



RAVALLI COUNTY

Long Range Plan

Version 2, edited in August 2024

**Long Range Plan
Ravalli County, Montana**

Section I. Introduction

Purpose

The Ravalli County Long Range Plan (LRP) was developed by the Hamilton Field Office for the Natural Resources Conservation Service (NRCS) with contributions from the Ravalli County Local Work Group (LWG). The LRP is a working document outlining the natural resource data, status and trends for Ravalli County. The LRP demonstrates a collaborative effort by the NRCS and partners to evaluate natural resource issues in Ravalli County and approach them strategically. The plan will be used to prioritize projects for NRCS technical assistance and financial incentive programs.

The LRP will be updated annually, as needed, and the goal of the document is to provide a tool that will be used to assess resource concerns of high priority and provide guidance on future planning of Targeted Implementation Plans (TIPs).

Multiple partners were consulted during the completion of this plan. In addition, existing resource plans and management plans from partners have been referenced in completing this document. A full listing of resources can be found in the 'reference' section.

Partners

Conservation Partnerships in Ravalli County include:

- Bitterroot Conservation District (BCD)
- Natural Resources Conservation Service (NRCS)
- Bitter Root Conservation and Development (RC&D)
- Farm Service Agency (FSA)
- US Forest Service, Bitterroot National Forest (USFS)
- Bitter Root Land Trust
- Bitter Root Water Partnership
- Fire in the Root
- US Fish and Wildlife Service (USFWS)
- Montana Fish, Wildlife & Parks (FWP)
- Teller Wildlife Refuge
- Montana State University Extension for Ravalli County
- Montana Dept. of Natural Resources and Conservation (DNRC)
- Trout Unlimited (TU)
- Ravalli County Weed District
- Montana Association of Conservation Districts (MACD)
- Ravalli County Economic Development
- Pheasants Forever

Section II. County Profile and Natural Resource Inventory

Ravalli County is located in southwestern Montana, along the Bitterroot River between the Bitterroot Range and Sapphire Mountains. The county extends approximately 95 miles from Lost Trail Pass in Idaho, where it is narrow, to a point near the city of Missoula. To the west is the Bitterroot Range and its large Selway-Bitterroot Wilderness Area, and to the east is the smaller Sapphire Mountains and their Anaconda-Pintler Wilderness Area. The Bitterroot Range has steep faces, deep canyons, is heavily forested, and is within the Bitterroot National Forest. The Sapphire Mountains are more rounded, drier, and much less forested. The southern end of the valley is split into the East and West Forks of the Bitterroot River, and the northern end has the confluence of the Bitterroot River with the Clark Fork River.

Communities within the county include: Florence, Stevensville, Victor, Corvallis, Hamilton, Darby, Conner, and Sula. Hamilton, the largest town and the county seat of Ravalli County, is located at 46°14.8'N and 114°09.6'W at an elevation of 3,570 ft with a population of 5,100.

County Overview

Ravalli County and the Bitterroot Valley has a rich history in both Native American culture and early settlers. The valley was the ancestral home of the Salish tribe of the Flathead nation. The Lewis and Clark Expedition crossed through the Bitterroot Valley in both 1805 and 1806. The first 'white' settlement in the valley was founded in 1841 at St. Mary's Mission, near present-day Stevensville, by Father DeSmet. Fort Owen was established nearby in 1850, and difficult relations occurred between the white settlers and the Salish until 1891, when the native tribes were relocated to the north. Agriculture has always been at the root of survival in the valley. In the early 1900's, the Bitterroot Valley had nearly a million apple trees, and was one of the world's largest producers of MacIntosh apples at that time. Irrigation was provided by about 80 miles of canals. Settlement has continued since that time with a significant increase in population in the last 30 years. The major industries are development and construction, ranching, agriculture, forestry, and tourism.

According to the most recent statistics available from the US Bureau of Census, the population of Ravalli County was estimated at 47,738 in 2023. The county is estimated to be 95.0% white, 4.4% Hispanic and 1.3% American Indian (US Census Bureau, 2023). Ravalli County covers 2,391 square miles and shares county borders with Granite County to the east, Missoula County to the north, Beaverhead County to the southeast and Idaho to the south and west. Ravalli County has federal, state, county and privately owned land. Ownership distribution is approximately 1,160,000 acres federal, 40,000 acres state and 370,000 acres private. US Forest Service and Wilderness occur to both the west and eastside of the valley (Figure 1).

Conservation Easements

Easements have become a very important tool for landowners within Ravalli County that seek to conserve certain attributes and values associated with their land. Montana leads the country with easements and Ravalli County is a significant contributor to that. An important factor in easement popularity in Ravalli County is the Open Lands Programs which came into effect in 2007. The Open Lands Bond Program has conserved about 6,610 acres in Ravalli County by helping to establish an impressive array of easements with an estimated value of \$17,083,800. The Open Lands Bond Program has contributed almost \$4.5 million to the placement of the easements with matching funds coming in

from other sources totaling over \$4.2 million. Participating landowners have donated a total of about \$8.5 million. Figure 2 displays easements and grantees within Ravalli County.

Many of the easements created in Ravalli County have utilized the NRCS's Agricultural Land Easement program and the newly available, Bitterroot Conservation Connectivity Project through Regional Conservation Partnership Program. As easements continue to gain popularity, these NRCS opportunities are an important tool for conservation.

Depending on the parameters contained in the deed language, easement land can be protected for decades or even perpetuity for the purposes of protecting plant or animal habitat, landscape features (e.g. wetlands) or land management activities like farming and ranching. Ravalli County contains a total of 37,984 acres (2%) under some form of conservation easement (Figure 2). Of these, 28,130 acres are associated with private easement holders (land trusts, animal conservation organizations, etc.). The remaining easements are federally owned (2,138 acres) and state or locally owned (7,716 acres). Of the federal acres, the United States Department of Agriculture currently holds 388 acres under easement within the county.

Ravalli County is located in the North American Bird Conservation Initiative's Bird Conservation Region 10 and contains two designated Important Bird Areas: Bitterroot River (27,868 acres total; 66% private ownership) and Blodgett (11,199 acres total; 0% private ownership).

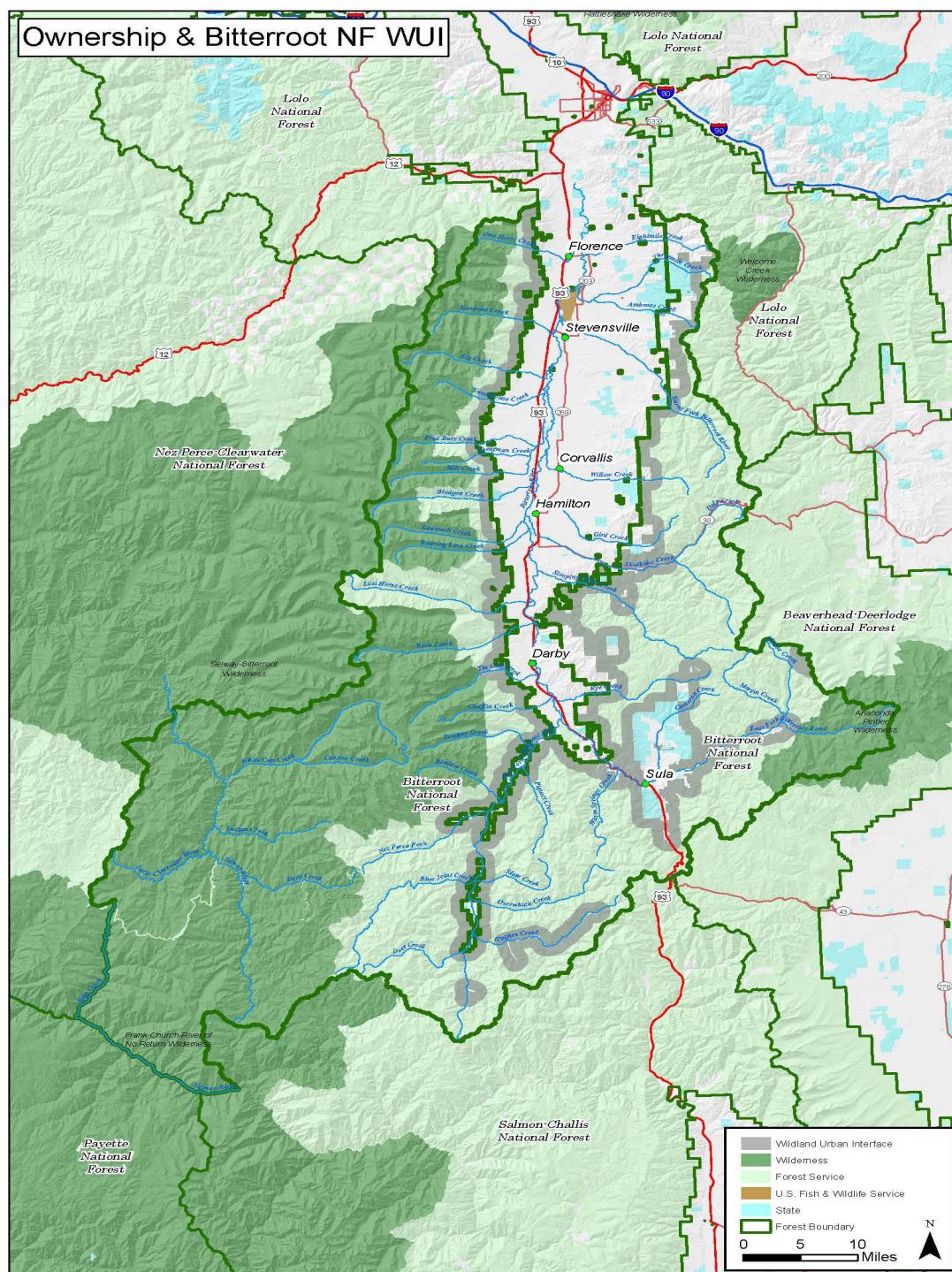


Figure 1. Ownership within Ravalli County

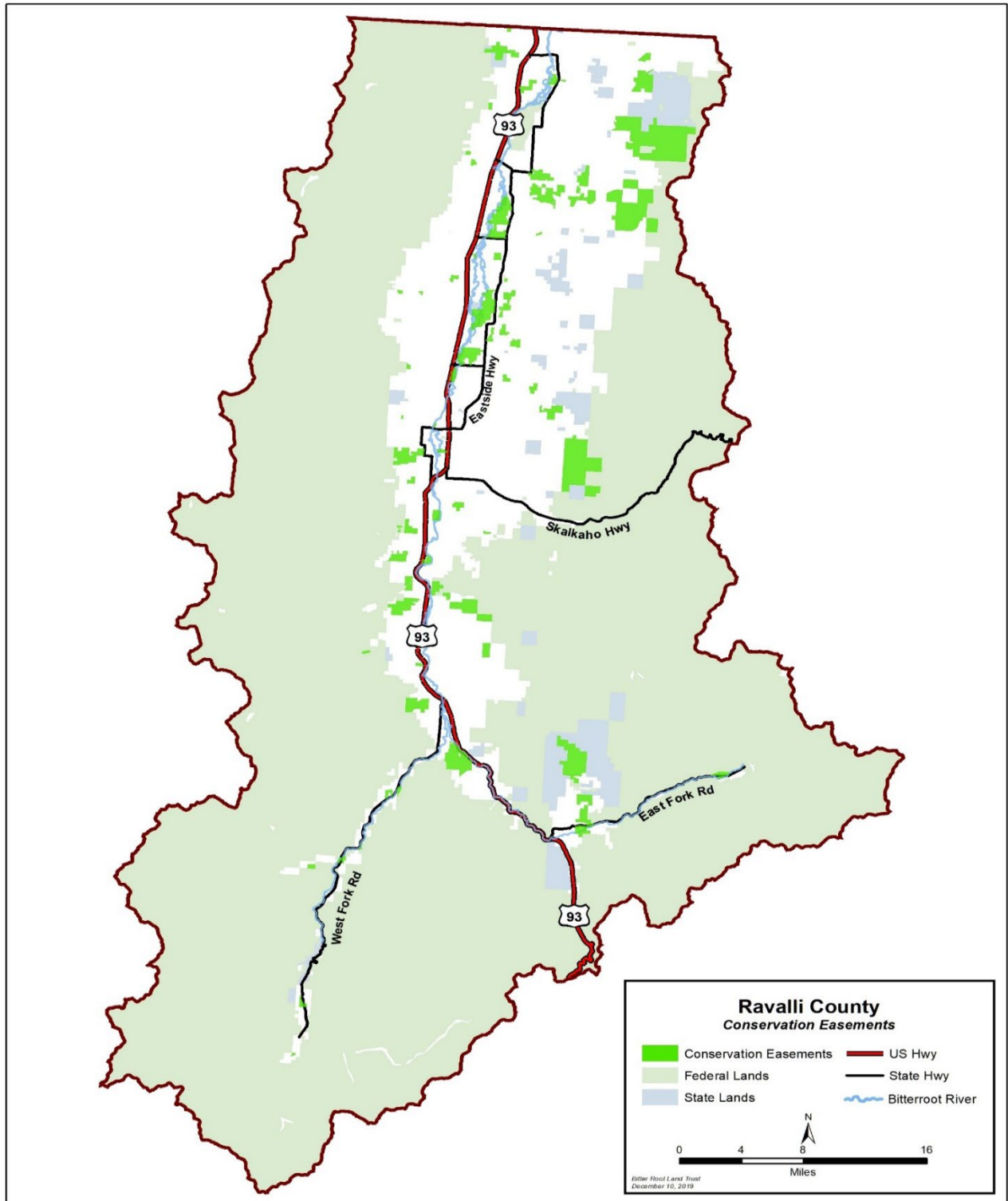


Figure 2. Ravalli County Conservation Easements

Agriculture

Agriculture has always been a critical industry to the economy of Ravalli County. The Montana Agricultural Statistics (USDA 2018) identifies significant agricultural commodities in Ravalli County to be logging and timber, cattle, apples, sugar beets, potatoes, wheat, and dairy. In 2017, there were 1,576 agriculture operations recorded in Ravalli County with an average size of 153 acres (USDA 2017). Most farms, 47%, have an acreage between 10 to 40 acres (USDA 2017).

Table 1: Agricultural Statistics for Ravalli County in 2017: Average Production (USDA 2018)

Commodity	Production
Alfalfa Hay	4.5 ton/ac
Other Hay	2 ton/ac
Cattle and Calves	31,000
Sheep and Lambs	2,400
Swine	300

In addition to these traditional agricultural commodities, smaller ‘truck farms’ have grown in popularity in recent years and provide a variety of vegetables and fruit to the local communities. As the population in Ravalli County grows many farms and ranches have become subdivided. New residents frequently purchase tracts of 5 to 80 acres and establish small farms or ranches. This subdivision of existing properties has fractured some of the

farmland and created a large base of additional smaller-scale agricultural producers. Often these smaller-scale landowners have different viewpoints and goals than those within the traditional agricultural community. The subdivision of existing farms creates additional logistical challenges when working to make resource improvements. Conservation projects completed on smaller, fractured land parcels often require participation of more landowners and neighbors and an increase in coordination between all parties in order to provide more value.

Geology and Soils

The field work for the Bitterroot Valley Soil Survey (Soil Survey Area MT645) was completed from 1947-1951 and published in 1959. This survey was remapped and major revisions were made in the 2000s and released via Web Soil Survey (<https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx>) in 2009. The Bitterroot National Forest Soil Survey Area (MT647) makes up the remainder of Ravalli county. The soil survey field work was done in the late 1990s and early 2000s and released via Web Soil Survey in 2005.

