Lower Blackfoot
Ecosystem Analysis at the Watershed Scale

Resource conditions and management opportunities on public lands in the Lower Blackfoot River area including the Twin Creek, Gold Creek, and Belmont Creek drainages as well as the Game Ridge and Ninemile Prairie area.

Missoula Field Office, Bureau of Land Management

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Chapter 1 – Introduction

1.1 Assessment Overview

The purpose of the assessment is to provide a comprehensive and systematic analysis of the Bureau of Land Management (BLM)-administered public lands in the Lower Blackfoot river area including the Twin Creek, Gold Creek, and Belmont Creek drainages as well as the Game Ridge and Ninemile Prairie area in Missoula County, Montana. This assessment generally follows the process outlined for Ecosystem Analysis at the Watershed Scale (EAWS): Federal Guide for Watershed Analysis (1995). The assessment considers past and present resource conditions and trends, identifies desired future conditions, and recommends actions that are needed to move towards or achieve desired future conditions. The recommendations incorporate direction and guidance found in the Missoula Field Office Resource Management Plan (Missoula RMP) (USDI-BLM 2021), and contemporary BLM policies. An interdisciplinary team (IDT) integrates the recommendations for all resource disciplines into final recommendations that serve as the basis for developing specific management proposals for the public lands in the assessment area.

While the IDT made approximations of past and present conditions on neighboring federal and non-federal lands, the assessment is designed as a tool for the BLM's use and does not presume that other owners will follow similar recommendations in managing their lands. Cooperative management with neighboring federal, state, and private landowners may be undertaken as opportunities arise during the development of specific project plans and if common management goals can be identified. These opportunities are best identified during the public scoping and National Environmental Policy Act (NEPA) process when the actual management actions and decisions are being made.

This assessment does not constitute a Federal decision document. It is a stage-setting analytical process that makes recommendations, surfaces constraints, and provides guidance for future management decisions. It is those future decisions which undergo the Federal decision-making process subject to NEPA regulations.

Ecosystem Analysis is an ongoing process. Current direction indicates that such assessments be revisited every 10 to 15 years and revised and updated as conditions or assumptions change, as Resource Management Plan direction changes, and as new information becomes available. They are also intended to be used as open "case-files" that can be updated or appended at any time when new information about the analyzed area becomes available.

This document brings together both published information and internal working documents. New information may be appended as it is collected or becomes available.

1.2 How this Document is Organized

The organization of this document is based on guidance contained in *Ecosystem Analysis at the Watershed Scale: Federal Guide for Watershed Analysis* (1995).

Chapter 1 - Introduction and description of the assessment.

Chapter 2 - Characterization of the Assessment Area.

Chapter 3 - Issues and Key Questions. Reviews the issues and concerns considered when doing this analysis.

Chapter 4 - Historical and Reference Conditions. Presents a historical perspective of the past influences and processes that occurred in this ecosystem.

Chapter 5 - Current Conditions. Describes the current condition of the resources of the watershed, according to terrestrial, aquatic, social, and other issues.

Chapter 6 - Potential Conditions and Trends. Projects possible future conditions based on current trend and ecosystem processes in the watershed with application of resource management plans (*and assumptions on private land management*). This incorporates the synthesis and interpretation of all available data and information about the watershed.

Chapter 7 - Management Recommendations. Recommends actions that should be taken on public lands based on the findings of the analysis.

Chapter 8 - Data Gaps, Inventory, and Monitoring. A list of information gaps found during the analysis and what information should be collected in the future.

Literature Citations – Bibliographic sources of any references in the EAWS text.

Appendices - Additional supportive information and maps.

Chapter 2 – Characterization

2.1 Geology and Mineral Resources

2.1.1 Physiography

The assessment area of the Lower Blackfoot is located within the Northern Rocky Mountain subdivision of the Rocky Mountain Physiographic Province (Mallory and others 1972). This province is characterized by the basin and range style of topography where tall mountain ranges are separated by parallel valleys or basins. This basin and range topography is directly associated with extensional tectonics and faulting. There are many mountain ranges surrounding the assessment area: the Rattlesnake Mountains to the west, the Mission and Swan Ranges to the north, and the Garnet Range to the south. The Clearwater River and Blackfoot River basins bound the area to the east and south, and to a lesser extent the Flathead River basin to the northwest. The Camas Prairie (Potomac Valley) stretches along the southern edge of the assessment area.

The assessment area lies within the Rocky Mountain Fold and Thrust Belt, and along the Lewis and Clark Fault Zone, adjacent to the leading edge of the fold and thrust belt. See section 2.1.3 for more information on the structural geology and tectonics of the area.

The two primary drainages within the assessment area are Gold Creek and Belmont Creek, draining to the south. These drainages differ from those in the vicinity, as Blanchard Creek (just outside the assessment boundary) drains towards the east. One long flat prairie, Ninemile Prairie, extends along the eastern portion of the assessment area. The topography within the assessment area varies greatly from the peak of Sheep Mountain at 7,650 ft in the southwest to about 3,600 ft along the Blackfoot River corridor in the southeast.

There are several topographic features of note in the assessment area. Game Ridge (about 6,100 ft) is an east-west trending ridge in the northeast portion of the assessment area. There are multiple high peaks that are within the assessment boundary including Belmont Point (6,659 ft), Black Mountain (6,932 ft), Sunflower Mountain (5,689ft), Little Belmont Point (5,256 ft) and Boulder Point (7,295 ft), and multiple high peaks along the boundary including Sheep Mountain (7,650 ft) and Mineral Peak (7,449 ft). Two notably flat areas include Ninemile Prairie and Primm Meadows. Valley bottoms, and flat areas, are characterized by geologically young glacial and alluvial deposits, while the northwest-trending ridges are generally formed from Precambrian Belt Rocks.

2.1.2 Geologic Units

See Map 7 in Appendix C for a simplified geology map of the assessment area. Geologic units are mapped by age. For the units that occur within the assessment boundary, geologic unit descriptions are adapted from the Butte and Choteau 1 X 2 degree quadrangles (Lewis 1998a and Mudge and others, 2001, respectively), the Missoula East 30’ X 60’ quadrangle (Lonn and others 2010), and the Montana geologic map (Vuke and others 2007). Below is a list, from youngest to oldest, of the rocks and deposits present in the assessment area.

Several of the rock units in the map area have notable road-building or erosive characteristics that were noted in the “Notes on Mechanical Properties of Units” section of the Missoula West 30’ X 60’ quadrangle report (Lewis 1998b). Relevant to the assessment area are the best road-building units and the units that experience the most erosion and sedimentation. The argillite and siltite in the McNamara, Mount Shields, and Snowslip Formations are the best for road-building. The red argillite is better than the

less durable green argillite. The Shepard Formation is the most erodible rock unit in the assessment area and weathers readily, forms dusty roads, and can be a source of silt into streams (Lewis 1998b). Along faults and flat areas, the Bonner Quartzite weathers to clay-rich soils, which is not conducive to road-building. The Tertiary sediments, glacial deposits, and Quaternary alluvium would be potential sources of road maintenance material or aggregate.

Quaternary (Holocene and Pleistocene)

All quaternary deposits are grouped for ease of mapping, as well the Butte and Choteau 1 X 2 degree quadrangles use several quaternary deposit names interchangeably for the same rock types. This is the youngest group of deposits in the assessment area and include sediments deposited through glacial, lacustrine, and fluvial processes. These deposits occur in the low elevation areas of the assessment area, particularly along river and stream drainages and channels.

Alluvium (Qal): Well to moderately sorted gravel, sand, and minor silt along active stream channels on modern floodplains.

Glacial deposit (Qgd): Dominantly till, glacial lake, and outwash deposits. Till consists of unsorted boulders, gravel, sand, silt, and clay, which makes up lateral and terminal moraines with irregular topography and internally drained associated basins. Glacial lake deposits are grayish brown, light to dark yellowish brown, gravelly silt, light pink silt and sand, very fine-grained sand in cyclic beds, and silty and clayey gravel that form to flat surface. Glacial outwash deposits consist of moderately to well-sorted cobble gravel, sand, and silt on dissected terraces, braid plains, or in perched valleys.
Cenozoic (Pliocene, Eocene, Oligocene, and Miocene)

Sedimentary Deposits and Rocks (Ts): Fan and gravel deposits, conglomerate, sandstone, mudstone, and volcanic ash beds. Poorly to moderately sorted conglomerate containing locally derived boulders and cobbles in a silty matrix. Mostly white to light gray clay and silt deposited in fluvial and lacustrine environments.

Precambrian Belt Supergroup

The following rock units comprise the Precambrian Belt Supergroup and is divided into three sections: the uppermost/youngest Missoula Group (split into upper and lower groups), the Piegan group, and the lowermost/oldest Ravalli Group. Those present in the assessment area include the Upper and Lower Missoula Group and Piegan Group. Precambrian Belt rocks make up the majority of the bedrock in the assessment area, and the dominant formation is the Snowslip Formation of the Lower Missoula Group. The assessment area includes an almost complete section of the Missoula Group (only missing exposure of the Libby Formation). The Missoula Group is dominated by argillite, siltite, and quartzite, while the Piegan group is dominated by limestone and dolomite.

Garnet Range Formation (Ygr): Grayish-green micaceous fine-grained quartzite with green to black argillite interbeds. Occasionally speckled by hematite and includes cross-beds and ripple marks. Distinguished by rusty-brown to yellow weathered surfaces and abundant detrital mica.

Upper Missoula Group (Ymu): McNamara Formation, Bonner Quartzite, and Mount Shields Formation are combined for mapping this geologic unit.

McNamara Formation (Ym): Red and green interbedded siltite and argillite. Contains flat-laminated and cross-bedded, buff, fine- to medium-grained quartzite. Mudcracks common. Contains diagnostic thin, red, and green chert beds and chert rip-up clasts.

Bonner Quartzite (Yb): Pink, medium- to coarse-grained, feldspathic quartzite. Includes matrix-supported granules and pebbles and fragments of micaceous, red argillite interbeds. Contains abundant trough cross-beds and ripple marks.

Mount Shields Formation (Yms): Reddish-brown, thinly laminated, micaceous, siltite, argillite, and thin- to thick-bedded quartzite. Sedimentary features include cross-laminations, ripple marks, mud-crack fillings, and mud chips. Salt-crystal casts widespread in the upper part of the formation. Cross-beds in the quartzite are hard to distinguish from those in the Bonner Quartzite. Previously subdivided into three informal members (see Wallace and others, 1986, Lewis 1998a, and Lonn and others 2010).

Lower Missoula Group (Yml): Shepard and Snowslip Formations are combined into this geologic unit.

Shepard Formation (Ysh): Green microlaminated argillite overlain by thin lenticular beds of green dolomitic siltite and fine-grained white quartzite. Ripples and load casts are common, mudcracks are rare. Weathers into thin plates, and the dolomitic beds have a characteristic orange-brown weather rind. Poorly exposed and easily missed when mapping.

Snowslip Formation (Ysn): Red to reddish-brown and green-gray interbedded argillite and siltite, interbedded with thin intervals of very fine- to fine-grained quartzite. Diagnostic quartzite beds and lenses contain coarse, well-rounded, well-sorted, white, quartz-rich grains. These beds contain more quartz and less feldspar than is typical for quartzite in the Belt Supergroup. Commonly includes mud cracks, ripple marks, cross-beds, desiccation cracks, and mud rip-up clasts. Contains bumps that mimic trace fossils but are likely incipient salt casts.

Piegan Group (Ypg): Helena and Wallace Formations are combined to map this geologic unit.

Helena Formation (Yh): Commonly divided into three units (upper, middle, and lower). The upper unit consists of beds of limestone interbedded with dolomite, siltite, and argillite, and widespread beds of oolites, stromatolites, and conglomerates. The middle unit – comprising most of the formation – includes grey, silty limestone, dolomite, and calcitic dolomite that weathers to a yellowish gray to grayish orange. Vertical ribbons, blobs, horizontal mats, lenses, and pods differentially weather to form crenulating patterns (molar tooth structure; Mudge and others, 2001). The lower unit consists of calcareous or dolomitic, gray-green siltite with beds of dolomite and light-gray, poorly-sorted, medium-grained, bedded quartzite. Previously the Lower Wallace portion of the Piegan Group (Vuke and others 2007) and sometimes referred to as the Wallace Formation (Lonn and others 2010).

2.1.3 Geomorphology

As described under the Physiography section, the assessment area lies within the Rocky Mountain Fold and Thrust Belt (FTB) and is adjacent to the Lewis and Clark Fault Zone (LCFZ; sometimes referred to as the Lewis and Clark Line). The LCFZ is a wide, 800km-long, west to northwest-striking zone of folds and faults that transect the more northerly trending FTB structure of the northern Rocky Mountains. The Blackfoot thrust fault is exposed just southwest of the assessment area. Tertiary extension led to the creation of many normal faults in the area. Associated tectonism has been widespread from the

Mesoproterozoic to the Holocene, showing a variety of extensional and transpressional faulting (McDonald et al. 2020).

The broad valley around Clearwater Junction to the east and the Potomac Valley (Camas Prairie) to the south of the assessment area are both deep extensional basins. Hyndman and Thomas (2020) suggest these two valleys were once a single continuous basin until the ridge, informally referred to as Greenough Hill, was tilted up along the northwest-trending normal fault as indicated by the vertical offset of overlying Miocene and Pliocene gravel layers. This evidence and the occasional earthquake out of the Greenough area may mean the ridge is still tectonically active.

The dominantly northwest-striking tendency of the LCFZ is reflected in the structural observations of the assessment area. There are few observable folds and faults in the assessment area, however according to the Butte and Choteau 1 X 2 degree quadrangles, there are several normal faults (Lewis 1998a and Mudge and others 2001). The majority of the ridge lines follow the structural trends of the area. Game Ridge, however, trends east-west, differing from the local norm of the assessment area.

During the Wisconsin Stage of the last glacial maximum (75,000-11,000 years ago) continental ice sheets covered much of North America, extending south into Montana for about 60-70 miles, overriding most mountain ranges. At the peak ice extent, the southern fringes of the large continental ice sheet, the Cordilleran Ice Sheet, extended long lobes of thick ice into the north-trending valleys of the FTB, including the Flathead Valley. Alpine glaciers and ice fields covered many of the low mountain ranges and valleys to the north of the assessment area, and the Cordilleran Ice Sheet may have extended into the northwestern (upper Gold Creek) and eastern portions (Woodchuck Canyon vicinity) of the boundary. The elevation high points of Sunflower Mountain, Black Mountain, and Game Ridge appear to have limited the advancement of the continental glaciation at its maximum extent.

Terminal moraines and glacial till filling the low-elevation sections of the assessment area exemplify how glaciers have shaped this area. Evidence of terminal moraines can be found at the confluence of Gold Creek and West Fork Gold Creek and along the north-eastern edge of Ninemile Prairie (Alden, 1953; Brenner, 1964). The area near the confluence of Gold Creek and the West Fork was observed to have many gravel outcroppings and roadcuts during field reconnaissance, consistent with the observation of glacial moraines. These moraines were deposited by an alpine glacier likely headed at McLeod Peak (at the boundary of the present-day Rattlesnake Wilderness) and flowing into the Gold Creek drainage.

The hummocky hills where Game Ridge meets Ninemile prairie are indicative of morainal topography and are likely from a terminal moraine of the Clearwater glacier (Alden 1953). This intermontane glacier filled the Clearwater River valley and extended southward past the junction with the Potomac Valley. As a result, Ninemile and Camas Prairies contain glacial deposits from the cordilleran glaciation (Alden 1953).

As one lobe of the Cordilleran ice sheet had extended down the Flathead Valley, another lobe to the west had also poured down the larger Purcell Valley in northern Idaho. Near Sandpoint and Lake Pend Oreille area, the 2,000-ft thick ice blocked the ancestral Clark Fork River, backing up surface water and forming the massive paraglacial lake known as Glacial Lake Missoula (GLM). At its maximum extent, GLM occupied the valleys and basins of western Montana below the approximated 4200-ft elevation with a volume of about 500 cubic miles—comparable to modern-day Lake Ontario. As the GLM level rose behind the ice blockage, the water would begin to creep underneath and ultimately float the ice dam. This

dam failure would be catastrophic in scale, empty GLM in a matter of days, and send an enormous volume of flood water and debris rushing downstream to scour the landscape of Idaho, Washington, and Oregon. The continental ice sheet would continue to flow and dam the Clark Fork River, and the ice dam failure and flood cycle would repeat. This cycle occurred an estimated 42 times over about a 1,000-year period within the ice age, with GLM decreasing in size each cycle.

The assessment area may be the only location within the Missoula Field Office that contains remnants of GLM features, particularly deposits of glacial lake silts. These deposits can be found in the lower elevations along the Blackfoot River corridor around Johnsrud Park and Ninemile Prairie.

2.1.4 Mineralization and Mineral Occurrence Potential

Because most of the area is underlain by privately owned subsurface mineral estate (See Subsurface Owner Tables 27 and 28 in Appendix D and Map 12 in Appendix C), the Bureau of Land Management did not conduct a formal mineral potential assessment by classifying areas for occurrence potential with levels of certainty. In the few areas that the subsurface estate is owned by the United States, the lack of favorable geology and mineralization indicates the assessment area to have a low occurrence of minerals that would be subject to leasing or location (Hydrosolutions 2014).

2.2 Landforms and Soils

2.2.1. Landforms

The Lower Blackfoot EAWS area includes a diverse range of landforms that have been derived from recent glaciation and alluvial geomorphic processes. These landforms range from glacial outwash plains, intermountain basins, glacial moraines, and mountain slopes. The vast majority of this landscape is characterized as mountains (52% of total acres), glacial moraines (11%), and pothole depressions (8%) of the landscape.

The National Resources Conservation Service (NRCS) is responsible for soil mapping on public and private lands; the last soil mapping updates to the assessment area were completed in 2020, but approximately 17,968 acres have not been further classified with information on soil taxonomy. The dominant soil orders represented in the EAWS are Inceptisols, with Andic Cryochrepts being the most common soil subgroup within the analysis area. Inceptisols are characterized as young soil that have not undergone significant soil development since the last significant geomorphic event; in this case, these soils have remained relatively unchanged since the last glaciation approximately 10,000 years ago. These soils are typically thin surface soils with significant mineral composition and subsurface rock incorporated into shallow soil horizons. Organic and A horizon soils are generally lower in organic materials. The most common soil subgroup, Andic Chryochrepts, can be broken down into further information as having an “Andic” surface epipedon, meaning the soil mineralization includes moderately weathered (poorly crystalline) minerals like allophane, imogolite, and ferrihydrite. The term “chryo” refers to soil forming factors occurring in cold climates, an “crhepts” referring to the poorly weathered, gravelly rock fragments common in this soil type (NRCS 2015). In addition to Inceptisols, the Gold Creek area also includes large inclusions of Alfisols, a soil noted for mineral leaching and clay accumulations. Additionally, the Ninemile Prairie and Woodchuck areas have relatively large inclusions of Mollisols, soils known for high organic matter concentrations in surface horizons. Both Alfisols and Mollisols are known for higher soil fertility and greater forest production characteristics; these soil types are located under notable areas in the analysis landscape including Primm Meadow, the Gold Creek confluence meadows, and Ninemile Prairie.

2.2.2. Erosional Regimes

Soil erosion is a physical and chemical process that is common in all dynamic natural systems. Erosion and subsequent deposition of soil is associated with significant natural disturbance events, like post-wildfire soil instabilities, and anthropogenic causes such as mechanized treatments on steep slopes, including road construction and vegetation management.

Soil erosion characterization for this analysis focused on areas with known previous soil disturbances, including recent wildfires, including the 2017 Liberty Fire and the 2003 Mineral Primm Fire, and on erosion causing anthropogenic elements like roads and vegetation management.

2.2.3. Soil Productivity and Sensitive Soils

BLM's 2021 Missoula Resource Management Plan (RMP) includes requirements to manage upland health for soil productivity that supports normal ecological functions; measurements of soil productivity are therefore tiered to measures of other elements, such as forest health. For example, soils should support normal forest growth cycles, dependent on a suite of biogeochemical factors like soil moisture ratings, soil – water infiltration, and organic matter availability. These factors vary spatially and therefore soil productivity is site specific and has its own natural range of variability within the Lower Blackfoot landscape. For example, a north facing slope with cool – moist forest stands is likely to be a more productive site than south facing dry forest types that take longer to recover from disturbances. Soil productivity can be impacted from anthropogenic disturbances such as soil compaction from mechanized forest treatments, high soil burn severity (when human caused), and actions like road and trail creation.

Sensitive soils are characterized as conditions that are not highly resilient to soil disturbances or have low soil recovery potential from previous disturbances. A Lolo National Forest assessment of soil resiliency and recovery potential was conducted in 2019 and includes soil analysis for the EAWS assessment area (Simpson and Campbell 2019).

2.3 Water Resources

2.3.1 Water Quality and Utilizations

Water Rights

Montana water rights are managed by Montana Department of Natural Resources and Conservation (DNRC) for beneficial uses including agricultural irrigation, livestock, industrial uses, fisheries, recreation, and municipal or domestic uses. The assessment area includes 683 water rights located on Bureau of Land Management (BLM) and The Nature Conservancy (TNC) owned lands; the majority of these water rights are tied to historic industrial and livestock uses that are no longer actively used today; however, these administrative uses are still active. In addition to beneficial uses, most streams in the assessment boundary are managed for in-stream flows to support effective water quantities for healthy fisheries. Field surveys of the EAWS area reviewed the 19 existing domestic and municipal water rights, these are largely tied to water uses to adjacent private landowners and are maintained for fire protection.

Public Water Supply

The EAWS boundary includes two points of diversion for public water supply – these are located at Johnsrud River Access Site (DNRC) and Thibodeau Campground (BLM). The BLM manages the Thibodeau campground through an agreement with Montana Fish Wildlife and Parks who maintain the drinking water features in these public areas.

Water Quantity
The Blackfoot River subbasin has well documented climatic data for a 30-year record from 1992 to 2022; in the subbasin liquid precipitation ranged from 14 to 31 inches of liquid precipitation annually (averaging 25.3 inches). The majority of this precipitation occurs as snow from December – March (National Climate Dataset, NOAA, report generated 1/13/2023).

The assessment area's water supply is largely derived from winter snowpack in the Rattlesnake and Garnet Mountains. National Resource Conservation Service (NRCS) Snow Telemetry (SNOTEL) station information was analyzed from Stuart Mountain (7400 feet elevation, Rattlesnake Mountains) and North Fork Elk Creek (6,250 feet elevation, Garnet Mountains). At the Stuart Mountain SNOTEL station, the 30-year average snow water equivalents (SWE) is 13.3 inches; at the North Fork Elk Creek site, the 30 year average SWE was just 3.7 inches – the variability in these values is attributed to differences in elevation and different weather patterns across the assessment area (NRCS SNOTEL Data 1990 – 2021).

Water Temperatures
Stream temperatures have important implications for the habitat quality of many aquatic species, particularly for native species such as Westslope Cutthroat Trout and ESA threatened Bull Trout- both cool water species. In the assessment area, Onset HOBO data loggers are installed seasonally in streams to monitor peak temperatures. Stream temperature data is also gathered at United States Geological Survey (USGS) stream gaging locations. The nearest USGS stream gage is located just upstream of the project area at the confluence of the Blackfoot and Clearwater rivers. At this gage location, stream temperatures from a 10-year period of record show a mean annual temperature of 42°F, ranging from 30°F (temperature gages don't work when frozen, ratings below 30°F are possible but not recordable) to 69°F (DNRC StAGE Database, Blackfoot River near Clearwater Junction, MT stream gage data 2013-2023).

Total Maximum Daily Loads (TMDLs) and Clean Water Act Section 303(d) Listings
Montana Department of Environmental Quality (DEQ) provides oversight for watershed improvements throughout the state, including the EAWS assessment area. In addition to providing water monitoring data and information that's available in 2-year cycles, DEQ has released 2 relatively recent Water Quality Integrated Reports (305b & 303d): Lower Blackfoot Nutrients TMDLs and Water Quality Improvement Plan (Sept 2013) and Lower Blackfoot TMDLs and Water Quality Improvement Plan (December 2009).

2.3.2 Riparian Wetlands & Streams

Lotic Hydrology
The Missoula RMP manages for riparian habitat through an analysis framework based on riparian conservation areas; these areas are managed for primary resource benefits to riparian and aquatic habitat but allows for other treatments that are complementary to those resource objectives on a site-specific basis. Commonly, a shared suite of resource management objectives (RMOs) are identified for streams and rivers managed on public lands. Those baseline RMOs are assessed at a stream reach specific level and include managing for stream temperature, sediment, large woody debris, and water quality. Using the PacFish/InFish Native Fish Strategy definitions, the Lower Blackfoot EAWS area includes 4,080 acres of Riparian Conservation Areas on BLM and TNC managed lands in the EAWS project area.

For the Lower Blackfoot EAWS effort, riparian habitat was also assessed using a "riverscape" based valley bottom assessment method, which considers that in their natural range of variability (NRV), streams and rivers move and change across their valley bottom over time. Based on 10-meter resolution

DEM modeling with the Valley Bottom Extraction Tool (VBET), the existing valley bottom extent for the EAWS area is approximately 17,345 acres (includes all land ownerships). In the assessment area, the combination of managing for RMOs and valley bottom riverscape health, creates a holistic picture of hydrologic function and stream potential within the NRV.

Lentic Hydrology

The assessment area is notable for several wetland features and beaver dam derived riparian complexes, especially in the Twin Creek, Gold Creek, and Belmont Creek watersheds. In total, there are approximately 2600 acres of riparian wetlands within the EAWS boundary (Montana Digital State Library riparian wetland dataset, 2022). Most of these riparian features are in headwater reaches on Forest Service, BLM, and TNC lands.

A beaver dam census completed for this assessment documented 6 beaver complexes in the West Fork Gold, Gold, and Belmont Creek watersheds; in total 72 dams were documented using remote sensing and field survey. Beaver dam complexes have a high likelihood to move and change through time, but even abandoned beaver dams create important habitat and hydrologic structure long after they are abandoned. The Beaver Restoration Assessment Tool (BRAT) uses several factors to assess likelihood of beaver pervasiveness in lotic and lentic areas (MTNHP 2020 and MT/DK Riverscape Restoration EA 2021). The BRAT model can provide an existing dam building capacity metric and a comparative historic (NRV) capacity based on landscape changes over time. The model includes inputs such as stream geomorphology, presence of suitable vegetation, and anthropogenic factors (roads, railroads, etc). For the existing condition, the EAWS assessment area has 272 miles of streams; approximately 122 miles of streams were determined to have frequent dam building capacity (5 to 15 dams/kilometer) and 46 miles of streams have existing conditions for pervasive dam building (15 to 40 dams/kilometer). The remainder of the project stream miles are largely in the Blackfoot River, but because of the high discharge during spring runoff events, beaver dams are not readily persistent in the main river corridor. The largest existing capacity for beaver dams is located in the tributaries to the upper Gold Creek watershed (14 miles), West Fork Gold Creek watershed (20.6 miles), Belmont Creek Watershed (14.6 miles), and West Twin Creek watershed (23.5 miles). A summary of current dam building capacity from the Beaver Restoration Assessment Tool is included in Table 1.

Table 1. Miles of stream by land ownership and beaver dam building capacity within the Lower Blackfoot Ecosystem Analysis project boundary.

