range that resembles communities more typical of the Great Basin and Colorado Plateau than Montana. Riparian areas are limited minor drainages, and it is the driest area in Montana, typically receiving only 6 inches of precipitation annually. Snow seldom lasts long due to the predominant and seemingly ever present southwest winds. Native vegetation is generally dominated by shrubs, primarily black sagebrush, Wyoming big sagebrush, and greasewood. Understory grasses are generally sparse, with invading annuals such as cheatgrass often dominating. This is the home of the prairie rattlesnake as well as the sagebrush and greater short-horned lizards. Greater sage-grouse are abundant as are gray partridges. This is the only habitat in Montana that supports the chukar partridge. However, given the desert nature of the habitat, mule deer and pronghorn antelope can exist only in low densities.

Landscape Characteristics

This subsection consists of dissected plains, hills, terraces, and fans that formed in shale, siltstone, and sandstone overlain by some alluvium and lacustrine sediment. Elevations range from 3,700 to 4,700 feet. Drainage density is moderate. Mean annual precipitation ranges from 5 to 12 inches. The soil temperature and moisture regimes are mesic and aridic ustic. Winters are very dry. The primary natural disturbance is drought. Another important natural disturbance regime is prairie dog complexes. Land use is predominantly livestock

grazing and irrigated cropland. The breakdown for land stewardship in the Bighorn Intermontane Basin area is as follows:

U.S. Federal Agencies: 163,275 acres, or 56.2% of total area, which include:
 BLM: 157,097 acres, or 54.1% of total area
 USFS: 3,707 acres, or 1.3% of total area
 NPS: 2,471 acres, or 0.8% of total area
 State Agencies: 14,517 acres, or 5% of total area
 Tribal Lands: 4,819 acres, or 1.7% of total area
 Private: 107,676 acres, or 37.1% of total area

Associated Habitats

Habitat	Habitat Tier	Percentage of Area
Agricultural Lands - Irrigated	III	2.46
Low/Moderate Cover Grasslands	I	3.44
Utah Juniper	III	3.73
Xeric Shrub Grassland Associations	I	5.67
Badlands	II	17.19
Very Low Cover Grasslands	I	28.28
Sagebrush	I	33.78

Note: A total of 94.55% of the Bighorn Intermontane Basin area is represented; 5.45% is made up of a combination of other habitat types.

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 174 terrestrial vertebrate species that are found within the Bighorn Intermontane Basin Focus Area. Tier I species are listed below. All associations can be found in Table 33.

Amphibians: Northern Leopard Frog

Reptiles: Western Hog-nosed Snake and Milksnake

Birds: Bald Eagle, Greater Sage-Grouse, Mountain Plover, Long-billed Curlew, and Burrowing Owl

Mammals: Spotted Bat, Pallid Bat, Black-tailed Prairie Dog, White-tailed Prairie Dog, Gray Wolf, and Black-footed Ferret

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Loss of habitat due to conversion agriculture	Policy-based approaches that encourage the conservation of natural communities, rather than support their conversion
	Support public and private conservation programs/activities that encourage and support private land use stewardship
Drainage of natural wetlands	Participate in government and private conservation partnerships to reduce the loss of wetland habitat and restore lost wetlands
Invasive or exotic plant species	Cooperative efforts to reduce the abundance of exotic plant species
Disruption of natural disturbance processes, especially fire	Work with other agencies, tribes and private organizations to restore the natural disturbance processes
Fragmentation of habitat due to fossil fuel exploration and development activities	Work with corporations, land owners and other agencies to reduce impacts of exploration
	Education and research on fossil fuel development and its impacts on natural landscape

References

A Biological Conservation Assessment for the Utah-Wyoming Rocky Mountain Ecoregion: Report to the Nature Conservancy. 2001. R. Noss, G. Wuerthner, K. Vance-Borland, and C. Carroll. Conservation Science, Inc. 125 pp. + Executive Summary and Appendix D.

U.S. Fish and Wildlife Service. 2004. Conservation Focus Areas of the Great Divide: a vast region encompassing the Upper Missouri, Yellowstone and upper Columbia watersheds. Publisher: USFWS, Benton Lake Wildlife Refuge, Great Falls, MT. 77 pp.