General Nature of the Area

The county contains portions of the Sapphire and Bitterroot mountain ranges. The Sapphire Range to the east; the Bitterroot Range to the west and south. The Bitterroot River runs from the south to the north down the middle of the valley. A small area of the Anaconda Range is in the extreme southeast part of the county.

The county includes about 1,536,899 acres and about 82 percent is forest land, 14 percent range and pasture, 3 percent irrigated land, 1 percent fallow and dry hayland.

The county lies within two Major Land Resource Areas including 44A – Northern Rocky Mountain Valleys and 43B – Central Rocky Mountains.

Parent Material

During the Pleistocene Epoch, approximately 13,000 to 15,000 years ago, a large body of water backed up behind an ice dam that was 2,000 feet high and was filled by the rising waters in the Clark Fork, Flathead, and Bitterroot Valleys. This body of water has been named Glacial Lake Missoula. The lake extended into many of the valleys in western Montana and reached a maximum elevation of about 4,200 feet above sea level, or about 1,000 feet above the present elevation of the city of Missoula. Deposits from the lakebed consist principally of silty material and fine sand but deposits of this material are uncommon in the Bitterroot Valley.

Though the valley was filled many times during the Pleistocene with the waters of Glacial Lake Missoula, most of the evidence of those flooding events have been wiped away by more recent alluvium. Few scattered glacial erratics, boulders that were captured in an “iceberg” and floated across the valley where it ran aground can be found at the flood waters highest elevations. The major portion of the valley is filled with fluvial sediments in the riparian areas, alluvial fans and outwash deposits reaching back towards the mountain ranges.

The Precambrian rocks are among the oldest exposed sedimentary rocks in the world. They are represented by the Ravalli, Piegan, and Missoula Groups, which are collectively referred to as the Belt Supergroup. Most of the soils found in the Sapphire Range areas are underlain by sediment from the “Belt rocks”. These east side soils are medium to fine grained in texture and relatively productive.

The soil of west side of the valley are coarser grained because the source of the parent material is from the Idaho Batholith. This is rock type is primarily granite and gneiss that has been transported in colluvium and glacial till and outwash into the valley. Many of these soils are also very rocky within and on the surface.

Important Farmland

Farmland of Local Importance - These are widely scattered in areas where hay and forage are grown and occur mainly on elevated fans and terraces on both sides of the Bitterroot River.

Farmland of Statewide Importance - These soils occur mainly on the east side of the Bitterroot River on broad alluvial fans and terraces.

Prime if Irrigated – These areas are mainly on low lying alluvial terraces on the southern end of the valley on the east side of the Bitterroot River (refer to Figure 4).

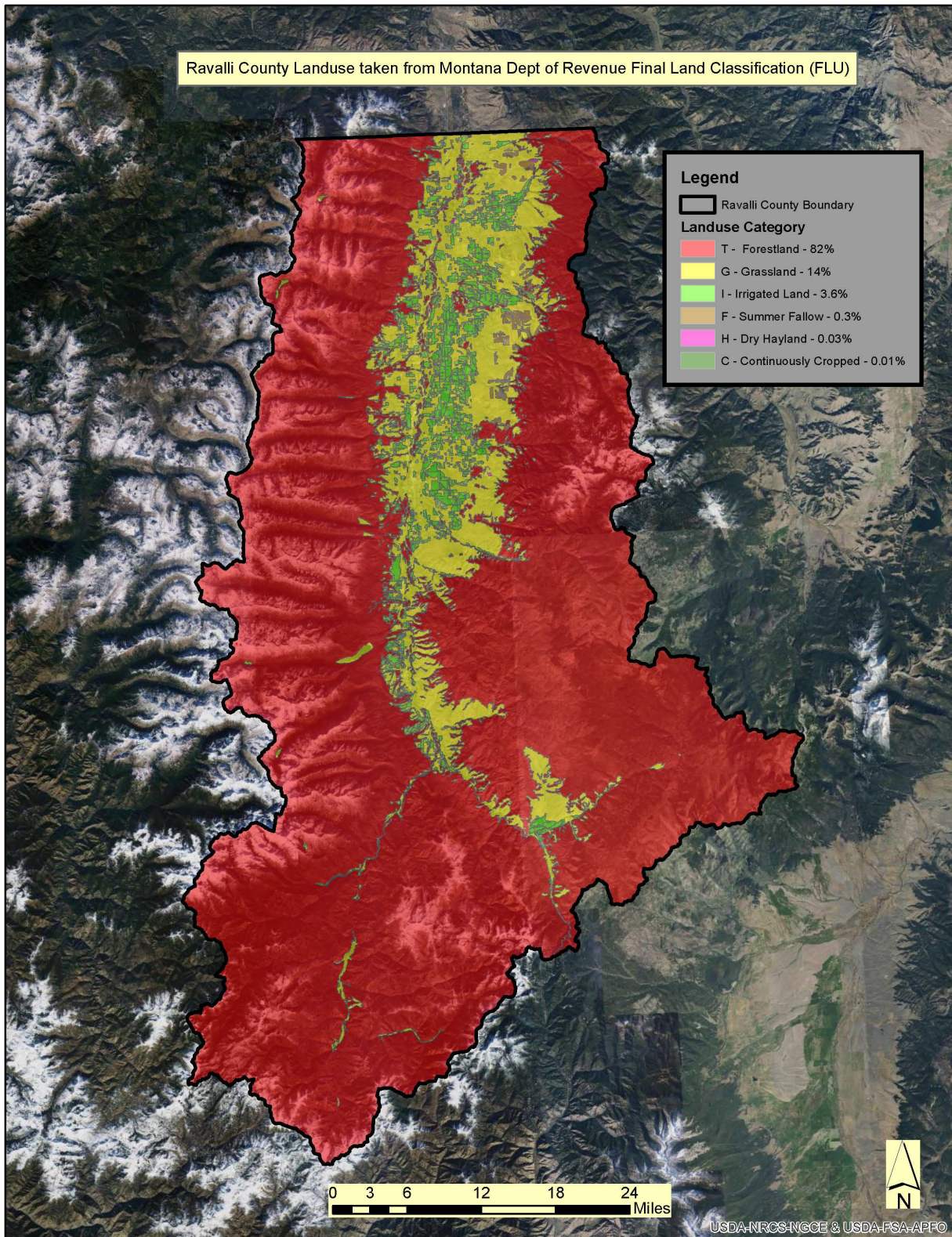


Figure 3: Ravalli County Land Use

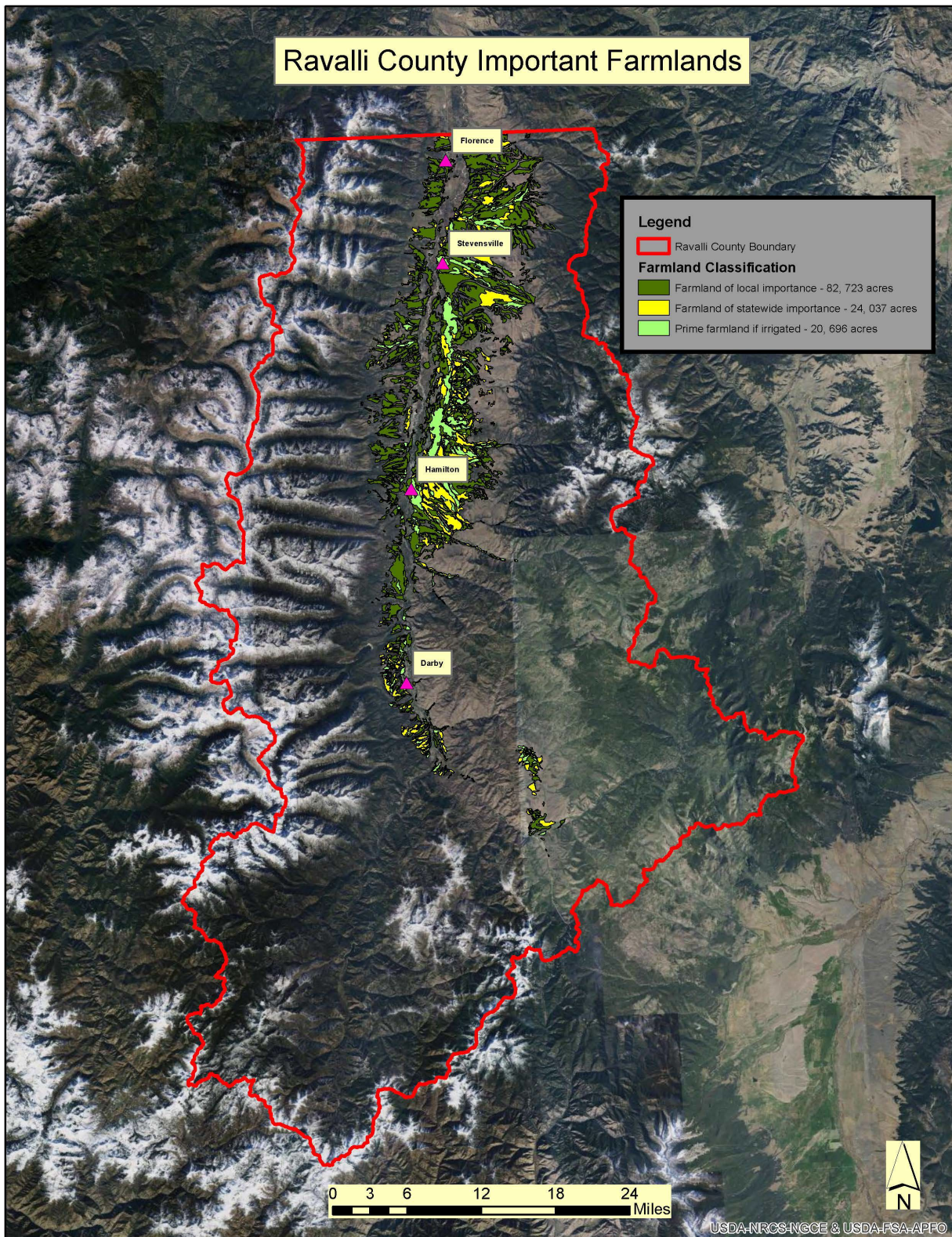


Figure 4: Ravalli County Important Farmlands

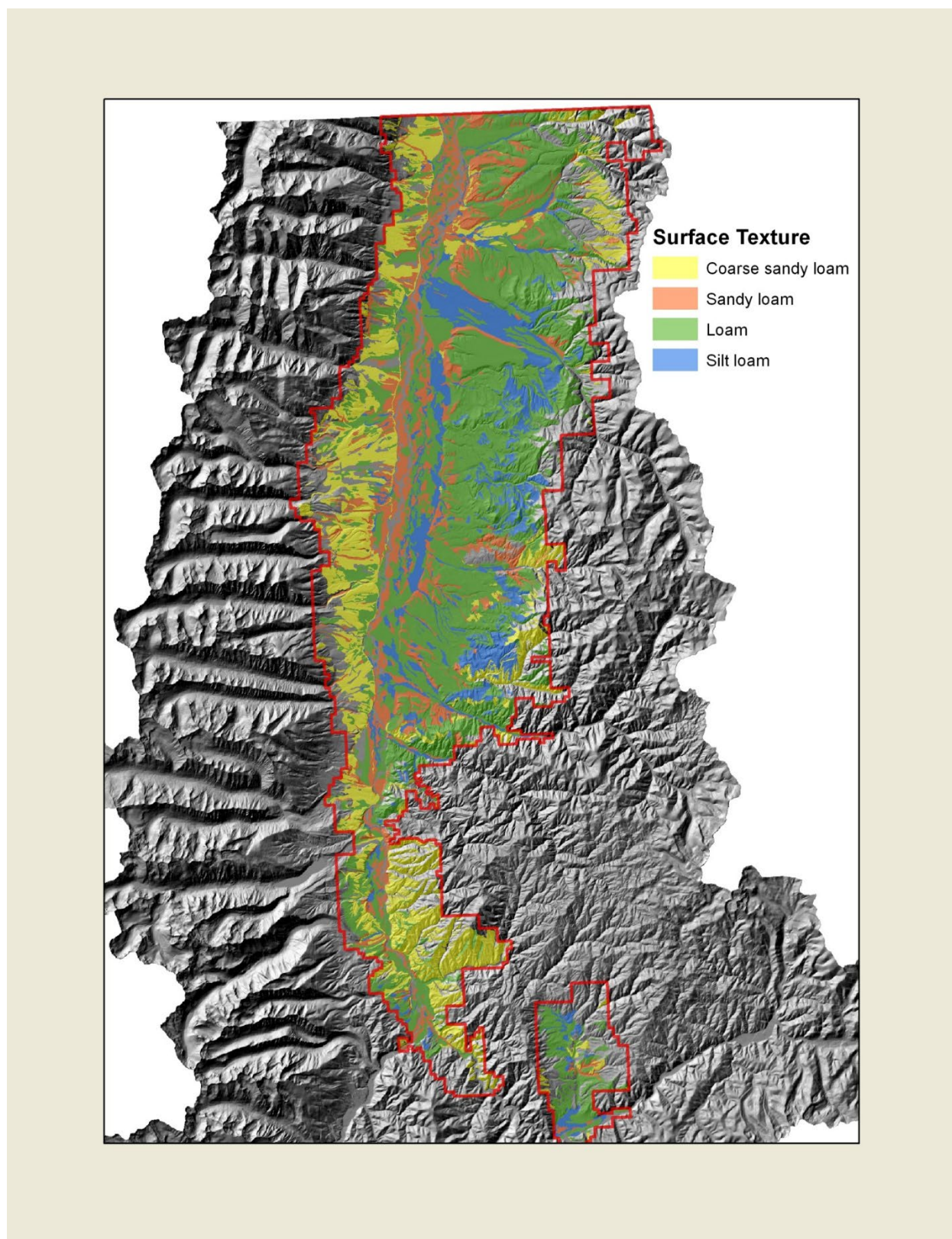


Figure 5: Soil Textures within Ravalli County

Water

Precipitation

Precipitation in Ravalli County ranges from approximately 12 inches in the valleys to over 50 inches on top of some of the highest peaks (NWS 2019). Generally, precipitation is lower in the valleys and increases as elevations rise.