Land Manager **Ownership as of December 2023*	**Stream Name**	**Miles of Stream by Dam Building Capacity**			**Total Stream Miles of Dam Building Capacity (> 2 dams/mile)**
		Occasional 2 to 8 (dams/mi)	**Frequent 8 to 24 (dams/mi)**	**Pervasive 24 to 64 (dams/mi)**	
BLM	Unnamed Tributaries		0.06	0.54	**0.60**
	Belmont Creek	0.58	5.07	1.17	**6.82**
	Blanchard Creek		0.08		**0.08**
	Buck Creek			0.02	**0.02**

	Burnt Creek	0.08	2.33	0.73	**3.15**
	Gold Creek	0.47	0.95	0.02	**1.44**
	Little Belmont Creek			0.03	**0.03**
	Union Creek	0.01			**0.01**
	BLM Subtotal	*1.14*	*8.49*	*2.51*	***12.14***
Forest Service	Unnamed Tributaries	5.01	9.41	6.22	**20.64**
	Belmont Creek		0.88		**0.88**
	East Twin Creek	0.37	0.94		**1.30**
	Gold Creek	0.71	4.64	2.34	**7.69**
	Spring Creek	0.29	0.34		**0.64**
	West Fork Gold Creek		1.44	4.77	**6.21**
	West Twin Creek	1.51	1.80		**3.31**
	Forest Service Subtotal	*7.89*	*19.45*	*13.33*	***40.67***
Private	Unnamed Tributaries		0.07	0.27	**0.34**
	East Twin Creek	0.01	0.01	0.13	**0.15**
	Elk Creek	0.00	0.37	0.40	**0.77**
	Union Creek	0.56	0.00	0.05	**0.61**
	Wagner Creek			0.06	**0.06**
	West Twin Creek	0.18	0.28		**0.46**
	Private Property Subtotal	*0.75*	*0.73*	*0.91*	***2.39***
State - DNRC	Belmont Creek		0.53		**0.53**
State - U of M	Unnamed Streams		0.03	0.21	**0.24**
The Nature Conservancy	Unnamed Tributaries	0.55	2.56	1.05	**4.17**
	Belmont Creek	0.21	0.68	0.19	**1.08**

	East Twin Creek	0.36	2.90	0.39	**3.65**
	Gold Creek		2.99	3.57	**6.56**
	Spring Creek		0.45	1.12	**1.56**
	West Fork Gold Creek		0.58	1.42	**2.00**
	West Twin Creek	0.12	1.45		**1.56**
	TNC Subtotal	*1.24*	*11.61*	*7.74*	***20.58***
Total Stream Miles		**11.02**	**40.83**	**24.69**	**76.54**

Like lotic hydrology, lentic features are managed using a suite of riparian management objectives and considerations for riverscape health. Common RMOs for lentic hydrology manage for temperature, water quality, and site appropriate plant communities dependent on wetland type. Lentic features are assessed for their hydrologic and biologic function as well as riverscape potential to grow or change.

2.3.3 Hydrology

The Lower Blackfoot assessment area includes 13 watershed (HUC 6) subbasins, including Twin Creeks, Lower and Upper Gold Creek, Belmont Creek, and the Buck Creek/Blackfoot River. These watersheds are tributaries to the Blackfoot River in the middle Clark Fork River basin. The Dunnigan Gulch to Woodchuck Gulch portion of the assessment area includes a series of hydrologically disconnected intermittent and/or perennial streams; these streams do not reach the Blackfoot River due to influences of glacial outwash plains and the water sources going subsurface. The assessment area includes approximately 95 miles of perennial streams and 308 miles of intermittent streams (USGS NHD 2022). Hydrologic conditions throughout the assessment area are based on seasonal winter snow accumulations that boost stream flows during peak snowmelt in May and June; streams return to base flows in late July through September. The Gold Creek and Belmont Creek drainages are well known for supporting significant quantities of snow which benefit native fisheries with cold water throughout the summer months.

2.4 Vegetation

2.4.1 Forest Vegetation

Characterization of forest vegetation was completed by assessing current conditions and habitat types across the assessment area. Vegetation was then stratified into Habitat Type Groups (HTGs) to enable assessment of vegetation composition, structure, pattern and disturbance processes along environmental gradients (Refer to Habitat Type Group Map 20 in Appendix C and descriptions in Appendix A and B). HTG delineation is an ecologically-based vegetation classification system which defines a sites potential to support similar plant communities, characterized by successional responses to disturbance (Pfister and others, 1977; Fischer and Brady, 1987).

2.4.2 Rangeland Vegetation

Upland range vegetation within the assessment area consists of open parks, meadows, and grasslands. These areas support a variety of native grass species such as rough fescue, Idaho fescue, bluebunch wheatgrass, needle-and-thread, Sandberg bluegrass, green needlegrass, and prairie junegrass. Grasslands with southern or southwestern aspects primarily support bluebunch wheatgrass and Idaho fescue. Associated with forest habitat types are wet meadows and perennial streams. These areas may contain a riparian shrub overstory with carex/tufted hairgrass/bluegrass understories.

The majority of preferred or palatable livestock forage is produced by the drier bunchgrass vegetation types mentioned above. However, public lands which have been harvested for timber have provided some livestock forage until forest canopy cover increases to the point it diminishes herbaceous production. Native graminoids located at these sites are mainly elk sedge and pinegrass which are not typically preferred by livestock. These areas can also contain introduced species such as *Dactylis glomerata* (orchard grass), *Phleum pratense* (timothy), and *Bromus inermis* (smooth brome). These introduced species can produce a significant amount of livestock forage; however, the quality of standing forage may decline with maturity.

2.4.3 Special Status Plants and Habitat

There is one BLM designated sensitive plant species that occurs or may occur within the assessment area; Howell's gumweed (*Grindelia howellii*). There are 7 recorded occurrences of Howell's gumweed within the assessment area; 2 of which are on Forest Service and 5 of which are on privately managed land. Howell's gumweed is endemic to the Seeley Lake-Ovando area of Montana (and in one likely introduced population near Coeur d'Alene, Idaho) (Lesica 2001). It is found in moist areas with lightly disturbed soils adjacent to ponds and marshes or similar human created habitats (Lesica 2012). Most present-day populations are found along roadsides accompanied by various non-native plants (Lesica 2001). Howell's gumweed is very similar in appearance to the more common and widespread curlycup gumweed (*Grindelia squarrosa)* but is distinguishable from curlycup through the presence of stalked glands along the stem (Lesica 2012). There are no known occurrences of non-tree plant species protected by the Endangered Species Act (ESA) in the assessment area.

There are two plant species considered culturally important to the Confederated Salish and Kootenai Tribes within the assessment area, blue camas (*Camassia quamash*) and bitterroot (*Lewisia rediviva*). These species were included in a 2018 Reserve Treaty Rights Lands (RTRL) project where, along with the prioritization of fuels and forestry treatments, the Confederated Salish and Kootenai Tribes worked with the Missoula Field Office and The Nature Conservancy to prioritize enhancement and restoration of these two culturally important species within the assessment area. This work has continued through three stages of the RTRL agreement and will likely continue.

Blue camas typically exists in deep soil of wet to moist areas (Lesica et al. 2012), occurring primarily in wetland environments with seasonal wet periods (Gould 1942). Usually found in large colonies, these camas dominated wetland areas are often referred to as camas prairies (Maclay 1928, Gould 1942). Camas prefers soil that is saturated at or near the soil surface during the early portion of the growing season, and dry during the summer (Maclay 1928, Thoms 1989). Camas needs well-defined cold/warm and wet/dry periods (Thoms 1989).

Bitterroot grows in gravelly or sandy, well-drained, usually sparsely-vegetated soil of grasslands, valleys, and montane environments (Lesica et al. 2012). It is an herbaceous succulent perennial that can be found at elevations ranging from 90 to nearly 9,000 ft (Roderick 2005).

Table 2. Special Status and Culturally Important Plants and Associated Habitat in the Lower Blackfoot Watershed.

Plant Species	Habitat	Agency Status
Howell's gumweed (*Grindelia howellii*)	Moist areas with lightly disturbed soils adjacent to ponds and marshes or similar human created habitats	Sensitive
Blue camas (*Camassia quamash*)	Deep soil of moist to wet meadows, grasslands, valleys to lower subalpine	None
Bitterroot (*Lewisia rediviva*)	Gravelly or sandy, well-drained, usually sparsely-vegetated soil of grasslands; valleys, montane	None

Source: https://mtnhp.org/mapviewer/, Lesica et al. 2012. Manual of Montana Vascular Plants. BRIT Press. Fort Worth, TX

2.4.4 Noxious Weeds

Management of noxious weeds is carried out on lands administered by the Missoula Field Office in cooperation with state, county, and other federal agencies. All listed species on the Montana state noxious weed list are being managed within the scope of the Missoula RMP. The term "weed" refers any plant growing where it's not wanted, and the definition of a "noxious weed" is any non-native plant which is determined to be injurious to public health, agriculture, recreation, wildlife or the environment. Noxious weeds have invasive characteristics which result in the reduction and/or elimination of desirable vegetation.

The Montana Department of Agriculture's Noxious Weed Management Plan (2010) contains a Noxious Weed List and prioritizes weeds by threat and abundance.

Most of the invasive species being dealt with in this region were introduced from Europe and Asia during the nineteenth and early twentieth centuries, but new species are continually being brought into the United States. Generally, these "non-native" plants no longer have the natural control factors such as predatory insects, pathogens, other competitive plants, and grazing that they were once subjected to in their native habitats. As a result, the introduced plants successfully compete with native plants for water, sunlight, and soil nutrients. This can result in lower soil quality, increased erosion, and reduced wildlife and livestock yields through the presence of less desirable forage.

These species are found within a broad range of habitat types in the assessment area. The lower elevation sites are dominated by spotted knapweed, which has expanded from roadsides and invaded many disturbed sites and to a lesser extent undisturbed sites, with the densest populations found primarily on south-facing slopes. Roadsides are the primary spread vector (Mortensen and others 2009) throughout the assessment area. Areas away from roadsides that have not had ground disturbance or have dense canopy cover have little or no weed infestation. Past logging, wildland fire and livestock grazing have contributed to the spread of noxious weeds. This spread has been ongoing for many decades, allowing noxious weeds to spread off the roads and infest adjacent lands.

Many parts of the assessment area have considerable amount of land use by the public, partly because of the proximity to Missoula and other urban areas, this translates to continued weed spread and possible introduction of new invasive species. With more lands going back to the public domain access to these

lands and roads will increase the need for noxious weed management at the federal, state, local and private level.

2.5 Forest Resources

Forest Resources generally consist of those items which hold a monetary value to society. Chief among these, at least as commodities go, is timber for lumber production which, as will be discussed in Section 4.5, has been a primary economic driver in the assessment area for well over 100 years. Other forest resources with smaller markets are also present such as firewood, Christmas trees, berries and mushrooms. Newer, developing forest resource markets include carbon offsets or credits which can be bought and sold, and at least one forest owner in the assessment area (The University of Montana's Lubrecht Experimental Forest) has taken steps in that direction. For purposes of this EAWS, this discussion is limited to those market driven resources such as listed above and will not consider the intangible and yet hugely important suit of Ecosystem Services present on the landscape, such as fish and wildlife habitat, clean water and oxygen production, and open space for recreation and solitude – those discussions are addressed in the assessment in other sections.

The forest resources that are found in the assessment area today are due almost entirely to the management history of the area, discussed in detail in Section 4.5. Vast acreages of dense young stands have regenerated from past harvests, helped along in many cases by broadcast burning, mechanical site preparation (purposeful scarification to encourage natural regeneration) or planting. While dense stands do provide habitat for some wildlife species, they also exist in an overstocked condition and are under severe competition for resources. As discussed in the Forest Vegetation section, managing towards midpoint NRV and for healthy, resilient forests will often mean thinning of these stands to increase growing space, increased available resources and improved resiliency. Thinning of young stands can produce various small-diameter timber products including firewood, posts and rails and logs for paper chip production. Thinning and similar treatments also increase understory development which in many sites will include berry producing species which are important for wildlife as well as for human picking.

Forest resource management in the Lower Blackfoot EAWS area in the near-term (the next 5 - 20 years) will focus on forest restoration (as described in the Forest Vegetation sections) where forest resources will be produced largely as a biproduct of restorative treatments. However, in the longer term (20 – 100 years) these treatments will also provide growing conditions that will produce a viable and sustainable timber supply, which remains a priority of the 2021 Missoula RMP, as well as a key component of the Multiple Use and Sustained Yield mandate per FLPMA (Federal Land Policy and Management Act of 1976).

2.6 Terrestrial Wildlife and Habitat

The assessment area is characterized by a wide range of conifer forests with small grassland meadows. Elevations range from approximately 3,400 feet along the Blackfoot River to about 7,400 feet near Mineral Peak. Low elevations contain both the Warm and Dry Douglas-fir as well as Moderately Warm and Dry Douglas-fir habitat type groups (HTG 1-2). The mid-elevations are composed of Moderately Cool and Dry Douglas-fir habitat type group (HTG 3). The upper elevations are comprised of Cool and Moist subalpine-fir habitat type group (HTG 4). These are described in detail in Section 4.4.

Although limited, the most common deciduous hardwood trees in this area are black cottonwood and quaking aspen. Forest understory shrub communities include snowbrush, ceanothus, kinnikinnick, common chokecherry, western serviceberry, mountain alder, mountain maple, and huckleberry. Native grass species include rough fescue, Idaho fescue, bluebunch wheatgrass, needle-and-thread, Sandberg bluegrass, green needlegrass, and prairie junegrass. Areas of southern or southwestern aspects primarily support bluebunch wheatgrass and Idaho fescue. Native graminoids include elk sedge and pinegrass.

Introduced grass species include *Dactylis glomerata* (orchard grass), *Phleum pratense* (timothy), and *Bromus inermis* (smooth brome).

Vegetation provides various habitats for terrestrial wildlife species. The way organisms interact with each other, the distribution of habitats, and the stage of plant succession influences wildlife community composition, structure, and function. Water, soil, topography, vegetation, cover, travel corridors, snags, down logs, and ecological disturbances create optimal, suitable, and/or unsuitable terrestrial wildlife habitat. Conifer forests have been fragmented by logging activity and wildfire. Historically, the majority of the lands within the assessment area were privately owned and heavily harvested by the Anaconda Copper Company, the Champion Timber Company, and Plum Creek Timber from 1925-1990. The Nature Conservancy purchased these lands in the 2000s. These lands have been recently acquired by the BLM through The Nature Conservancy's involvement with the Blackfoot River legacy program. This has allowed the BLM managed public lands within the assessment area to expanded from 40 acres to about 43,372 acres.

Tables 3 and 4 list some of the species, including the Bureau of Land Management Terrestrial Special Status Species (USDI 2020), known or suspected to occur in the assessment area at least occasionally. These organisms constitute a representative sample of the terrestrial wildlife community. Species lists are augmented from various wildlife surveys conducted in the assessment area. However, due to the long history of private ownership of majority of these lands the available wildlife data is somewhat limited and majority of wildlife data available is at edges of the assessment area and on lands managed by the Forest Service. Biodiversity is similar to historic times, though community composition likely contains less diverse gene pools than historically present. The community structure and preponderance of terrestrial wildlife species historically present have changed due to heavy habitat alteration and fragmentation due to extensive logging and fire suppression. However, due to habitat restoration and habitat security enhancement work completed in recent decades, the abundance and distribution of wildlife (e.g. grizzly bear) are increasing.

Table 3. Bureau of Land Management Terrestrial Wildlife Special Status Species possibly occurring within the assessment area.

COMMON NAME	SCIENTIFIC NAME	STATUS
Canada Lynx	*Lynx canadensis*	Threatened
Grizzly Bear	*Ursus arctos horribilis*	Threatened
Wolverine	*Gulo gulo*	Threatened
Western Bumble Bee	*Bombus occidentalis*	Candidate
Monarch Butterfly	*Danaus plexippus*	Candidate
Fisher	*Pekania pennanti*	Sensitive
Gray Wolf	*Canis lupus*	Sensitive
Townsend's Big-eared Bat	*Corynorhunus townsendii*	Sensitive
Fringed Myotis	*Myotis thysanodes*	Sensitive
Hoary Bat	*Lasiurus cinereus*	Sensitive
Black-backed Woodpecker	*Picoides arcticus*	Sensitive
Lewis' Woodpecker	*Melanerpes lewis*	Sensitive
Flammulated Owl	*Psiliscops flammeolus*	Sensitive

Great Gray Owl	*Strix nebulosa*	Sensitive
Bald Eagle	*Haliaeetus leucocephalus*	Sensitive
Golden Eagle	*Aquila chrysaetos*	Sensitive
Peregrine Falcon	*Falco peregrinus*	Sensitive
Black Tern	*Chlidonias niger*	Sensitive
Horned Grebe	*Podiceps auritus*	Sensitive
American Bittern	*Botaurus lentiginosus*	Sensitive
Long-billed Curlew	*Numenius americanus*	Sensitive
Trumpeter Swan	*Cygnus buccinator*	Sensitive
Loggerhead Shrike	*Lanius ludovicianus*	Sensitive
Brewer's Sparrow	*Spilella breweri*	Sensitive
Northern Leopard Frog	*Lithobates pipiens*	Sensitive
Western Toad	*Anaxyrus borealis*	Sensitive

Table 4. Birds possibly present within assessment area. Status indicates resident, migratory, variable (wherein a population consists of both migratory and resident birds), or historic range.

COMMON NAME	SCIENTIFIC NAME	STATUS
Harlequin Duck	*Histrionicus histrionicus*	Migratory
Black-backed Woodpecker	*Picoides arcticus*	Resident
Evening Grosbeak	*Coccothraustes vespertinus*	Variable
Cassin's Finch	*Haemorhous cassinii*	Resident
Clark's Nutcracker	*Nucifraga columbiana*	Resident
Pilleated Woodpecker	*Dryocupus pileatus*	Resident
Flammulated Owl	*Psiliscops flammeolus*	Migratory
Varied Thrush	*Ixoreus naevius*	Migratory
Brown Creeper	*Certhia americana*	Resident
Bald Eagle	*Haliaeetus leucocephalus*	Resident
Great Blue Heron	*Ardea herodias*	Variable
Northern Goshawk	*Accipiter gentilis*	Variable
Pacific Wren	*Troglodytes pacificus*	Resident
Golden Eagle	*Aquila chrysaetos*	Resident
Bobolink	*Dolichonyx oryzivorus*	Migratory
Peregrine Falcon	*Falco peregrinus*	Resident
Long-billed Curlew	*Numenius americanus*	Migratory
Rufous Hummingbird	*Selasphorus rufus*	Migratory
Lewis' Woodpecker	*Melanerpes lewis*	Migratory
Great Gray Owl	*Strix nebulosa*	Resident
Black Swift	*Cypseloides niger*	Migratory
Hooded Merganser	*Lophodytes cucullatus*	Migratory
Boreal Chickadee	*Poecile hudsonicus*	Resident

Horned Grebe	*Podiceps auritus*	Migratory
Gray-crowned Rosy-finch	*Leucosticte tephrocotis*	Variable
Barrow's Goldeneye	*Bucephala islandica*	Variable
Brewer's Sparrow	*Spilella breweri*	Migratory
Ferruginous Hawk	*Buteo regalis*	Migratory
Trumpeter Swan	*Cygnus buccinator*	Migratory
Black-crowned Night-heron	*Nycticorax nycticorax*	Migratory
White-faced Ibis	Plegadis chihi	Migratory
Common Loon	*Gavia immer*	Migratory
Veery	*Catharus fuscescens*	Migratory
Boreal Owl	*Aegolius funereus*	Resident
Western Screech-Owl	*Megascops kennicottii*	Resident
Common Poorwill	*Phalaenoptilus nutallii*	Migratory
American Bittern	*Botaurus lentiginosus*	Migratory
Yellow-billed Cuckoo	*Coccyzus americanus*	Migratory
Black Tern	*Chlidonias niger*	Migratory
Tennessee Warbler	*Leiothlypis peregrina*	Migratory
Broad-tailed Hummingbird	*Selasphorus platycercus*	Migratory
Northern Hawk Owl	*Surnia uluta*	Migratory
Ovenbird	*Seiurus aurocapilla*	Migratory
Short-eared Owl	*Asio flammeus*	Resident
Sharp-tailed Grouse	*Tympanuchus phasianellus*	Historic
Alder Flycatcher	*Empidonax alnorum*	Migratory
Loggerhead Shrike	*Lanius ludovicianus*	Migratory
Common Tern	*Stema hirundo*	Migratory
Franklin's Gull	*Leucophaeus pipixcan*	Migratory
Black-neckked Stilt	*Himantopus mexicanus*	Migratory
Caspian Tern	*Hydroprogne caspia*	Migratory
Forster's Tern	*Stema forsteri*	Migratory
American White Pelican	*Pelecanus erythrorynchos*	Migratory
Black-and-white Wharbler	*Mniotitta varia*	Migratory
Clark's Grebe	*Aechmophorus clarkii*	Migratory

2.7 Aquatic Species and Habitat

All the streams in the assessment area are located within the Blackfoot River watershed. The Blackfoot River flows 132 miles from its headwaters near Roger's Pass to its confluence with the Clark Fork River near Bonner, MT. Aquatic habitats in the assessment area on BLM include approximately 24 miles of fish bearing streams interspersed with occasional beaver ponds, numerous wetland types, springs, and seeps. These habitats support a range of native and non-native fish, as well as native amphibians.

Within streams, the most widespread fish are species of the Salmonidae family (trout, char, and whitefish) along with members of the Cottidae (sculpin), Cyprinidae (minnows and dace), and Catastomidae (suckers) (Table 5). Streams are also home to larval and adult Rocky Mountain tailed frogs. Lentic waters in the assessment area provide breeding habitat for western toad, Columbia spotted frog, long-toed salamander, and Sierran treefrog. The Blackfoot River and three other streams in the assessment area (Gold, West Fork Gold, and Belmont Creeks) are categorized as Bull Trout Critical Habitat in the U. S. Fish and Wildlife Service's Bull Trout Recovery Plan (USFWS 2015) and the river is also an important stronghold for migratory westslope cutthroat trout (WCT).

Stream habitats in the assessment area exhibit a wide range of Rosgen channel types, gradients, flow rates, and substrates. While the streams differ in terms of their underlying geology and geomorphology, they are similar in that they drain steep, forested watersheds and, for much of their length, are hillslope-constrained and characterized by higher gradients. In these constrained channels, flood-plain development is typically sparse and (except for a thin band of deciduous shrubs) the dominant streambank vegetation is conifer. Although many of the stream reaches are primarily in higher-gradient channels that are stabilized with wood or rock, these reaches are punctuated by segments of lower gradient stretches where accumulated sediments and wider valley-forms permit the development of floodplains. The bulk of beaver influenced habitat (current and historic) occurs in these lower gradient segments such as on portions of Belmont, Gold, and West Fork Gold Creeks.

See Map 2 in Appendix C for aquatic resources and locations of investigations in the Lower Blackfoot assessment area. Habitat surveys and deployed temperature loggers were conducted in several stream locations during 2022 and 2023.

Table 5. Fish distribution in primary streams of the assessment area determined from BLM and MT FWP surveys. WCT=Westslope Cutthroat Trout; BULL=Bull Trout; WF=Mountain Whitefish; COT=Sculpin; LS SU=Largescale Sucker; LN DC=Longnose Dace; RS SH=Redside Shiner; N PMN=Northern Pikeminnow; RB=Rainbow Trout; EB=Brook Trout; LL=Brown Trout; RBxWCT=Rainbow and Westslope Cutthroat Trout Hybrid; EBxBULL=Brook Trout and Bull Trout Hybrid

Stream	Total stream miles	Stream miles on BLM	Fish-bearing miles on BLM	Fish species present on BLM
Blackfoot River	18.84	10.20	10.20	WCT-F, BULL, LL, RB, RBxWCT, WF, N PMN, COT, LS SU, LN DC, RS SH
Gold Creek	19.20	2.09	2.09	WCT, LL, RB, EB, BULL, EBxBULL, RBxWCT, COT, WF, LN DC
Belmont Creek	10.61	7.15	7.15	WCT, BULL, RB, RBxWCT, WF, LL, COT
Blanchard Creek	1.08	0.48	0.48	WCT, RB, LL, EB, LN DC, WF, NM PM, COT
East Twin Creek	5.55	0.00	0.00	WCT, BULL, RB, EB, LL, EBxBULL, RBxWCT

Burnt Creek	3.71	3.71	3.71	WCT
West Twin Creek	5.52	0.00	0.00	WCT, RB, EB, RBxWCT
Wild Horse Creek	3.51	0.00	0.00	WCT
Cow Creek	2.31	1.92	0.74	WCT
Game Ridge Creek	1.26	1.11	0.00	WCT
West Fork Gold Creek	9.07	0.00	0.00	WCT, BULL, RB, EB, LL, RBxWCT
Unnamed Creek	0.68	0.00	0.00	EB
Totals	**62.51**	**26.66**	**24.38**	

2.8 Cultural Resources

The assessment area has seen human occupation and land use for 10,000 years or more years since the recession of the glacial ice sheet from the Last Glacial period (circa 115,000 to c. 11,700) and start of the Holocene (c. 11,700 to present). The region saw occupation and resource use by the ancestral populations of current Indigenous people for generations. Archaeological evidence and material culture associated with these groups has been found in both surface and buried deposits throughout the area. This evidence coupled with the survival of oral traditions, stories and practices show an extensive presence and relationship within the functions of the ecosystem that remained largely stable and unchanged for thousands of years. The arrival of European and Euro-American explorers, trappers, homesteaders, miners, and agriculturalists at the start of the 1800's saw a significant shift of human presence, land use and cultural impact within the region. Agriculture, settlement, and logging have resulted in an incredible change to the environment, while at the same time leaving layers and deposits of modern human material culture and landscape modification within the archaeological record.

2.9 Recreation

In historic and modern times, people have used the assessment area to fish, hunt, camp, float, drive and snowmobile for several decades. As such, the lands in the assessment area are heavily used by the public, both commercially and non-commercially, for recreation. This recreation use is both water and land based. Land based recreation occurs as both concentrated and dispersed use. Water based use is usually confined to the Blackfoot River itself and the lands immediately adjacent to it. While most lands in the assessment area were privately owned by various timber companies for over a century, all the companies had an open lands policy, thus people have recreated on these lands as they would have on public lands.

2.10 Visual Resources

The lands in the assessment area, the river corridor in particular, provide important scenic values. Since the first BLM acquisition of the lands along the river corridor (see Map 11 Appendix C), the scenic values have been taken into consideration when planning for and conducting management actions. In this corridor, scenic values should have improved or at least not have been impacted by management actions. On the lands acquired after 2000, past management actions have, at times, altered the scenic values.

2.11 Wildland Fire Management

Wildfire has been the dominant disturbance agent shaping vegetation structure and composition in the Interior Columbia Basin for thousands of years (Johnson and others 1994). Wildfires included natural ignitions from lighting as well as planned ignitions from Indigenous people for a variety of purposes. Wildfires continued to have these important roles until 1940 when fire suppression was effective enough to limit the role of natural fire throughout the region (Pyne 1982). Prior to organized suppression, the mean fire intervals for three dominant forest types in the Inland Northwest were: (1) open ponderosa pine forest types every 20 years; (2) interior Douglas-fir and larch every 52 years; and (3) lodgepole pine every 112 years (Barrett and others 1997). These mean fire intervals and associated vegetation correspond well to the site-specific HTGs, fire groups and mean disturbance intervals (see Appendix B) within the assessment area.