Montana Glaciated Plains (17,806,106 acres)



Figure 31. Montana Glaciated Plains Focus Area

The Montana Glaciated Plains area is dominated by level to rolling till plains covered by sagebrush grasslands and mixed short-grass prairie and croplands. This area also encompasses two island mountain ranges: the Bears Paw and Highwood mountains. The major river drainages of the area include the Milk, Missouri, Marias, and Musselshell. In the east, this focus area is characterized by prairie that is dissected by badlands of the major tributaries to the Milk, Missouri, Marias, and Musselshell drainages. From the bluffs dotted with ancient tepee rings, one can observe numerous prairie wildlife species. To the west, the area is characterized by the numerous rugged breaks that support diverse assemblages of ponderosa pine and cottonwoods depending on the availability of moisture. This area also is considered very fertile wheat growing country, most notable in the Golden Triangle to the west.

Landscape Characteristics

This area consists of plains, terraces, fans, and floodplains that formed in glacial till, gravel deposits, and alluvium over clay shale, sandstone, and siltstone. Elevations range from 1,800 to 7,500 feet in the Highwood and Bears Paw mountains. Drainage density is moderate and glacial potholes are common, especially in the northern part of the subsection. Mean annual precipitation ranges from 10 to 15 inches, with about 20 to 30 percent falling as snow. The soil temperature and moisture regimes are frigid and aridic ustic. Primary natural disturbances are drought and fire. Another important natural disturbance regime is prairie dog complexes. Land use is predominantly livestock grazing and dryland farming. The breakdown for land stewardship in the Montana Glaciated Plains area is as follows:

U.S. Federal Agencies: 3,394,302 acres, or 19.1% of total area, which include:
 BLM: 3,003,010 acres, or 16.9% of total area
 USFS: 62 acres, or less than 0.1% of total area
 USFWS: 283,492 acres, or 1.6% of total area
 NPS: 247 acres, or less than 0.1% of total area
 State Agencies: 1,253,566 acres, or 7% of total area
 Tribal Lands: 1,141,133 acres, or 6.4% of total area
 Private: 11,995,485 acres, or 67.4% of total area
 County and City: 494 acres, or less than 0.1% of total area

Associated Habitats

Habitat	Habitat Tier	Percentage of Area
Wetland and Riparian	I	3.22
Moderate/High Cover Grasslands	I	3.38
Altered Herbaceous	II	4.33
Sagebrush	I	4.67
Very Low Cover Grasslands	I	4.79
Agricultural Lands - Irrigated	III	13.87
Agricultural Lands - Dry	III	20.19
Low/Moderate Cover Grasslands	I	33.66

Note: A total of 88.11% of the Montana Glaciated Plains area is represented; 11.89% is made up of a combination of other habitat types.

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 364 terrestrial vertebrate species that are found within the Montana Glaciated Plains Focus Area. Tier I species are listed below. All associations can be found in Table 34.

Amphibians: Northern Leopard Frog

Reptiles: Snapping Turtle, Spiny Softshell, Western Hog-nosed Snake, and Milksnake

Bird: Common Loon, Bald Eagle, Greater Sage-Grouse, Yellow Rail, Whooping Crane, Piping Plover, Mountain Plover, Long-billed Curlew, Interior Least Tern, Black Tern, and Burrowing Owl

Mammals: Spotted Bat, Townsend’s Big-eared Bat, Black-tailed Prairie Dog, Black-footed Ferret, and American Bison

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Conversion of native prairie to small grain production	Policy-based approaches that encourage the conservation of natural communities, rather than support their conversion
	Support public and private conservation programs/activities that encourage and support private land use stewardship
	Increased cooperative efforts to maintain ecological features or processes on public, private, and tribal lands
	Implement practices (economic and ecological) that sustain ranching profitability and promote public access
Petroleum exploration and development impacts	Work with corporations, land owners and other agencies to reduce impacts of exploration
	Education and research on fossil fuel development and its impacts on natural landscape
	Evaluate ecological implications of road development as well as reservoir and pit retention construction related to petroleum development
Invasive or exotic plant species	Cooperative efforts to reduce the abundance of exotic plant species
Disruption of natural fire disturbance processes and hydrologic regimes	Work with other agencies, tribes and private organizations to restore the natural disturbance processes
Loss of natural wetlands	Maintain existing structure and functional uses of wetlands on private and federally managed lands

References

The Nature Conservancy. 2005. Unpublished report.