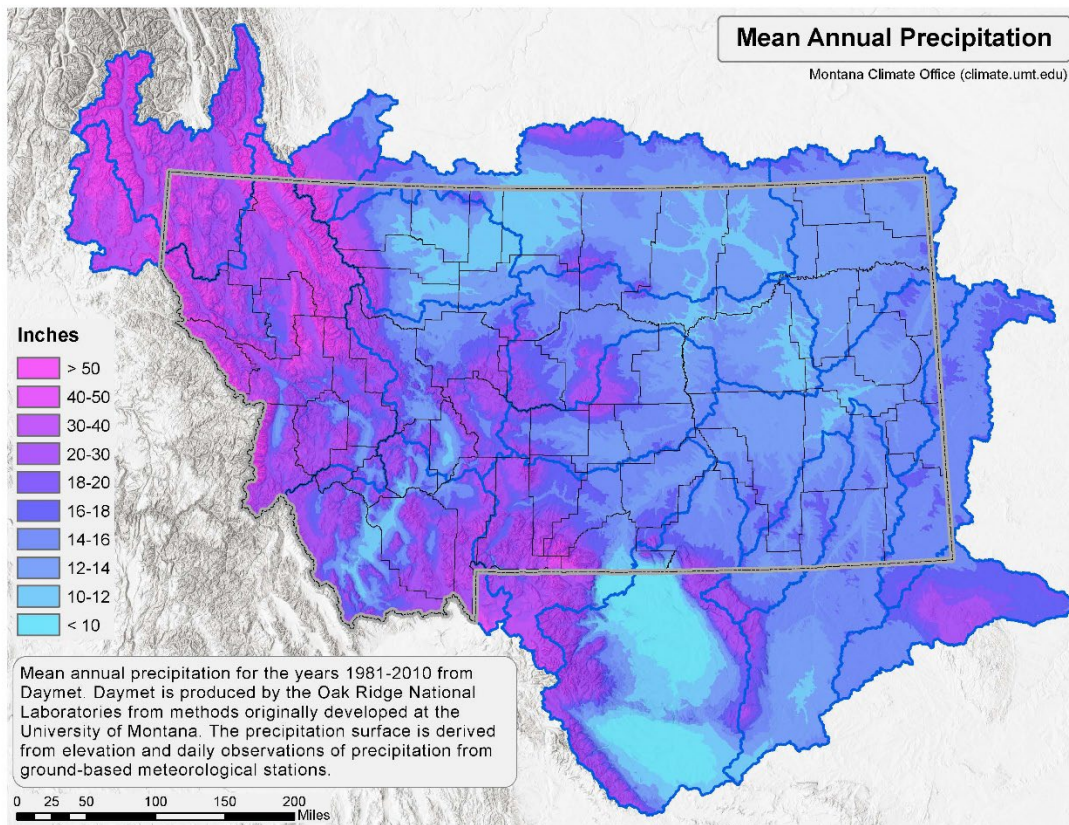


Figure 6: Average Precipitation in Montana

Watershed and Streams

The Bitterroot River is a northward flowing river running through the Bitterroot Valley, from the confluence of its West and East forks near Conner in southern Ravalli County to its confluence with the Clark Fork River near Missoula in Missoula County (approximately 84 miles). The Clark Fork River is tributary to the Columbia River and ultimately, the Pacific Ocean. The Bitterroot River is a Blue-Ribbon trout fishery with a healthy population of native westslope cutthroat trout and bull trout. It is the third most fly-fished river in Montana behind the Madison and Big Horn Rivers (BCC 2019).

The Bitterroot River watershed drains 2,889 square miles in Ravalli and Missoula counties (Ravalli WRS 1958). The Bitterroot Valley averages 7–10 miles wide and is uniquely low gradient for western Montana streams. The river mainstem begins at the confluence of the East Fork Bitterroot River and the West Fork Bitterroot River. From there the mainstem receives numerous tributaries from the Bitterroot Mountains

to the west and the Sapphire Mountains to the east. The watershed is a snowmelt dominated system with large interannual variations in streamflow and peak flows from mid-May to mid-June. The variation is compounded by extensive irrigation withdrawals and upstream reservoir storage at Painted Rocks Reservoir on the West Fork Bitterroot River with the most severely dewatered reaches along 12 miles of the river located between Woodside Crossing near Corvallis and Bell Crossing near Stevensville (Ravalli WRS 1958). The target minimum flow of about 400 cfs at Bell Crossing is met during wet years, but not during very dry years, when streamflows can drop to below 200 cfs (MFWP 2019). In the early 1990's the dam at Lake Como was raised 3 feet and the extra stored water is released into the Bitterroot River after Labor Day each year. Major tributaries include Skalkaho Creek, and Lolo Creek. The Skalkaho Creek drainage sub watershed originates in the Sapphire Mountains and drains 132 square miles and flows 28 miles west-northwest to it confluence with the Bitterroot River. Lolo Creek is the primary tributary in the northern portion of the Bitterroot watershed. Lolo Creek is often completely dewatered in late summer in its lower 2 miles due to withdrawals for irrigation and rural water use.

The Montana Water Quality Report and List of Impaired Waters (known as the Integrated Report) combines reporting information for the Clean Water Act Section 305(b) assessment of water bodies and the Section 303(d) list of water bodies that do not meet water quality standards (DEQ 2021). Water bodies not meeting standards need pollution reduction studies, called Total Maximum Daily Loads (TMDLs). TMDLs also include plans to improve water quality to eventually meet standards. Table 2 lists the stream segments within Ravalli County that have been identified by the DEQ not to meet water quality standards.

Table 2: Stream Segments in Ravalli County on 303d List

Impaired Stream	Water Quality Standard	Length (miles)
Bitterroot River, east and west fork to Skalkaho	Vegetative cover	27
Bitterroot River, Skalkaho creek to eightmile creek	Flow regime modification; Temperature	34
Bitterroot River, eightmile creek to mouth (Clark Fork)	Vegetative cover; Lead; Temperature	24
East Fork Bitterroot, Anaconda-Pintler Wilderness boundary to mouth (Bitterroot River)	Vegetative cover; Sedimentation; Temperature	31
Reimel Creek, headwaters to mouth (Bitterroot River)	Vegetative cover; Sedimentation	8
Laird Creek, headwaters to mouth (Bitterroot River)	Vegetative cover; Sedimentation	6
Gilbert Creek, headwaters to mouth (Laird creek)	Vegetative cover; Sedimentation	2
West Fork Bitterroot River, headwaters to mouth	Substrate alteration; Sedimentation; Temperature	39
Nez Perce Fork Bitterroot River, headwaters to mouth (west fork of Bitterroot River)	Temperature	15
Hughes Creek, headwaters to mouth (west fork of Bitterroot River)	Vegetative cover; Substrate alteration	18
Overwhich Creek, headwaters to mouth (west fork of Bitterroot River)	Temperature	18
Ditch Creek, headwaters to mouth (west fork Bitterroot River)	Sedimentation	3

Buck Creek, headwaters to mouth (west fork Bitterroot River)	Sedimentation	3
Bass Creek, Selway-Bitterroot Wilderness boundary to mouth (Fred Burr creek)	Flow regime modification; Nitrogen; Phosphorus; Sedimentation	5
Kootenai Creek, Selway-Bitterroot wilderness boundary to mouth)	Vegetative cover; Flow regime modification	6
Bear Creek, Selway-Bitterroot wilderness boundary to mouth (Fred Burr creek)	Flow regime modification	8
North channel Bear Creek, headwaters to mouth (Fred Burr creek)	Flow regime modification	4
Mill Creek, Selway-Bitterroot wilderness boundary to mouth (Fred Burr creek)	Vegetative cover; Flow regime modification	9
Mill Creek, Selway-Bitterroot wilderness to the mouth (Fred Burr creek)	Temperature	9
Blodgett Creek, Selway-Bitterroot wilderness boundary to mouth (Bitterroot River)	Flow regime modification	14
Lost Horse Creek, headwaters to mouth (Bitterroot River)	Flow regime modification	21
Tin Cup Creek, Selway-Bitterroot wilderness boundary to mouth (Bitterroot River)	Vegetative cover	8
Sleeping Child Creek, headwaters to mouth (Bitterroot River)	Sedimentation; Temperature	25
Skalkaho Creek, headwaters to mouth (Bitterroot River)	Flow regime modification	28
Willow Creek, headwaters to mouth (Bitterroot River)	Vegetative cover; Sedimentation	17
Ambrose Creek, headwaters to mouth (Threemile creek)	Nitrogen; Phosphorus; Substrate alteration; Sedimentation	12
Miller Creek, headwaters to mouth (Bitterroot River)	Vegetative cover; Sedimentation	18
Threemile Creek, headwaters to mouth (Bitterroot River)	Flow regime modification; Nitrate/nitrite; Nitrogen; Phosphorus; Sedimentation	18
McClain Creek, headwaters to mouth (Sin-tin-tin-em-ska creek)	Sedimentation	7
North Fork Rye Creek, headwaters to mouth (Rye creek-Bitterroot Rive, south of Darby)	Vegetative cover; Nitrogen	7
Lick Creek, headwaters to mouth (Bitterroot River)	Vegetative cover; Aluminum; Chlorophyll-a; Phosphorus; Sedimentation	7
Muddy Spring Creek, headwaters to mouth (Gold Creek)	Nitrate/Nitrite; Sedimentation	2
Rye Creek, north fork to mouth (Bitterroot River)	Vegetative cover; Phosphorus; Nitrogen; Sedimentation	6

North Burnt Fork Creek, confluence with south burnt fork creek to mouth (Bitterroot River)	Nitrogen; Phosphorus; Sedimentation	11
Sweathouse Creek, Selway-Bitterroot Wilderness boundary to mouth (Bitterroot River)	Vegetative cover; Flow regime modification; Phosphorus; Sedimentation	8
Lolo Creek, Mormon Creek to mouth (Bitterroot River)	Flow regime modification; Substrate alteration; Sedimentation	3
Lolo Creek, Sheldon Creek to Mormon Creek	Substrate alteration; Sedimentation	14
Lolo Creek, headwaters to Sheldon creek	Substrate alteration; Sedimentation	14
South Fork Lolo Creek, Selway-Bitterroot wilderness boundary to mouth (Lolo creek)	Flow regime modification; Substrate alteration	7
Granite Creek, headwaters to mouth (Lolo creek)	Vegetative cover; Fish passage barrier; Sedimentation	10
West Fork Lolo Creek, headwaters to mouth (Lolo Creek)	Vegetative cover; Sedimentation	8
Lost Park Creek, confluence with east fork Lolo creek)	Vegetative cover; Fish passage barrier	5

Bitterroot Watershed TMDL Project Area

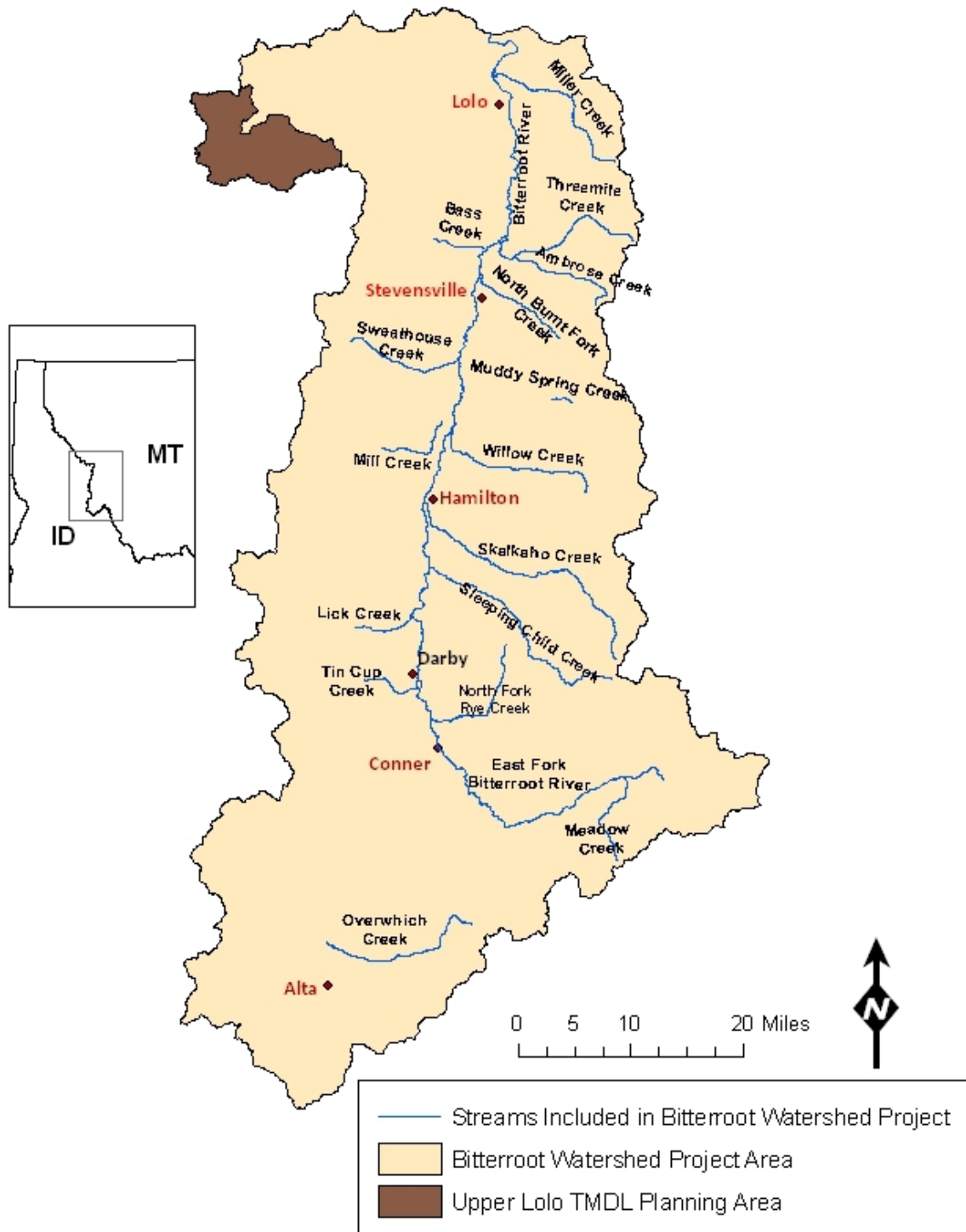


Figure 7: TMDL Watersheds in Ravalli County

Irrigation

There is an estimated 241,000 acres of land in agricultural production in Ravalli County (MSU 2023). In support of this production, there is an extensive system of stream diversions ditches that has been developed throughout the county to reroute water to provide irrigation. While some of the water is delivered in pipes, much of the water is delivered through open ditches. Table 3 lists those irrigation districts organized and presented in the Ravalli County Water Resource Survey (1958).

Table 3: Irrigation Districts within Ravalli County
Bass Lake Reservoir
Big Creek Lakes Reservoir Association
Bitter Root Irrigation District (BRID)
Blodgett Creek Irrigation District
C&C Ditch Users Association
Canyon Creek Irrigation District
Carlton Creek Irrigation District
Charlos Irrigation District
The Corvallis Canal
Daly Ditch
Etna Ditch
Fred Burr Creek Water Users' Association
Lomo Irrigation District
Mill Creek Irrigation District
Rock Creek Water Company
Sunset Irrigation District
Supply Ditch Association
Tin Cup Water Company
Union Ditch Company
Ward Irrigation District
Webfoot Ditch Company
West Fork Water Users Association
Woodside Irrigation Company

The Montana Department of Natural Resources and Conservation (DNRC 2014) evaluated demand trends for irrigation in western Montana. General trends in irrigated agriculture over the last twenty years in the western Montana basins can be surmised by utilizing data from the Montana Department of Revenue Final Lands Unit (FLU), National Agricultural Statistics Service (NASS), Agricultural Census and permits granted by DNRC for irrigation (DNRC 2014). These resources indicate that irrigated acres have been static or on the decline in the Clark Fork Basin for the last twenty years. A review of irrigation water use permits granted by DNRC over the last twenty years indicates that very limited development has occurred (DNRC 2014). Agricultural demand of water over the next 20 years in the Clark Fork basin is expected to remain near current levels. Trends in agriculture and water rights permitting suggest that expansion of irrigated agriculture is not likely. Climate modeling indicates the potential for minor increases in evapotranspiration in the basin. Water resources for new agricultural development in the Clark Fork basin are limited by senior irrigation rights, hydropower water rights, instream flow rights and basin closures.