Organized fire suppression in the assessment area began in 1922 when timber companies in the Big Blackfoot river drainage formed the Blackfoot Forest Protection Association (BFPA) to provide forest fire protection to 1,200,000 acres of private, state, and federal land. The BFPA continued suppression operations in the assessment area until 1970, at such time the State of Montana Department of Natural Resources and Conservation (DNRC) transitioned to providing fire suppression. The DNRC continues to provide wildland fire management on the majority of the lands in the assessment area including BLM, U.S. Forest Service (USFS), The Nature Conservancy (TNC), Department of Natural Resources and Conservation (DNRC), Montana Fish Wildlife & Parks (MT FWP), Lubrecht State Experimental Forest, and private.

2.12 Lands/Realty/Access

For over a century most lands in the assessment area were owned by timber companies before being acquired by The Nature Conservancy. Current ownership is composed of USFS, TNC, BLM, DNRC, MT FWP, Lubrecht Experimental Forest, and private landowners. See Map 1 in Appendix C for current ownership. The BLM has acquired parcels in this area in separate realty transactions over several decades. Recent additions, named Woodchuck (6,575 acres) and Ninemile Prairie (4,636 acres), were acquired by BLM in 2022 to extend the BLM lands eastward towards Clearwater Junction. This assessment area is one of the largest contiguous parcels of the BLM Missoula Field Office, covering about 43,372 acres. See Map 11 in Appendix C for a history of the acquisitions.

2.13 Facilities and Assets

Assets in this assessment area are primarily transportation facilities and some recreational. The terrain is mountainous and mostly a good mix of rock parent material that is conducive to road building. Side slopes generally allowed for balanced road construction. Most roads were developed in this area since the 1950s for the purposes of timber management. The assessment area ownership was unique in that it was mostly owned by one entity instead of a checkerboard pattern typical in other areas of western Montana. There were large blocks of consistent ownership in the assessment area. Roads in the assessment area

were constructed for timber management without ownership constraint, which has led to better locations on the landscape and with more gentle road grades to accommodate equipment and logging. Most of the roads in the assessment area were built during an era of heavy equipment meaning the road location wasn't as limited by rock formations or intermittent steep slopes. Many of the roads were built after the environment movement and associated laws thus the roads being constructed were starting to be more environmentally friendly. The roads and former roads and trails in the assessment area show multiple eras of entry with the first being more non-constructed roads that are along the draw bottoms and the ridgelines with little to no cut and fill. The next era began constructing roads off the main lines at lower elevations, and the last entries have changed haul direction and connected between previously existing roads.

All of the day use sites and Thibodeau campground were in existence when the BLM acquired the first large parcel (11,000 acres) in the late 1990s/early 2000s. After that first acquisition, BLM did take out one day use site and then redesigned the other day use sites, improved Thibodeau Campground, and improved Whitaker Boat Launch and day use site. BLM first maintained the Johnsrud Road installing jersey barriers and adding gravel around that time as well.

2.14 Lewis and Clark Trail Corridor

The Lewis and Clark National Historic Trail is designated on approximately 12 miles of BLM managed public lands within the Blackfoot River corridor and valley. The Lewis and Clark Trail was designated a National Historic Trail after the National Parks and Recreation Act of 1978 (Public Law 95-625) amended the National Trails System Act to include the new category of National Historic Trails. According to the Foundation Document (USDI-NPS 2012), the purpose of the Lewis and Clark National Historic Trail is to commemorate the 1804 to 1806 Lewis and Clark Expedition through the identification; protection; interpretation; public use and enjoyment; and preservation of historic, cultural, and natural resources associated with the expedition and its place in U.S. and Indigenous history.

The Secretary of the Interior was given the trail administrator responsibility and long-term administration of the trail was delegated to the National Park Service (NPS). In the 1982 Comprehensive Management Plan (USDI-NPS 1982), the NPS recommended two types of development for Lewis's return trip between Traveler's Rest and Great Falls—a motor trail and a land trail. They proposed that the land trail would be located on the south side of the Blackfoot River between McNamara and Roundup Bridge, and that Johnsrud Park and Ninemile Prairie Access were to be trailheads for the land trail. The motor trail would be along Highway 200. A railroad grade runs through the Blackfoot on the north side of the river. On the BLM managed public lands within the assessment area, it is designated as the Road to the Buffalo Trail which is the trail that Lewis and his men used, and could be further developed as the land trail. The rest of the trail is not accessible and could be the part of the motor trail.

2.15 Socioeconomics

Missoula County encompasses the assessment area. Missoula is the largest city within the County but the majority of the County's acreage is rural. The natural landscape is one of the reasons that residents live in the area and enjoy a high quality of life. The natural resources of the area (e.g., timber, agriculture) have supported the local economy since European settlement. As the County has seen population growth and less extractive economic activity, there has been increased demand for recreation on public lands, along with a desire to protect and restore ecologically sustainable forests. Opportunities for outdoor recreation bolster tourism and support economic development. The mixed ownership, along with BLM's multi-use

mission, will require collaborative discussions with the community and other land owners to identify shared goals and priorities for the watershed.

Chapter 3 – Issues and Key Questions

3.1 Geology and Mineral Resources

- Much of the public lands managed by the Bureau of Land Management within the analysis area are underlain by mineral estate that is privately owned by several entities and a few individuals. In regard to this complex subsurface estate, what parcels of public lands within the watershed assessment are privately owned and by whom?
- What areas could be developed into mineral material sites to support maintenance of the public system of roads?

3.2 Landforms, Soils, and Site Productivity

- How have past management actions changed soil productivity and erosional regimes?
- What soil mass wasting hazards and significant natural or management-caused sediment sources exist on the landscape?
- What sensitive soil communities are in the Lower Blackfoot area and where are they?

3.3 Water Resources

3.3.1 Water Quality

- What is the current water quality status and TMDL management plan element(s) relevant for the Lower Blackfoot area?
- What sources of water quality impairment are linked to BLM administered public lands and TNC lands?
- What management actions are needed to help move towards meeting (or continue meeting) State water quality standards?

3.3.2 Riparian, Wetlands, and Streams

- What is the current status and trend of lentic areas and lotic stream conditions?
- How do existing riverscape conditions compare to natural ranges of variability and potential conditions?
- What management opportunities can improve riverscape and riparian health?

3.3.3 Hydrology

- How have past and present management actions changed hydrologic characteristics and the ability to support water utilizations in the Lower Blackfoot area?
- What management actions are needed to improve hydrologic conditions?

3.4 Vegetation

3.4.1 Forest Vegetation

Forest vegetation within the assessment area has experienced: 1. a disruption in disturbance from naturally occurring fires from 1940 to present day (for the past 80 years) and 2. extensive harvest from the

early 1900s until the mid 1990s. Past logging practices and a lack of fire across the landscape have resulted in a shift in forest vegetation composition, structure, density and disturbance regimes that deviate substantially from historic or more naturally occurring conditions that would exist if disturbance regimes were intact and the logging practices had not been as intense and wide ranging as they were. Issues and key questions associated with these vegetation changes follow.

- Are land management actions needed to begin to shift forest vegetation to conditions that would have occurred prior to European-American occupancy to enhance and/or maintain long term biological diversity?
- If so, what vegetation manipulation is needed to begin to shift forest vegetation to conditions that would occur more naturally?
- Are land management actions needed to reduce the risk of undesirable disturbance from wildfire, insects, and diseases in the near and long term?
- Are land management actions needed to perpetuate federally listed threatened whitebark pine in the EAWS area?

3.4.2 Rangeland Vegetation

- Are existing grazing leases meeting the goals for desired plant communities?
- What grazing systems can be implemented to facilitate the achievement of rangeland health for long-term sustainable use?

3.4.3 Special Status Plants and Habitat

- What is the distribution of Howell's gumweed?
- How genetically distinct is Howell's gumweed from curlycup gumweed?
- What are the current conditions of gumweed habitat?
- What are the distributions of camas and bitterroot?
- What are the opportunities for restoration of camas and bitterroot?
- What are the current conditions of camas and bitterroot habitat?

3.4.4 Noxious Weeds

- What is the current status of noxious weed populations and their outlook for continuing to spread?
- What are the primary mechanisms of weed spread and what management actions should be taken to minimize or eliminate spread?
- What's happening after weeds are treated? Is revegetation with native plants/seeds being done?

3.5 Forest Resources

- How have past and present management actions changed forest resources present?
- What management actions are needed to improve forest resource conditions?
- How can management for other resource benefits produce forest resources?
- How can forest vegetation management aid in a sustainable supply of forest resources from these lands in perpetuity.

3.6 Terrestrial Wildlife and Habitat

Issues and key questions involving wildlife and special status species are related to ecosystem integrity including ecological, social, and economical integrity. Ecological integrity involves wildlife habitat associated with forest, range, and aquatic systems. Social and economic integrity are related to human uses and resiliency.

3.6.1 Species Habitat

- What wildlife species historically occupied the assessment area?
- What wildlife species are currently present and how are they distributed?
- What natural and management-related processes have the potential to reduce or limit the viability of wildlife species, particularly Endangered Species Act (ESA)-listed species?
- What management actions (restoration, maintenance, recreational development and protection) could be undertaken that would maintain and/or restore the desired populations of wildlife, , particularly ESA-listed species?
- How much of the designated Canada lynx Critical Habitat within the assessment area contains forest composition with appropriate structure and suitable dense horizontal cover to provide primary foraging and denning habitat?
- What area(s) does the American Wolverine use and what management decisions can be made to secure this habitat and improve connectivity between primary and maternal habitats?
- Where within the assessment area is there secure habitat for the grizzly bear based on open road density?
- Which pollinators are present and which areas are important for their survival?
- Where are the big game winter, crucial winter, summer and crucial summer ranges?
- Are weed management (promoting native forage species) and range management actions (compliance with lease terms and conditions including forage limits and fence maintenance) compatible with big game movement and forage needs?

3.6.2 Ecological Integrity (Forest, Range, and Aquatic)

- What's happening after weeds are treated? Is revegetation with native plants/seeds being done?
- Forest Integrity: What are the conditions of forestlands and the factors contributing to their integrity? The absence or presence of wildfire, changes in fire severity and frequency since historic times, levels of timber management, patch size and spatial arrangement of forest stands, stand composition, amounts of snags and down woody debris, road density, and the spread of invasive weeds will be evaluated. Forest integrity as it relates to the grizzly bear and Canada lynx will be especially analyzed.
- Range Integrity: What are the conditions of rangelands and the factors contributing to their integrity? The absence or presence of wildfire; the changes in fire severity and frequency since historic times; the spread of invasive weeds; and the associated influences on vegetation patterns, composition, and wildlife distribution will be evaluated. Livestock grazing is allowed on two allotments, Belmont Creek and Black Canyon.
- Aquatic Integrity: What are the conditions of riparian areas and the factors contributing to their integrity? The absence or presence of wildfire, the changes in fire severity and frequency since historic times, and the mechanisms influencing high or low quality conditions will be evaluated.

3.6.2 Social Integrity

- What types and level of human activities interact with wildlife and how do these activities affect the resiliency of wildlife? Various types of motorized and non-motorized recreation, including winter-recreation, will be evaluated.

3.6.3 Economic Integrity

- What types and level of human business interact with wildlife and how do these activities affect the resiliency of wildlife? Timber harvest and commercial river use will be evaluated.

3.7 Aquatic Species and Habitat

3.7.1 Habitat

- What was the likely historical condition and distribution of aquatic and riparian habitats throughout the assessment area and how have human activities affected them?
- What is the current condition of aquatic habitat throughout the assessment area?
- What processes are important in shaping/maintaining aquatic and riparian habitats?
- What components of aquatic habitat are important to maintain suitable water and habitat quality for aquatic species?
- What and where are natural and human-caused obstructions to the movement and dispersal of aquatic species?
- What management actions (restoration, maintenance, protection, etc.) could be undertaken that would maintain and/or restore the integrity and productivity of aquatic and riparian habitats within the assessment area?

3.7.2 Species

- What aquatic and riparian-associated species historically occupied drainages in the assessment area?
- What aquatic and riparian-associated species are currently present and how are they distributed?
- How have exotic species affected the distribution and condition of populations of native species?
- What natural and management-related processes have the potential to reduce or limit the viability of these organisms?
- What management actions (restoration, maintenance, and protection) could be undertaken that would maintain and/or restore the desired populations of aquatic species?

3.8 Cultural Resources

- Are there important historic and precontact sites on public lands?
- How can the BLM conduct the following?
    - Protect known precontact and historic cultural sites from looting, damage, and destruction.
    - Protect culturally modified trees from the negative impacts of beetle kill, wildfire, firewood collection, and potential vandalism.
    - Update previous inventories that are 10+ years or older.
    - Protect site integrity of the Cokahlarishkit/Lewis and Clark Trail as trail use by the public increases.
- Would installing signs about cultural resources and relevant laws be helpful to protect site integrity?

- How can the BLM create and maintain spaces for Indigenous people to reconnect with the landscape through the procurement of traditional plants?
- How can the BLM facilitate opportunities for Indigenous people to teach and pass down traditional skills to younger generations?
- How can the BLM engage in co-stewardship of this landscape to incorporate Indigenous knowledge and create space for meaningful consultation and engagement in the management of resources?

3.9 Recreation

- As recreation increases in the Blackfoot Valley, what opportunities and experiences can the BLM provide and how can the BLM offset some of the use that is happening elsewhere?

3.10 Visual Resources

- How will the BLM protect the scenic values of the Lower Blackfoot Watershed?

3.11 Wildland Fire Management

- How will wildfires be managed across the assessment area given USFS and BLM Fire Management Zone (FMZ) guidance and DNRC protection?
- How should vegetation management incorporate/coordinate with wildland fire management?
- How will Potential Operational Delineations in the assessment area be used?

3.12 Lands/Realty/Access

- With other federal organizations and private land owners in the watershed, how does BLM ensure public access is maintained?

3.13 Facilities and Assets

- Issues and questions as it relates to the watershed and analysis are addressed by other resources.
- How will the BLM maintain its assets and facilities.

3.14 Lewis and Clark Trail Corridor

- How will the BLM identify, protect, interpret, and ensure public use and enjoyment of the Lewis and Clark National Historic trail?
- How will the BLM preserve of the historic, cultural, and natural resources associated with the expedition and its place in U.S. and Indigenous history?

3.15 Socioeconomics

- How would the BLM consider social and economic conditions in the assessment area when managing BLM lands, specifically how should the BLM contribute to local economies and infrastructure needs through recreation opportunities, rights-of-way, mineral exploration and development, livestock grazing, and forest products while managing for wildlife and aquatic habitat?
- Consider how BLM's implementation of management decisions impacts any low-income, minority or Indigenous populations that utilize or have cultural affiliations to the assessment area. Are there ways to potentially mitigate any disproportionate adverse impacts?

Chapter 4 – Historical and Reference Conditions

4.1 Geology and Mineral Resources

4.1.1 Geologic History

The youngest deposits in the assessment area are mainly exposed in low-elevation areas, within the Gold Creek drainage and along Ninemile Prairie. Formed during advances and melting of the Cordilleran Ice Sheet during the last glacial maximum and subsequent alpine glaciations. Glacial Lake Missoula also contributed to this sediment, as the paraglacial lake sat in many low-lying sections of the assessment area and deposited silt atop glacial till (Alden 1953). See section 2.1.3 for more detail on the glacial history and influence in the region.

Cenozoic sedimentary deposits are exposed in patches along major water drainages in the southern stretch of Gold Creek and Blanchard Creek, and in small sections along the Blackfoot River through Ninemile Prairie. These sediments were deposited through fluvial processes between 55-5 Ma and overlie the oldest rocks in the assessment area, the Precambrian Belt Supergroup.

No Cambrian through Cretaceous-age rocks occur within the Lower Blackfoot assessment area. In some instances they were never deposited, and in others, they were eroded. During Tertiary time volcanism and sedimentation formed extensive deposits in intermontane valleys. Volcanism during early and middle Tertiary time formed the volcanic fields in the Garnet Range, just to the south of the analysis area. No igneous intrusions or outcrops were observed during field reconnaissance trips. Lake and terrestrial deposits accumulated in the intermontane valleys during mid-to late-Tertiary time. During that time, extensive pediments formed, and gravels were deposited on these pediment surfaces.

The predominant and oldest exposed geologic units in the assessment area are the metasedimentary rocks of the Precambrian Belt Supergroup. During Precambrian time, sediments composed of silt, clay, sand, and limestone were deposited into an expansive shallow sea. This sea covering western Montana, northern Idaho, and southeastern British Columbia was known as the Belt Basin (McDonald et al. 2020). Since emplacement, the Supergroup has undergone low-grade metamorphism that turned the mudstone to argillite, siltstone to siltite, sandstone to quartzite, and the limestone retained some of their carbonaceous characteristics. Consequently, the dominant rock types in the assessment area are argillite, siltite, and quartzite. These rocks make up the majority of the assessment area and form an almost complete section of the Missoula Group in the southwest section of the assessment area (except the Libby Formation).

4.1.2 Mining History

Since the late 1990s, the Bureau of Land Management has acquired more than 43,000 acres of surface estate within the assessment area. Of these total acres of acquisition, only about 400 acres (less than 1%) of the subsurface mineral estate were reconveyed to the United States (see Map 12 in Appendix C and Tables 28 and 29 in Appendix D).

There are no known historic hardrock or placer mine sites within the assessment area. No evidence of mining was found during the field visits nor literature and record search as part of this watershed assessment. This area of the Blackfoot watershed is not included in any historic mining districts, with the closest being the Elk Creek Mining District in the Garnet Mountains to the south. Since 2020, the significant subsurface estate owner in the assessment area, WRH Nevada Properties, LLC, has been

conducting geological surveys and surface sampling. No follow-up mineral exploration, development, or published reports have resulted from this work.

4.2 Landforms, Soils, and Site Productivity

Soil productivity is generally stable unless soils are disturbed by natural or anthropogenic events. In the Lower Blackfoot EAWS area, anthropogenic soil productivity impacts were noted related to compaction from mechanized forest treatments, road and trail building, and cattle grazing. Significant soil compaction was noted throughout BLM managed lands during field surveys because of historic timber harvest practices, leaving a legacy network of skid trails and excavated hillslopes. Skid trails are often located in drainage bottoms and swales, connecting to the large network of roadways. Excavated hillslopes were noted particularly in the Cow Creek and Belmont Creek drainages; these features often followed topographic contours to create flat locations for historic tree planting treatments. This compaction can have a lasting impact on long-term site productivity, especially related to forest stand stability from erosion creep and "J rooted" soil compaction where forest vegetation cannot penetrate compacted soil layers; these conditions can lead to vegetation stress outside of natural variability.

Erosional regimes in the Lower Blackfoot EAWS area are similarly driven by anthropogenic or natural events, including impacts from road building, historic vegetation management, and post-fire erosion. Most notably, the analysis area includes a significant network of roads which have resulted in soil compaction and loss of hydrologic function within these road prisms and the cut and fill slopes adjacent to these features. Road prisms commonly result in accelerated soil erosion due to loss of soil-water infiltration and concentrated surface water flows on and adjacent to road prisms during rain events. Roads concentrate hillslope runoff and have a greater likelihood of delivering sediment to streams, especially fine particulate matter that is picked up in surface waters during rain events and seasonal snow melt (Switalski et al., 2004). A road sediment production model the Geomorphic Analysis and Inventory Package model (GRAIP Lite) showed that the road sediment production within the EAWS area was approximately 0.4 tons of sediment per year per road mile (Switalski 2019, Nelson et al. 2018). The Lower Blackfoot EAWS area includes over 920 miles of road. The model showed that the highest likelihood for road sediment delivery to streams was located where roads are steeper, closer to streams, had little vegetation, and more traffic (i.e. open to the public). Within the EAWS area, the highest road impacts were noted on key roads in the Jamison Gulch, West Fork Gold Creek, Belmont Creek, and Black Canyon areas from this analysis. Specific highly erodible road prisms were identified in the InRoads Consulting GRAIP Analysis report (Switalski et al. 2019).

In cases where roads are no longer needed for resource management the road prisms result in a long-term change to soil productivity; they often can only support stunted small trees, reduced soil water infiltration, and reduced soil organic matter unless further treatments, such as road surface decompaction, are completed. Research on the Clearwater National Forest shows significant improvement of hydrologic connectivity and nearly double the rooting depth of trees within recontoured road prisms that untreated roads (Lloyd et al. 2013).

Natural erosion regimes in the analysis area focused on a field survey for signs of mass wasting and large hillslope scale erosion; no recent signs of mass wasting were noted and relic, alluvial fans noted in some drainage bottoms in the Woodchuck area were stable and no longer showing signs of growth or additional mass movement. Additionally, field survey reviewed recently burned areas where soils can become hydrophobic, leading to surface water flows instead of normal soil-water infiltration processes. When this happens, surface flows can concentrate into erosional rills, or in some cases, large gullies that erode and

incise topographic low areas. In the Liberty Fire scar, most erosion was co-located in many of the intermittent drainage channels, with some streams having signs of vertical instability related to periods of heightened overland flow. In the 2017 Liberty Fire burn scar, evidence of hillslope erosion was present in the Upper Gold Creek watershed; several stream crossing culverts have become completely plugged with sediment associated with localized instream erosion and stream incision.

Land health surveys of the Belmont Creek and Black Canyon allotments were conducted concurrently with EAWS analysis for soils. Soil productivity is inherently very different in each allotment; the Belmont Creek drainage is a large north – south aligned watershed with a predominantly forested vegetation component, while the Black Canyon allotment is a south facing mountain side with dry forest and grassland vegetation. Decreased soil productivity from hoof shear compaction adjacent to perennial water sources in the Ninemile and Woodchuck areas was noted. Under TNC management, this area reduced the total number of animal unit months of grazing to allow for soil recovery.

Portions of the Lower Blackfoot EAWS area were included in an analysis of soil sensitivity and overall likelihood of soil resiliency by the Lolo National Forest (Campbell and Simpson 2019). This geospatial modeling effort used 20 years of Forest Soil Disturbance Monitoring Protocol field data to determine biophysical factors that can increase likelihood of detrimental impact from soil disturbances. The model results found that soil disturbances are less likely to recover in areas with high annual average soil water deficits and areas where previous management (prior to 1980) had occurred (Campbell and Simpson 2019). In the Lower Blackfoot area, the model outputs show that the most sensitive soil sites are located in the Ninemile Woodchuck areas where there are very thin surface soils along ridges and south facing slopes. The model also showed areas of lower soil resiliency in the 2017 Liberty Fire Scar, in the immediate vicinity of Mineral Peak, and along the Blackfoot River corridor where steep slopes and south facing aspects are well aligned.

4.3 Water Resources

4.3.1 Water Quality

Water quality and associated measures have been monitored in the Blackfoot River watershed since the 1990s. While some data from historic and reference conditions may exist, it is not comparable to statistically rigorous modern-day data. Montana DEQ monitors and manages water quality health across the watershed; BLM works as a partner agency and manages its public land to avoid impairment of water quality. The Montana DEQ TMDL Program is developed around the framework of beneficial public uses, such as municipal water supplies, fisheries, and irrigation. Since anthropogenic factors have certainly played a role in water quality impairment, a pre-human managed landscape could be considered as a historic reference condition- however, a long temporal evaluation of historic conditions would not be appropriate. But modern comparisons (1990s to 2020) for the Lower Blackfoot River are available from the 2013 Montana DEQ TMDL Report and from the Montana DEQ CWAIC 2020 website. See Table 6, for a summary of water quality issues in the 303d listed streams in the EAWS assessment area.

For the Blackfoot River, water quality impacts were associated with temperature impacts – with sources identified from streambank modification or destabilization and from flow alterations associated with water diversions. The Blackfoot is listed for nutrients, metals, and temperature through several of its reaches; but notably the Johnsrud Reach from Belmont Creek to Union Creek had “very minor impairments” noted. The 2009 TMDL document included recommendations to focus conservation and restoration efforts on source tributary streams and provide careful monitoring for metals, nutrients, temperature, and sediment.

On Belmont Creek, stream sedimentation was documented at almost double the anticipated level for normal baseline erosion with the source identified as forest road construction. Through the mid-1990s, the Belmont Creek watershed had 135 miles of roads which resulted in significant contribution to sediment (Plum Creek Timber Company, 1994 study). The hillslope and road erosion rates associated with logging practices and associated timber hauling was documented as 4 times higher than reference conditions for the drainage (MT DEQ 2009). When the stream was resampled in the early 2000s, sedimentation rates had dropped by 80% from the highest historic values; this significant drop was assumed to be correlated with road improvement projects (MT DEQ 2009). The TMDL document recommends continuation of road and grazing best management practices.

Elk Creek has had sedimentation and temperature water quality issues. Probable sources of sediment were listed to include streambank modifications/destabilization and placer mining activity, road drainage problems, channelization, and poor riparian grazing activities.

In Union Creek, stream temperature, sedimentation, phosphorus, arsenic, iron, copper, and nitrogen have been the reasons for being listed for water quality. The sediment sources were likely from rangeland grazing and streambank modification/destabilization. Low flow alterations were the probable source for the stream temperature issues. Some of the other elemental water quality issues were likely related to the Copper Cliff mine that is near a tributary of Union Creek.

Table 6. Lower Blackfoot EAWS area 303d listed streams by report year (MT DEQ CWAIC 2020)

Stream Reach	Impairment	MT DEQ TMDL 303d Reports				303d Delisting Date	WQ Category
		1996	2006	2009	2013		
Blackfoot River, Belmont Creek to mouth	Unionized Ammonia		X	X		11/26/13	3 - Waters for which there is insufficient data to assess the use support of any applicable beneficial use, so no use support determinations have been made.
Blackfoot River, Monture Creek to Belmont Creek	Total Phosphorus	X	X	X		09/21/08	4A - All TMDLs needed to rectify all identified threats or impairments have been completed and approved.
	Total Nitrogen	X	X	X		09/21/08	
	Temperature		X	X		11/30/14	
	Sedimentation/Siltation					09/21/08	
Belmont Creek, headwaters to mouth	Sedimentation/Siltation	X	X	X		12/22/09	
Elk Creek, Stinkwater Creek to mouth	Sedimentation/Siltation	X	X	X		12/22/09	
	Temperature		X	X		12/22/09	
Union Creek, headwaters to mouth	Temperature	X	X			12/22/09	
	Solids (Suspended/Bedload)		X	X		12/22/09	
	Total Phosphorus		X	X	X	09/08/13	
	Arsenic		X	X		10/29/13	
	Iron					12/29/13	
	Copper		X	X		10/29/13	
	Total Nitrogen				X	09/08/13	

4.3.2 Riparian Wetlands & Streams

Proper Function Condition (PFC) Assessments are used as a relatively quick way to qualitatively determine the current on-the-ground condition of a lotic (flowing water) or lentic (still or very slow-moving water) riparian area. Reaches are assessed by a trained Interdisciplinary Team (IDT) using the appropriate technical reference as a guide, Proper Functioning Condition Assessment for Lotic Areas (Technical Reference 1737-15) or Proper Functioning Condition Assessment for Lentic Areas (Technical Reference 1737-16). Each reach is assessed and compared to it's potential, which is defined as the highest ecological status a riparian area can attain in the present climate. This potential is based on site specific factors such as geomorphology, riparian plant communities, and site hydrology. At the end of each assessment, the IDT determines a PFC rating to assign to the reach; these ratings, from highest to lowest, are as follows: Proper Functioning Condition (PFC), Functional-At Risk (FAR), or Nonfunctional (NF). PFC ratings and stream potential are discussed under riparian existing conditions section 5.3.2. The PFC assessment is not an appropriate tool for certain riparian areas, including ephemeral reaches or reaches with significant human alteration (e.g., irrigation ditches). When PFC is not an appropriate assessment method, some of the same indicators, such as riparian vegetation and geomorphic processes are still considered through the larger lens of riverscape health.