The Nature Conservancy. 1999. Ecoregional Conservation in the Northern Great Plains Steppe. Northern Great Plains Steppe Ecoregional Planning Team. 76 pp.

U.S. Fish and Wildlife Service. 2004. Conservation Focus Areas of the Great Divide: a vast region encompassing the Upper Missouri, Yellowstone and upper

Columbia watersheds. Publisher: USFWS, Benton Lake Wildlife Refuge, Great Falls, MT. 77 pp.

Whitewater Wetlands Conservation Area Plan. 2004. B. Martin and J. Stutzman. 16 pp + appendices.

Montana Shale Plains (2,403,965 acres)



Figure 32. Montana Shale Plains Focus Area

Much of the Montana Shale Plains area can be considered mountain foothill terrain that contains many woody draws with ponderosa pine and cedar stands throughout.

Landscape Characteristics

This subsection consists of dissected plains, hills, terraces, fans, and floodplains that formed in shale, siltstone, and sandstone. Elevations range from 1,500 to 3,500 feet. Drainage density is moderate to high. Mean annual precipitation ranges from 10 to 14 inches, with about 30 percent falling as snow. The soil temperature and moisture regimes are frigid and aridic ustic. Summers are dry. Primary natural disturbances are drought and erosion. Another important natural disturbance regime is prairie dog complexes. Land use is predominantly livestock grazing with some dryland farming. The breakdown for land stewardship in the Montana Shale Plains area is as follows:

U.S. Federal Agencies:	278,550 acres, or 11.6% of total area, which include:
BLM:	275,461 acres, or 11.5% of total area
USFWS:	3,089 acres, or 0.1% of total area
State Agencies:	158,889 acres, or 6.6% of total area
Private:	1,965,538 acres, or 81.8% of total area

Associated Habitats

Habitat	Habitat Tier	Percentage of Area
Wetland and Riparian	I	2.46
Agricultural Lands - Dry	III	4.66
Xeric Shrub Grassland Associations	I	4.68
Moderate/High Cover Grasslands	I	5.04
Very Low Cover Grasslands	I	6.45
Badlands	II	8.04
Sagebrush	I	8.48
Mixed Xeric Shrubs	I	16.51
Low/Moderate Cover Grasslands	I	36.35

Note: A total of 92.67% of the Montana Shale Plains area is represented; 7.33% is made up of a combination of other habitat types.

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 307 terrestrial vertebrate species that are found within the Montana Shale Plains Focus Area. Tier I species are listed below. All associations can be found in Table 35.

Amphibians: Northern Leopard Frog

Reptiles: Spiny Softshell, Western Hog-nosed Snake, and Milksnake

Birds: Common Loon, Bald Eagle, Greater Sage-Grouse, Whooping Crane, Mountain Plover, Long-billed Curlew, Black Tern, and Burrowing Owl,

Mammals: Townsend’s Big-eared Bat, Black-tailed Prairie Dog, Meadow Jumping Mouse, Black-footed Ferret, Canada Lynx, and American Bison

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Invasive or exotic plant species	Cooperative efforts to reduce the abundance of exotic plant species
Disruption of natural disturbance processes or fire regimes	Work with other agencies, tribes and private organizations to restore the natural disturbance processes
Conversion of natural habitat to croplands	Policy-based approaches that encourage the conservation of natural communities, rather than support their conversion

	Support public and private conservation programs/activities that encourage and support private land use stewardship
	Increased cooperative efforts to maintain ecological features or processes on public, private, and tribal lands
Range or forest management practices	Support government and private conservation activities that encourage and support sustainable land management practices (example; rest and rotation schedules)

References

The Nature Conservancy. 1999. Ecoregional Conservation in the Northern Great Plains Steppe. Northern Great Plains Steppe Ecoregional Planning Team. 76 pp.