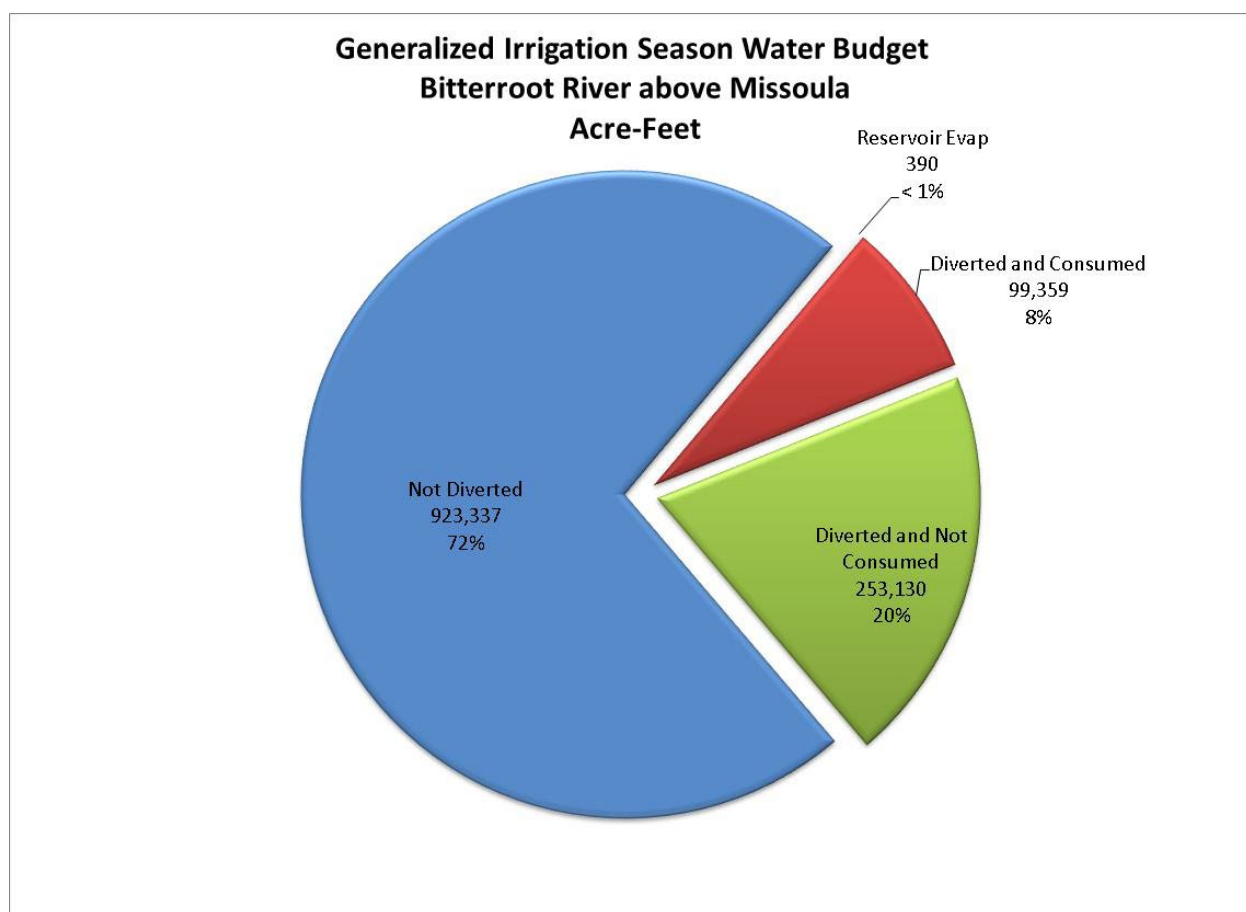


Figure 8: Generalized Irrigation Season Water Budget (DNRC 2014)

Groundwater

Groundwater in Ravalli County has been studied through groundwater assessments and modeling completed by the Montana Bureau of Mines and Geology (MBMG 2013). The MBMG found that the annual groundwater-level fluctuation patterns vary across the Lolo-Bitterroot area. Groundwater-level changes are related to seasonal streamflow and climate variability, re-charge from irrigation practices, long-term (yearly to decadal) climate variations, and groundwater pumping (usage). Some hydrographs display influences from multiple factors, such as high-frequency seasonal water-level fluctuations superimposed on slowly changing multi-year climate patterns. Common patterns of water-level change that occur in the Lolo-Bitterroot Area include:

(a) The “runoff/stream recharge” response where water levels rise and fall in concert with streamflow and snowmelt runoff.

(b) The “irrigation” response is where groundwater levels abruptly rise in late spring or early summer, stay elevated throughout the summer when irrigation is occurring, and then decline through the winter and into early spring. The irrigation response is the most common water-level pattern in the Lolo-Bitterroot area, occurring throughout the Bitterroot and Missoula valleys and in many other areas where irrigation water is diverted to canals and delivered to fields. Annual water-level change in irrigation-responsive groundwater systems ranges from a few to tens of feet.

(c) The “pumpage” response occurs where groundwater levels are affected by pumping; the response is characterized by sharply downward groundwater-level changes during summer months, usually in response to irrigation withdrawals. Regional pumpage response may be followed by long recovery periods after pumping ceases. Pumpage responses may be as little as a few feet in non-pumped wells that provide groundwater data documenting widespread groundwater use across an area, to many feet if the groundwater withdrawals are near or in the measured well.

Wetlands

Wetlands are amongst the most important and beneficial ecosystems on the landscape. Wetlands provide critical biological, ecological, and economic benefits including flood attenuation, water filtration, carbon sequestration, and drought resiliency. Further, wetlands are home to 31% of all U.S. plant species, half of all North American bird species use wetlands as some point in their lifecycle, and nearly half of all threatened or endangered species in the US are also associated with wetlands. Ravalli County contains a diverse array of wetland types. A total of 46,641 acres of wetlands can be found within the county borders. Of these, 14,052 acres are palustrine (lacking flowing water), 2,997 are lacustrine (lake associated) in nature, 5,132 acres are riverine (river associated), and 24,460 acres are located within riparian zones.

Typical wetlands within Ravalli County are riparian wetlands located within the valley floor. Kudray (2008) evaluated wetlands within the Bitterroot Valley and confirmed that wetlands and wetland associated ecological functions are concentrated in the valley bottom and along riparian areas. Common activities within the valley that impact wetlands are armoring banks with riprap which may limit the ability of the river to maintain the same number of wetlands on the floodplain because high flow events are essential in creating and renewing wetlands (Kudray 2008). Beavers have also been a significant factor in creating and maintaining wetlands within Ravalli County. Beavers are a keystone species with a disproportionate effect on ecological functions compared to their numbers. Beaver activity improves water quality through sediment retention, influences on nutrient cycling and decomposition, and hydrologic modifications. Beavers create wetlands that would otherwise be rare in mountainous terrain, thus providing important habitat for many other wetland-dependent species (Kudray 2008).

Air and Energy

Air Quality

Ravalli County is occasionally in non-compliance with Environmental Protection Agency air quality standards. The main reason for non-compliance is particulate matter associated with forest fires, woodstoves/fireplaces and open burning. Ravalli County does not have its own Air Quality District and Montana law prevents local regulation and enforcement of without such a district.

Utilities

The two distributors of electricity in Ravalli County are Northwestern Energy and Ravalli Electric Co-op. Solar power and other energy efficient approaches are increasing in popularity, however, cost of installation is often the limiting factor. Credit and grant programs are available to assist in off-setting cost of solar conversion, but funding is often inconsistent. Distribution of natural gas is administered by Northwestern Energy. Propane is a common source of energy and there a variety of commercial and residential distributors.

Wildlife

Ravalli County is home to a wide variety of fish and wildlife species. Many species of ducks and waterfowl are common along with osprey (*Pandion haliaetus*), bald eagles (*Haliaeetus leucocephalus*) and great blue herons (*Ardea herodias*). Elk (*Cervus canadensis*), moose (*Alces alces*), and both white-tailed deer (*Odocoileus virginianus*) and mule deer (*Odocoileus hemionus*) frequent the Bitterroot River and other riparian areas for water and to graze. Montana Fish, Wildlife and Parks has identified priority areas for big game winter range and migration corridors for pronghorn, elk, and mule deer. The Anaconda Range to Big Hole, Bitterroot, and Upper Clark Fork Watershed Priority Area occurs in Ravalli County (MFWP 2019). Common predator species include: black bears (*Ursus americanus*), mountain lions (*Puma concolor*), wolves (*Canis lupus*), coyotes (*Canis latrans*) and red foxes (*Vulpes vulpes*). The most notable wildlife viewing locale along the Bitterroot River is the famous US Fish and Wildlife Service (USFWS) Lee Metcalf National Wildlife Refuge, named for U.S. Senator Lee Metcalf, a pioneer of the conservation movement.

A renowned fly fishing stream, the Bitterroot River mainstem and many of its tributaries are important migratory corridors and spawning habitat for native westslope cutthroat trout (*Oncorhynchus clarki lewisi*) and bull trout (*Salvelinus confluentus*). Other native fish include mountain whitefish (*Prosopium williamsoni*), longnose sucker (*Catostomus catostomus*), slimy sculpin (*Cottus cognatus*), and longnose dace (*Rhinichthys cataractae*).

The Bitterroot River is managed as a wild trout fishery, emphasizing natural reproduction. The basin is also a focus area for native fish recovery efforts (MFWP 2019). The Bitterroot River is home to 10 native fish species including bull trout, westslope cutthroat trout, mountain whitefish, northern pike minnow, longnose dace, redbelly shiner, peamouth, longnose and largescale sucker, and Columbia slimy sculpin.

Irrigation diversions and dewatering of streams can pose a barrier to fish migration and entrain fish in pumps, pipes and irrigation canals. Fish entrainment results in mortalities that may impact fish populations; which may be a concern for westslope cutthroat trout (a species of concern) and bull trout (listed threatened species) in the Bitterroot. Diversions with headgates can entrain more fish due to creating a barrier for fish movement back to host streams. To prevent fish from swimming into irrigation diversions fish screens can be used. Most of Montana's irrigation canals lack fish screens due to cost and other barriers to installation.

Rainbow trout (*Oncorhynchus mykiss*) and brown trout (*Salmo trutta*) are popular game fish but are not native to the Bitterroot River watershed and pose significant threats to native trout. In Montana, rainbow trout are only native to the upper Kootenai River in the state's extreme northwest corner. Non-native rainbow trout pose one of the greatest threats to cutthroat trout by hybridization, producing "cutbows". In addition, non-native brook trout (*Salvelinus fontinalis*) often displace native cutthroat trout and bull trout in small streams.

Federally Listed Species

The USFWS's Ecological Services Division lists the following threatened species as present within areas of Ravalli County: bull trout (*Salvelinus confluentus*), Canada lynx (*Lynx canadensis*), grizzly bear (*Ursus arctos horribilis*), Whitebark Pine (*Pinus albicaulis*), and yellow-billed cuckoo (*Coccyzus americanus*) (Appendix B). One candidate species (Monarch butterfly, *Danaus plexippus*) and one proposed species, the North American Wolverine (*Gulo gulo luscus*) are also considered present. None of Montana's federally endangered species are known to reside within the county.

Bull trout require specific habitat needs and are more vulnerable to environmental degradation than are other fish species. They require clean, cold, complex and connected habitat (the four C's). Bull trout populations have declined due to habitat loss and degradation from a variety of human-caused factors. Bull trout are rare in the mainstem of the Bitterroot River (MFWP 2019). Fluvial (river dwelling) forms exist in the East and West Forks but are uncommon. Adfluvial (lake dwelling) lifeforms exist primarily in Painted Rocks Reservoir. Resident lifeforms exist in many smaller tributaries throughout the drainage (MFWP 2019).

A plethora of high mountain lakes, irrigation reservoirs, lakes and streams support abundant fish populations. However, quality of habitat has been degraded by development activities. Water diversion structures block access to spawning grounds over much of the original ranges of bull trout and cutthroat trout. Many streams are dewatered each year due to overpreparation and irrigation uses.

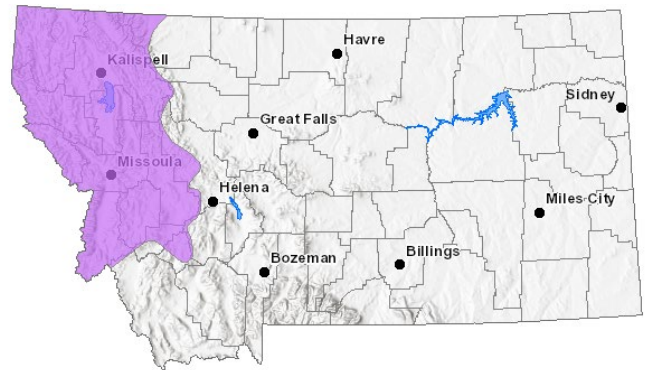


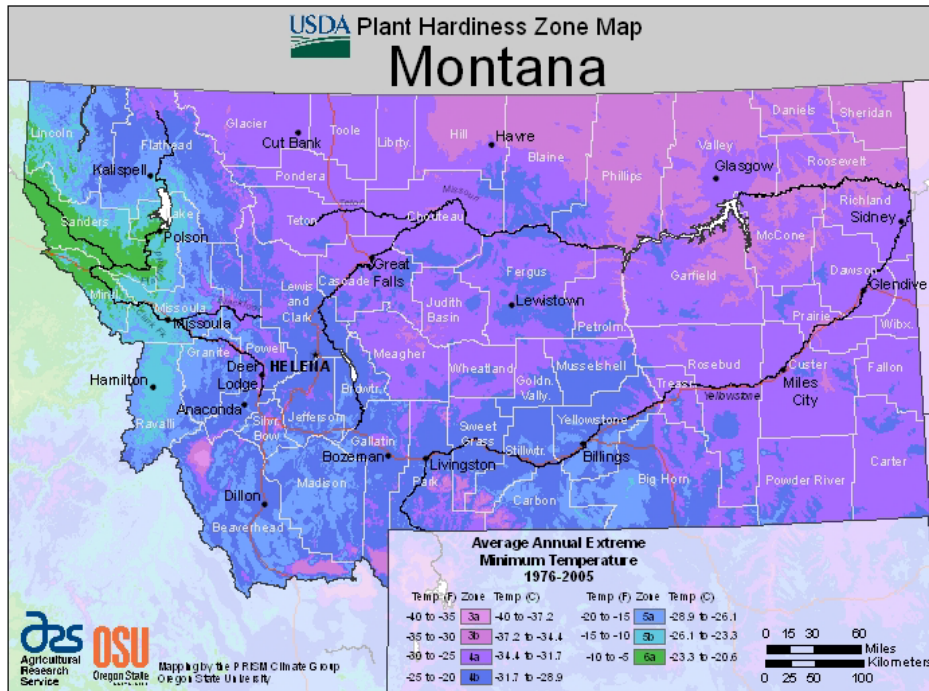
Figure 9: Current range of bull trout in Montana (Montana Field Guide)

State Animal Species of Concern

According to the Montana Natural Heritage Program, Ravalli County contains 85 state listed animal Species of Concern (2024). These species consist of 13 mammal species, 46 bird species, 2 reptile species, 3 amphibian species, 3 fish species, and 18 invertebrate species. Habitats generally associated with these species are diverse including both terrestrial and aquatic types and comprise mountain streams, rivers, lakes, grasslands, riparian forests, conifer forests, wetlands, and sagebrush. More specialized species on the list can be found only in association with Ravalli County's waterfalls, rocky side slopes, alpine, and forested habitat caves.