For this EAWS analysis, in addition to PFC assessments, riparian and hydrologic conditions are also compared to their riverscape health potential. Riverscapes are defined as the connected surface waters, aquifers, floodplains, and alluvially altered corridors located adjacent to streams (BLM Riverscape Restoration Programmatic EA 2022). In most cases, riverscapes encompass a valley bottom where a modern flood event could plausibly result in hydrologic inundation. These valley bottoms are often a much larger geographic area than the traditionally managed riparian conservation area – and this difference in geographic size represents how the valley bottom has changed over time; generally this has resulted in shrinking riparian areas, straightening of streams, and loss of riparian vegetation and habitat (Goldfarb 2018, BLM Riverscape Restoration Programmatic EA 2022).

Before human management, the valley bottoms in the Lower Blackfoot area were controlled by alluvial processes which include a natural balance of erosion and deposition of sediment, seasonal flooding, and a lot more stream structure such as log jams, large woody debris, and beaver dams. In particular, in the western United States, beavers acted as significant environmental engineers in riparian areas; the importance of beaver population presence should not be underestimated. Historic documentation shows that the Lewis and Clark expeditions in the early 1800s brought an influx of beaver trappers into the western United States. At the height of the beaver fur trade in North America, several communities in western Montana exploded with population growth as new beaver trappers came to the area. Within 30 years, the North American beaver populations were essentially decimated, and these beaver populations have still not rebounded today, by the 1860s the beaver populations and subsequent fur trade were a thing of the past (Goldfarb 2018, Montana Historical Society Press 2008).

While the anecdotal references abound, there is relatively little known about beaver populations and the full extent of their impact on riverscapes in the American West before their populations were trapped out. As homesteading Montanans settled in these newly beaver-less areas, their impacts of road building, railroad construction, agriculture, and forestry quickly accelerated the alluvial geomorphic changes in these landscapes. Without beavers to add structural elements that slow down and pond water, riparian floodplains began to shrink, along with the associated riparian vegetation and habitat. Streams began to channelize and lose access to their floodplains. Over the next 170 years, many streams would become incised through elevated rates of erosion and limited opportunity for deposition on adjacent floodplains.

To compare the existing condition of riparian features in the Lower Blackfoot to the natural range of variability, including significant beaver populations, this assessment uses the Valley Bottom Extraction Tool (VBET) to compare the historic valley bottom to the active riparian areas today (McFarland 2023). VBET uses a high-resolution digital elevation modeling to determine topographic breaks where streams likely previously inundated the historic valley bottom in a pre-human condition. VBET can then run a comparison of historic topographic extent of a valley bottom and the remotely sensed existing riparian extent – the difference in these values represents the amount of riparian area that has been historically lost. In the EAWS project area, the valley bottom extent (historic reference condition) represents 6,697 acres or approximately 6% of the entire EAWS assessment area.

4.3.3 Hydrology

Hydrologic conditions are responsive to landscape level changes to vegetation, soils, erosion regimes, and natural or anthropogenic disturbances within a watershed. It is assumed that historical conditions in the assessment boundary likely varied through time as a response to changes in vegetation treatments, wildfires, road building, and other factors.

4.4 Vegetation

4.4.1 Forest Vegetation

Forest vegetation across the assessment area has been heavily impacted by historic logging practices and wildfires that have burned since successful fire suppression in the area creating fires that are outside of what would have naturally occurred in terms of size and intensity. In general, prior to fire suppression and historic logging practices there were: fewer trees (lower tree density); trees that were larger in diameter; a greater amount of fire adapted species (such as ponderosa pine and western larch) across the landscape; and a greater diversity of successional (or developmental) stages in the mid to higher elevation areas. More specific descriptions across each habitat type group follow and numeric comparisons of Historic/Reference conditions with current conditions by habitat type group can be viewed in Appendix B Tables 23-26 (especially size class differences as these are more easily shown in tabular format).

Habitat Type Group 1: Warm and Dry Douglas-fir

These are low elevation dry sites that were historically dominated by large diameter ponderosa pine growing in open park-like conditions on the driest sites with some Douglas-fir intermixed in stands on the more moist sites in this group. Prior to disruption of fire as a disturbance, bunchgrasses dominated the understory and tree density was relatively low (Hessburg et. al. 2005). Fires were generally frequent non-lethal ground fires with a relatively uniform pattern across the landscape. Average fire frequency ranged between 5 and 25 years. Average fire size ranged from 50-250 acres with some up to 500 acres (Fisher and Bradley 1987). Ponderosa pine regeneration would become established sporadically following fire events that coincided with good cone crops, seed production, and adequate moisture to allow for survival of established seedlings. A subsequent fire would remove substantial amounts of this regeneration resulting in open multi-storied and multi-aged stands of ponderosa pine and/or Douglas-fir. The frequent low severity fires maintained open stand conditions by removing understory shrubs and selectively thinning most understory trees. Indigenous burning practices played an important part of historic fire frequency in this habitat type group, especially along established travel routes.

Habitat Type Group 2: Moderately Warm and Dry Douglas-fir

This habitat type group is similar to Habitat Group 1 in that it historically supported relatively open grown ponderosa pine and Douglas-fir forests. However, some sites within this habitat type group have slightly higher soil moisture and cooler temperatures resulting in vegetation differences, most notably

the occurrence of western larch and an increase in the amount of Douglas-fir in stands. In addition, increased moisture availability on these sites allowed them to support greater tree densities than in HTG 1. Shrubs and forbs dominated the understory; pinegrass and elk sedge were often present and well represented. Ponderosa pine and western larch are shade intolerant species whose abundance would vary based on developmental phase. Douglas-fir is typically present at most stages of stand development. Western larch is often a seral dominant on the more moist habitat types within this group.

Historically fire severity was variable, ranging from frequent, low intensity, non-lethal, understory fires to infrequent, mixed severity fires. Fires were generally either: frequent non-lethal ground fires with a relatively uniform pattern across the landscape with an average fire frequency ranging between 5 and 25 years and an average fire size ranging from 50-250 acres with some up to 500 acres (Fisher and Bradley 1987); or more infrequent with a combination of non-lethal to mixed severity effects on tree cover, a wide ranging fire frequency spanning between 5 and 50 years, and average fire size ranging from 50-250 acres with some up to 500 acres (Fisher and Bradley 1987). Indigenous burning practices played an important part of historic fire frequency in this habitat type group, especially along established travel routes.

Habitat Type Group 3: Moderately Cool and Dry Douglas-fir
This habitat type group historically supported Douglas-fir and western larch. On some habitat types within this group, Douglas-fir is the primary species in all stages of stand development. Lodgepole pine and western larch are common shade-intolerant species where site conditions permit adequate sunlight and moisture. Mixed species stands of Douglas-fir, lodgepole pine, western larch, and ponderosa pine are also common. Stands in this habitat type group may be either single or multi-storied as both conditions were historically prevalent and dictated by disturbance history, site conditions, and seed availability.

Historically fire severity was more infrequent than in HTGs 1 and 2 with mixed severity effects on tree cover, a wide-ranging fire frequency spanning between 5 and 50 years, and average fire size ranged from 50-250 acres with some up to 500 acres (Fisher and Bradley 1987, Arno et. al. 1997).

Habitat Type Group 4: Cool and Moist Subalpine fir
Engelmann spruce was typically a major component of stands along with lodgepole pine and Douglas-fir. Older stands were usually dominated by subalpine fir and Engelmann spruce although Douglas-fir and lodgepole pine were commonly found in the overstory as well. Understory vegetation is abundant and consists of moisture favoring species such as twinflower and dwarf huckleberry.

The average historical fire return interval was 130 years with a wide range, from 50 to 200 years. Small, moderate severity fires occurred on sites with discontinuous fuels. More severe, infrequent fires were more prevalent on the drier sites within this group. While some low intensity surface fires probably did occur, they were not typical, as the moisture on these sites would preclude such events to a very narrow window during the summer. Average fire size historically trended toward 150 to greater than 500 acres and is largely a function of topography and juxtaposition with other HTGs and their corresponding fire return intervals.

In 2000 the Missoula Field Office finalized an EAWS on the initial 11,000 acres acquired through an exchange. The assessment found that vegetation species composition, density, and structure had shifted away from NRV, and treatments were designed to start bringing vegetation conditions back to within NRV, which was analyzed in an Environmental Assessment (EA) in 2001. From 2002-2006 the BLM implemented approximately 3,800 acres of vegetation treatments including prescribed burns, pre-

commercial thinning, chipping, planting, timber harvest, and weed spraying. These treatments were focused on forest restoration, fuels reduction, and incorporating fire back onto the landscape.

After several acquisitions, in 2017 and again in 2020, the BLM completed EAs covering vegetation management on these lands, including ongoing treatments (such as prescribed burning) to address maintenance of vegetation treatments that were implemented under the 2001 EA, fuels reduction, forest restoration, and forest health. The 2017 EA, Lower Blackfoot Corridor Ecosystem Maintenance, Forest Restoration and Fuels Reduction analyzed 11,210 acres of vegetation management treatments including prescribed fire, timber harvest, mastication, cut-pile-burn, and chainsaw thinning. The 2020 Belmont Gold Forest Restoration and Fuels Reduction EA analyzed 7,852 acres of similar treatments.

The three EAs analyzed a combined 22,862 acres of vegetation management (52% of current BLM ownership) and 13,071 acres have been implemented (30% of BLM ownership). These activities have begun to move vegetation towards NRV on a substantial portion of BLM managed lands.

TNC has also been implementing similar treatments with similar objectives on their lands in the assessment area since they acquired the lands from Plum Creek. To date they have completed approximately 5,000 acres.

Whitebark pine has historically been found very sporadically at the highest elevations within this habitat type group. The BLM Missoula Field Office (MiFO) completed a field office wide five needle pine inventory in 2013 and 2014. Although there is no historical whitebark pine distribution data for the field office before the inventory was initiated, field observations of dead individuals indicate the population of mature individuals was greater in the past than today.

4.4.2 Rangeland Vegetation

Non-forest upland vegetation

The Missoula County soil survey (NRCS 2007) depicts vegetation types in relation to specific soil types. Species composition can vary between soil types however, in some cases different soil types can also retain like or similar vegetation. A range site is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from natural plant communities on other range sites in kind, amount and proportion or range plants (NRCS 2007). Most of the uplands within the watershed are identified as a silty range sites. Silty range sites can vary from 10-14” precipitation to 15-19” precipitation zones. The climax plant community found on drier sites may be composed of approximately 93% grasses and 5% forbs. Characteristic vegetation with these sites may contain 90% bluebunch wheatgrass, 2% prairie Junegrass, 1% Sandberg bluegrass, and 5% perennial forbs. Silty range sites in higher precipitation zones may contain 85% grasses, 10% forbs, and 3% shrubs. More specifically, these sites contain characteristic vegetation of 50% rough fescue, 20% bluebunch wheatgrass, 20% other perennial grasses, 10% perennial forbs, 5% Idaho fescue, and 3% other shrubs. Generally, the climax vegetation community is dominated by rough fescue while southern aspects are dominated by bluebunch wheatgrass.

Historically, most of the open grassland types were probably dominated by bunchgrasses such as rough fescue (*Festuca scabrella*), Idaho fescue (*Festuca idahoensis*), and bluebunch wheatgrass (*Pseudoroegneria spicata*). Numerous other perennial grasses including Sandberg bluegrass (*Poa secunda*), needle-and-thread (*Stipa comata*), green needlegrass (*Stipa viridula*), and prairie junegrass (*Koeleria macrantha*) were present on these sites. A diverse forb community may have been present at these sites including lupine (*Lupinus sp.*) and arrowleaf balsamroot (*Balsamorhiza sagittata*). Sagebrush (*Artemisia sp.*) might have been a component in some of these upland communities but possibly present as scattered communities.

Non-forest wet meadows
Wet meadows can vary with a variety plant species. Plant communities found at these sites may be composed of approximately 90% grasses, 5% forbs, and 5% shrubs/conifers. Characteristic herbaceous species are reedgrass and sedges along with lesser amounts of tufted hairgrass, mannagrass, and rushes. Shrubs such as hawthorn, shrubby cinquefoil, and willow species may also be present.

Woodlands
Historically, Douglas-fir habitat type probably had adequate amounts of understory forage. The usual native grasses found at these sites are mainly beargrass, elk sedge, and pinegrass. Generally, these herbaceous species are not preferred by livestock. Some Douglas-fir habitat types (e.g. Douglas-fir/snowberry) areas probably contained small populations of native bunchgrasses such as rough fescue, Idaho fescue, and bluebunch wheatgrass. Ponderosa pine understories were probably dominated by bluebunch wheatgrass with lesser populations of Idaho fescue, and rough fescue. Lodgepole pine forest types typically did not provide much in the way of understory forage.

4.4.3 Special Status Plants and Habitat
Howell's Gumweed is thought to be endemic to the Seeley-Ovando area of Montana. Before roads were introduced, Howell's gumweed existed near the edges of glacial ponds (Lesica 2001). Large animals, including deer, elk, and bison, would use these ponds to drink, creating compaction and disturbance around the water's edge. Wave action and frost heaving also caused disturbance. The moisture, disturbance, and compaction were key habitat requirements for Howell's gumweed. When roads proliferated in the area with the rise of homesteading and logging in the 19th and 20th centuries, they created perfect habitat for Howell's gumweed. A high moisture environment is created as water runs off the road surface to the roadside and as snow gathers in wheel ruts. Vehicles driving the roads and occasionally parking on roadsides generate compaction and disturbance. A survey in 1986 found 55 of 59 populations of Howell's gumweed were found along roads (Lesica 2001).

Camas has been noted as the most important root food for many Indigenous groups across the northwestern United States and southwestern Canada (Gould 1942, Turner & Kuhnlein 1983, Thomas 1989). Camas provided Indigenous people with an important and reliable source of protein and sugar (Matthews 2020). Camas was one of the most widely traded goods. Before European colonization, camas dominated wetland systems were vast and common throughout what is now the western United States (Matthews 2020). Large expanses of camas in bloom were noted by numerous explorers and botanists that entered the Pacific Northwest in the 19th century, including the Lewis and Clark expedition, and which were frequently described as "blue lakes" when viewed from a distance (Leiberg 1897, Thomas 1989). Indigenous people utilized a variety of horticultural techniques such as burning, weeding, and selective harvesting resulting in high camas yields (Marshall 1999, Beckwith 2004). The assessment area is within the ancestral homeland of the Confederated Salish and Kootenai Tribes, who have been harvesting, tending, and managing the landscape in and around the Lower Blackfoot Watershed for Camas since time immemorial. As Merriweather Lewis and his party were travelling along the Blackfoot River in July of 1806, they noted a considerable quantity of camas, referred to as quamash, along the Blackfoot River (Lewis 1806).

After the Hellgate Treaty of 1855 and the removal of native peoples from the area, there was an influx of Euro-American homesteaders. Settlers considered camas a weed and intentionally irradicated the plant. Homesteaders channelized streams and converted what used to be seasonal wetlands to fields of European grasses. (Black et al. 1998, Servheen et al. 2002). As much of the Blackfoot Watershed was owned by a succession of timber companies, land that supported camas was also likely planted with trees. As a result

of land conversion, camas habitat has diminished significantly since Indigenous peoples' management in the 1800s.

Within the Lower Blackfoot Watershed, bitterroot grows on sparsely vegetated rocky slopes, hilltops, and grasslands. Bitterroot is a sacred plant to Salish people, who before displacement inhabited the lands along the Blackfoot River. Salish people tended and harvested bitterroot in the area for thousands of years. After Indigenous people were removed from the area, the land in the Blackfoot watershed came under the ownership of the railroad then several successions of timber companies. Most land was used for intensive timber harvest. The shallow soils of bitterroot habitat were not capable of supporting trees and so were left unplanted by timber companies. During timber ownership of the area, roads were created through bitterroot habitat, compacting soil and destroying some populations. Fire suppression and dozer lines have also impacted bitterroot habitat in recent decades.

4.4.4 Noxious Weeds

There are no data available on historical conditions or reference conditions. It is assumed noxious weeds did not exist in the area prior to European settlement.

4.5 Forest Resources

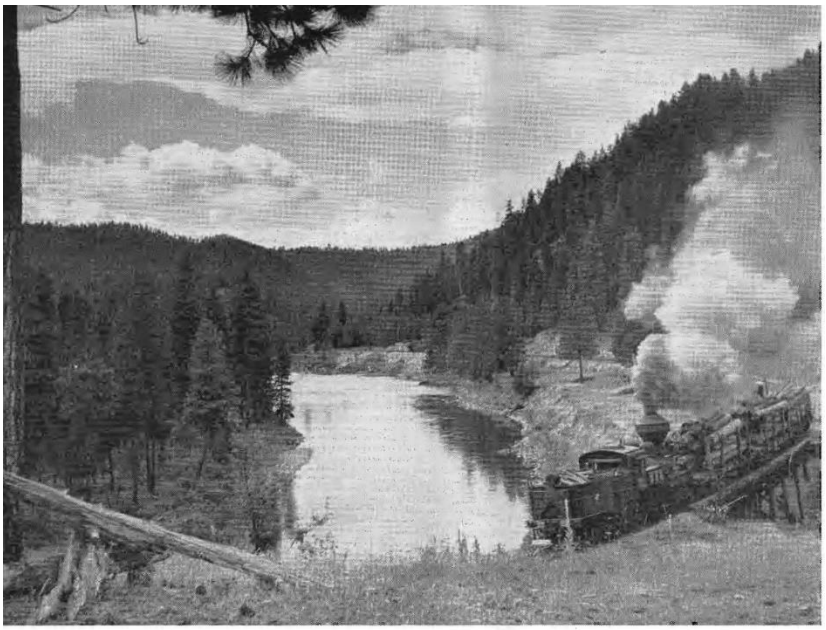
Prior to Euro-American settlement in the area which began in the early 19th century, Indigenous people had an economy based on barter and trade. The first non-native people in the area en masse were fur trappers who arrived in pursuit of beaver pelts and other furs of value which occurred not long after the Lewis and Clark Corps of Discovery passed through the area in 1806. The trappers traded with the Indigenous people and with each other, gathering annually at rendezvous to trade pelts for goods. Indigenous people also traded pelts to the trappers in exchange for rifles, tools, and other goods.

The trappers were followed by miners in pursuit of precious metals and by 1900 largescale mining operations were active in Western Montana. Loggers and cattlemen followed the gold booms to support and profit from the mining operations.

From Losenky's Historical Vegetation of Montana, 1997:

> *Settlement (of the area) began in the 1840s but it wasn't until the arrival of the Northern Pacific Railroad and development of the mines in Butte and Anaconda in the 1880s that there was any significant impact on the forest structure. By the 1890s major portions of the Clark Fork and Bitterroot Valleys had been logged. Leiberg reports "that below Grantsdale* (in the Bitterroot Valley*) fully 90 percent of the accessible merchantable timber has been cut (1899a).*

Many sawmills were built to support the growing towns and mining operations in the area including those that still operate in Deer Lodge, Bonner, and Seeley Lake. Of those, the mill at Bonner was of greatest importance to the forests within the assessment area.



Scene from "Timberjack", showing the old Shay engine and log flats crossing The Milwaukee Road's Belmont Creek bridge about 20 miles west of Bonner, Mont.

Figure 1: A shay locomotive hauling rail cars of logs over Belmont Creek along the Blackfoot river. From the 1955 film "Timberjack".

From "A History of Transportation in the Garnet Range Area: 1700 – 1930" by Hunter Ten Brook, BLM volunteer project 1983:

> *In 1881 the Northern Pacific RR contracted with Eddy Hammond and Co. to furnish ties for tracks between the Little Blackfoot and the Idaho state line. The company started a mill at the mouth of the Blackfoot (at Bonner), and soon afterward built or bought mills up and down the Clark Fork for bridge timbers and other lumber purposes* (DOI-BLM 1983).

Initially logs were floated down the Blackfoot to the mill and in 1886 a large log drive was made from near the conflux of the Clearwater River down the Blackfoot to the mill at Bonner (Ten Brook 1983). In 1898, Hammond sold the Blackfoot Mill and timberlands for nearly $1.5 million to Marcus Daly, and his Anaconda Company (https://bonnermilltownhistory.org/).

In the early 1900s The Anaconda Company's lumber division began building railways into the Blackfoot to facilitate log transportation to the mill. During the winter of 1904-1905 two Shay locomotives were disassembled and sledded on the snow from Bonner to McNamara at the mouth of Union Creek, and in 1905 a rail line was built from McNamara up Union Creek to near the site of the present-day Potomac Post Office (Ten Brook 1983). That operation consisted of horse-drawn skidding to the rail spur, transport of logs on the rail line to McNamara and then log drives down the Blackfoot to the Mill in the spring high water period.

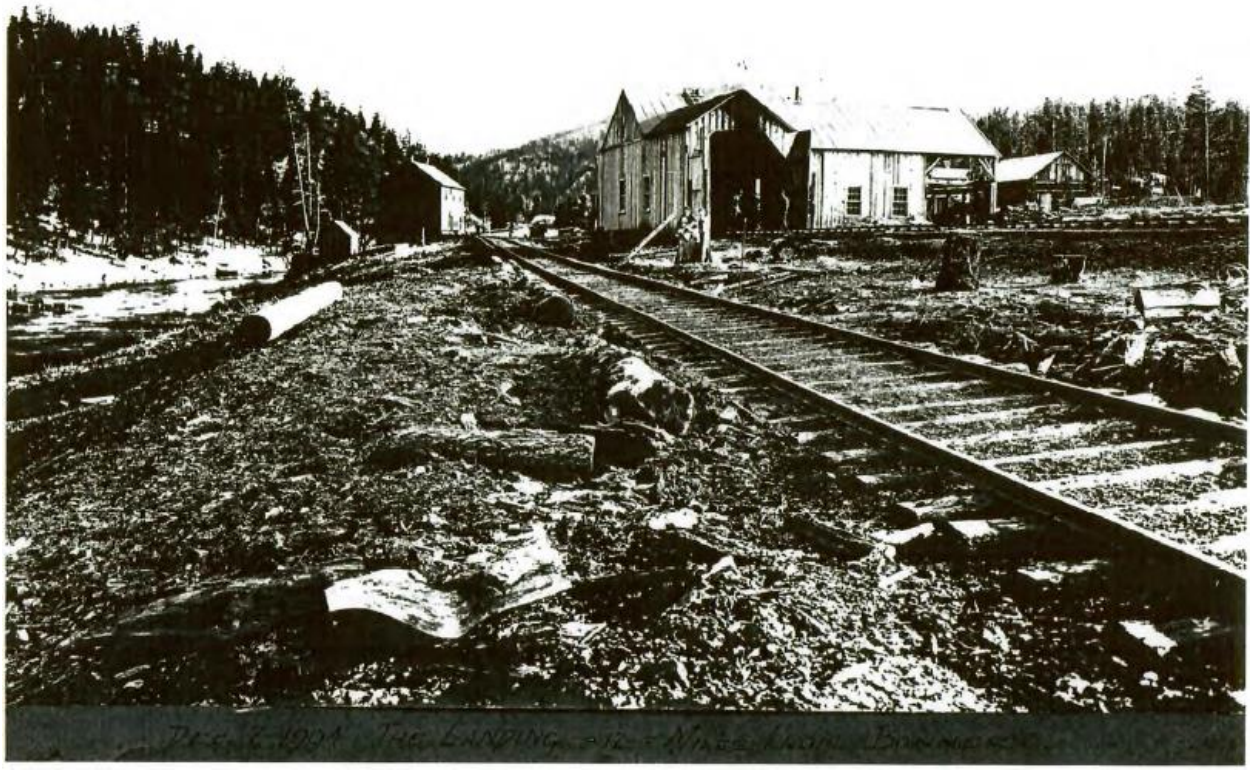


Figure 2: McNamara Landing, December 2, 1904. At the site where Johnsrud park sits now, with the Blackfoot River in the left of the image. This is where logs were offloaded from the rail cars and dumped in the Blackfoot River for log drives to the mill at Bonner, MT.

Log drives down the Blackfoot continued intermittently until 1927 (Ten Brook 1983). This initial entry in to the Blackfoot valley lasted until 1916 when timber cutting ended in the Camas Prairie (Potomac) area and the operations were moved to Ninemile Creek west of Missoula. Timber harvesting on the Blackfoot was quiet for a time, until 1926 when the Milwaukee Railroad completed a rail line to Sunset (Near present-day Greenough, MT). This also coincided with the transition to crawler tractors (bulldozers) for log skidding and signaled the end of horse logging in the area.

This new rail line on the North side of the Blackfoot river and is currently managed as the Lewis and Clark National Historic Trail as well as the Road to the Buffalo Trail. Timber operations were again active in the area with a main camp at Greenough/ Elk Creek until 1934, when operations were again moved further upstream, to the Cottonwood Creek area, and continued until 1949. This was the end of the company railroads in the Blackfoot valley. In the roughly 50 years they operated, the Anaconda Company built around 128 miles of railroad. Of the eight shays locomotives used, only two survived: one is in Arizona and one is on display at the Fort Missoula Forestry Interpretive Site (Ten Brook 1983).

Log transportation now shifted entirely to log trucks, and it is at this time that road building into the analysis area began in earnest. In the 1950s operations entered Gold Creek north of Potomac and in the

1960s they entered Belmont Creek (from personal communications with former Anaconda and Champion International Forester Bob Simes, 7/6/2023). Between then and the 1990s, hundreds of miles of forest roads would be built for the purpose of transporting logs to the Bonner mill via truck, with Gold Creek as the primary access point. When The Nature Conservancy conducted an assessment of these lands in 2016, it found that 93.4% of the lands were within 660 feet of a road and 99.7% were within a quarter mile (1,320 feet) (From the Clearwater Blackfoot Ecological Assessment by ERG 2016). This makes sense for a private industrial timber company who's main focus is tractor-skidding logs to roads, where ideally a road should be no further than 1,000 feet from the trees to be harvested. While it is likely that the landscape is over-roaded in cases, and The Nature Conservancy reported that 70 sections (1 square mile plots of land) in the area had a road density of 6-7 miles of road per square mile (Clearwater Blackfoot Ecological Assessment by ERG 2016), these roads were designed and built for timber hauling. As stated in the management direction of this document, maintaining a robust transportation network and sufficient roads in the area will be key to the BLM's ability to manage the forests in the long term.

Anaconda sold the Bonner mill and its timberlands to US Plywood-Champion Papers, Inc. in 1972. By 1974, US Plywood-Champion Papers became Champion International and invested heavily in a plywood mill at the Bonner Site. When plywood operations began at Bonner, it was one of the largest plywood producers in the country (https://bonnermilltownhistory.org) and touted as the largest in the world (Missoulian Article: Bonner plywood mill's future was long in doubt. May 27, 2007).