U.S. Fish and Wildlife Service. 2004. Conservation Focus Areas of the Great Divide: a vast region encompassing the Upper Missouri, Yellowstone and upper Columbia watersheds. Publisher: USFWS, Benton Lake Wildlife Refuge, Great Falls, MT. 77 pp.

Powder River Basin/Breaks/Scoria Hills (2,095,021 acres)



Figure 33. Powder River Basin/Breaks/Scoria Hills Focus Area

Much of this unglaciated area extends across Montana's border into Wyoming. The flat to rolling mixed-grass prairie contains considerable areas of sagebrush grassland as well as ponderosa pine and juniper woodlands that are broken by occasional rugged breaks. The Powder River cutting through the area provides significant riparian habitat for many species. This area supports irrigated and dryland crops.

Landscape Characteristics

This subsection consists of dissected plains and hills, terraces, and fans with some river breaks and badlands that formed in alluvium and colluvium from sandstone, shale, and siltstone. Elevations range from 2,100 to 4,980 feet. Drainage density is moderate to high. Mean annual precipitation ranges from 10 to 14 inches, with about 20 percent falling as snow. The soil temperature and moisture regimes are frigid and aridic ustic. Summers are dry. Primary natural disturbances are drought and erosion. Another important natural disturbance regime is prairie dog complexes. Land use is predominantly livestock grazing and irrigated and dryland crops. The breakdown for land stewardship in the Powder River Basin/Breaks/Scoria Hills area is as follows:

U.S. Federal Agencies:	503,292 acres, or 24% of total area, which include:
BLM:	197,993 acres, or 9.5% of total area
USFS:	304,928 acres, or 14.5% of total area
NPS:	371 acres, or less than 0.1% of total area
State Agencies:	90,873 acres, or 4.3% of total area
Tribal Lands:	313,824 acres, or 15% of total area
Private:	1,186,909 acres, or 56.7% of total area

Associated Habitats

Habitat	Habitat Tier	Percentage of Area
Very Low Cover Grasslands	I	2.70
Mixed Mesic Shrubs	II	3.31
Sagebrush	I	5.30
Wetland and Riparian	I	6.21
Mesic Shrub Grassland Associations	I	7.42
Low Density Xeric Forest	II	8.15
Mixed Xeric Shrubs	I	10.04
Ponderosa Pine	II	11.60
Low/Moderate Cover Grasslands	I	31.86

Note: A total of 86.59% of the Powder River Basin/Breaks/Scoria Hills area is represented; 13.41% is made up of a combination of other habitat types.

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 299 terrestrial vertebrate species that are found within the Powder River Basin/Breaks/Scoria Hills Focus Area. Tier I species are listed below. All associations can be found in Table 36.

Amphibians: Northern Leopard Frog

Reptiles: Snapping Turtle, Spiny Softshell, Western Hog-nosed Snake, and Milksnake

Birds: Common Loon, Trumpeter Swan, Bald Eagle, Greater Sage-Grouse, Whooping Crane, Long-billed Curlew, Black Tern, and Burrowing Owl,

Mammals: Spotted Bat, Townsend's Big-eared Bat, Black-tailed Prairie Dog, Meadow Jumping Mouse, Black-footed Ferret, and American Bison

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Loss of habitat as a result of conversion of native habitat to agriculture	Policy-based approaches that encourage the conservation of natural communities, rather than support their conversion
	Support public and private conservation programs/activities that encourage and support private land use stewardship

	Increased cooperative efforts to maintain ecological features or processes on public, private, and tribal lands
Fragmentation of habitat due to fossil fuel exploration and development activities	Education and research on fossil fuel development and its impacts on natural landscape
	Work with corporations, land owners and other agencies to reduce impacts of exploration
	Careful study impacts of road development and retention pond construction as a result of coal bed methane development in both Montana and Wyoming
Invasive or exotic plant species	Cooperative efforts to reduce the abundance of exotic plant species
Range or forest management practices	Support government and private conservation activities that encourage and support sustainable land management practices (example; rest and rotation schedules)
Disruption of natural disturbance processes, especially fire	Work with other agencies, tribes and private organizations to restore the natural disturbance processes

References

The Nature Conservancy. 1999. Ecoregional Conservation in the Northern Great Plains Steppe. Northern Great Plains Steppe Ecoregional Planning Team. 76 pp.