Vegetation Communities

Ravalli County is fortunate to have a variety of vegetation communities and land uses. The county is located within plant hardiness zone 5b, which is relatively mild for Montana (Figure 10). Common land uses within Ravalli County include: pastureland, cropland, rangeland, forestland and riparian.



large quantities of livestock. Continuous, season-long grazing and over stocking has led to significant reductions in rangeland quality over the past 120 years. As bunchgrasses declined, they were replaced with less desirable grasses, shrubs and weeds. Exotic species such as timothy, smooth brome, orchardgrass, tall fescue, crested wheatgrass and many others were planted for hay and pasture and these plants displaced native rangeland vegetation in some areas, mostly in valley bottoms. Knapweed, sulphur cinquefoil, whitetop, leafy spurge, goatweed, Dalmatian toadflax, thistles and other noxious weeds are common within the rangelands of the county. These plants often out-competed many native grasses. Annual grasses are also outcompeting native species and include, cheatgrass, Japanese brome and most recently ventenata. The short-lived perennial grass bulbous bluegrass is also a common invader. Poor grazing management, invasive species, and changes in fire regime are responsible for rangelands moving away from climax plant communities.

Forestland

Ravalli County falls within the West-Central Montana Forest Region, characterized by larch and ponderosa pine with grand-fir locally dominant as well as warm, dry Douglas-fir forest habitat types. As elevations rise, forest types include lodgepole pine, on up to subalpine fir. Ravalli County is 82% forested. Sixty-nine percent of forest acres held in federal and state ownership, leaving about 82,357 acres in private ownership. Ravalli has 395,941 acres in the wildland urban interface, 262,239 of which are USFS.

The lowland ponderosa pine forest natural fire regime would be frequent, low intensity fires with fire free intervals of 5 to 25 years. In the Douglas-fir forests, the natural, uninhibited fire regime would be fire free intervals of about 45 years, with low to moderate intensity fires that maintained forests in a state where the tree species present, spacing between trees, and understory vegetation are well adapted to fire in healthy state. Lodgepole pine forests experience a longer duration fire interval from 100 to 500 years and are stand replacing. A century of fire suppression and manipulation of the natural disturbance mechanisms leave many forests, both public and private, in a state that fires quickly surpass the historic norm and become high severity, stand replacement fires. The wildfire threat and trend toward more catastrophic fire to the urban interface is common knowledge. The county has a Community Wildfire Protection Plan that discusses this topic in detail, so it is not repeated here (<https://ravalli.us/668/CWPP>).

Forest insect and disease issues are ever-present and in a constant state of flux. The current culprits in Ravalli County include: bark beetles, spruce budworm, alarming mistletoe infestations, and root rot. The manipulation of disturbance mechanisms has increased the number of trees per acre far beyond the natural system sustainability and skewed the forest tree species composition toward those more susceptible to insects, disease, and wildfire. This situation complicates and limits forest management options.

The RCLWG that helps guide NRCS priorities recognizes the current state of forests as being far from historical state of resilience and have prioritized forest degradation as a resource concern. The BCD, RC&D, DNRC and USFS stand ready to collaborate with the NRCS in identifying and delivering focused conservation efforts.