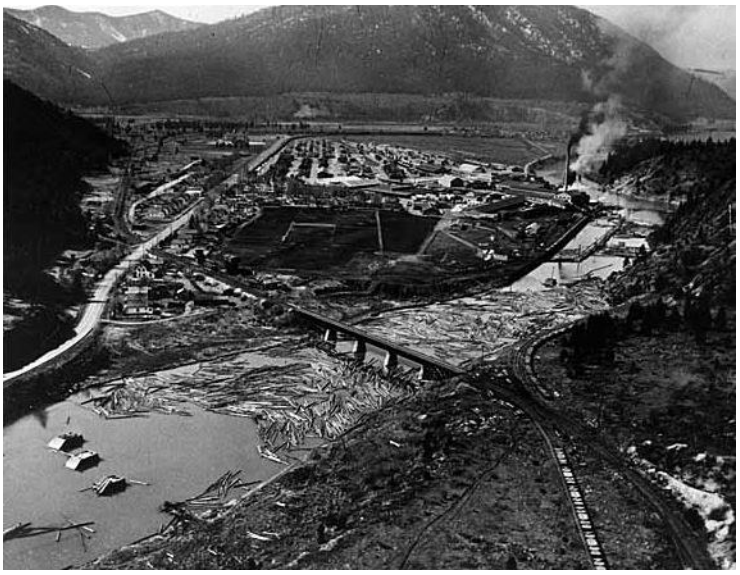


Figure 3: Bonner in the 1950's. https://bonnermilltownhistory.org/

While this shift in ownership was a boon to the local economy and the mill employed over a thousand people at the time, it was also a huge shift in forest management philosophy. While the Anaconda Company had adopted Sustained Yield Management in 1950 (a view of forest management for the long term), Champion International was a "custodial manager" with no interest in long-term stewardship. From The Bonner Milltown Historical Center and Museum website, (https://bonnermilltownhistory.org/)

> *In a 1978 draft report, the Champion stated, "It is anticipated this first operating plan [for Montana Forest lands] will be for a period of 18 years. During this period, the remaining old growth timber will be removed."*

It was during this period that timber harvesting in the Blackfoot River was greatly scaled up to feed the huge demand of the world-class Bonner Mill, and the plywood operation also required targeting the largest diameter trees. Originally, Champion International's plywood mill at Bonner was tooled to use 16-inch diameter or larger logs, but this would not last. About a year after Champion purchased the Bonner plywood plant, it was retooled to make use of much smaller (8" diameter) logs. (Missoulian Article: Bonner plywood mill's future was long in doubt. May 27, 2007).

By the early 1990s Champion International's "custodial ownership" had played out and they were looking for a way out. Separating their assets, Champion International sold their sawmills to Stimson Lumber Company and the 867,000 acres of timberland to Plum Creek Timber Company (Missoulian Article: Bonner plywood mill's future was long in doubt. May 27, 2007).

At that time Plum Creek Timber signed an agreement to supply Stimson Lumber with 100 million board feet per year annually for 10 years (Missoulian Article: Bonner plywood mill's future was long in doubt. May 27, 2007). It was during this time that many of the areas forest stands which were originally harvested in the early years of the industrial forestry regime were revisited and re-harvested to remove any remaining viable material.

That agreement was originally viewed as an opportunity for Stimpson Lumber to acquire timberland in Montana and establish a sustainable operation. Stimson bought 10,000 acres of land between Drummond and Lincoln in 2000. Company officials said Stimson hoped to eventually own nearly 100,000 acres within 100 miles of Missoula, but that did not materialize (Missoulian Article: Bonner plywood mill's future was long in doubt. May 27, 2007).

Stimpson closed the Bonner mill in 2008 and auctioned the components of the sawmills, ending 122 years of continuous operations at the site. But Bonner's ties to the forest industry did not end there. Willis Enterprises bought 60 acres of the former mill site and installed a paper chip manufacturing facility there, which operates to this day producing paper chips for brown cardboard boxes.

Meanwhile Plum Creek Timber Company (which transitioned to a Real Estate Investment Trust during this period) began selling off its timber lands in Montana in the 1990s. Fortunately, visionary leaders including former Missoula Field Office Manager Darrell Sall (Recipient of the Public Lands Foundation Outstanding Public Lands Professional Award in 1996) set out to maintain these areas as open space and forest land, rather than seeing them succumb to private development. The Nature Conservancy stepped up and purchased much of Plum Creek's timber land in the Blackfoot and it has subsequently been acquired by state and federal agencies such as the MT DNRC, the USFS, and the BLM. These acquisitions are still ongoing and yet this does represent the final chapter in this area's ownership: The Land and Water Conservation Fund (LWCF) which has been used to acquire the lands, prohibits the resale of the lands, meaning that they are now, finally, public lands permanently.

The forest resources that are found in the assessment area today are due almost entirely to the management history of the area as discussed, and yet that does not mean there are no trees present. Vast acreages of dense young stands have regenerated from the harvests, helped along in many cases by burning, mechanical site preparation (purposeful scarification to encourage regeneration) or planting. While dense stands do provide habitat for some wildlife species, they also exist in an overstocked condition and as such are under severe competition for resources. As discussed in the Forest Vegetation section, managing towards midpoint NRV and for healthy, resilient forests will often mean thinning of these stands to increase growing space, available resources and improved resiliency. Thinning of young

stands can produce various small-diameter timber products including firewood, posts and rails, and logs for paper chip production.

It is in this way that forest management in the Blackfoot has taken its latest turn: from a production model to a restoration model, where forest resources are a biproduct of forest restoration. It is also a return to Sustainable Yield management, where forest health and productivity are not judged in the near-term or one to two decades, but in the long-term and in perpetuity.

With the changes in management, forest resource production remains important. Resource managers rely on the private sector to implement prescribed treatments. Without a viable and vibrant forest products industry in Western Montana, forest restoration would be very difficult to accomplish.

4.6 Terrestrial Wildlife and Habitat

Species Background

Canada Lynx (Lynx canadensis)

The Canada lynx is federally listed as a threatened species. Lynx habitat occurs in mesic coniferous forests that experience cold, snowy winters and provide a prey base of snowshoe hare (USDI-USDA 2013). The snowshoe hare require hiding and thermal cover and forage provided by dense horizontal cover. The habitats that lynx use in the contiguous United States are characterized by patchily distributed moist forest types with relatively higher hare densities in a matrix of other habitats (e.g., hardwoods, dry forest, non-forest) with lower landscape hare densities (USDI-USDA 2013, USDI-FWS 2009). In these areas, lynx incorporate the matrix habitat (non-boreal forest habitat elements) into their home ranges and use it for traveling between patches of boreal forest that support higher hare densities where most lynx foraging occurs. While lynx may utilize all Habitat Type Groups (HTG), HTG 4: Cool and Moist Subalpine fir is the most likely to provide foraging or denning habitat when the HTG nears climax condition, in part because the climax tree species (typically subalpine fir and Engelmann spruce often mixed with lodgepole pine) allow the development of dense horizontal cover. Other HTGs may provide potential lynx foraging habitat when in the advanced regeneration stage, but as these stands reach mature condition large crowns tend to diminish the understory horizontal cover needed for snowshoe hare production.

In 2009, the USFWS designated critical habitat for lynx (USDI-FWS 2009, with a revision in 2014 (USDI-FWS 2014). The Primary Constituent Element (PCE) of lynx habitat was defined as boreal forest landscapes supporting a mosaic of differing successional forest stages and containing:

> 1(a). Presence of snowshoe hares and their preferred habitat conditions, which include dense understories of young trees, shrubs or overhanging boughs that protrude above the snow, and mature multi-story stands with conifer boughs touching the snow surface;
> 1(b). Winter snow conditions that are generally deep and fluffy for extended periods of time;
> 1(c). Sites for denning that have abundant coarse woody debris, such as downed trees and root wads; and
> 1(d). Matrix habitat (e.g., hardwood forest, dry forest, non-forest) that occurs between patches of boreal forest in close juxtaposition (at the scale of a lynx home range) such that lynx are likely to travel through such habitat while accessing patches of boreal forest within a home range.

Grizzly Bear (Ursus arctos)

The grizzly bear is listed as a threatened species range wide. Much of the area historically occupied by grizzly bears is not suitable due to land conversion and human occupancy where traditional food sources have been reduced and replaced with domestic livestock and other anthropogenic attractants. The 2019 Conservation strategy for the grizzly bear in the Northern Continental Divide Ecosystem (NCDE) (NCDE Subcommittee 2020) established a zoned system to support grizzly bear range expansion and recovery in the Northern Continental Divide region. The watershed assessment area is within occupied grizzly bear habitat, Northern Continental Divide Grizzly Bear Zone 1 and a portion of the Primary Conservation Area. The grizzly bear population continues to increase in the Northern Continental Divide Grizzly Bear Ecosystem (USFWS 2022). Presence of females with dependent offspring in all seven occupancy units of Zone 1 has been documented during the 6-year period 2016-2021 (USFWS 2022). The grizzly bear is a wide-ranging species occurring across all Habitat Type Groups within this assessment area. Whitebark pine forests occur occasionally in this area though the full extent is not known. Grass, forbs, berries, and ungulates are considered primary food sources as well as serviceberry, chokecherry and hawthorn in the riparian areas. Wildfire disturbance in the past contributed to forest structure and has had a positive effect on grizzly bear spring, summer, and fall habitat.

North American Wolverine *(Gulo gulo luscus)*

The North American Wolverine (wolverine) is listed as a threatened species under the Endangered Species Act.

The contiguous U.S. Distinct Population Segment (DPS) of the North American (wolverine) is listed as a threatened species under the Endangered Species Act. The species is highly territorial, with very little overlap between same-sex adults, and sensitive to human disturbance, avoiding areas of human development and backcountry winter recreation (USFWS 2023). Wolverines occupy a variety of habitats, but generally select habitat in locations away from human settlements and activities. Year-round habitat for the wolverine is found at high elevations centered near the tree line: in conifer forests below tree line, rocky alpine habitat above tree line, talus slopes, cirque basins, and avalanche chutes that provide food sources (USFWS 2018, USFWS 2023).The wolverine is a snow adapted, cold-climate animal with primary and maternal denning habitats occurring at higher elevations of 1,800 to 3,500 meters (5,906 to 11,483 feet). In the contiguous United States, denning behavior and several additional months of maternal care have only been observed in snow (USFWS 2018, USFWS 2023). Dispersal habitat occurs at lower elevation areas including valley bottoms which often see more human impact than higher elevation habitats.

Key physical and environmental requirements of the wolverine are (USDI-USFWS 2023):

1) Large territories in relatively inaccessible landscapes, at high elevation (1,800 to 3,500 m (5,906 to 11,483 ft).
2) Access to a variety of food resources that vary with seasons.
3) Physical/structural features (e.g., talus slopes, rugged terrain) linked to reproductive behavioral patterns.
4) Habitats characterized by the presence of persistent spring snow (of greater than or equal to 1 meter on May 1) for survival and reproduction.

Key threats to the wolverine are (USDI-USFWS 2023):

Habitat loss as a result of climate change is the primary threat to the wolverine's future viability in the contiguous United States. The Service expects climate change to exacerbate effects from multi-lane roads,

backcountry winter recreation, and human development, all of which could then impact genetic diversity and small population dynamics.

Migratory Birds
Various migratory bird species are known to utilize this assessment area but the details such as full species composition, dates and specific areas are unknown. Migratory bird species include those listed in Table 4. Due to the large number of migratory bird species, inventory and monitoring efforts will be prioritized for BLM Focal Species identified in the Missoula Field Office Resource Management Plan.

Big Game
Big game species within the assessment area include elk, white tail deer and mule deer. Big game species generally spend the warmer months at higher elevations within the assessment area and move down to find forage in the valley bottoms during the winters. Areas along the Blackfoot River serve as winter and crucial winter ranges as indicated by Montana Fish, Wildlife and Parks biologists during the colder months because the lower snow depths allow access to forage and easier movement.

Human Disturbance to Wildlife Habitat
Original human activity was related to Indigenous camping, hunting, gathering, and movement, which complemented the ecological integrity of the area. Native people also used fire in the assessment area. Euro-American activity in the assessment area began in the early 1800s with fur trappers following in the footsteps of Lewis and Clark. Miners and the Northern Pacific Railroad followed which resulted in intensive logging in the surrounding areas by the late 1800s due to the high timber demands for railroad construction. Road building and livestock grazing followed the mining boom as well.

There is a long history of logging and land transfers in the Blackfoot River Valley, thoroughly described in Section 4.5 and 4.12. The Northern Pacific Railroad acquired lands from the federal government in the 1860s. Anaconda Copper Company purchased these lands and eventually sold them to Champion Timber Company, who later sold these lands to Plum Creek Timber Company, who eventually sold these lands, through the Blackfoot Challenge Land Exchange, to The Nature Conservancy and finally to state and federal agencies, including the BLM. The objectives of logging were economical and between the 1950's and 1990's hundreds of miles of roads were built to transport timber while the Champion loggers were instructed to remove the remaining old growth trees. The Nature Conservancy assessed these lands in 2016 and reported that 70 sections in the area had a road density of 6-7 miles of road per square mile (Clearwater Blackfoot Ecological Assessment by ERG 2016). Majority of these roads have been gated to motorized use (except in winter) and are open to administrative use. Additionally, suppression of naturally occurring fires beginning in the 1940's interfered with the role of natural fire throughout the assessment area. Refer to Sections 4.11 for details on historic Wildland Fire Management. This resulted in fires that are outside of what would have naturally occurred in terms of size and intensity, leaving the homogeneous forest within the assessment area more susceptible to high intensity and stand replacing fires, insects and disease. This extensive logging, road building and fire suppression have altered community structure and the ecological integrity of the area has been compromised to varying degrees.

Natural Disturbances to Wildlife Habitat
Wildfire was the prominent natural disturbance, followed by insect and disease. Common fire behaviors were non-lethal, mixed severity, and lethal regimes. Open ponderosa pine cover types were common at lower elevations and were repeatedly disturbed by short fire intervals of non-lethal severity. These fires maintained open stand conditions and may have been augmented by Indigenous people. Mid to upper

elevation forested slopes experienced mixed severity and lethal fires. Large forest patches of mature trees were common due to fire frequency and severity. A greater amount of fire adapted species (such as ponderosa pine and western larch) were present across the landscape; and a greater diversity of successional (or developmental) stages in the mid to higher elevation areas. Most recent fires in the assessment area include the Mineral Primm (2003) and the Liberty Fires (2017). Please refer to Sections 2.11 and 4.11 for a thorough description of wildland fire history in the assessment area.

Habitat Type Group 1 -2: Warm and Dry Douglas-fir & Moderately Warm and Dry Douglas-fir and Dependent Wildlife Species

HTG 1 and 2 are similar and have been combined for this analysis. Logging began in the late 1800s in these HTGs. The majority of logging occurred on private lands with economic interests in mind. Road building began in the 1900s. Livestock were likely grazed in this habitat type groups where more forage would have been available than at the upper elevations. Vegetation composition and structure were predominantly altered by the industrial logging. Resulting in impacts to wildlife use and movement.

Habitat Type Group 1 is composed of low elevation dry sites that were historically dominated by large diameter ponderosa pine growing in open park-like conditions on the driest sites with some Douglas-fir intermixed in stands on the more moist sites in this group. Prior to disruption of disturbance bunchgrasses dominated the understory and tree density was relatively low (Green et al. 1992, Errata 2008).

The dominant fire group is within dry Douglas-fir habitat types (fire group 4). Fires were generally frequent non-lethal ground fires with a relatively uniform pattern across the landscape. Average fire frequency ranged between 5 and 25 years (Fisher and Bradley 1987). Ponderosa pine regeneration would become established sporadically following fire events that coincided with good cone crops and seed production and adequate moisture to allow for survival of established seedlings. A subsequent fire would remove substantial amounts of this regeneration resulting in multi-storied and multi-aged stands of ponderosa pine and/or Douglas-fir that would still be open and parklike. The frequent low severity fires maintained open stand conditions by removing understory shrubs and selectively thinning understory trees.

Habitat Type Group 2 is similar to Habitat Group 1 in that it historically supported relatively open grown ponderosa pine and Douglas-fir forests. However, these sites had slightly higher soil moisture and cooler temperatures resulting in some vegetation differences, most notably the occurrence of western larch. Increased moisture availability on these sites allowed them to support greater tree densities. Shrubs and moist site forbs dominated the understory; pinegrass and elk sedge were often well represented. Ponderosa pine and western larch are shade intolerant species whose abundance varies by habitat type phase. Douglas-fir is typically present at most stages of stand development. Western larch is often a seral dominant on moist Douglas-fir habitat types.

The dominant fire groups are dry Douglas-fir habitat types (fire group 4) and the more moist Douglas-fir habitat types (fire group 6) (Fischer and Bradley 1987). Average fire frequency ranged between 5 and 50 years. Historically fire severity was variable, ranging from frequent, low intensity, non-lethal, understory fires to infrequent, mixed severity fires.

Wildlife communities and populations evolved with frequent wildfires. Biodiversity (species richness, abundance, and evenness), community structure, and ecosystem processes were maintained by wildfire. Wildlife communities were likely stable before the Euro-American settlement. Historically, biodiversity

was maintained from generation to generation as organisms adapted to the effects of wildfire. Community structure and ecosystem processes were maintain providing habitat for organisms adapted to open forest environments with frequent, low-severity fire regimes.

With the introduction of Euro-American human disturbances discussed above, the biodiversity and community structure were disturbed and negatively impacted due to the alteration and fragmentation of habitat. Special Status Species, such as bald eagle, golden eagle, flammulated owl, grizzly bear, Canada lynx, gray wolf and wolverine would have been likely to inhabit these areas before the industrial logging and decreased in numbers and distribution as the logging progressed. This also holds true for a variety of big game species including elk, mule deer, and white-tail deer which use these habitat type groups at lower elevations as winter range.

Habitat Type Group 3: Moderately Cool and Dry Douglas-fir

Logging and associated road building in this habitat type group occurred mostly during the 1900s as logging companies began to operate at higher elevations. The majority of logging occurred on private lands with economic interests in mind. Livestock were likely grazed in this habitat type group where more forage would have been available than at the upper elevations. Vegetation composition and structure were predominantly altered by the industrial logging and associated road building, resulting in impacts to wildlife use and movement.

The main forest types within this habitat type group are Douglas-fir and western larch (fire group 6). On some habitat types within this group, Douglas-fir is the primary species in all stages of stand development. Lodgepole pine and western larch are common shade-intolerant species where site conditions permit adequate sunlight and moisture. Mixed species stands of Douglas-fir, lodgepole pine, western larch, and ponderosa pine are also common. Stands in this habitat type group may be either single or multi-storied as both conditions were historically prevalent and dictated by disturbance history, site conditions, and seed availability.

Wildlife communities and populations evolved with frequent wildfires. Biodiversity (species richness, abundance, and evenness), community structure, and ecosystem processes were maintained by wildfire. Wildlife communities were likely stable before the Euro-American settlement. Historically, biodiversity was maintained from generation to generation as organisms adapted to the effects of wildfire. Community structure and ecosystem processes were maintain providing habitat for organisms adapted to large mixed severity and lethal fire regimes.

With the introduction of Euro-American human disturbances discussed above, the biodiversity and community structure were disturbed and negatively impacted due to the alteration and fragmentation of habitat. Special Status Species, such as bald eagle, golden eagle, flammulated owl, grizzly bear, Canada lynx, gray wolf, and wolverine would have been likely to inhabit these areas before the industrial logging and decreased in numbers and distribution as the logging progressed. This also holds true for a variety of big game species including elk, mule deer, and white-tail deer.

Habitat Type Group 4: Cool and Moist Subalpine fir

Logging and associated road building in this habitat type group occurred mostly during the 1900s as logging companies began to operate at higher elevations. The majority of logging occurred on private lands with economic interests in mind. Vegetation composition and structure were predominantly altered

by the industrial logging and associated road building. Resulting in impacts to wildlife use and movement.

The cool moist habitat types currently have a Douglas-fir cover type with a mix of associated conifer species to include lodgepole pine and subalpine fir. Common conifers include lodgepole pine, Douglas-fir, and subalpine fir. Engelmann spruce is also a key component on moist sites. Understory vegetation is abundant and consists of moisture favoring species. Average fire frequency is probably 130 years, but in many stands exceeds 130 years. Small, moderate severity fires occurred on mesic sites with discontinuous fuels. More severe, infrequent fires were more prevalent on the drier sites within this group. While some low intensity surface fires probably did occur, they were not typical, as the moisture on these sites would preclude such events to a very narrow window during the summer.

Wildlife communities were influenced by mixed severity and lethal fire regimes. The impacts of mixed severity fires created a mosaic of burned and unburned vegetation. The level of wildlife habitat disturbed depended on burn pattern and fire intensity. Lethal fires altered wildlife habitat. Lethal fires disturbed resources, changed conditions, and affected the ability of some species to occupy burned areas, while other species benefited. Riparian areas were productive wildlife habitats.

With the introduction of Euro-American human disturbances discussed above, the biodiversity and community structure were disturbed and negatively impacted due to the alteration and fragmentation of habitat. Special Status Species, such as bald eagle, golden eagle, flammulated owl, gray wolf, fisher, wolverine, grizzly bear, and Canada lynx would have been likely to inhabit these areas. The Canada lynx was a year-round resident and foraged and denned in this habitat type group when it contained complex, multi-storied stands. Riparian areas with large woody debris would have served as Canada lynx den sites as well. The grizzly bear was also a year-round resident and found optimal habitat for foraging, denning, and raising young. With the intensive alteration of the forest through logging and road building directly up drainages, these areas lost their structural complexity which was key for Canada lynx and also impacted the grizzly bear. This likely resulted in the resident Canada lynx and grizzly bears to move out of the area and possibly to the north and west where the Forest Service lands retained complex forest structures. Other Special Status Species wildlife would have decreased in numbers as the logging progressed and moved into more secure adjacent habitats. This also holds true for a variety of big game species including elk, mule deer, and white-tail deer which utilized this area as summer range and likely gave birth to young in these areas with more cover.

4.7 Aquatic Species and Habitat

Land use practices that began during Euro-American settlement caused dramatic changes to the landscape and aquatic resources of the inland Northwestern United States compared to prior conditions, including within the assessment area (Hessburg and Agee 2003, Smith 2010). Though the exact conditions of the assessment area previous to Euro-American settlement can only be speculated, it is likely that historic conditions of forests were primarily driven by intact fire regimes (Hessburg and Agee 2003); standing and dead trees were mostly continuous along riparian corridors (Schmetterling and Pierce 1999); climatic conditions were likely cooler than present day (Pederson et al. 2010); beaver and their ponds were common (Müller-Schwarze 2017, Smith 2010); and native fish species such as bull trout and westslope cutthroat trout were abundant and widely distributed (Shepard et al. 2005, Thurow et al. 1997).

Aquatic systems in the assessment area were likely transformed from their historic conditions through mining, road building, timber harvest, and extensive removal of beaver (Pierce et al. 2013). Specifically,

mining, timber harvest, and road building likely degraded the aquatic habitat by increasing sedimentation in streams, in turn clogging gravel beds important to fish reproduction, rearing, and macro-invertebrate production (Waters 1995, Muck 2010). Timber harvest along the riparian corridor also decreased the availability of large woody debris that support pool formation in streams, which are important features of fish habitat (Schmetterling and Pierce 1999). The removal of beaver to support the fur trade—and thereafter the loss of their ponds—likely further decreased habitat for fish and amphibians (Hossack et al. 2015). Further, water temperatures rising in the assessment area in-step with global temperatures have played a role in changes to fish assemblages (Eby et al. 2014). Though these environmental disturbances have been large factors in the decline of native trout throughout the west, stocking of non-native fish possibly had the largest direct impact on fish assemblages in the assessment area (Behnke 1992, Pierce et al. 2019).

Key areas where habitat and species conditions may depart from the historic conditions include:

Riparian Vegetation

Beginning in the late 1950s, vast tracts of land within the assessment area were under the ownership of industrial timber companies and managed almost exclusively for timber production and harvest until purchased by The Nature Conservancy (TNC) in 2003. Forestry Best Management Practices (BMPs), such as maintaining Streamside Management Zones (SMZ) during timber harvest, were not developed and put into law until as late as 1991 in Montana. Prior to the development of modern practices and regulations, logging operations likely had extensive impacts on assessment area streams (Burns 1972). For example, logs were typically skidded down intermittent stream channels or down excavated trails on either side of stream channels, typically within 30 feet of the stream (Sugden 1994). Very little erosion control was used along these trails and undoubtedly, extremely high quantities of sediment were delivered to assessment area streams during these years.

Furthermore, along streams such as Gold Creek, mature conifers were commonly harvested at the edge of the stream and dead in-stream wood was also removed (Sugden 1994, Schmetterling and Pierce 1999). This practice drastically reduced the potential for large woody debris (LWD)—one of the most important components in creating and maintaining stream habitats such as scour pools—to be deposited in streams.

Fish Species Assemblages

Concerns regarding fish assemblages in the Blackfoot River began in earnest in the late 1980s when state managers observed low numbers of native trout (Pierce et al. 2019). Prior to the introduction of non-native fish in the early 20th century, westslope cutthroat trout were the predominant trout species in the assessment area and larger bull trout were also very abundant. In the Blackfoot system, non-natives such as rainbow trout were stocked for at least a sixty-year period ending in 1974 (Pierce et al 2019); brook trout were introduced into the Blackfoot basin in 1933 and rainbow trout likely soon thereafter. Other exotic fish species introduced to the Blackfoot River include brown trout, largemouth bass, yellow perch, pumpkinseed, white sucker, walleye, and fathead minnow. The oldest known systematic aquatic and riparian habitat surveys known were performed in Gold Creek in 1991 (MT FWP) and Belmont Creek in 1994 (Sugden 1994).

Bull Trout

Bull trout (*Salvelinus confluentus*) is federally listed as Threatened and BLM considers it a Special Status species. Historically bull trout were abundant in the area and a consistent food source for the Salish and Pend d'Oreille Tribes in the greater Clark Fork region. Notably, their placenames for present-day Missoula and Bonner meant "place of small bull trout" and "place of large bull trout", respectively (Smith

2010). Though once the apex fish in western Montana, the abundance and distribution of bull trout have declined in the region due to excessive sediment in streams (Muck 2010), competition and hybridization with introduced non-native fish species (Leary et al. 1993), higher stream temperatures due to climate change and degraded riparian habitat (Eby et al. 2014, Selong et al. 2001), and habitat loss and fragmentation due to dams, culverts, and other in-stream barriers that reduce connectivity (Nearas and Spuell 2001, Nelson et al. 2002, Al-Chokhachy et al. 2008). Within the assessment area, the Blackfoot River, Gold Creek, West Fork Gold Creek, and Belmont Creek, are now categorized as Bull Trout Critical Habitat in the U. S. Fish and Wildlife Service's Bull Trout Recovery Plan (USFWS 2015). Records from MT FWP and others suggest that these creeks were once important bull trout spawning streams of the lower Blackfoot River (Swanberg 1997). As recently as 1995, Swanberg (1997) did find that 24 bull trout with radio-transmitters migrated an average of 63 km upstream in the Blackfoot, though severe declines in numbers of migrating fish are suspected since this time.

Westslope cutthroat trout

Westslope cutthroat trout (*Oncorhynchus clarki lewisi*) is a BLM Sensitive species and, historically, the most abundant fish species in the assessment area. The declines in westslope cutthroat trout abundance and distribution across their native range has been well documented and it is estimated they persist in only 27% of their historical range in Montana, and genetically pure populations reside in only 2.5% of their historical range (Liknes and Graham 1988, Young 1995, Shepard et al. 2005). Like bull trout, the causes of westslope cutthroat trout decline likely stem from habitat fragmentation from dams, culverts, and other barriers (Heckel IV et al., 2020), competition and genetic introgression from non-native fish, especially rainbow trout (Muhlfeld 2008), and warming water temperatures from climate change and other factors (Kovach et al. 2016).