U.S. Fish and Wildlife Service. 2004. Conservation Focus Areas of the Great Divide: a vast region encompassing the Upper Missouri, Yellowstone and upper Columbia watersheds. Publisher: USFWS, Benton Lake Wildlife Refuge, Great Falls, MT. 77 pp.

Shale Scablands (417,176 acres)



Figure 34. Shale Scablands Focus Area

The very dry Shale Scablands area is covered mostly by sagebrush grassland that is intersected by woody draws. The species that make up the woody draws are mostly green ash, buffaloberry, chokecherry, and some juniper.

Landscape Characteristics

This subsection consists of dissected shale plains formed in calcareous shale, claystone, and sandstone. Elevations range from 2,650 to 4,100 feet. Drainage density is high. Mean annual precipitation ranges from 11 to 15 inches, with about 20 percent falling as snow. The soil temperature and moisture regimes are frigid and aridic ustic. Primary natural disturbances are drought and fire. Another important natural disturbance regime is prairie dog complexes. Land use is predominantly livestock grazing. The breakdown for land stewardship in the Shale Scablands area is as follows:

U.S. Federal Agencies: 126,889 acres, or 30.4% of total area, which include:
 BLM: 126,889 acres, or 30.4 of total area
State Agencies: 21,992 acres, or 5.3% of total area
Private: 268,295 acres, or 64.3% of total area

Associated Habitats

Habitat	Habitat Tier	Percentage of Area
Mixed Broadleaf Forest	I	2.22
Mesic Shrub Grassland Associations	I	3.01
Low Density Xeric Forest	II	3.17

Moderate/High Cover Grasslands	I	3.47
Rock	III	4.40
Mixed Mesic Shrubs	II	4.60
Mixed Xeric Shrubs	I	5.42
Very Low Cover Grasslands	I	5.49
Badlands	II	7.60
Wetland and Riparian	I	8.50
Salt-desert Shrub/ Dry Salt Flats	I	8.56
Low/Moderate Cover Grasslands	I	13.01
Sagebrush	I	25.05

Note: A total of 94.52% of the Shale Scablands area is represented; 5.48% is made up of a combination of other habitat types.

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 245 terrestrial vertebrate species that are found within the Shale Scablands Focus Area. Tier I species are listed below. All associations can be found in Table 37.

Amphibians: Northern Leopard Frog

Reptiles: Snapping Turtle, Spiny Softshell, Western Hog-nosed Snake, and Milksnake

Birds: Common Loon, Bald Eagle, Greater Sage-Grouse, Whooping Crane, Mountain Plover, Long-billed Curlew, Black Tern, and Burrowing Owl,

Mammals: Townsend's Big-eared Bat, Black-tailed Prairie Dog, Meadow Jumping Mouse, and Black-footed Ferret

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Loss of habitat due to conversion of native prairie to crops	Policy-based approaches that encourage the conservation of natural communities, rather than support their conversion
	Support public and private conservation programs/activities that encourage and support private land use stewardship
	Increased cooperative efforts to maintain ecological features or processes on public, private, and tribal lands

Drainage of natural wetlands	Participate in government and private conservation partnerships to reduce the loss of wetland habitat and restore lost wetlands
Invasive or exotic plant species	Cooperative efforts to reduce the abundance of exotic plant species
Disruption of natural disturbance processes, especially fire	Work with other agencies, tribes and private organizations to restore the natural disturbance processes
Range or forest management practices	Support government and private conservation activities that encourage and support sustainable land management practices (example; rest and rotation schedules)

References

The Nature Conservancy. 1999. Ecoregional Conservation in the Northern Great Plains Steppe. Northern Great Plains Steppe Ecoregional Planning Team. 76 pp.