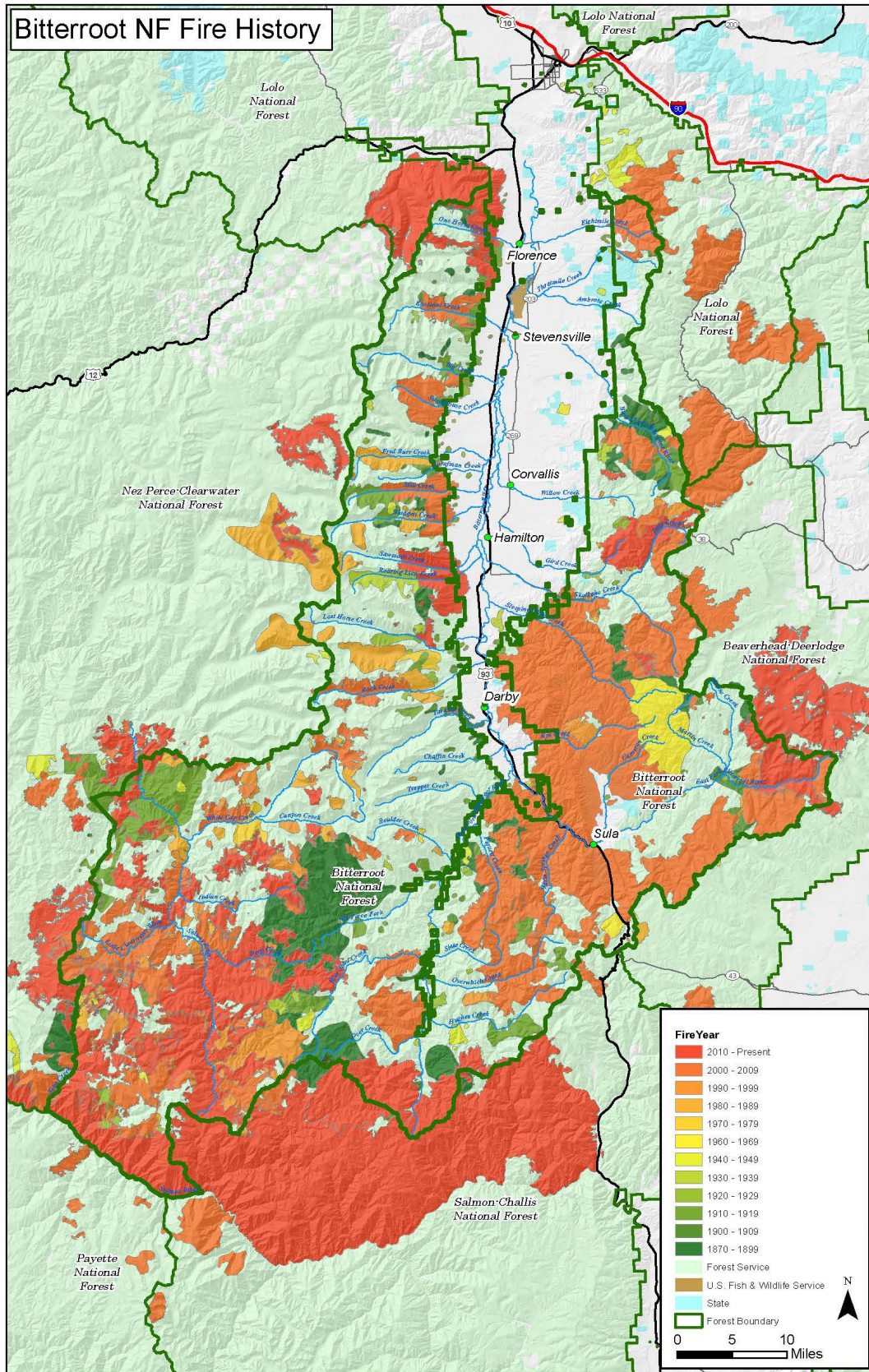


Figure 11: Fire History in Ravalli County

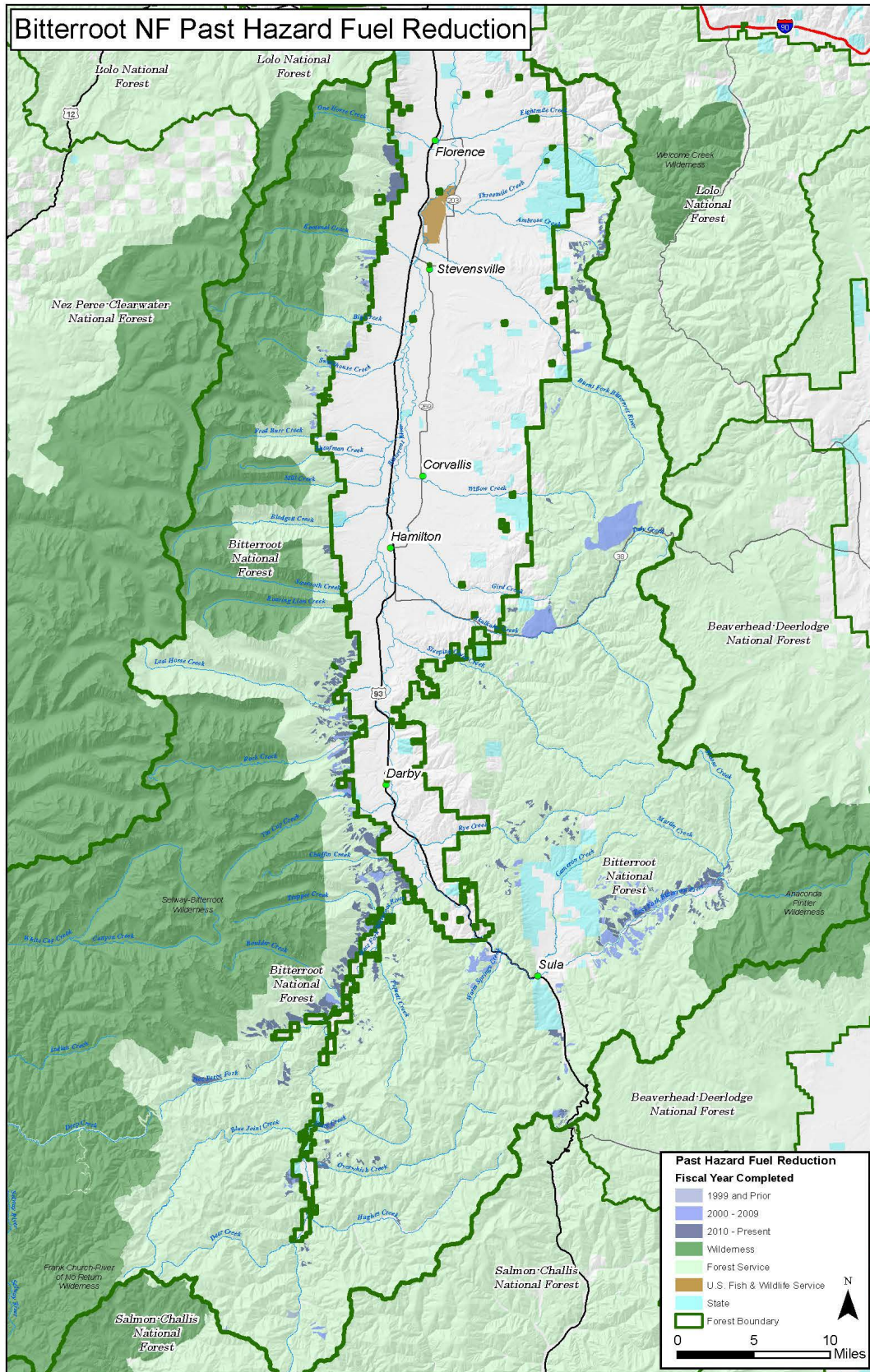


Figure 12: Past Hazard Fuels Reduction Projects

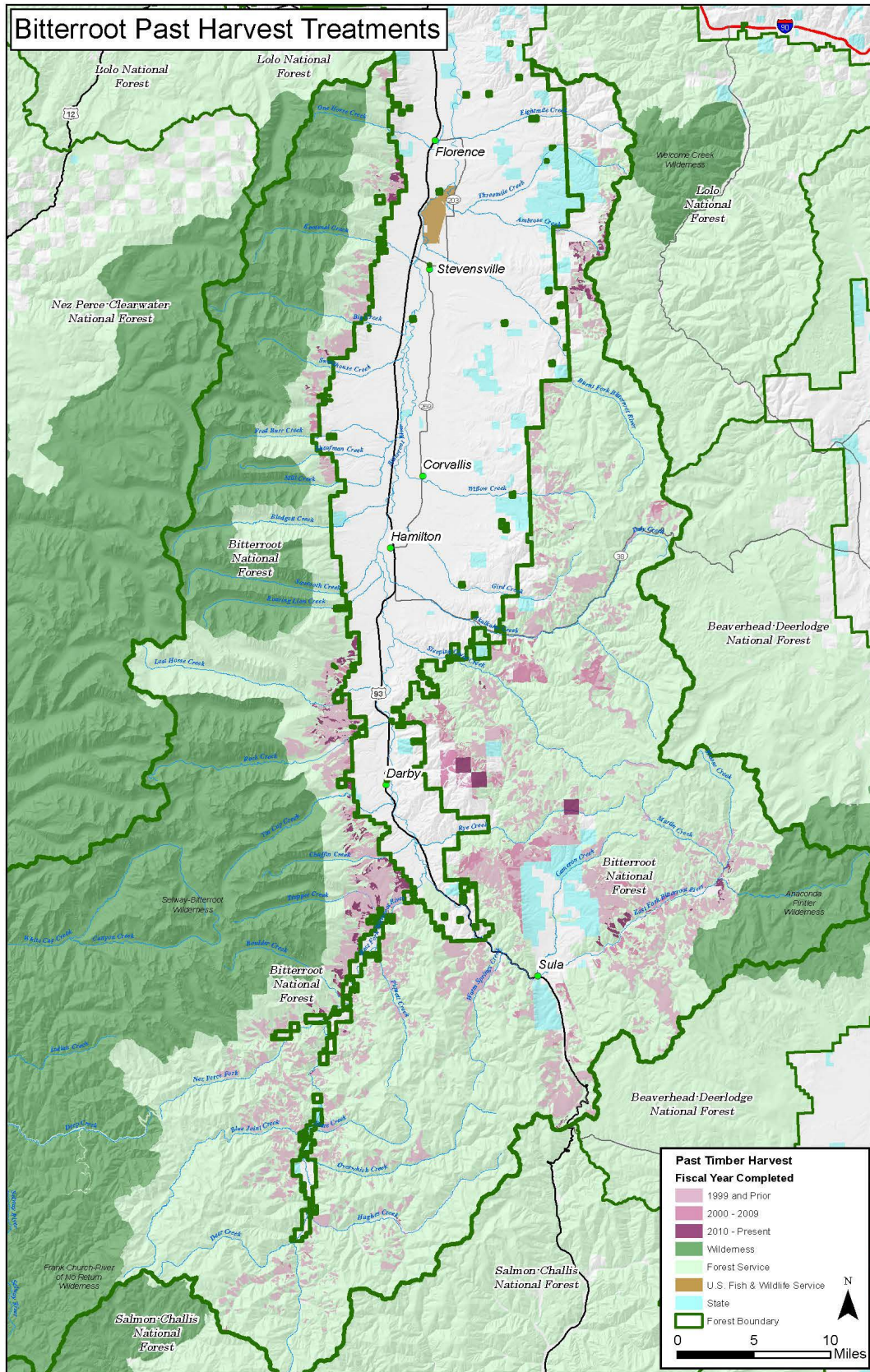


Figure 13: Past Timber Harvest Projects

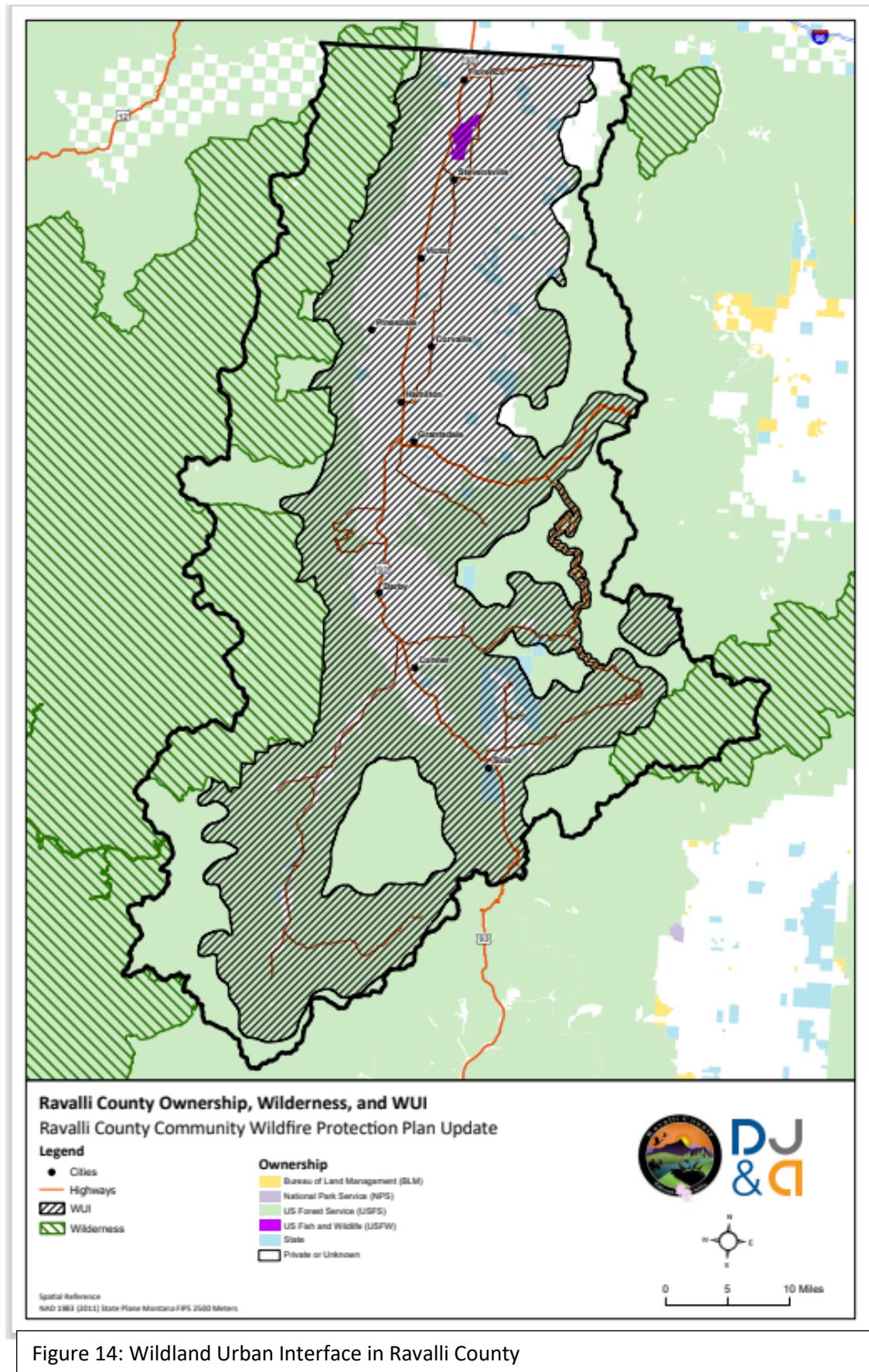


Figure 14: Wildland Urban Interface in Ravalli County

Riparian

Riparian zones play a critical role in our watersheds. From flood control to habitat and recreation, these areas are some of the most important within the landscape. Many of our partners have taken a leading role in preserving and restoring riparian zones.

Riparian vegetation and wetlands can be extremely effective at buffering streams, rivers, and lakes from nonpoint sources of pollutants. Often, poor water quality is associated with areas of low riparian vegetation cover and low wetland abundance. Many nonpoint sources of pollutants are derived from land use activities that can negatively influence the riparian areas and wetlands. While some sources of nonpoint source pollution can be sub-surface or difficult to observe on the ground, it is possible to use publicly-available imagery to account for varying riparian vegetation cover and certain types of land use activities that may negatively impact riparian vegetation and wetlands.

Montana Department of Environmental Quality recently completed an assessment and evaluation of riparian areas in Bitterroot (MDEQ 2019). Figure 16 and the list below highlights their findings:

Streams with <25% low riparian cover:

- Willow
- Miller
- McClain
- Lick
- Ambrose
- West Fork Lolo
- Granite

Streams with >75% high riparian cover:

- Tin Cup
- Rye Creek Watershed
- Lost Horse
- Kootenai
- Blodgett
- Bear
- Overwhich

Others important notes:

- North Burnt Fork (~40% low riparian cover)
- Most unevaluated reaches are in USFS property, where fine scale source assessment work is routinely done

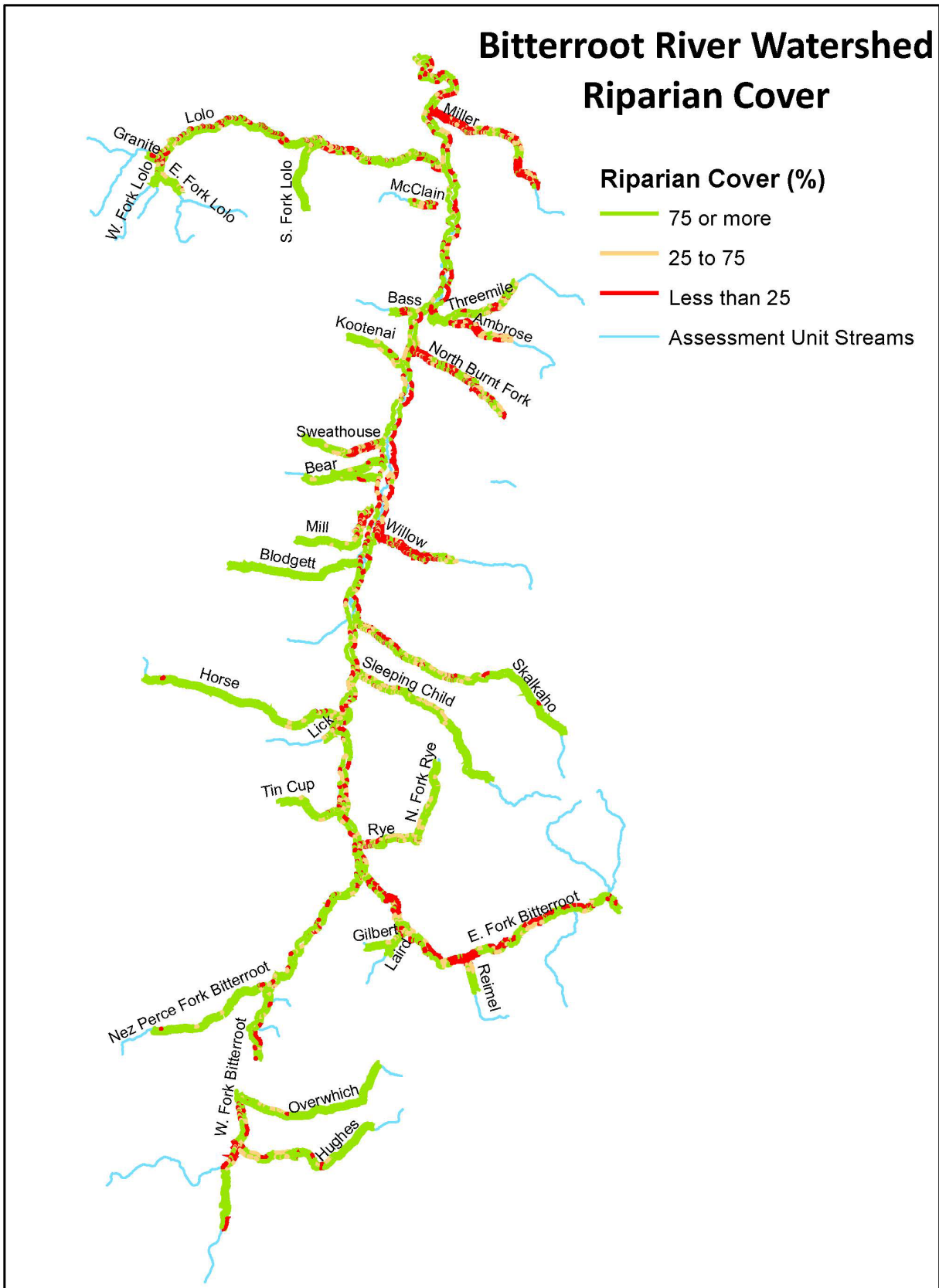


Figure 15: Riparian Cover in Ravalli County

Noxious Weeds

Like many counties in western Montana, Ravalli County has a wide variety of state listed noxious weeds. However, identification and treatment of new and emerging threats should be prioritized. Priority 1 species identified in Ravalli County: knotweed complex, purple loosestrife, rush skeleton weed, and blueweed. There are a number of Priority 2 and 2 species common in Ravalli County. Refer to Appendix B for a list of noxious weeds that occur within Ravalli County. Ravalli County weed management plan calls for integrated weed management strategies and methods including treatment, control, prevention, education, mapping, and chemical control.

State Plant Species of Concern

A total of 101 state listed plant Species of Concern can be found within Ravalli County. They are generally comprised of 7 fern species, 1 conifer, 47 dicot species, 15 monocot species, 17 bryophytes, and 7 lichens. Most of these species subsist in Ravalli's general habitat types (grasslands, riparian, forests) but a few specialized species can only be found in more limited habitats including rock crevices, alpine, and fens.

Section III. Conservation Activity Analysis

NRCS work in Ravalli County has historically focused on meeting the needs of the RCLWG's priority. A summary of common practices that have been installed in Ravalli County between 2004 and 2018 can be seen in Table 4. Over the past 15 years (2004 thru 2019), the NRCS in Ravalli County has focused heavily on irrigation-related practices. During this time, 59 irrigation projects have been installed. High tunnels have also been a commonly contracted practice with 23 installed during the most recent 15-year period. Other common practices include grazing-related practices such as weed control and fencing. Cover crop and nutrient management have been common practices associated to cropland with 23 and 53 projects completed, respectively. Forest stand improvements have also been a popular conservation practice with 59 completed in the last 15 years. Multiple other practices have been contracted to lesser extents.

Table 4. NRCS Hamilton Field Office EQIP implementation of commonly applied practices from 2004 to 2019.

Practice Name	Unit Type	Applied Amount	Number of Projects
Herbaceous Weed Treatment	Ac	1,667	114
High Tunnel System	SqFt	40,830	23
Cover Crop	Ac	11.7	23
Diversion	Ft	2446	4
Fence	Mi	6.1	22
Fuel Break	Ac	22.4	7
Woody Residue Treatment	Ac	206.2	16
Irrigation Pipeline	Mi	7.5	35
Irrigation System, Microirrigation	Ac	14.1	17
Sprinkler System	Ac	1542.1	42

Practice Name	Unit Type	Applied Amount	Number of Projects
Irrigation Water Management	Ac	949.3	41
Forage and Biomass Planting	Ac	392.3	8
Livestock Pipeline	Ft	3568	9
Prescribed Grazing	Ac	165.8	5
Pumping Plant	No	42	29
Spring Development	No	4	4
Structure for Water Control	No	40	36
Nutrient Management	Ac	288.6	53
Tree/Shrub Establishment	Ac	119.3	19
Watering Facility	No	13	9
Forest Stand Improvement	Ac	766.1	59

Section IV. Natural Resource Issues to be Addressed

Throughout 2024 the Hamilton Field Office has met with partners and evaluated opportunities to expand partnerships for the betterment of conservation. Listed below are some of the most pressing resource issues identified by NRCS and our partners. The RCLWG has been meeting regularly since the implementation of Montana Focused Conservation and discussing resource concerns and focus for future efforts.

Forestry

Forest health and fire risk is a growing concern in the Bitterroot Valley on both private and public lands. The 2016 Roaring Lion fire was a wake-up call to residents in Ravalli County and since that time, there has been increased collaboration between natural resource management agencies to work together and improve the health of the forest on both sides of the fence. Forest site potential is not being realized in most areas due to fire suppression and a lack of management over the last 100 years. Implementation of management practices are needed to improve forest health and resilience to insects, diseases and fire as well as improve wildlife habitat. Forest Stand Improvement practices should be promoted within the Wildland Urban Interface (WUI) within the Bitterroot Valley. Conservation practices would also help address the goals and objectives in the National Cohesive Wildland Fire Management Strategy, Bitterroot Community Wildfire Protection Plan, and the Joint Chief's Landscape Restoration Partnership.

The most pressing forestry concerns in the county are as follows:

- Reducing stand density within over-stocked stands. Decades of fire exclusion has allowed stem densities of shade-tolerant species to greatly increase. The high number of trees per acre has resulted in competitive stress through competition for growing space, water, nutrients, and sunlight. Tree stress is further exacerbated by moderate to severe western spruce budworm defoliation and Douglas-fir dwarf mistletoe. Competitive stress and poor tree vigor provide opportunities for insects and disease to establish and spread such as Douglas-fir beetle and mountain pine beetle.
- Root disease. A fungal disease, root disease is a native forest pathogen that lives in the soil. Douglas-fir and the true firs are the most susceptible, and as the amount of these species has greatly increased in stands over the last 100 years. Fire historically played a major role in

subduing firs species and promoting root disease resistant species. As fire has been removed, firs have begun to dominate stands thereby increase susceptibility of the stand to root diseases.

- Lack of large diameter, old growth forests. These forests have greatly declined in the last 100 or more years and often occurred in riparian areas that burned less frequently and have higher moisture. These forests provide a habitat component lacking in younger, smaller diameter forests. Cavity dependent species utilize these forests heavily, and other wildlife, such as ungulates utilizing them during deep snow periods. Heart rots increase as trees get older. This allows primary cavity excavators to hollow out trees that creates habitat for secondary cavity users (pine marten, fisher, bats, owls, etc.).
- Fire-wise home and property practices. Like most of the west, Ravalli County has seen an increase in home construction and subdivision in recent years. Many landowners have not taken necessary precautions to protect their property and/or structures from wildfire. Working with landowners to manage vegetation near structures and add resiliency to their properties is an important resource issue.

Water Quality and Water Quantity

Irrigation is fundamental to agriculture in Ravalli County. Water quality and quantity are often overlapping resource concerns. In Ravalli County, water quality issues are created as a result of irrigation and agricultural-related use. Irrigation runoff is a major concern affecting both the quality of water in rivers, streams and waterbodies as well as the quantity of water available for irrigation. Areas in particular need of improvement include updating water delivery conveyances to gravity pressure where possible, converting from open ditch to pipeline to reduce system losses, improving water measurement abilities, reducing system waste including stemming the significant tailwater return flows and providing alternative stockwater options to reduce off-season delivery through canals solely for livestock water. On-farm improvements are also needed throughout the system. Currently there remains significant wild-flood irrigation on steep slopes which could benefit from flood-to-sprinkler conversion. Improving irrigation efficiency by upgrading irrigation type may also be worthwhile in many cases. Improvements should focus on maximizing efficiency while eliminating off-site movement of water, nutrients and sediments. Working with partners to address multiple resource benefits is a key goal of the Hamilton NRCS Field Office.

Weeds

Weeds are a constant natural resource issue in Ravalli County. Controlling and reducing the spread of noxious weeds is a priority for partners in Ravalli County, however, focus has been put on emerging threats and new invaders. Aggressively targeting new threats should be a cornerstone of any active weed management plan and should be a high priority for focusing resources whenever possible.

Habitat

Wildlife habitat is a priority for many natural resource partners in Ravalli County. Native fisheries of bull trout and westslope cutthroat trout have been a primary focus for partners such as the Bitter Root Water Forum and Trout Unlimited. Addressing issues such as forestry and rangeland health, improving riparian areas, and reducing dewatering will result in overall improvement to wildlife habitat.

Soil Health

Soil health remains an area of interest in Ravalli County. Many producers are interested in improving their soil health and increasing the sustainability of their agricultural operations. Farmers have started utilizing cover crops, but adoption is still low. Encouraging more landowners to adopt soil building practices should be prioritized. Producers using cover crops have reduced input costs and created additional forage opportunities. Expanding the use and adoption of cover crops, and other soil health practices could prove beneficial within the county.