Amphibians

There are several species observations from the assessment area in the Montana Natural Heritage records dating back to 1947, but conditions prior to this are largely unknown. Recent amphibian declines across the region are well documented, and though the reasons for the declines are not totally clear, some declines have been linked with habitat loss, pathogens, and climate change (Hossack et al. 2015, Johnson et al. 2011, Kissel et al., 2019). Importantly and perhaps not surprisingly, it has recently been shown that beaver play a critical role in the amount of pond habitat available for amphibian breading (Popescu et al. 2009) and, therefore, historic removal of beaver in the assessment area likely had lasting effects on the local abundance and distribution of amphibians. Though amphibian populations may currently be less vigorous compared to their historic levels, the species assemblage in the assessment area is likely unchanged from pre-Euro-American settlement with one exception: the northern leopard frog previously occupied Montana from east to west, but is no longer present in western Montana (Werner et al. 2004, Johnson et al. 2011).

Beaver Abundance

The population of beaver in North America prior to Euro-American settlement is estimated to have numbered in the hundreds of millions and ranged from the tundra of Canada to northern Mexico (Naiman et al. 1988). From the early 1600s until it's near extirpation in the early 1900s, beaver populations throughout North America were decimated by trappers working the fur trade (Naiman et al. 1988). Beaver of the northern Rockies and inland Northwest were trapped most aggressively in the mid-1800s. Pelt records from the Hudson Bay Company compiled by Johnson and Chance (1974) showed that drastic declines of beaver occurred in the inland Northwest of the Columbia River Basin from 1830s to 1850s.

In recent years, beaver have seen a resurgence, including in the assessment area where approximately 70 active dams were recently identified; the population in North America is estimated to be from 6–12 million (Naiman et al. 1988). Despite this resurgence, the numbers of beaver currently in the assessment area are likely small compared to the historic condition. Beaver have a tremendous influence on the environment including creating wetlands, altering nutrient cycles, and water retention in watersheds. And the riparian habitat, water retention capabilities, and water temperatures in the streams of the assessment area are likely altered from historical conditions due to past reduction of beaver populations (Dittbrenner et al. 2022).

4.8 Cultural Resources

4.8.1 Precontact/Precolonial Land Use

In the assessment area, human occupation likely began around 12,000 years ago, during the recession of the glacial sheet (Bryson et al. 1970, Reeves 1969). This is what the archaeological record indicates, coinciding with Salish oral traditions that recount the receding of the glaciers in the Mission Valley and the land opening for the people to live in again, showing human occupation of the region. The early inhabitants of the area left behind tool types suggesting larger game subsistence such as mammoth and Bison Antiquus. Climatic changes over thousands of years contributed to the extinction of larger fauna and resulted in changes to lithic technology used in hunting.

During the Altithermal period (5,000 to 2,000 BC), a period of more prevalent and widespread drought expanded forests due to increase precipitation in the Northern Rockies, fires became more prevalent, and grasslands were limited decreasing the availability of game animals (McLeod and Melton 1986: V-20). Hunting tool types change from spear technology to atlatl technology. Modern fauna such as elk, deer, mountain goat, bighorn sheep, and bison occur in the region and are the major subsistence for human populations. By 1000 BC forests were less dense and game populations increased across the Northern Rockies (Peterson 2011:5-6). In addition to hunting, Indigenous use of local plants like camas, bitterroot, huckleberry, chokecherry, and numerous other species contributed as food resources. Movements of human populations likely followed routes that had opportunities for the hunting of wild game and collection of edible plat resources, depending on seasonal availability. From 350 AD until contact with Europeans, tool types shift to much smaller projectile points reflecting bow and arrow technology. This new weapon resulted in a much more efficient exploitation of upland game, particularly when employed with communal hunting techniques (McLeod and Melton 1986, Roll and Hackenberger 1998:132). Trade networks between various groups allowed for the procurement of non-local lithic material, like obsidian from sources in modern Oregon, Idaho, and Wyoming (Yellowstone specifically). Sources of lithic material in this region resulted in numerous quarry sites that made use of the chert and flint that formed 300-250 million years ago when Montana was a shallow sea.

European Contact occurred in the study area in 1805/1806 with the Corps of Discovery Expedition. The Pend d'Oreille and Salish were the primary occupants of this area. To the northeast were the Blackfeet. To the southwest and south were the Nez Perce, the Bannock, and the Shoshone to the south and southeast (Peterson 2011:5-8). Horses were introduced to the Tribes in the late 1600s via Spanish colonization, and this revolutionized hunting, settlement patterns and warfare for these Indigenous groups. By the late 1700s the Northern Rockies Tribes gained access to firearms, first the Blackfeet through the fur traders and then the Nez Perce in 1805. By 1808 the Kootenai and Salish both had regular access to firearms via the fur trade forts. This also dramatically changed the culture of the Tribes. Hunting

became less important, while trading became more important resulting in certain Tribes claiming specific areas as their own. At this time the Salish predominantly subsided in the Lower Blackfoot watershed area.

Oral history suggests that the Cokahlarishkit Trail or "The Road to The Buffalo" was utilized for generations by historic groups as a travel route from the mountains to the plains. Long ridgeline landforms were also used as travel corridors between the Jocko Canyon area, Blackfoot corridor, and Cokahlarishkit Trail. The trail largely follows the Blackfoot River to the Sun River Valley East of the Rockies. There are documented segments of the Cokahlarishkit Trail on the southern border of the watershed area, paralleling the Blackfoot River along the northern bank. Important food harvesting along the trail includes what are now referred to as Culturally Modified Trees (CMTs). The Indigenous groups would cut through the bark of pines and peel back the outer layers, exposing the cambium sugar layer underneath and providing a necessary food resource along the travel route. The peeled trees then healed and continued to grow, resulting in fully grown trees that exhibit large, window like scars down to the sapwood. The depth of the scar and thickness of the healed bark illustrate the age of these trees since they were peeled. There are CMTs, along with other aboriginal sites, located within the watershed.

In 1855, the Hellgate Treaty was signed at Council Grove, just west of Missoula on the Clark Fork River. This established the Flathead Reservation and reserved treaty rights on aboriginal lands- including the entirety of this assessment area- off the reservation. These reserved treaty rights included for hunting, fishing, plant gathering, and camping. The Treaty was ratified by Congress in 1859.

4.8.2 Historic Land Use

European-American History and the Fur Trade

The earliest confirmed European contact and visitation to the immediate area is likely during Meriwether Lewis and his breakaway expedition on the return trip of the Corps of Discovery in 1806. The expedition camped in the Twin Creeks drainage before passing eastward toward Lewis and Clark Pass, in the Alice Creek Drainage near Lincoln, Montana. As of this writing, the exact location of this campsite is unknown. Shortly after the Corps of Discovery, fur traders made their way to the region. Trappers associated with the Hudson Bay Company and the Northwest Company explored drainages in the study area in pursuit of beaver pelts. David Thompson of the Northwest Company established two trading posts, Salish House and Kootenai Post, north of the study area on the Clark Fork River near Thompson, British Columbia. These posts were far closer than those on the Saskatchewan River, allowing for more extensive exploration and trapping activities with the Blackfoot Watershed (Peterson 2011:6-2).

Mining History

The assessment area was largely devoid of mining activity. Gold and silver had been discovered in the nearby Garnet Mountains and on Elk Creek, a tributary of the Blackfoot River. One operation, the Winona Placer was located in May 1887 and was fully patented and amended by August 1888. The Winona Placer was located on the edge of the study area boundary at the confluence of Elk Creek and the Blackfoot River and is the only documented mining event within the study area. This operation consisted of six shafts, two dams and reservoirs, a bypass ditch, and several flumes. It is likely that testing occurred along the Blackfoot River at the confluences of Belmont Creek and Gold Creek, within the study area, but negative results curbed further and more impactful mining operations.

Homesteading Era

Homesteading in the study area began in 1891 with a patent filed by Clayton Butler. These patents steadily increased as time went on. Only three confirmed homestead sites are currently recorded within

the study area: the Daniel Wise Homestead, which had been fully patented by Daniel Wise on April 5, 1911. A building located on the south side of the Blackfoot River at Goose Rock was likely a homestead patent (No. 671) by Alexander Kennedy in 1895. The third is known as Primm Meadow, a homestead that was patented in 1905 by Frank H. Parker, (recorded on the 1905 GLO map, patent awarded 1912). Primm Meadow also includes a substantial number of living 200-500+ year old ponderosa pine trees, several of which are culturally modified and have visible cambium peel scars. This site remains intact, while the rest of the watershed was heavily logged. The Northern Pacific Railroad Company acquired numerous sections in the area in 1896, as part of the federal government land grants.

Logging History

Extensive logging has been conducted in and near the assessment area since the 1860s. However, by the 1880s the scale of logging had changed. The new railroads in the region required a substantial amount of lumber for its construction and settlement in the region began to increase and the need for lumber also increased. In 1883 the Northern Pacific Railroad completed its line from Lake Superior to Puget Sound. This allowed for the transport of lumber from this region to the eastern markets. Logging has been a strong institution in the region since its beginning.

In 1885 the Montana Improvement Company began construction of a sawmill near the confluence of the Blackfoot River and Clark Fork Rivers, the current site of Milltown/Bonner. The sawmill was completed in 1886, and by 1887 legal troubles drove the Montana Improvement Company to become the Big Blackfoot Milling and Manufacturing Company (incorporated 1888). The company was sold in 1898 to Marcus Daly to provide timber resources to Anaconda Mining operations in Butte, Montana. By 1914 the Big Blackfoot Railroad was completed, which provided the transport of logs from the watershed area to the Bonner Mill, prior to this the logs were floated down the Blackfoot River to the mill. This same railroad line, as part of the Chicago, Milwaukee, St Paul & Pacific Railroad, also provided passenger transport making it easier to live in outlying areas. During World War I the need for Montana timber increased dramatically by 1916. This rail line was abandoned by 1957 but remnants of the railway remain on the landscape near Highway 200 and Johnsrud Park. The railroad infrastructure and availability of lumber in the watershed area provided a stable and large labor force. In 1928, the Anaconda Copper Mining Company purchased the entire operation and all its holdings, operating until it was rebranded Anaconda Forest Products in 1961. Champion International purchased Anaconda Forest Products in 1972, before eventually selling to Plum Creek Timber Company in the 1990s, and the Nature Conservancy in the 2000s. Since then, the BLM has expanded from its mere 40 acres in the assessment area to approximately 43,000 acres.

The cultural legacy of this activity within the assessment area includes logging camps, log flumes, roads, can dumps, railroad infrastructure, and log cabins constructed by company employees. Most of this activity is along the Blackfoot River and in larger drainages.

4.9 Recreation

Human use in the assessment area goes back thousands of years with the original inhabitants occupying the lands to hunt, fish, gather plants and live. An important trail, the Cokahlarishkit Trail or Road to the Buffalowas used to access buffalo hunting grounds on the plains across the Continental Divide. This trail was later used by Captain Lewis and his men during their return trip of the Lewis and Clark Expedition. With the establishment of Missoula and other settlers in western Montana, people started using this area for more recreational and resource extraction activities. Since the early 1900s, the lands in the assessment area were owned by private industrial timber companies. These companies, Anaconda, Champion, and

Plum Creek, all had an open lands policy that allowed recreational uses such as hunting, camping, and fishing. In the mid-1990s, Plum Creek Timber Company entered into a Habitat Conservation Plan (HCP) with the U.S. Fish and Wildlife Service (USFWS) to help protect native fish. One of the conditions of the HCP was to close roads to motorized use. Most of the gates in the assessment area went in at this time and restricted the use on those roads to non-motorized only (except in the winter).This changed the motorized access in the assessment area, particularly in the Belmont drainage. In the 2000s, Plum Creek began selling off parcels of land to private individuals who built houses on many of the parcels. In 2014, TNC purchased 117,000 acres, most of which was in the assessment area. When TNC became stewards of the land, several shooting areas and homeless camps existed within the Twin Creeks and Gold Creek area. TNC fenced and rehabilitated the lands to improve the condition of some of the areas as well as to preserve native plants. In addition, they implemented a no shooting and no camping area on land in the Twin Creek and Gold Creek areas.

On the BLM administered public lands within the assessment area, the dominant recreation use has been fishing and floating the Blackfoot River. Early people living in area fished for both pleasure and for subsistence along the Blackfoot River and its tributaries. Beginning in the 1960's management of the recreational use and a conservation program for the river corridor became a topic of discussion with local landowners and the managing agencies who were concerned about the increasing recreational pressure on the river. In 1976 the Blackfoot River Recreation Corridor Agreement was established between the local landowners (both private and public) and Montana Fish Wildlife and Parks. The Corridor Agreement encompassed 26 miles of mostly privately owned river frontage. The Corridor Agreement allowed for recreational day use access to private lands up to 50 feet above the high-water mark unless otherwise posted and for camping in designated areas only. In addition, a recreation management plan was written tied to the agreement. In 1976, BLM managed only 40 acres within the River Corridor. BLM became a larger cooperator in this agreement after the acquisition of approximately 11,000 acres in the lower Blackfoot. Prior to the BLM acquisition in the lower Blackfoot, MT FWP managed the campground, launch site and day use sites in this area.

The first Cooperative Management Agreement between the BLM and the MT FWP for the management of recreation along the Blackfoot River was created in 1997. The agreement allowed for MT FWP to manage the BLMs campground and day use sites within the Lower Blackfoot River Corridor and continues today. In 2005, the Cooperative Management Agreement was amended to add the Special Recreation Permit program. As such, MT FWP manages the commercial use on the entire Blackfoot River in coordination with the BLM. This agreement benefits the outfitters and guides and the people who use them in that only one permit is needed to commercially float the river. Annual permit numbers have ranged throughout the years from 90 to 115. The annual number of permits for the BLM managed portion is about 25 to 30. Montana FWP collects the fees for the permits and the campground and retains them to offset the cost of conducting maintenance at all the sites, monitoring sites and use, conducting surveys, overseeing the entire permit program, hiring a river ranger and a survey technician.

In the early 2000s the Blackfoot River, especially at Johnsrud Park and Whitaker Bridge, saw unprecedented numbers of visitors partially brought on by some extreme summer temperatures. At that time the Clark Fork River and East Missoula were largely undiscovered by the Missoula population. All sites in the Blackfoot River Recreation Corridor were overcrowded during the busy months. In fact, all the sites were at their capacity and overflowing. Montana FWP, BLM and Missoula County Sheriff Department started working together to help manage the use particularly in this part of the river corridor

with an increased presence. Through time and the discovery of other places, the need for such increased presence has diminished although the partnership with the three agencies continues.

In 2004 the Missoula Field Office published supplementary rules specifically for the Lower Blackfoot River Recreation Corridor. The Corridor boundary extends the length of the river through the BLM administered lands and ¼ mile on either side of the river and/or the road. The rules prohibited the activities: Camping outside of designated sites or areas; Lighting or maintaining a fire except in designated areas or established by government fire rings; Operating a motor vehicle off a designated trail, road or route.; Collecting firewood for other than on-site use, only dead and down wood may be burned; Discharging a firearm or projectile (except for legal game hunting purposes as established by the Montana Department of Fish, Wildlife and Parks), or engaging in other recreational shooting including, but not limited to, plinking, target shooting, or shooting varmints, etc.; Using of a fireworks; Violating a posted regulation pertaining to the protection of natural resources or public safety, and; Occupying or camping at an area longer than 7 days during any 30-day period.

Also, in the early 2000s another effort was started to manage the use on the Blackfoot River. After several iterations and different committees, in 2010 MT FWP finalized a River Recreation Management Plan. The River Recreation Management Plan divided the river up into 7 different reaches with the BLM managed lands along the river within this watershed in Reach 5. Reach 5 was further split into two parts – Lower Reach 5 Whitaker Bridge to Johnsrud Fishing Access Site and Upper Reach 5 Roundup Fishing Access Site to Whitaker Bridge. In addition, it outlined desired conditions for each reach of the river. The plan did not set limits on the number of people, but rather the size of groups. Also as part of the plan, use was like a funnel with the most use being more acceptable down river and lower use up river. While MT FWP's plan could not dictate management direction on BLM administered lands, it did bring forward recommendations including the development of designated float-in campsites and working with the BLM on the public safety of Johnsrud Road.

In addition to the water related activities, big game hunting has historically been a popular recreation activity within the assessment area. The area supports elk, deer, and black bear, mountain lions and upland game birds and is part of the second oldest Block Management hunting area in Montana. The Morrison Peak Block Management Area, developed in 1978, is a walk-in area only and permission is not required in order to hunt. Big game hunting is popular outside of the BMA as well. In addition, mountain lion hunters frequent the area using the snowmobile trails and roads in the winter. The BLM's Resource Management Plan (RMP), finalized in 2021, does not allow commercially outfitted hunting on BLM lands in this area unless in conjunction with Forest Service lands.

Recreation opportunities in the uplands north of the river dramatically changed in 1995 when Plum Creek implemented a road closure program. With implementation of these closures public access was restricted heavily. Prior to this time most the timber haul road had been open to the public. These closures were not supported by the people that had traditionally hunted this area. Because of these public comments, after the first large acquisition (11,000 acres) and through a watershed analysis and subsequent environmental assessment and public participation process, the BLM seasonally opened some of the roads in the lower corridor.

Snowmobiling has been a popular use in the assessment area for several decades and is allowed on gated roads. Most roads in the assessment area are open to snowmobiling. The north end of the assessment area includes designated snowmobile trail system maintained by the Driftriders out of Seeley Lake.

There are several Forest Service trailheads on the west side of the assessment area that have been popular destinations for decades. These trailheads provide access to the Rattlesnake National Recreation Area. These include Sheep Mountain, West Fork Gold Creek, Mineral Peak, and Gold Creek.

4.10 Visual Resources

The scenic values of the Blackfoot River have always been important. The early management plans discuss the importance of the scenery and landscape elements. The 1986 Garnet Resource Area Management Plan designated the river corridor as a visual corridor in recognition of its highly scenic visual qualities. Management priorities focused on maintaining or improving the scenic quality within the corridor. With the 2021 Missoula RMP revision, this area was encompassed into the Lewis and Clark Historic Trail Corridor. One of the management objectives for the trail corridor is to manage it as a Visual Resource Management (VRM) Class II. VRM Class II objectives are to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color and texture found in the predominant natural features of the characteristic landscape.

4.11 Wildland Fire Management

Prior to 1922 there was no organized wildland fire suppression in the assessment area. At that time, timber owners in the Big Blackfoot river drainage formed the Blackfoot Forest Protection Association (BFPA) to provide forest fire protection to 1,200,000 acres of private, state, and federal land. Annual reports from the BFPA from the Archives and Special Collections at the Maureen and Mike Mansfield Library at the University of Montana record fires in the assessment area from 1923 to 1936. During that time period, BLM lands were known as the "unappropriated public domain" and managed by the Division Inspector of the General Land Office. Every year the assessment area experienced wildfires. Most were caused by lighting with a few caused by humans, and most of the fires were suppressed at five acres or less (size class A and B). The fires were spread out across the assessment area with most lightning fires occurring on ridges and most human caused fires occurring in the lower, flat areas. While most fires were suppressed small, some years a few wildfires escaped initial attack and grew large.

Notable large fire years in the assessment area include 1910, 1919, 1929, 1961, 2003 (Mineral Primm Fire), and 2017 (Liberty Fire). These last two fires have had a significant impact to the vegetation in the northwest quarter of the assessment area and are a major feature on the landscape today.

According to the Fire Warden of the BFPA in his report on December 31, 1930, "Taken as a whole, 1929 was the most severe season, from the standpoint of cost protection and acreage burned over the region has experienced since 1910" (Spaulding 1935). In 1929 there were other large fires in the Northern Rockies including the Half Moon Fire (103,000 acres) and the Sullivan Fire (35,000 acres), both on the Flathead National Forest. That year the BFPA managed the Elk Creek Fire (1929) which started on July 23rd and burned 33,203 acres (south and outside of the assessment area). This fire and this fire season was a catalyst for the BFPA to double down on suppression. Again, from the report from the Fire Warden, "The dominant factor in fire control is accessibility and this is obtained only by improvement construction." After the 1929 season the BFPA proposed a "network of roads and trails in the region" mainly to get access to the "unappropriated public domain lands" (Spaulding 1935). See Figure 4 for an early lookout built on Belmont Point on the north end of the assessment area.

The assessment area contained very little unappropriated public domain lands (or USFS) thus most roads were built by ACM and for logging, but then utilized by the BFPA for suppression. The 1959 report states, “Each year more and more roads are opening up logging areas and we are confronted with the maintenance of such trunk roads thru the areas of increased risk”. The Forest Service also built several roads in the Gold Creek drainage for fire control and to build the Mineral Peak lookout.

There are a few exceptions where the BFPA did directly build “improved construction” in the assessment area for fire control. The 1956 report states, “During the latter part of the season, 7 miles of new Jeep road was constructed along a ridge between Belmont and Blanchard creeks, opening an area formerly accessible only by foot travel or parachutes. Fire control for this area has proven expensive to both the Lolo forest and the Association.” Segments of this Jeep road located on Game Ridge still exist today.

Figure 4. Early lookout on Belmont Point.

In 1964, “One class B fire in the Belmont creek drainage occurred on August 18th at the time the spread index was 79, the highest recorded for the year. Fortunately, there was a logging crew with a dozer nearby and we were able to control it with only 1/1/2 acres burned. This was the costliest fire of the season at $495.00”.

The BFPA continued suppression operations in the assessment area until 1970, at such time the State of Montana Department of Natural Resources and Conservation (DNRC) transitioned to providing fire suppression. The BFPA records from 1936-1970 include generic fire summaries for all fires they suppressed, thus there is no way to identify which fires occurred in the assessment area within this time period. According to BFPA documents, by 1970 fire control roads were finished and enabled good access to many parts of the assessment area.

These historical records support the conclusion of Agee (1993) that changing land use patterns and attempts to exclude fire have greatly reduced the scope of fire on the landscape.

4.12 Lands/Realty/Access

For thousands of years these were the aboriginal lands of the Salish, Kootenai, and Pend d'Oreille people. The north side of the Blackfoot River was an important travel route for these and several other Tribes to travel from north Idaho and western Montana to buffalo hunting grounds in eastern Montana. Some Tribes referred to this route as the Road to the Buffalo. The Tribes also used this area for hunting, fishing, plant gathering and managed vegetation for a variety of objectives. The Blackfoot River was known as the Place of Bull Trout Waters by the Salish and Kalispel people.

In 1846, the United States acquired the Oregon/Washington territory through the Oregon Treaty with Great Britain, which included the assessment area.

In 1855, the Hellgate Treaty was signed at Council Grove, just west of Missoula on the Clark Fork River. This established the Flathead Reservation as well as reserved treaty rights on aboriginal lands off the reservation. These reserved treaty rights included for hunting, fishing, plant gathering, and camping. The Treaty was ratified by Congress in 1859.

To encourage westward expansion and development, the US Government issued land grants to railroads in the 1860's. The Northern Pacific Railroad (NPR) was granted lands in the assessment area to connect St. Paul, Minnesota to Seattle, Washington.

In 1886 Andrew Hammond built a lumber mill in Bonner and bought some land from NPR as well as the rights to cut timber on NPR lands. His company was called the Big Blackfoot Milling Company (BBMC). The town of Bonner was built to house employees and managers of the mill, and in the spring of 1886 the first log drive down the Blackfoot River floated twenty million board feet of logs to the Bonner mills. Through the years, these lands and facilities tied to the production of lumber and other timber products passed through multiple ownerships. In 1898, Anaconda Copper Mining Company (ACM) acquired lands and mill infrastructure from the NPR and BBMC. In 1972, ACM sold over 600,000 acres to Champion International, then in 1993 Plum Creek Timber company (PCTC) purchased all the Champion holdings: about 860,000 acres in Montana.

On November 6th, 1906, President Theodore Roosevelt would designate the timbered area north of the Blackfoot River as the Missoula Forest Reserve using the General Revision Act (or Forest Reserve Act of 1891), which later became the Lolo National Forest.

In 1937, ACM donates 20,000 acres to University of Montana for an experimental forest, which is named after W.C. Lubrecht-the general manager of ACM timber operation in Bonner.

In the 1970's, partnerships started forming to better protect and conserve the watershed. Envisioning between these groups, BLM, and Champion International began in 1988, led by Darrell Sall with the idea of exchanging or purchasing outright the land along the lower Blackfoot river corridor. Those discussions continued with Plum Creek, and in 1996 Plum Creek agreed to a land exchange. The Nature Conservancy stepped in to help facilitate the exchange, and from 1997 to 1999 142 parcels of BLM land (22,097 acres) from Missoula, Butte, and Dillon Field Offices were exchanged for 11,730 acres along the lower Blackfoot river.

From 2003 to 2014 TNC purchased over 500,000 acres of Plum Creek lands in western Montana with the objective of long-term conservation. Through a community driven process TNC has been working with BLM and other agencies to in turn acquire these lands into federal ownership utilizing Land and Water Conservation Fund (LWCF), which comes from offshore oil and gas royalties.

The BLM has acquired through exchange and purchase approximately 43,372 acres of these lands since 1997 in the assessment area and is working with the TNC on additional acquisitions in the area within the next several years (see Map 11 in Appendix B).

4.13 Assets and Facilities

All transportation assets were existing at the time of acquisition. Recreation assets along the river corridor were developed and improved during the last two decades. Maintenance has been primarily focused on the McNamara Road (Johnsrud) in the past and on the recreation sites in the Lower Blackfoot. Prior to 2021, the McNamara Road was gravel that had worn down to native cobbles and was in desperate need of reconstruction with gravel or pavement. In 2021 the BLM worked with Federal Highways to pave the route to Whitaker bridge. All other maintenance on roads was limited to timber sales or other adjacent landowners.

4.14 Lewis and Clark Trail Corridor

On July 3, 1806, Lewis and Clark divided into two parties and left Travelers Rest, located near present day Lolo, Montana, to continue on their return trip home. Lewis, his party of nine men and several guides, travelling on horseback, began their journey through Hellgate Canyon (near present day Missoula, Montana), up the Blackfoot River and across the Continental Divide. Lewis and his men followed the "Cokahlaharishkit Trail". The “Cokahlaharishkit Trail” was a trail used for centuries prior to 1806 by Indigenous people to access buffalo hunting lands east of the Continental Divide and is the Nez Perce name for the trail. The Salish call the trail the Buffalo Hunt Road.

The trail generally follows the Blackfoot River although segments veer away from the river. The General Land Office maps and maps created by Lewis and Clark expert Bob Bergantino, show the trail leaving the area next to the river and taking a more overland route around the Ninemile Prairie towards the Clearwater River, then the trail begins to parallel Highway 200 or was covered by Highway 200 until around the turn off to Scotty Brown Bridge. According to Lewis’ journal the group halted and dined in a little drainage feature on the left of the Ninemile Prairie area.