Aquatic Conservation Focus Areas in Greatest Need (Tier I)

Middle Missouri River (540 River Miles)

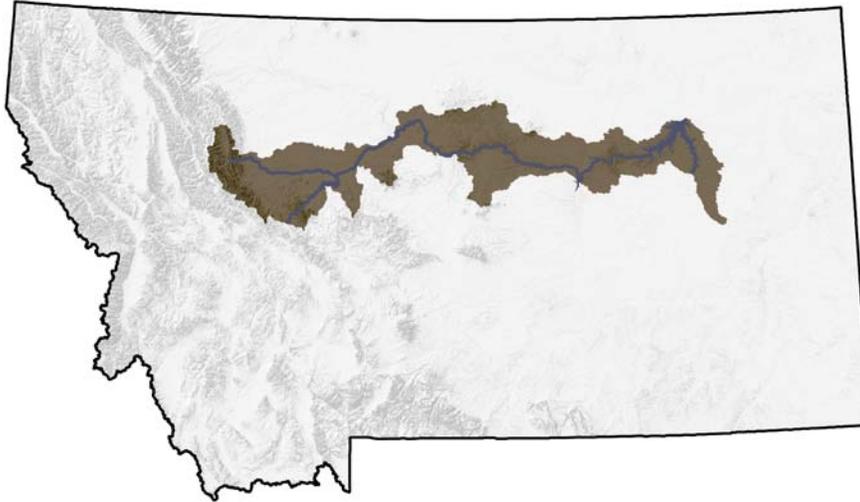


Figure 35. Middle Missouri River and Tributaries Focus Area

Once the Missouri River reaches the confluence with Hardy Creek, it becomes wide and slow for the next 60 miles and then turns into whitewater as it flows over the falls at Great Falls. Although dams have effectively covered the falls, the original cascade posed a tremendous obstacle for Lewis and Clark. From here downstream for more than 200 miles to the Fort Peck Reservoir is the longest free-flowing section of the entire Missouri River. One hundred and fifty miles of this stretch has been designated as Wild and Scenic and flows through cottonwood forests and canyons.

Associated Habitats

Habitat Type	Habitat Tier	Acres	Miles
Intermountain Valley Streams	II		2,170
Lowland Lakes	III	281,756	
Lowland Reservoirs	III	4,505	
Mixed Source Rivers (Intermountain and Prairie Flow)	II		438
Mountain Lakes	III	1,139	
Mountain Reservoirs	III	1,445	
Mountain Streams	I		2,289
Prairie Rivers	II		148
Prairie Streams	I		8,909

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 63 aquatic species that are found within the Middle Missouri River and Tributaries Focus Area. Tier I species are listed below. All associations can be found in Table 38.

Fish: Pallid Sturgeon, Paddlefish, Sturgeon Chub, Sicklefin Chub, Blue Sucker, Burbot, and Sauger

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Culverts, dams, irrigation diversions, and other instream barriers that fully or partially impede fish movement and reduce connectivity of habitat	Removal or modification of barriers in a manner that restores fish passage to ensure full migratory movement
Modification and degradation of stream channels caused by various construction or land management practices	Restoration of stream channels or streambanks to a condition that simulates their natural form and function
Riparian vegetation effected by range and forest management practices and streamside residential development (such activities destabilize streambanks, increase sediment inputs, reduced shading, and remove woody debris)	Support government and private conservation activities that encourage and support sustainable land management practices in riparian areas
	Modification of riparian management practices such that riparian vegetation is allowed to recover
	Develop statewide riparian best management principles
Entrainment of juvenile and adult fishes by irrigation diversions or other water intakes	Screening or modification of irrigation diversions or other water intakes in a manner that prevents entrainment of fishes
Alterations of the quantity or timing of stream flows, causing dewatering or unnatural flow fluctuations that diminish the quantity or quality of essential habitats	Implementation of various water conservation or flow management practices that restore essential habitats and simulate the natural hydrograph
	Protect Instream flow reservations

Water chemistry problems that arise due to municipal discharge, irrigation return water, and other sources	Work with municipal government and private landowners to reduce point source pollutants
Unnatural hydrograph and water temperatures associated with the presence and operations of large dams	Work with appropriate authorities to restore hydrograph that mimics the natural regime
Non-native fish species	Support activities to promote natural habitats that support native species