Pasture and Range Improvements

Many of the grasslands in Ravalli County, which include pastures (dry and irrigated), rangeland and grassland habitat areas are in poor condition. The conditions are a result of both poor grazing management, weed encroachment and a general lack of species diversity. Targeting improvements related to weed control, species selection and grazing management could provide significant resource benefits. Improving grazing management should be strongly encouraged and when necessary providing infrastructure to facilitate rotational grazing such as fences and stock water systems.

Riparian Zones:

Riparian vegetation and wetlands can be extremely effective at buffering streams, rivers, and lakes from nonpoint sources of pollutants. Often, poor water quality is associated with areas of low riparian vegetation cover and low wetland abundance. Many nonpoint sources of pollutants are derived from land use activities that can negatively influence the riparian areas and wetlands. While some sources of nonpoint source pollution can be sub-surface or difficult to observe on the ground, it is possible to use publicly-available imagery to account for varying riparian vegetation cover and certain types of land use activities that may negatively impact riparian vegetation and wetlands. Improving and protecting riparian vegetation is a priority, especially along those streams with less than 25 percent of cover (Willow, Miller, McClain, Lick, Ambrose, West Fork Lolo, and Granite). Riparian revegetation plantings and the installation of livestock exclusion fence would be effective practices for improving the condition of these areas.

Conservation Easements

Conservation easements will continue to be encouraged as a tool for landowners within Ravalli County that seek to conserve certain attributes and values associated with their land. The Hamilton NRCS Field Office will continue to work with partners and landowners to assist with the easement process.

Section V. Prioritization of Natural Resource Problems and Desired Outcomes

The RCLWG has been meeting regularly since the introduction of Montana Focused Conservation in order to prioritize resource concerns, identify focus areas, and discuss opportunities for partnerships. The RCLWG represents a commitment and partnership from: BCD, NRCS, USFS, Bitter Root Land Trust, Bitter Root Water Forum, MSU Extension, MTFWP, Teller Wildlife Refuge, DNRC, TU, Ravalli County Economic Development Agency and the Ravalli County Weed District. The group has prioritized water quality and water quantity (identified as similar resource concerns), plant health and vigor (to include the interrelated resource concerns of weeds, grassland habitats and forage-issues) and forest health as

the main resource concerns in Ravalli County. The RCLWG meets twice a year to allow partners to collaborate on conservation efforts and identify TIPs.

Prioritized Resource Concerns (no order of priorities provided):

- **Water Quality and Water Quantity:** Identified as similar resource concerns, often addressed via irrigation-related improvements. There exists support within the county and within the RCLWG to address water quality and water quantity issues. The goal would be to address non-point water pollution while complementing partner efforts and collaboration. This TIP proposal is still in development.
- **Forest Health:** Ravalli County is 82% forested and supporting healthy forests and fire resiliency is a priority to the RCLWG. Extensive efforts and collaboration have been put forward by partners and the Hamilton NRCS Field Office to develop a forest health TIP that would address forest health concerns along the Sapphire front.
- **Weed Control:** Like most counties in Montana, Ravalli County is plagued by numerous noxious weeds. There is strong support for weed control-related projects. Much discussion at the RCLWG revolved around weed control. More research and planning need to be done on potential projects and partnerships.
- **Riparian Protection and Restoration:** Riparian protection and restoration is a strong priority for the RCLWG. The group is committed to utilizing the recent DEQ evaluation and assessment to collaborate and prioritize riparian restoration within those drainages with less than 25 percent cover. This TIP is in current development.
- **Conservation Easement:** The local Bitter Root Land Trust has submitted a RCPP proposal for ALE easements within Ravalli County. Through planning and collaboration, the RCLWG is committed to developing a TIP to support conservation efforts identified within the RCPP proposal. The TIP would focus on resource concerns identified within cropland.

Section VI. Targeted Implementation Plans

Ventenata Control Targeted Implementation Plan

Ventenata is an invasive annual winter grass, and due to its high silica content, it is not palatable for most wildlife or livestock. The issue with Ventenata is that it can be extremely difficult to identify, especially early on in its growing stage where it looks almost exactly like bulbous bluegrass. It rapidly will become the dominant species on the landscape. Ventenata is listed as a Priority 2A weed for the state of Montana and is commonly found more often on the western half of the state. Gaining control of a weed before it can take over is the best-known practice for eradication of any invasive species. The conservation practices offered under this Targeted Implementation Plan are Herbaceous Treatment (315), Prescribed Grazing (528), Pasture and Hay Planting (512), Range Planting (550), Critical Area Planting (342), and Fence (382). The detailed descriptions of each practice can be found in the Montana Field Office Technical Guide. The Project Partner is the Bitterroot Conservation District.

Agriculture Resiliency and Farmland Preservation Targeted Implementation Plan

This Targeted Implementation Plan aims to support the agricultural producers through more efficient irrigation practices and improved grazing management. Agriculture in Ravalli County is in jeopardy. Ravalli County is one of the fastest growing counties in Montana and has experienced 15% population

growth in the last 20 years with 6.5% of that growth occurring between 2020-2022. The mission of the NRCS is to deliver conservation solutions so agricultural producers can protect natural resources and feed a growing world. This TIP seeks to deliver that mission in supporting agricultural producers to increase sustainability through more efficient irrigation practices and improved grazing management.

The Conservation Practices Offered are Sprinkler System (442), Irrigation Pipeline (430), Pumping Plant (533), Structure for Water Control (587), Irrigation Water Management (449), Prescribed Grazing (528), Fencing (382), Watering Facility (614), and Livestock Pipeline (516). The Project Partners are the Bitterroot Land Trust and the Bitterroot Conservation District. The NRCS will be working with the Lant Trust to promote easements on these vital agricultural lands. The primary resource concern is degradation of plant condition, which improves soil health over time.

Robbins Gulch Forest Health Targeted Implementation Plan

This Targeted Implementation Plan aims to reduce the biomass accumulation that fuels wildfires and improve forest health in the highly forested Ravalli County through implementing forest stand improvement practices. Declining forest health are a growing concern for the citizens in Ravalli County, which has been identified as having the highest wildfire risk to homes in Montana. The 2016 Roaring Lion Fire shed light on how important preventing a large fire is. A community action group, Fire in the Root, focuses on wildfire preparedness through community education. In August of 2023, this TIP was modified to accommodate more partnerships joining to provide resources and staff.

Partnerships:

- Blue Forest
- Pheasants Forever
- Montana Department of Natural Resources (DNRC)
- US Forest Service (USFS)
- Bitter Root Resource Conservation and Development (RC&D) have recently entered into the Mud Creek

Another way that the TIP was modified in 2023 was to expand it to include the West Fork and further North, to compliment partnership efforts and to capture more high-risk areas. The focus area includes a total of 35,026 acres with 18,827 acres of private forest land. Site visits and forest stand assessments have revealed that much of the forestland within the focus area is comprised of overstocked ponderosa pine with Douglas-fir encroachment. Competitive stress and poor tree vigor provide opportunities for disease and insects such as Douglas-fir dwarf mistletoe, Douglas-fir beetle and mountain pine beetle to establish and spread. This insect and disease caused mortality adds to the fuel load and makes fire suppression activities more difficult.

Bitterroot Conservation Connectivity RCPP Project

This Regional Conservation Partnership Program (RCPP) utilizes conservation easements and conservation practices to protect forestland properties that are significant in the Bitterroot Valley. The preservation of these properties aims to improve forest health on private lands and wildlife connectivity.

Partners in this Project:

- Bitter Root Land Trust (lead partner)

- Ravalli County Right to Farm & Ranch Board
- Ravalli County Local Working Group
- Ravalli County Open Lands Board
- Montana Association of Land Trusts

Cover Crop Targeted Implementation Plan

From fiscal year 2024 to 2027, the goal is to treat approximately 1,000 acres by improving soil health using cover crops. The use of cover crops entails planting grasses, legumes and/or forbs for seasonal vegetative cover. Cover crops are not cash crops, but instead are planted to build soil health and carbon stocks by reducing erosion, incrementally increasing organic matter, building soil structure and reducing soil compaction. Cover crops add pertinent nutrients back into the soil, reduce erosion through reduction of bare ground, increase humus (organic matter) content, and increase soil organism habitat. The primary resource concern addressed is organic matter depletion. The secondary resource concerns are soil organism habitat and wind erosion. In addition to the multitude of soil health benefits, the cover crop increases climate resiliency by increasing carbon sequestration and offsetting greenhouse gas emissions. This TIP builds upon existing partnerships between the BCD and Montana State University Extension office. Another goal of this TIP is to educate and spread awareness of soil health in Ravalli County. We found that once producers implement cover crop is regularly, they are more likely to adopt other soil health practices, such as reducing tillage.

In 2021, the FO and BCD launched their local Soil Health Education Effort which is a public outreach and education effort to promote the implementation of soil health principles and practices. This Soil Health Education Effort has been developed to promote the four soil health strategic goals as outlined in the Action Plan: demonstrate agency-wide commitment to integrating soil health principles across all agency functions; implement soil health principles and promote soil health innovations; develop and strengthen partnerships to increase the adoption of soil health principles; and, provide education, communication and outreach to employees, producers and partners to increase knowledge and adoption of soil health principles. One benefit of the local Soil Health Education Effort was also for the FO and BCD staff to observe first-hand the soil health condition of cropland and pastureland within Ravalli County.

An additional benefit of incorporating cover crops onto the landscape is the opportunity to integrate livestock, which is one of the 5 soil health principles. Conservative livestock grazing can improve soil health by processing biomass quickly and accelerating nutrient cycling. It should be noted that the cover crop practice remains relatively low in Ravalli County, our expectation is that this TIP will expand the number of producers in Ravalli County who adopt cover cropping and will lead those producers to progressively implement greater improvements over time. Participants will also be encouraged to complete soil health testing through the Haney Test and the Phospholipid Fatty Acid Test (PLFA). These tests will serve as an educational tool towards understanding soil microbiology, the importance of organic carbon and organic nitrogen and guiding species selection for cover crop seed mix.

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Appendices

Appendix A

Montana Natural Heritage Program: Animal Species of Concern Report

<http://mtnhp.org/SpeciesOfConcern/?AorP=a>

This Report Generated on: 2022-05-12

S_Sci_Name	S_Com_Name	G_Rank	S_Rank	Short_Habitat
Corynorhinus townsendii	Townsend's Big-eared Bat	G4	S3	Caves in forested habitats
Gulo gulo	Wolverine	G4	S3	Boreal Forest and Alpine Habitats
Lasiurus cinereus	Hoary Bat	G3G4	S3	Riparian and forest
Myotis evotis	Long-eared Myotis	G5	S3	Forest
Myotis lucifugus	Little Brown Myotis	G3G4	S3	Generalist
Myotis thysanodes	Fringed Myotis	G4	S3	Riparian and dry mixed conifer forest
Myotis volans	Long-legged Myotis	G4G5	S3	Conifer forest
Pekania pennanti	Fisher	G5	S3	Mixed conifer forests
Sorex preblei	Preble's Shrew	G4	S3	Sagebrush grassland
Synaptomys borealis	Northern Bog Lemming	G5	S2	Conifer forest wetland
Ursus arctos	Grizzly Bear	G4	S2S3	Conifer forest
Accipiter gentilis	Northern Goshawk	G5	S3	Mixed conifer forests
Aquila chrysaetos	Golden Eagle	G5	S3	Grasslands
Ardea herodias	Great Blue Heron	G5	S3	Riparian forest
Athene cunicularia	Burrowing Owl	G4	S3B	Grasslands
Botaurus lentiginosus	American Bittern	G5	S3B	Wetlands
Catharus fuscescens	Veery	G5	S3B	Riparian forest
Certhia americana	Brown Creeper	G5	S3	Moist conifer forests
Coccothraustes vespertinus	Evening Grosbeak	G5	S3	Conifer forest
Cygnus buccinator	Trumpeter Swan	G4	S3	Lakes, ponds, reservoirs
Cypseloides niger	Black Swift	G4	S1B	Waterfalls
Dolichonyx oryzivorus	Bobolink	G5	S3B	Moist grasslands
Dryocopus pileatus	Pileated Woodpecker	G5	S3	Moist conifer forests
Falco peregrinus	Peregrine Falcon	G4	S3	Cliffs / canyons
Haemorhous cassinii	Cassin's Finch	G5	S3	Drier conifer forest
Himantopus mexicanus	Black-necked Stilt	G5	S3B	Wetlands
Ixoreus naevius	Varied Thrush	G5	S3B	Moist conifer forests
Leucosticte atrata	Black Rosy-Finch	G4	S2	Alpine
Melanerpes lewis	Lewis's Woodpecker	G4	S2B	Riparian forest
Nucifraga columbiana	Clark's Nutcracker	G5	S3	Conifer forest
Numenius americanus	Long-billed Curlew	G5	S3B	Grasslands

Nycticorax nycticorax	Black-crowned Night-Heron	G5	S3B	Wetlands
Oreoscoptes montanus	Sage Thrasher	G4	S3B	Sagebrush
Picoides arcticus	Black-backed Woodpecker	G5	S3	Conifer forest burns
Pipilo chlorurus	Green-tailed Towhee	G5	S3B	Shrub woodland
Psiloscops flammeolus	Flammulated Owl	G4	S3B	Dry conifer forest
Spizella breweri	Brewer's Sparrow	G5	S3B	Sagebrush
Strix nebulosa	Great Gray Owl	G5	S3	Conifer forest near open meadows
Troglodytes pacificus	Pacific Wren	G5	S3	Moist conifer forests
Elgaria coerulea	Northern Alligator Lizard	G5	S3	Talus slopes / rock outcrops
Plestiodon skiltonianus	Western Skink	G5	S3	Open conifer forest and adjacent grasslands
Anaxyrus boreas	Western Toad	G4	S2	Wetlands, floodplain pools
Plethodon idahoensis	Coeur d'Alene Salamander	G4	S2	Spring / seep, waterfall, fractured rock
Oncorhynchus clarkii lewisi	Westslope Cutthroat Trout	G5T4	S2	Mountain streams, rivers, lakes
Salvelinus confluentus	Bull Trout	G5	S2	Mountain streams, rivers, lakes
Rhyacophila potteri	A Rhyacophilan Caddisfly	G3	S2	Forested mountain springs
Isocapnia crinita	Hooked Snowfly	G5	S2	Mountain Streams to Rivers
Hemphillia danielsi	Marbled Jumping-slug	G3	S1S2	Mesic/moist conifer forests
Magnipelta mycophaga	Magnum Mantleslug	G3	S2S3	Mesic/moist conifer forests
Margaritifera falcata	Western Pearlshell	G5	S2	Mountain streams, rivers
Polygyrella polygyrella	Humped Coin	G3	S1S2	Moist conifer forests

Montana Natural Heritage Program: Plant Species of Concern Report

<http://mtnhp.org/SpeciesOfConcern/?AorP=p>

This Report Generated on: 2022-05-11

S_Sci_Name	S_Com_Name	Family_Com_Name	G_Rank	S_Rank	Short_Habitat
Botrychium sp. (SOC)	Moonworts (SOC)	Adder's-Tongue / Moonworts	G1G3	S1S3	
Cryptogramma cascadiensis	Cascade Rockbrake	Maidenhair Fern Family	G5	S3	
Dryopteris cristata	Crested Shieldfern	Wood Fern Family	G5	S3	Wetland/Riparian
Equisetum palustre	Marsh Horsetail	Horsetails	G5	S3	
Equisetum pratense	Meadow Horsetail	Horsetails	G5	S2	
Isoetes echinospora	Spiny-spore Quillwort	Quillworts	G5	S3	freshwater lakes
Polystichum scopulinum	Mountain Swordfern	Wood Fern Family	G4	S1S2	Rock Crevices