The Lewis and Clark Trail was designated a National Historic Trail after the National Parks and Recreation Act of 1978, Public Law 95-625, amended the National Trails System Act to include the new category of National Historic Trails. According to the Foundation Document (2012),

> The purpose of the Lewis and Clark National Historic Trail is to commemorate the 1804 to 1806 Lewis and Clark Expedition through the identification; protection; interpretation; public use and enjoyment; and preservation of historic, cultural, and natural resources associated with the expedition and its place in U.S. and Indigenous history.

The Secretary of the Interior was given the trail administrator responsibility and long-term administration of the trail was delegated to the National Park Service (NPS). In the 1982 Comprehensive Management Plan, the NPS recommended two types of development for Lewis’s return trip between Traveler’s Rest and Great Falls -a motor trail and a land trail. They proposed that the land trail would be located on the south side of the Blackfoot River between McNamara and Roundup Bridge and that Johnsrud Park and Ninemile Prairie Access were to be trailheads for the land trail. The motor trail would be along Highway 200.

4.15 Socioeconomics

Missoula County was founded with natural resource-related industries with timber production and agriculture as its primary economic sectors. Timber and wood products, in particular dominated the economy throughout the 20th century (see additional details in Section 4.5). The timber companies allowed for recreational access on their property.

Rural residents feel a strong sense of protection for the character of their communities and pride themselves on their self-reliance (Missoula County 2019). In the 1970s people began to work together building partnerships with the university, agencies, and others including private landowners to manage recreation and protect to the river corridor. Population growth has pushed residential development into the forest and onto agricultural lands. BLM has found local support for land acquisition of previously private timber company lands (Kearns and West 2023).

Since the early 2000s, tourism and outdoor recreation have become greater contributors to local economies. Often considered to be inspired by the 1992 film "A River Runs Through It" which was based on Norman McClean's accounts of growing up on the Clark Fork and Blackfoot Rivers along with more recent effects from the COVID19 pandemic and other social and demographic factors, more people are moving to western Montana and the Clark Fork region or finding it an attractive place to vacation or buy a recreational property. The rising price of real estate in western Montana represents the next great shift in land use, where lands are valued less for extractive resources and more for urban development. In fact, the greatest contributors to Montana's 2023 GDP were the Real Estate and Rental and Leasing sectors, with forestry in 9th place according to the IBIS World, Montana Economic Overview (ibisworld.com).

Chapter 5 – Current Conditions

5.1 Geology and Mineral Resources

Changes to the landscape as a result of tectonic forces, deposition, and/or erosion occur incrementally over long periods of time and are generally imperceivable without precise measurement. There are exceptions such as mass wasting and flooding events that could affect geomorphology relatively quickly, but the assessment area does not contain nor appear prone to these types of features under current climate conditions. Even in existing areas recovering from wildfire, significant changes to landforms have not occurred. Structural geology and geomorphology are described in Chapter 2, Section 2.1.3, and geologic history is provided in Chapter 4, under Section 4.1.1. Together, these two sections from Chapters 2 and 4 describe the current conditions as they relate to geology and landforms.

As described in Section 2.1.4, less than 1% subsurface mineral estate below acquired public lands is owned by the United States. A summary of this subsurface ownership is provided in Appendix D and Map 12 in Appendix C. For the minerals that are federally owned within the assessment area, there are three restrictions that may limit mineral exploration and development: the Thibodeau conservation easement, a power site withdrawal, and a segregation. The Thibodeau conservation easement is about 320 acres in the S½ of section 22, T.14N., R.16W., and per the easement language, it says, "The exploration for or extraction of all minerals, except oil and gas and the extraction of soils, sand or gravel, on or below the surface of [the land], shall be prohibited." The second restriction, a power site withdrawal, is 40 acres in the SE¼SE¼ of section 29, T.14N., R.16W., and is a withdrawal from entry under the land laws (including the mining laws), administered by the Federal Energy Regulatory Commission. The final restriction is a segregation from mineral entry that is 40 acres in the SE¼SE¼ of section 4, T.13N.,

R.16W., that was recommended for an opening order under the 2021 Missoula Field Office Resource Management Plan.

Because the subsurface is not owned by the United States, the Bureau of Land Management did not conduct a formal mineral potential assessment by classifying areas for occurrence potential with levels of certainty. In the few areas that the subsurface estate is owned by the United States, the lack of favorable geology and mineralization indicates the assessment area to have a low occurrence of minerals that would be subject to leasing or location (Hydrosolutions 2014). There are no active hardrock or placer mines within the assessment area, and there are no old mine sites that would be considered Abandoned Mine Lands impacting soil productivity, vegetation conditions, stream connectivity, water quality, or the safety of the public. A few active gravel pit sites are within the watershed analysis boundary but are not on public lands (Hydrosolutions 2014).

5.2 Landforms, Soils, and Site Productivity

Erosional regimes and geomorphic processes that develop conditions for changes to soil occur on geologic timescale; generally, formation can take anywhere from several hundred years to thousands of years under very harsh site conditions. Because of this, soil elements, including landforms, erosion regimes, and site productivity remain stable in their current state unless significant new landscape disturbances occur such as wildfires. Land health surveys found that soils were functioning properly across the majority of this landscape, with notable areas of compaction and impacts from historic roads and grazing discussed in Section 4.2; these historic conditions remain on the landscape today and present opportunities for future restoration treatments.

5.3 Water Resources

5.3.1 Water Quality

The most recent Montana DEQ TMDL Water Quality Integrated Report available is from September 2013. In the 2013 report, all streams in the Lower Blackfoot EAWS area were delisted except for Union Creek (total phosphorus and total nitrogen).

The Montana DEQ also publishes water monitoring data and information every 2 years. At the time of this report, the 2022 data was not yet available, so the most recent TMDL data available is from 2020. The EAWS assessment area includes 5 streams that were once 303(d) listed but have since been delisted. These streams include: the Blackfoot River from Monture Creek to Belmont Creek (delisted in 2014), the Blackfoot River from Belmont Creek to mouth (delisted in 2013), Belmont Creek (delisted in 2009), Elk Creek from Stinkwater Creek to mouth (delisted in 2009), and Union Creek from headwaters to mouth (delisted in 2013). However, since the last of those streams got delisted on 11/30/2014, all streams within the EAWS project area have been delisted (MT DEQ CWAIC 2020). See Table 6, for a summary of when 303d delisting occurred for streams in the EAWS project area.

5.3.2 Riparian Wetlands & Streams

PFC

The BLM uses the Properly Functioning Condition (PFC) framework to evaluate stream function and riparian health for lotic and lentic features (Table 7). PFC assessments are on-going in the assessment area and in several of the recently acquired lands, PFC and stream inventories have already been completed on 64.6 miles of stream. Approximately 16 miles of streams have not yet been surveyed, these

reaches are mostly located on lands currently managed by TNC that will eventually be acquired – additional PFC assessments will take place as these acquisitions continue.

PFC ratings are evaluated at a reach specific scale; stream reaches are delineated based on hydrologic and vegetation conditions; for example, a highly sinuous stream reach through a relatively flat meadow would be separately delineated from a steep, forested stream reach.

Table 7. Properly Functioning Condition (PFC) Ratings for Stream Reaches in the Lower Blackfoot Planning Area on BLM and TNC Managed Lands by 12th HUC.

HUC 12 Watershed: Belmont Creek		
Reach Identifier	***PFC Rating and Trend***	***Reach Length (miles)***
Belmont 1	PFC	0.17
Belmont 2	PFC	0.61
Belmont 3	PFC	0.59
Belmont 4	PFC	1.74
Belmont 5	PFC	0.27
Belmont 6	PFC	3.25
Belmont 7	PFC	1.52
Burnt Fork 1	PFC	2.36
LBC017	PFC	0.68
LBC018	PFC	0.35
LBC019	PFC	0.17
LBC020	PFC	0.38
LBC022	PFC	0.49
LBC023	PFC	0.52
HUC 12 Watershed: Buck Creek – Blackfoot River		
Reach Identifier	***PFC Rating and Trend***	***Reach Length (miles***
Game Ridge Creek 1	FAR, No Apparent Trend	0.88
LBC001	PFC	0.64
LBC002	PFC	0.25
LBC003	PFC	0.11

LBC004	PFC	0.78
LBC005	PFC	0.23
LBC006	PFC	0.03
LBC007	PFC	0.44
LBC008	PFC	0.03
LBC009	PFC	0.82
LBC010	FAR, No Apparent Trend	0.27
LBC014	PFC	0.04
LBC015	PFC	0.03
LBC016	PFC	0.06
LBC024	PFC	0.38
LBC025	PFC	0.93
LBC035 - Little Belmont Creek	PFC	1.11
LBC036 - Little Belmont Creek	PFC	0.56
LBC037 - Buck Creek	PFC	0.76
LBC038 - Dunnigan	PFC	0.33
Dunnigan Gulch 1	Not Yet Completed	1.81
Lower Blackfoot River 1	PFC	10.44
Ninemile Prairie 3	FAR, No Apparent Trend	0.89
Whiskey Gulch 1	PFC	0.27
Whiskey Gulch 2	PFC	0.10
Whiskey Gulch 3	PFC	0.06
Whiskey Gulch 4	PFC	0.14
HUC 12 Watershed: Lower Gold Creek		
Reach Identifier	***PFC Rating and Trend***	***Reach Length (miles)***
Cow Creek 1	PFC	2.25

Cow Creek 2	FAR, Upward Trend	1.76
Gold 1	PFC	2.00
Gold Creek 2	PFC	1.80
Cow Creek 3	Not Yet Completed	1.12
HUC 12 Watershed: Lower Union Creek		
Reach Identifier	***PFC Rating and Trend***	***Reach Length (miles)***
LBC011	PFC	0.16
LBC031	FAR, No Apparent Trend	0.17
LBC032	PFC	1.13
LBC032	PFC	0.44
LBC033	PFC	0.36
LBC034	PFC	0.37
HUC 12 Watershed: West Twin Creek – Blackfoot River		
Reach Identifier	***PFC Rating and Trend***	***Reach Length (miles)***
East Twin Creek 1	PFC	3.47
East Fork Twin 2	PFC	1.28
East Fork Twin 3	FAR, No Apparent Trend	0.54
West Fork Twin 1	Not Yet Completed	1.67
West Fork Twin 2	Not Yet Completed	1.33
HUC 12 Watershed: Upper Gold Creek		
Reach Identifier	***PFC Rating and Trend***	***Reach Length (miles)***
Gold Creek 3	PFC	1.43
Gold Creek 4	PFC	2.85
Gold Creek 5	Not Yet Completed	0.84
Gold Creek 6	Not Yet Completed	1.67
Gold Creek 7	Not Yet Completed	0.35
Gold Creek 8	Not Yet Completed	0.86
Wildhorse Creek 1	FAR, Upward Trend	0.57
Wildhorse Creek 2	Not Yet Completed	1.05

Wildhorse Creek 3	Not Yet Completed	0.71
HUC 12 Watershed: West Fork Gold Creek		
Reach Identifier	***PFC Rating and Trend***	***Reach Length (miles***
Spring Creek 1	Not Yet Completed	1.58
West Fork Gold Creek 1	Not Yet Completed	2.03
West Fork Gold Creek 2	Not Yet Completed	1.14

Stream reaches that get rated as Functional-At Risk (FAR) or Nonfunctional (NF) are considered to not be in Properly Functioning Condition (PFC). When streams are in a condition less than PFC, BLM evaluates causal factors that impact stream function and health and recommends actions to improve those stream conditions. In the EAWS area, 7 stream reaches are rated as Functional-At Risk (FAR) and have opportunities for stream improvements. A summary of the causal factors for these stream reaches and recommended treatments are included in Table 8.

Table 8. Stream Reaches Not Meeting PFC with Causal Factors and Recommended Remediation Actions.

Reach Identifier	PFC Rating	Causal Factor for Not Meeting PFC	Treatment Recommendations
Cow Creek 2	FAR - U	The channel was overly straightened from historic road building and has stabilized in a new confined valley bottom. The stream does not have room to access floodplain in many areas which is causing vertical downcutting under high flow conditions.	Consider road realignments and decommission all road crossings. Consider stabilizing in-stream low tech restoration options to slow vertical incision.
Dunnigan Gulch	FAR – Stable	Road encroachment on floodplain connectivity on an intermittent stream.	Consider road decommissioning, keep as single track motorized/non-motorized trail access.
East Fork Twin 3	FAR - NA	Stream has erosion of channel margins and significant sedimentation in aggradation pools beyond normal conditions.	Pursue erosion control measures and sediment reduction from Gold Creek road.
Game Ridge Creek 1	FAR-NA	The hydrologic and geomorphic conditions of this stream have changed because of lateral instability. Riparian vegetation is present but not consistently vigorous along	Consider fencing riparian areas to allow long-term recovery of stream conditions.

		streambanks. Herbaceous vegetation has been overgrazed by cattle.	
LBC010 - Morrison Mountain Tributary	FAR-NA	Cattle hoof shearing has altered the lateral stream channel margins but has not caused incision. The width depth ratio has increased beyond normal conditions for this stream type. No clear lotic path is evident.	Increase range patrols of this area to assure cattle are not using this area; this location is not within an active grazing allotment.
LBC031 - Lower Union Creek	FAR-NA	Extensive grazing impacts placing this riparian at risk.	Increase range patrols of this area to assure cattle are not using this area; this location is not within an active grazing allotment.
Ninemile Prairie 3	FAR-NA	The stream channel has incised and disconnected from its floodplain in some areas while other areas have aggraded and reduced water depth. Slump blocks and lateral erosion were noted and livestock caused. Riparian vegetation was present in patches, but cattle grazing of herbaceous stabilizers has limited riparian vegetation expansion and reduced the ability for vegetation to stabilize the floodplain under high flow events.	Consider fencing riparian areas to allow long-term recovery of stream conditions.
Wildhorse Creek 1	FAR-U	The stream has imbalances in the hydrologic profile, with incised sections caused by historic stream straightening for irrigation ditching. The sinuosity of the stream is lower than it should be and the stream should have more meandering bends through the valley bottom. The floodplain is improving with more hydrologic inundation and establishment of riparian vegetation from Beaver Dam Analogue installations.	Continue to monitor and maintain low tech process-based restoration structures.

Riverscape Health

Riverscape health was assessed by conducting analysis of potential riparian environments using the Valley Bottom Extraction Tool (VBET) (Riparian Condition Assessment Toolbox, Riverscape Consortium 2022) and using Montana Natural History Program's wetland database. The VBET model uses a combination of physical characteristics including Digital Elevation Modeling, LIDAR (if

available), and geomorphic characterizations to determine where streams and rivers have historically been driving agents of the landscape. This valley bottom landscape is then further characterized into active and inactive floodplain areas; the model can show where a floodplain is routinely activated versus areas where the valley bottom extent has not been flooded by using remote sensing measures of greenness (NDVI), surface water, and other values. The difference between these two characterizations (active and inactive floodplain) is the equivalent of the restoration potential for the riverscape on this landscape. Based on the historic reference conditions, moving towards re-wetting those inactive floodplains through various restoration techniques is recommended for this project.

In the assessment area (across all land ownerships), there are 6,697 acres of valley bottom or 5.4% of project area as defined by the VBET tool; this represents the historic extent where rivers actively moved and changed across the landscape. Comparatively, only 4,014 acres (or 3.2% of the project area) were identified as active floodplain and 2,683 acres were inactive floodplain. This means that today, riparian habitat has shrunk, represented by the "inactive" floodplain acres, and there is potential to restore some of that lost floodplain connectivity. Currently, the active riverscape (floodplains and channel area) is only actively using 60% of its historic range. The results in Table 9 show where floodplain connectivity and riverscape restoration potential are highest; where the current active floodplain is a low percentage of the historic extent, there is opportunity for riparian restoration.

Table 9. Valley Bottom Extraction Tool Results for Lower Blackfoot EAWS Area HUC6 Watersheds.

Watershed (HUC12)	**Historic Extent (Total Valley Bottom acres)**	**Current Extent (Active Floodplain and Channel acres)**	**Percent of Riverscape Currently Active**
	Total Valley Bottom Acres	*Active Floodplain and Channel Acres*	*Existing Acres as percent of historic extent*
Blackfoot River-Lost Prairie Creek	48	21	43%
Lower Elk Creek	140	64	45%
Fish Creek-Blackfoot River	186	91	49%
Lower Union Creek	537	295	55%
Blanchard Creek	60	33	56%
Lower Gold Creek	543	310	57%
West Fork Gold Creek	563	327	58%
Buck Creek-Blackfoot River	2777	1636	59%
Grand Total	6697	4014	60%
Upper Gold Creek	804	512	64%
West Twin Creek-Blackfoot River	510	338	66%

Belmont Creek	490	364	74%
Johnson Gulch-Blackfoot River	14	14	97%

For example, Wildhorse Creek (Figure 5), a relatively flat meadow stream system in the Upper Gold Creek watershed, was historically straightened to facilitate irrigation and hayfield management. These historic actions changed how Wildhorse Creek moves throughout the valley bottom and has resulted in shrinking the active floodplain and riparian extent. VBET analysis shows that 10.8 acres were historically part of the riverscape system, but today the active floodplain and channel area in the meadow is only 4.7 acres (or 44% of its historic extent); the difference (the "inactive floodplain") is the restoration potential, in this case there is an opportunity to restore riverscape conditions in 6.1 acres of Wildhorse Creek.

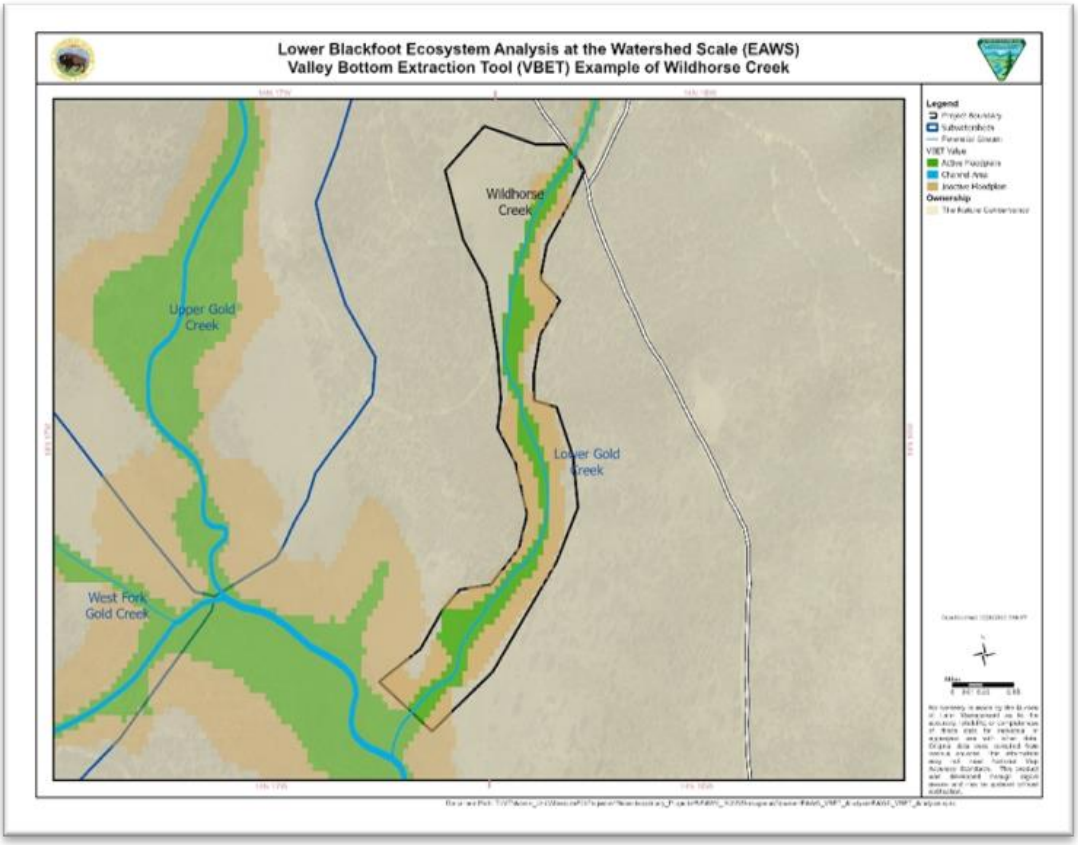


Figure 5. Valley Bottom Extraction Tool (VBET) results for Wildhorse Creek (black outline) shows that 4.7 acres are considered active riparian area, including active channel (blue) and active floodplains (green). The inactive floodplain represents the historic riverscape extent (brown) and also reflects the areas where there are opportunities to expand floodplain connectivity.

5.3.3 Hydrology

As discussed above in the discussion on Properly Functioning Condition and Riverscape health, hydrologic conditions have been impacted from historic anthropogenic changes, resulting in some localized areas of decreased stream function and an overall shrinking of riverscape potential.

In many cases, roads are located in valley bottoms, where the flattest land is located. Over time, this has straightened streams, resulting in localized areas of vertical instability. The EAWS area includes over 1200 miles of road, with over 560 miles of road located within Riparian Habitat Conservation Area (InFISH) boundaries. There are 832 road stream crossings in the project area – of which 61 are located on perennial waterways; these features include culverts, bridges, and stored (decommissioned) crossings. Several of these features were noted during field assessments for this project and approximately 99 of them have been identified for maintenance needs to improve road drainage, realign culverts with streams, and install upgraded, correctly sized crossings within these road features. Additional culverts and stream crossings will continue to be reviewed and it is recommended that all crossings be evaluated for restoration opportunities during future management activities.

Water utilization, including authorized water rights uses, was evaluated in the project area. Many of these uses are for instream flow and/or emergency utilization for fire suppression. No concerns or notable changes in water utilization were noted.

5.4 Vegetation

5.4.1 Forest Vegetation

Detailed current vegetation attributes are displayed in the Blackfoot Habitat Type Group NRV/Existing/Desired Condition Tables (Appendix B) and geographically in the Habitat Type Group, Cover Type, and Structure Maps (Appendix C, Maps 20, 21, and 22). Data used to characterize forest vegetation was obtained using a variety of methods including ground-based forest inventory over several years on BLM and some Forest Service lands, a mix of remotely sensed and ground-based inventory on TNC lands and remote sensing on other lands. A geodatabase containing data representing multiple ownerships was created and used for this assessment. The following narrative compares current vegetation and disturbance risk conditions with NRV which will be used to assess potential conditions and trends (in Chapter 6) within the context of issues and key questions (developed in Chapter 3).

As mentioned in the Historic and Reference Conditions section, forest vegetation across the Blackfoot EAWS area has been heavily impacted by historic logging practices and wildfires that have burned since successful fire suppression began in the area, creating fires that are outside of what would have naturally occurred in terms of size and intensity. Vegetation has developed based on what the most recent disturbance was (historic harvest practices or wildfire or both) and time since that disturbance. For example, the northwest portion of the landscape was logged heavily in the 80s then much of it burned in one or both the Mineral Primm wildfire (in 2003) and the Liberty fire (in 2017). As a result, much of that area has either relatively young (approximately 20-year-old) trees that are tightly spaced together or areas that are in transition from being recently burned grasslands and shrublands to becoming established as forests again.

Figure 6. Relatively young (approximately 20-year-old) forests in the northwest portion of the EAWS areas that developed following large fires that burned in the early 2000s.

Figure 7. Grass and shrublands in the northwest portion of the EAWS that are in a slow transition back to having forest cover following the Liberty Fire that burned in 2017.

The area located closer to the Blackfoot river in the middle of the assessment area was historically not harvested as heavily as other areas and for the most part has experienced a reduction in tree density by thinning small diameter trees and reintroduction of fire (by means of 1-2 prescribed fires) so there are more ecologically appropriate conditions in those areas in terms of forest structure (large trees) and species composition.

Figure 8. A typical stand of mature large trees located near the Blackfoot River in the EAWS area.

The upper Belmont drainage and the eastern portion of the Gold Creek Drainage has relatively young trees that are approximately the same age the further away from the Blackfoot river you go. For example, many trees on the western side of the upper portion of Belmont creek are approximately 40 years old. This area was harvested heavily in the mid-1980s.

Figure 9. A typical stand averaging 40 years in age in the mid to upper Belmont and eastern portion of Gold Creek Drainages.

There are areas that were historically either wet meadows or upland grasslands that are being encroached upon by forest vegetation due to fire suppression. There is not a large quantity of high-quality snags or down logs at the landscape scale are due to the lack of mature large diameter forest structure. These general statements and photographs are intended to paint an over-all picture of the landscape, more specific information by dominate cover type follows. Numeric comparisons of Historic/Reference conditions with current conditions by habitat type group can be viewed in Tables 23-26 in Appendix B (especially size class differences as these are more easily shown in tabular format).

Whitebark pine (WBP) is a five-needle pine that lives in windy, cold, high-elevation or high-latitude environments across the western United States and southern Canada. WBP was federally listed as a Threatened species by the USFWS in January 2023. Major threats to WBP include mortality from disease that is caused by the non-native white pine blister rust and predation by mountain pine beetle in addition to climate change and associated habitat loss resulting in fire-related mortality. Mature whitebark pine stands in the EAWS area, occurring near and on Black Mountain and near and on Belmont Point (see the

Whitebark Pine Map 23 in Appendix C), have largely succumbed to white pine blister rust. Small trees show varying levels of damage from rust, although a few, very scattered individuals appear relatively vigorous suggesting they have some inherent rust resistance.

Current Species Composition, Density, and Structure on BLM Lands

On BLM managed lands current species composition as indicated by dominant forest cover type across the EAWS area is comprised primarily of Douglas-fir (53%) and ponderosa pine (29%). Western larch and lodgepole pine compose 11% and 4% respectively. The majority of all forest vegetation across the EAWS area has at least one species and two or more canopy layers in the understory of forest stands. Understory species are typically shade tolerant Douglas-fir, subalpine fir, and Engelmann spruce, depending on the habitat type on which they are growing.

The quantity of ponderosa pine cover is below the NRV within the warm Douglas-fir habitat type groups (HTGs 1 and 2). Ingrowth of shade-tolerant species, primarily Douglas-fir, has increased the quantity of Douglas-fir cover and density beyond the natural range thereby increasing vegetation competition on the site for limited moisture and nutrients, creating ladder fuels, and generally increasing the risk of a higher severity fire than would have historically occurred on the dry Douglas-fir sites.

The quantity of Douglas-fir cover and tree density has increased across the EAWS area (and across HTGs 1-3) when compared to NRV, resulting in increased risk of high severity fire and insect and disease damage in unmanaged stands. The quantity of Douglas-fir cover is outside the limits of the natural range within HTGs 1, 2, and 3 due to extended fire free intervals and past harvest on the warmer sites (i.e. HTG1 and HTG2).

The western larch cover type has been reduced from its natural range and within the larch cover type, the ingrowth of non-seral species such as Douglas-fir and subalpine fir in the understory has led to an increased risk of higher severity fire than what is considered natural, due to higher tree densities and increased ladder fuels.

Aspen, Engelmann spruce and subalpine fir as a dominant cover type is less than 1% of the assessment area. Understory subalpine fir has increased within HTGs 3 and 4 over the last 50 years as a result of fire exclusion and successional processes favoring shade tolerant spruce and subalpine fir over seral species (e.g., western larch, lodgepole and Douglas-fir on certain habitat types) which are progressively losing dominance in HTGs 3 and 4. Uncommon conifer species or species occurring at the periphery of their range include western red cedar and mountain hemlock, both of which are limited to a few isolated patches. Western red cedar occurs as scattered individuals in mid-elevation riparian areas and mountain hemlock occurs as scattered pockets of trees in mesic, high elevation areas. Within the project area both species are limited to the West Twin Creek drainage.