<i>Pinus albicaulis</i>	Whitebark Pine	Fir / Hemlock / Larch / Pine / Spruce	G3G4	S3	Subalpine forest, timberline
<i>Ageratina occidentalis</i>	Western Joepyeweed	Aster/Sunflowers	G4	S2	Rock/Talus
<i>Arctostaphylos patula</i>	Greenleaf Manzanita	Heath Family	G4	S1	Forest (Montane)
<i>Artemisia tilesii</i>	Tilesius Wormwood	Aster/Sunflowers	G5	S3	grassland, meadows
<i>Athyanus pusillus</i>	Sandweed	Mustards	G5	S1S2	Rock/talus-Mesic
<i>Bidens beckii</i>	Beck Water-marigold	Aster/Sunflowers	G5	S2	Aquatic
<i>Boechera fecunda</i>	Sapphire Rockcress	Mustards	G2	S2	Rocky, calcareous, montane slopes
<i>Castilleja covilleana</i>	Coville Indian Paintbrush	Broomrape Family	G3G4	S3	Subalpine slopes
<i>Centunculus minimus</i>	Chaffweed	Myrsine Family	G5	S2	Wetland/Riparian
<i>Clarkia rhomboidea</i>	Diamond Clarkia	Evening-primrose Family	G5	S3	Forests (Open, montane)
<i>Collomia debilis</i> var. <i>campanuliflora</i>	Alpine Collomia	Phlox Family	G5T2	S1S2	Rock/Talus (Valleys to Montane)
<i>Draba daviesiae</i>	Bitterroot Draba	Mustards	G3	S3	Alpine
<i>Draba densifolia</i>	Dense-leaf Draba	Mustards	G5	S2	Alpine
<i>Drosera anglica</i>	English Sundew	Sundew Family	G5	S3	Fens
<i>Erigeron asperugineus</i>	Idaho Fleabane	Aster/Sunflowers	G4	S2	Alpine
<i>Erigeron evermannii</i>	Evermann Fleabane	Aster/Sunflowers	G4	S2?	Alpine
<i>Erigeron formosissimus</i>	Beautiful Fleabane	Aster/Sunflowers	G5	S1S3	Meadows (Montane/subalpine)
<i>Erigeron linearis</i>	Linear-leaf Fleabane	Aster/Sunflowers	G5	S2	Sagebrush/Grasslands (Foothills to Montane)
<i>Erigeron tener</i>	Slender Fleabane	Aster/Sunflowers	G4	S2?	Slopes (Open, limestone, montane)
<i>Eriogonum crosbyae</i>	Crosby's Buckwheat	Buckwheat Family	G4	S3	Alpine
<i>Glossopetalon spinescens</i>	Spiny Greasebush	Greasebush	G5	S1	Rock/Talus
<i>Heterocodon rariflorum</i>	Western Pearl-flower	Bellflower Family	G5	S2	Vernally moist habitats
<i>Idahoia scapigera</i>	Scalegod	Mustards	G5	S1S2	Vernally moist, rock ledges
<i>Ipomopsis minutiflora</i>	Small-flower Ipomopsis	Phlox Family	G4	S1S2	Sagebrush (Open)
<i>Lewisia columbiana</i>	Columbia Lewisia	Purslane Family	G4G5	S1S2	Rock Crevices
<i>Ligusticum verticillatum</i>	Idaho Lovage	Parsley/Carrot Family	G4G5	S3	
<i>Micranthes tempestiva</i>	Storm Saxifrage	Saxifrage Family	G2G3	S2S3	Alpine
<i>Mimulus ampliatus</i>	Stalk-leaved Monkeyflower	Lopseed Family	G3	S3	Vernally moist soil (Valleys to subalpine)
<i>Mimulus floribundus</i>	Floriferous Monkeyflower	Lopseed Family	G5	SH	

Mimulus nanus	Dwarf Purple Monkeyflower	Lopseed Family	G5	S2S3	Open slopes (low-elevation)
Mimulus primuloides	Primrose Monkeyflower	Lopseed Family	G4	S3	Fens and wet meadows
Pedicularis contorta var. ctenophora	Pink Coil-beaked Lousewort	Broomrape Family	G5T3	S2S3	Slopes (Montane/Subalpine)
Pedicularis contorta var. rubicunda	Selway Coil-beaked Lousewort	Broomrape Family	G5T3	S2S3	Ridgetops and meadows (subalpine and alpine)
Penstemon flavescens	Yellow Beardtongue	Plantain Family	G3	S3	Rocky slopes (Open, montane)
Penstemon humilis	Low Beardtongue	Plantain Family	G5	S1S3	Sagebrush steppe (Montane)
Penstemon lemhiensis	Lemhi Beardtongue	Plantain Family	G3	S3	Sagebrush-grasslands
Penstemon payettensis	Payette Beardtongue	Plantain Family	G4	S1	Slopes (Open, Montane)
Physaria humilis	Bitterroot Bladderpod	Mustards	G2	S2	Alpine
Ribes triste	Swamp Red Currant	Currants / Gooseberries	G5	S2?	Forest openings (Mesic, montane/subalpine)
Rotala ramosior	Toothcup	Loosestrife Family	G5	S1S2	Wetland/Riparian
Sandbergia perplexa	Puzzling Rockcress	Mustards	G4	S2	Shrubland/woodland slopes (Open, Montane)
Satureja douglasii	Yerba Buena	Mints	G5	S3	Forest (Moist, montane)
Synthyris canbyi	Mission Mountain kittentails	Plantain Family	G2G3	S2S3	Alpine
Tonestus aberrans	Idaho Goldenweed	Aster/Sunflowers	G3	S1S2	Rock/Talus
Trifolium cyathiferum	Cup Clover	Pea Family	G4	S3	
Trifolium eriocephalum	Woolly-head Clover	Pea Family	G5	S2	Open areas (foothills and montane)
Trifolium gymnocarpon	Hollyleaf Clover	Pea Family	G5	S2	Open areas (foothills and montane)
Trifolium microcephalum	Woolly Clover	Pea Family	G5	S3	
Allium acuminatum	Tapertip Onion	Lilies	G5	S2S3	Dry Forest-Grassland
Allium columbianum	Columbia Onion	Lilies	G3	S1	Open, mesic sites
Allium parvum	Small Onion	Lilies	G5	S3	Dry Forest-Grassland
Allium simillimum	Dwarf Onion	Lilies	G4	S2?	Mesic Grasslands-Meadows
Calamagrostis tweedyi	Cascade reedgrass	Grasses	G3	S3	Montane Forest
Carex scoparia	Pointed Broom Sedge	Sedges	G5	S1S2	Wetland/Riparian (Valleys)
Carex stenoptila	Small-winged Sedge	Sedges	G3	S2S3	Grasslands (Montane)
Cyperus bipartitus	Shining Flatsedge	Sedges	G5	S1	Wetland/Riparian
Eleocharis bella	Delicate Spikerush	Sedges	G5	S1	

Eriophorum gracile	Slender Cottongrass	Sedges	G5	S3	Fens
Juncus covillei	Coville's Rush	Rushes	G5	S2S3	Wetland/Riparian
Muhlenbergia minutissima	Annual Muhly	Grasses	G5	S3	
Najas guadalupensis	Guadalupe Water-nymph	Water-nymph Family	G5	S2S3	Aquatic
Veratrum californicum	California False-hellebore	Lilies	G5	S2	Wetland/Riparian
Wolffia columbiana	Columbia Water-meal	Duckweeds	G5	S2S3	Aquatic
Dicranum acutifolium	Acuteleaf Dicranum Moss	Dicranaceae	G5	S1	
Grimmia incurva	Curved Dry Rock Moss	Grimmiaceae	GNR	S1	
Hennediella heimii	Heim's Hennediella Moss	Pottiaceae	G5	S1	
Meesia triquetra	Meesia Moss	Meesiaceae	G5	S2	
Physcomitrium hookeri	Hooker's Physcomitrium Moss	Funariaceae	G2G4	S1	
Porotrichum bigelovii	Bigelow's Porotrichum Moss	Thamnobryaceae	G4	S1	
Pseudocrossidium obtusulum	A Pseudocrossidium Moss	Pottiaceae	GU	S1	
Sphagnum centrale	A Peatmoss	Peat Mosses	G5	S1	
Sphagnum fuscum	Brown Hair Peatmoss	Peat Mosses	G5	S2	
Sphagnum magellanicum	Red Spoon Peatmoss	Peat Mosses	G5	S1	
Syntrichia bartramii	Bartram's Syntrichia Moss	Pottiaceae	G2G4	S1	
Syntrichia norvegica	Norwegian Syntrichia Moss	Pottiaceae	G5	S1	
Syntrichia papillosissima	Antler Twist Moss	Pottiaceae	G3G5	S1	
Tortula acaulon	Elfin Crisp Moss	Pottiaceae	G5	S1	
Dactylina ramulosa	Frosted Finger Lichen	Parmeliaceae	G5	S2	
Lobaria linita	Cabbage Lungwort Lichen	Lobariaceae	G5	S1	
Nodobryoria subdivergens	Alpine Foxtail Lichen	Parmeliaceae	G2G3	S1S2	
Normandina pulchella	Elf-Ear Lichen	Verrucariaceae	G4G5	S1	
Parmeliella triptophylla	Fingered Shingle Lichen	Pannariaceae	G5	S1	
Peltigera gowardii	Western Waterfan Lichen	Peltigeraceae	G3G4	S1	
Ramalina obtusata	Hooded Bush Lichen	Ramalinaceae	G5	S2	

Appendix B



United States Department of the Interior

Fish and Wildlife Service

Ecological Services

Montana Field Office

585 Shepard Way, Suite 1

Helena, Montana 59601-6287

Phone: (406) 449-5225, Fax: (406) 449-5339



ENDANGERED, THREATENED, PROPOSED AND CANDIDATE SPECIES MONTANA COUNTIES* Endangered Species Act

October 1, 2021

C = Candidate

LT = Listed Threatened

LE = Listed Endangered

P = Proposed

PCH = Proposed Critical Habitat

CH = Designated Critical Habitat

XN = Experimental non-essential population

*Note: Generally, this list identifies the counties where one would reasonably expect the species to occur, not necessarily every county where the species is listed

County/Scientific Name	Common Name	Status
RAVALLI		
<i>Salvelinus confluentus</i>	Bull Trout	LT, CH
<i>Lynx canadensis</i>	Canada Lynx	LT
<i>Coccyzus americanus</i>	Yellow-billed cuckoo (western pop.)	LT
<i>Ursus arctos horribilis</i>	Grizzly Bear	LT
<i>Pinus albicaulis</i>	Whitebark Pine	P
<i>Danaus plexippus</i>	Monarch Butterfly	C

Appendix C

Montana Noxious Weed List

Effective: February 2017

Highlighted = Present in Ravalli County

Underlined is High Priority

PRIORITY 1A These weeds are not present or have a very limited presence in Montana. Management criteria will require eradication if detected, education, and prevention:

- (a) Yellow starthistle (*Centaurea solstitialis*)
- (b) Dyer's woad (*Isatis tinctoria*)
- (c) Common reed (*Phragmites australis* ssp. *australis*)
- (d) Medusahead (*Taeniatherum caput-medusae*)

PRIORITY 1B These weeds have limited presence in Montana.

Management criteria will require eradication or containment and education:

- (a) **Knotweed complex** (*Polygonum cuspidatum*, *P. sachalinense*, *P. × bohemicum*, *Fallopia japonica*, *F. sachalinensis*, *F. × bohémica*, *Reynoutria japonica*, *R. sachalinensis*, and *R. × bohémica*)
- (b) **Purple loosestrife** (*Lythrum salicaria*)
- (c) **Rush skeletonweed** (*Chondrilla juncea*)
- (d) Scotch broom (*Cytisus scoparius*)
- (e) **Blueweed** (*Echium vulgare*)

PRIORITY 2A These weeds are common in isolated areas of Montana. Management criteria will require eradication or containment where less abundant. Management shall be prioritized by local weed districts:

- (a) Tansy ragwort (*Senecio jacobaea*, *Jacobaea vulgaris*)
- (b) Meadow hawkweed complex (*Hieracium caespitosum*, *H. praealtum*, *H. floridundum*, and *Pilosella caespitosa*)
- (c) **Orange hawkweed** (*Hieracium aurantiacum*, *Pilosella aurantiaca*)

- (d) Tall buttercup (*Ranunculus acris*)
- (e) Perennial pepperweed (*Lepidium latifolium*)
- (f) Yellowflag iris (*Iris pseudacorus*)
- (g) Eurasian watermilfoil (*Myriophyllum spicatum*, *Myriophyllum spicatum* x *Myriophyllum sibiricum*)
- (h) Flowering rush (*Butomus umbellatus*)
- (i) Common buckthorn (*Rhamnus cathartica* L.)

PRIORITY 2B These weeds are abundant in Montana and widespread in many counties. Management criteria will require eradication or containment where less abundant. Management shall be prioritized by local weed districts:

- (a) Canada thistle (*Cirsium arvense*)
- (b) Field bindweed (*Convolvulus arvensis*)
- (c) Leafy spurge (*Euphorbia esula*)
- (d) Whitetop (*Cardaria draba*, *Lepidium draba*)
- (e) Russian knapweed (*Acroptilon repens*, *Rhaponticum repens*)
- (f) Spotted knapweed (*Centaurea stoebe*, *C. maculosa*)
- (g) Diffuse knapweed (*Centaurea diffusa*)
- (h) Dalmatian toadflax (*Linaria dalmatica*)
- (i) St. Johnswort (*Hypericum perforatum*)
- (j) Sulfur cinquefoil (*Potentilla recta*)
- (k) Common tansy (*Tanacetum vulgare*)
- (l) Oxeye daisy (*Leucanthemum vulgare*)
- (m) Houndstongue (*Cynoglossum officinale*)
- (n) Yellow toadflax (*Linaria vulgaris*)
- (o) Saltcedar (*Tamarix spp.*)
- (p) Curlyleaf pondweed (*Potamogeton crispus*)
- (q) Hoary alyssum (*Berteroa incana*)

PRIORITY 3 Regulated Plants: (NOT MONTANA LISTED NOXIOUS WEEDS)

These regulated plants have the potential to have significant negative impacts. The plant may not be intentionally spread or sold other than as a contaminant in agricultural products. The state recommends research, education and prevention to minimize the spread of the regulated plant.

- (a) Cheatgrass (*Bromus tectorum*)
- (b) Hydrilla (*Hydrilla verticillata*)
- (c) Russian olive (*Elaeagnus angustifolia*)
- (d) Brazilian waterweed (*Egeria densa*)
- (e) Parrot feather watermilfoil (*Myriophyllum aquaticum* or *M. brasiliense*)

County Listed Regulated Plants: (NOT MONTANA LISTED NOXIOUS WEEDS)

These county listed weeds have the potential to have significant negative impacts and are present in Ravalli County. Management criteria will require eradication or containment and education:

- (a.) Common Bugloss (*Anchusa officianals*)
- (b.) Field Scabious (*Knautia arvensis*)
- (c.) Black Henbane (*Hyoscyamus niger*)
- (d.) Common Teasel (*Dipsacus fullionum*)
- (e.) Kochia (*Bassia scoparia*) – Roadside only
- (f.) Baby's Breath (*Gypsopila paniculate*)