Generally speaking, all habitat type groups across the assessment area have higher amounts of pole (5”-9” dbh) and medium (9”-15” dbh) sized trees than what would have historically occurred. The landscape is currently lacking in large (15”-21” dbh) and very large (>21” dbh) sized trees. See Tables 23-26 in Appendix B for a structural (size class) component comparison by habitat type group.

Disturbance and Risk of Disturbance outside NRV:

An important characteristic of forest vegetation disturbance is patch size. A patch is described as a continuous area affected by one disturbance event. Patch size distributions within all HTGs are generally

outside the NRV. Current patch sizes within the Douglas-fir habitat type groups are <50 acres in size. Historically the patch sizes were larger in size (i.e. 50-250 acres with some up to 500 acres). Current patch size within the subalpine fir HTG is also within the smaller patch size (<150 acres) while historically this series trended toward 150 to greater than 500 acre patches as a function of topography and juxtaposition with other high severity fire groups.

The BLM is currently implementing vegetation treatments from the 2017 Lower Blackfoot Corridor Ecosystem Maintenance, Forest Restoration and Fuels Reduction EA and the 2020 Belmont Gold Forest Restoration and Fuels Reduction EA.

Currently the role of fire is very limited in the assessment area due to the policy of full fire suppression that has been in effect since 1922. The Blackfoot Forest Protection Association (BFPA) continued suppression operations in the assessment area until 1970, at such time the State of Montana Department of Natural Resources and Conservation (DNRC) transitioned to providing fire suppression. During this time, very few fires have escaped initial attack and affected any major vegetation change across the landscape. The BFPA records from 1936-1970 include generic fire summaries for all fires they suppressed, thus there is no way to identify which fires occurred in the assessment area within this time period.

Historical fire regimes of the Lower Blackfoot assessment area have and continue to be directly and indirectly altered by human actions. Indigenous people interacted and influenced this landscape for thousands of years by the use of fire and those influences are incorporated into the fire history of the area. It is the extent of human influence over the last 100 years that is of primary concern when considering the cumulative impacts to the fire regimes of the Lower Blackfoot assessment area. Domestic livestock grazing, commercial logging, road and rail construction, urbanization and rural development all have contributed to the direct or indirect exclusion of fires (Hessburg et al. 2005) In particular, land conversion to residential and urban development are obvious changes. The majority of the urban development in the Lower Blackfoot assessment area is in the southwestern portion near the historic log landing site of McNamara.

Fire suppression efforts have successfully excluded fire for several natural cycles. This has resulted in the warm and dry Douglas-fir habitat types being dominated by increased Douglas-fir composition and density with marked changes in forest structure. Dominant species composition has shifted away from ponderosa pine toward more shade tolerant Douglas-fir. The bunchgrass and shrub component is currently characterized by lower coverage and vigor as compared to historic conditions. Prolonged absence of fire on many sites has resulted in an overabundance of trees in mid-range size classes and a lack of large trees. The amount of area in seedling/sapling sized trees as well as the very large size classes (> 21" dbh) individuals (especially within the seral species components) has been reduced from historic ranges. Pole (5”-9” dbh), medium (9.1”-15”) and to a lesser extent large (15.1”- 21”) tree size classes exceed historic ranges. Historic open uneven aged stand structures are currently underrepresented and have been replaced by dense even aged second growth ponderosa pine and multi-storied Douglas fir dominated stands. Current fire frequency in most of the planning area is greater than 50 years. Fire occurrence within the planning area under current conditions may result in rapid spread of stand-destroying crown fires (Fischer and Bradley 1987, Graham et al. 2004).

These historical records support the conclusion of Agee (1993) that changing land use patterns and attempts to exclude fire have greatly reduced the scope of fire on the landscape.

5.4.2 Rangeland Vegetation

Grazing Allotments

Grazing allotments are classified into one of three management categories: (I) improve conditions with management actions, (M) maintain present management, and (C) custodial management. Listed below in Table 10 are the grazing term leases within this watershed assessment.

Table 10. Grazing Allotments.

Grazing Allotments					
Allotment Name, Number & Category	**Livestock Number & Kind**	**Season of Use**	**% Public Land**	**Public Acres**	**Public AUMs**
Belmont #17127 Maintain	70 Cattle	06/01 – 09/30	100	9,700	281
Black Canyon #01633* Custodial	7 Cattle	06/15 – 09/30	100	820	25

* Recently operated in conjunction with TNC lands.

Standards and Guidelines

Prior to ten-year term grazing lease renewal, rangeland health assessments are conducted with an interdisciplinary team based on methods and indicators described in *Interpreting Indicators of Rangeland Health Technical Reference 1734-6, Version 5* (USDI-BLM 2020). The standards listed in Technical Reference 1734-6, Version 5 are:

- Standard 1 – Uplands in proper functioning condition.
- Standard 2 – Riparian and wetlands are in proper functioning condition.
- Standard 3 – Water quality meets state standards.
- Standard 4 – Air quality meets state standards.
- Standard 5 – Provide habitat, as necessary, to maintain viable and diverse populations of native plant and animal species, including special status species.

Table 11, below, shows the results of the Belmont allotment rangeland health assessment.

Table 11. Rangeland Health Standards.

Rangeland Health Standards						
Allotment	**Upland**	**Riparian/Wetland**	**Water Quality**	**Air Quality**	**Native Plant/ Animal Habitat**	**Assessment Year**
Belmont	Met	Met	Met	Met	Met	2023

The Black Canyon allotment is a recently acquired allotment through a series of land acquisitions and the remaining TNC grazing agreement expired on October 30, 2023. There is no rangeland health assessment completed on this allotment to date.

Rangeland Vegetation
Typical rangeland vegetation in the assessment area consists of intermountain grasslands, riparian areas, and mountain meadows. Plant community composition in uplands will vary with soil type, elevation, precipitation, and aspect. The most common and dominant grass species expected with uplands are rough fescue, Idaho fescue, and bluebunch wheatgrass. Additional components of the vegetation community may include pinegrass, Columbia needlegrass, Richardson's needlegrass, green needlegrass, prairie junegrass, Sandberg bluegrass, lupine, and fringed sagewort. These plant communities will vary in species composition and can contain additional grasses, forbs, and shrub species.

A Daubenmire transect was established on Dunnigan Flats in the Belmont allotment in 2003 and was read in 2004, 2010 and 2021. Confidence intervals have not been established for this plot; therefore, trend is estimated. Summary of this transect is as follows: Bare soil decreased from 12% to 9%, rock has decreased from 4% to 3%, moss/lichen increased from 5% to 11%, litter increased from 23% to 32%, grass composition increased from 41% to 83% and forb composition decreased from 58% to 16%. Collected data for this area shows an upward trend. The Black Canyon allotment is a recently acquired allotment through a series of land acquisitions and no vegetation grazing transects have been established at this time.

It is important to note, introduced graminoid species such as timothy and smooth brome have become established throughout the area. Timothy and smooth brome are more prevalent along roads and areas of historic logging. These species may be present in some grassland communities within the watershed. However, these grassland sites continue to produce characteristic native vegetation and are productive with adequate vegetative cover to protect soil from water erosion and allow infiltration.

5.4.3 Special Status Plants and Habitat
BLM botanists and biological technicians have been surveying the Lower Blackfoot Watershed for Special Status Plants since at least 2018. Though botanists have found numerous occurrences of the common curlycup gumweed (*Grindelia squarrosa)*, there have only been 7 occurrences of Howell's gumweed recorded. Four of these occurrences were found over 30 years ago and haven't been revisited. Two are on Forest Service land just east of Gold Creek and were recorded by a Forest Service botanist in 2019. Subsequent visits by Forest Service and BLM specialists suggest these populations may be the common curlycup gumweed or hybrids of Howell's and curlycup gumweed.

Camas habitat in the Lower Blackfoot Watershed has greatly diminished since European settlement. BLM and Nature Conservancy botanists have been surveying the area for camas since 2018. There are 528 acres of potential camas habitat within the assessment area. Most of these acres are potential habitat and either do not have camas or have small remnant populations. Meadows along Gold Creek have the best camas populations and represent the best opportunities for restoration in the assessment area. Camas is often outcompeted by pasture grasses, most commonly smooth brome (*Bromus inermis)* and Timothy (*Phleum pratense*), and noxious weeds, most commonly spotted knapweed (*Centaurea Stoebe var. macranthos).* The Nature Conservancy and BLM botanists are actively undertaking restoration activities for the species.

BLM and The Nature Conservancy botanists have also been surveying the area for bitterroot since 2018. At present, 133 acres of bitterroot habitat have been recorded, particularly along Little Belmont Point and Game Ridge. Bitterroot habitat is being invaded by non-native plants, particularly spotted knapweed, cheatgrass (*Bromus tectorum*), and field brome (*Bromus arvensis*).

5.4.4 Noxious Weeds

The current list of Noxious Weeds that have been found in the assessment area, many of these species such as Japanese knotweed and Russian olive are found in and around urban areas such as Missoula, other species like spotted knapweed are found throughout the assessment area. This list was created using the Montana Natural Heritage Program data.

*Species have been found on BLM

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

- Dyer's woad - *Isatis tinctoria*
- European common Reed - *Phragmites australis ssp. Australis*

PRIORITY 1B Species: These weeds have limited presence in Montana. Management criteria will require eradication or containment and education:

- Japanese knotweed - *Polygonum cuspidatum*
- Purple loosestrife - *Lythrum salicaria*
- Rush skeletonweed - *Chondrilla juncea*
- Blueweed - *Echium vulgare*
- Scotch broom - *Cytisus scoparius*

PRIORITY 2A Species: These weeds are common in isolated areas of Montana. Management criteria will require eradication or containment where less abundant:

- Orange hawkweed - *Hieracium aurantiacum**
- Meadow hawkweed - *Hieracium caespitosum**
- Tansy hagwort - Senecio jacobaea
- Tall buttercup - *Ranunculus acris**
- Perennial pepperweed - *Lepidium latifolium**
- Yellowflag iris - *Iris pseudacorus*
- Eurasian water-milfoil - *Myriophyllum spicatum*
- Flowering-rush - *Butomus umbellatus*
- Common buckthorn - *Rhamnus cathartica*
- Ventenata - *Ventenata dubia**

PRIORITY 2B Species: These weeds are abundant in Montana and widespread in many counties. Management criteria will require eradication or containment where less abundant:

- Canada thistle - *Cirsium arvense**
- Leafy spurge - *Euphorbia esula**
- Spotted knapweed - *Centaurea stoebe, C. maculosa**
- Dalmatian toadflax - *Linaria dalmatica**

- St. Johnswort - *Hypericum perforatum**
- Sulfur cinquefoil - *Potentilla recta**
- Common tansy - *Tanacetum vulgare**
- Oxeye daisy - *Leucanthemum vulgare**
- Houndstongue - *Cynoglossum officinale**
- Yellow toadflax - *Linaria vulgaris**
- Black henbane - *Hyoscyamus niger**
- Russian knapweed - *Acroptilon repens*
- Diffuse knapweed - *Centaurea diffusa*
- Curly-leaf pondweed - *Potamogeton crispus*
- Hoary false-alyssum - *Berteroa incana*

PRIORITY 3 Species: These are regulated plant species. (Not Montana Listed Noxious Weeds)

- Cheatgrass - *Bromus tectorum**
- Russian olive - *Elaeagnus angustifolia*

The current distribution of noxious weeds is largely associated with past timber management practices This is evident due to the "near road" distribution of many of the listed species (Mortensen et al 2009). In many of the areas with roadside populations of noxious weeds, distribution is within approximately 10 meters of the road edge as well as other disturbed sites. Spread from off roadside sites is likely due to forest management projects, wildlife, recreational use, and livestock. (Bryson and Carter 2004). Approximately 45,000 acres within the assessment area represent the highest density or highest potential for invasion and are associated high risk habitat types and human caused disturbance. Approximately 17,650 acres in the assessment area represent low/moderate potential for weed invasion, these areas are at higher elevations or are on north aspect slopes. Because of the low populations of weeds in some areas and an understanding of the spread vectors involved, management of these areas should have a higher rate of success in preventing future noxious weed spread.

Habitat types and groups have been well mapped and inventoried with in the assessment area, defining the threat of spread for each habitat group provides a consistent means to determine what the noxious weed risk may be at the project level. Each habitat type has a different risk for noxious weed invasion, these habitat types are grouped by similar characteristics. This has led to the creation of "Habitat Type Groups Invasive Species Risk" this helps to determine areas of high/low risk of noxious weed invasion or has already been invaded as well as determine the risk of invasion prior to projects allowing project managers to prioritize resources.

Two Habitat Type Groups are at the highest risk of being already infested or are high risk of becoming infested. Warm Douglas-fir: (HTG-1), Cool Douglas-fir: (HTG-2) these two contain the habitat types that are the most risk. Moist Douglas-Fir (HTG-3), Moist Subalpine Fir (HTG-4) and other habitat type groups are less likely to be or become infested, but local or site-specific areas can be invaded but spread off site is less likely or much slower, unless other factors contribute to further spread.

Risk Ranking

- **High -** Noxious weeds may frequently dominate native vegetation following disturbance or through invasion into an undisturbed community.

- **Moderate -** Noxious weeds may dominate interspaces of native vegetation but site generally have a limiting factor which prevents full development of the weed species.
- **Low -** Noxious weeds occur as single plants or small groups and will not dominate native vegetation.
- **No Risk -** Environmental conditions are unsuitable for weed spread.

Warm Douglas-fir: (HTG-1) (A1, A2, B1)
Invasive Species Risk: **High Risk** - Noxious weeds may frequently dominate native vegetation following disturbance or through invasion into an undisturbed community. HTG-1 consists of habitat types that are at the highest risk for invasion or are types that could already be infested. Spotted knapweed, leafy spurge and St. Johnswort are the three species that pose the greatest risk to this habitat type group. Currently spotted knapweed has the greatest distribution in the HTG-1 group. Leafy spurge is the greatest threat to HTG-1 but has a limited distribution. St. Johnswort currently has very limited distribution in the Missoula Field Office (MiFO) district but could spread rapidly if not managed aggressively. Cheatgrass is usually present in these habitat groups and can problematic. Other species that can become established include hounds tongue, musk thistle and Canada thistle these species usually are only sites specific problems and are managed as needed through project design features. Most of these habitat types are found in the Lower-Blackfoot Corridor. All ground disturbing projects in this group should have the MiFO Weeds Specialist involved and develop a management plan for each project based on existing infestations, reduce the risk of spread and introduction of new species.

Cool Douglas-fir: (HTG-2) (B2)
Invasive Species Risk: **Moderate Risk** - Noxious weeds may dominate interspaces of native vegetation but these sites generally have a limiting factor which prevents full development of the weed species. Again, spotted knapweed, leafy spurge and St. Johnswort are the three species that pose the greatest risk to this habitat type group. Other species could become locally dense. Currently spotted knapweed has the greatest distribution in the HTG-2 group. Leafy spurge is the greatest threat to HTG-2 but has a limited distribution. St. Johnswort currently has very limited distribution in the MiFO district but could spread rapidly if not managed aggressively. Other species that can be a problem include hounds tongue, musk thistle, Canada thistle, common tansy-*Tanacetum vulgare*, sulfur cinquefoil, oxeye daisy and yellow toadflax these species usually are only sites specific problems and are managed as needed through project design features and weed management goals of the current RMP. All ground disturbing projects in this group should evaluated for the risk of introduction new or spread of existing weed species.

Moist Douglas-Fir (HTG-3) (B-3, C-1, D2)
Invasive Species Risk: **Low Risk** - Noxious weeds occur as single plants or small groups and will not dominate native vegetation. Spotted Knapweed - *Centaurea stoebe* can be a problem but usually is localized because of limiting factor's that will keep knapweed and other noxious weeds from spreading beyond the project area. Other species such as leafy spurge - *Euphorbia virgata*, dalmatian toadflax - *Linaria dalmatica*, St. Johnswort - *Hypericum perforatum* will seldom become a problem because of ongoing weed management projects. Hawkweeds are one group of species that can spread in these habitat types, because of very limited distribution on MiFO land and the high level of awareness by staff and seasonal personnel for this invader will help minimize their spread. Many of these habitat types are on north aspects which seems to be one of the biggest factors influencing the spread of most weed species, most of which require high light levels to spread and compete with native vegetation. Management of

weeds on projects in these habitat types will usually be done on as needed basis, many areas with these types have few to no weeds present, so treatment of any existing infestation are done prior start of ground disturbing projects and should be followed up with seeding the area with appropriate native grasses and forb mixes.

Moist Subalpine Fir (HTG-4) (D-3)
Invasive Species Risk: **Low to Very Low Risk:** this habitat type is not susceptible to noxious weed invasion, similar to HTG-3 as single plants or small groups and will not dominate native vegetation. If ground disturbance occurs in these habitats, noxious weed can spread to adjacent disturbed ground, but not likely to invade non disturbed ground. Also, as the canopy cover increases the risk of noxious weeds invasion decreases as many noxious weeds do not tolerate shade. Much of this habitat type group are found at higher elevations making them even less susceptible to invasion. Spotted knapweed does not do well on these sites and only occasional becomes established, this is also true of other noxious weeds. Project work in these habitat types will not cause significant issues with noxious weed spread unless other factors are involved.

Conifer Riparian (HTG-7) (E2)
Invasive Species Risk: **Moderate Risk**: This habitat can be invaded by several species of noxious weeds including common tansy -*Tanacetum vulgare*, hound's-tongue - *Cynoglossum officinale,* spotted knapweed - *Centaurea stoebe*, leafy spurge - *Euphorbia virgata,* Canada thistle - *Cirsium arvense*, musk thistle - *Carduus nutans,* common tansy-*Tanacetum vulgare* and hawkweeds - *Hieracium sp*. Depending on the type of disturbance and its location, these species can spread into un-disturbed sites. This group is normally found in creek bottoms and lower elevation river bottoms where little or no major ground disturbing activities occur, but disturbance from livestock, mining and public recreation are the most likely to occur. Currently many of the HTG-7 types have noxious weeds present, but many are still un-infested. Aquatic invasives are most often found in riparian and aquatic environments in this habitat type. Invasives most often found are yellowflag iris - *Iris pseudacorus,* perennial pepperweed- *Lepidium latifolium,* tall buttercup - *Ranunculus acris,* curly-leaf pondweed - *Potamogeton crispus,* Eurasian water-milfoil - *Myriophyllum spicatum,* flowering-rush - *Butomus umbellatus,* purple loosestrife - *Lythrum salicaria* and European common reed - *Phragmites australis.* All of the above species are very invasive and once established are expensive and time consuming to control.

Other Types
All ecological land cover types classified as Human Land Use types within the assessment area can be considered infested, these land cover types include Agricultural Lands, Developed Lands, High Intensity Residential, Road Systems and others. Within the assessment area approximately 70,997 acres of land are human use or disturbed and these acres will have a mixed density of noxious weeds:

- Harvested forest-tree regeneration: 12%,17,962 Acres
- Recently burned forest: 11%, 16,658 Acres
- Harvested forest-shrub regeneration: 8%, 11,380 Acres
- Harvested forest-grass regeneration: 7%, 10,851 Acres
- Post-Fire Recovery: 7%, 10,373 Acres
- Roads: 4%, 4,155 Acres

5.5 Forest Resources

Although industrial forestry practices in the area have resulted in stands that are deviated from NRV in terms of species composition, structure and age, there is a variety of existing stand conditions and ages present due to the various entries into the area during the industrial forestry era. For instance, as described in section 4.5, the Anaconda Company initially entered the Potomac Valley in 1904 and logged in that area until 1916. Then after leaving the area for a decade, in 1926 a large logging camp was established in the Ninemile Prairie, and operations proceeded towards Elk Creek and eventually toward Woodward and Chamberlain Creeks to the east (beyond the assessment area). It wasn't until the 1950s that operations entered Gold Creek north of Potomac and the 1960s when they entered Belmont Creek (from personal communications with former Champion International Forester Bob Simes, 7/6/2023). For this reason, and because of the public land acquisitions in the area which began along the Blackfoot river in the 1990s, while the Plum Creek Timber Co.'s agreement to supply Stimson Lumber with 100 million board feet per year annually for 10 years was still in place, there is, generally speaking, a gradient of older trees along the river front to younger stands farther from the river. For instance, recent timber inventories near McNamara Landing have indicated an average diameter of 13" DBH (diameter at breast height or 4.5' from the ground) while inventories near Cow Saddle (in the Gold Creek drainage) have an average diameter of <8" DBH.

Managing these small diameter stands towards midpoint NRV and for healthy, resilient forests will often mean thinning to increase growing space, available resources and improved resiliency. In many cases this will consist of hand thinning small stands (also known as precommercial thinning) though in some cases where the average diameter is 8" DBH or more commercial thinning would be possible. In the short-term (5 – 10 years) commercial thinning of young stands can produce various small-diameter timber products including firewood, posts and rails, and logs for paper chip production. Thinning of these stands (by either means) in the near term will also develop a sustainable flow of merchantable timber for future harvest in the long term, (10- 50 years) which remains management priority in the 2021 Missoula Field Office RMP. Due to competition for resources and growing space, and density induced reduction in growth, without thinning in the near term it is likely that the time required for these stands to produce viable timber would be greatly increased or doubled (Reukema 1975).

As stated in the section 4.5, the analysis area has an extensive transportation network, which was designed and built for the efficient removal of timber over the last 60 years or so. While it is likely that the landscape is over-roaded in cases, and The Nature Conservancy reported that 70 sections (1 square mile plots of land) in the area had a road density of 6-7 miles of road per square mile (Clearwater Blackfoot Ecological Assessment by ERG 2016), these roads were designed and built for forest management. Maintaining a robust transportation network and sufficient roads in the area will be key to the BLM's ability to manage the forests in the long term, for restoration activities as well as long term sustainable forest resource production.

5.6 Terrestrial Wildlife and Habitat

5.6.1 Disturbances to Wildlife Habitat

Human Disturbance to Wildlife Habitat

Indigenous influence has not occurred for over 100 years. Lands consist of various ownerships: private, BLM, USFS, DNRC, MT FWP, Lubrecht Experimental Forest (University of Montana), and the Nature Conservancy (TNC). BLM ownership has increased in recent years due to acquisitions of lands from The Nature Conservancy (formerly held by Plum Creek Timber company). Evidence of extensive logging and

fire suppression is still present on the landscape as described in Section 4.5. Logging has slowed down, but continues on Forest Service, DNRC, Lubrecht Experimental Forest, and BLM lands. DNRC timber management is ultimately for economic reasons to provide timber sale receipts to the Montana School Trust. The Nature Conservancy and BLM-managed lands within the assessment area are being treated with various commercial and experimental thinning approaches as well as prescribed fire to restore the forest to the natural ranges of variability across the varying habitat types and improve wildlife habitat.

Total road density is similar to historic times with many of roads being gated and available to non-motorized public use. Motorized use of these roads is allowed in the winter and for administrative access only. Travel Management Plan for the roads is currently in development. Current total road density on BLM managed lands and the soon to be acquired TNC lands is 6.73 miles of road per square mile. The current open road density on BLM-managed lands is 0.26 mi/mi^2 and 0.75 mi/mi^2 on the TNC lands to be acquired. The current closed road density on BLM-managed lands is 6.48 mi/mi^2 and 5.93 mi/mi^2 on the TNC lands to be acquired. Open system roads are in drivable condition. Some of the gated roads have filled in with young conifers and windthrow. This is particularly true for roads while several arterial, gated roads remain in good drivable condition. Livestock grazing in the assessment area occurs predominantly at lower elevations. The BLM manages two active grazing leases, Belmont Creek (~9,700 acres) and Black Canyon (~820 acres). The eastern part of the Black Canyon allotment is a new addition to the BLM Range program as it was part of the last two land acquisition. The assessment area also includes two TNC leases, the Ninemile and Woodchuck leases. It has been noted internally that the Belmont Creek allotment fence is in poor condition. Mining operations are not occurring. Noxious weed spraying and biological control along roads is currently occurring.

Natural Disturbances to Wildlife Habitat

The latest large wildfires in the assessment area were the Mineral Primm wildfire (in 2003) and the Liberty fire (in 2017). Both occurred in the northwest portion of the assessment area. The Liberty Fire had variable effects on wildlife habitat depending on aspect, slope, and elevation which resulted in a mosaic of remaining habitat. Unlike the Mineral Primm Fire, which generally burned habitat to bare soil, the Liberty Fire left large patches of unburned areas, including a possible wildlife corridor along Gold Creek. The Mineral Primm Fire resulted in even age, young stands. Vegetation is described in more detail in Section 5.4. Due to higher densities of trees in Douglas-fir cover types than the NRV, there is an increased risk of high severity fire and insect and disease in the assessment area.

Species Diversity

The Canada lynx, listed threatened under the Endangered Species Act, is present and the assessment area. Most of the assessment area is designated Canada lynx Critical Habitat (see Map 24 in Appendix C). Canada lynx occurrence and reproduction have been verified during the winter of 2022/2023. The assessment area is occupied year-round grizzly bear habitat and is designated as Zone 1 (NCDE 2020) (see Map 25 in Appendix C). The grizzly dens in the assessment area between 5,900 and 6,600 feet. Wolverine presence was documented in the winter on 2022/2023. Big game are present throughout the year and utilize the winter range in the southeastern portion of the assessment area. Biodiversity is similar to historic times though community composition likely contains less diverse gene pools than historically present. The community structure and preponderance of terrestrial wildlife species historically present have changed due to heavy habitat alteration and fragmentation due to both extensive logging and fire suppression. The cessation of heavy logging has allowed wildlife to utilize the area in greater numbers. For example, grizzly bears now utilize the entire assessment area.

5.6.2 Forest Habitat Type Groups

Habitat Type Group 1 -2: Warm and Dry Douglas-fir & Moderately Warm and Dry Douglas-fir
Biodiversity is similar to historic times though community composition likely contains less diverse gene pools than historically present. The community structure and preponderance of terrestrial wildlife species historically present have changed due to heavy habitat alteration and fragmentation due to extensive logging, fire suppression and weeds. Ecosystem processes have been compromised due to fire suppression. Lack of wildfire has altered community structure.
Special Status Species, such as the bald eagle, golden eagle, flammulated owl, Canada lynx, gray wolf, wolverine, and grizzly bear currently inhabit these HTGs. Deer and elk are present year-round. Deer and elk habitat has been compromised by noxious weeds, logging, and roads.

HTG 1 and 2 are similar and have been combined for this analysis.

Cover types are different from historic conditions. Industrial logging has altered forest structure and fragmented lower elevation plant communities. Forest stands are in younger stages of growth than NRV. Wildfire events in this cover type are likely to be larger and burn at a higher severity than historically. Refer to Section 5.4 for details on current conditions of vegetation. Livestock grazing for cattle occurs on private lands as well as BLM managed lands.

Deciduous shrubs, and native grasses are present, but at lower levels than historically. Noxious weeds, such as spotted knapweed, are present and compromise ecological integrity of the assessment area. Fire suppression has impacted historic fire regimes to the point that stand replacement fires may occur at greater proportions.

Habitat Type Group 3: Moderately Cool and Dry Douglas-fir
Biodiversity is likely similar to historic times though community composition likely contains less diverse gene pools than historically present. The community structure and preponderance of terrestrial wildlife species historically present have changed due to heavy habitat alteration and fragmentation due to extensive logging, fire suppression and weeds. Ecosystem processes have been compromised due to fire suppression. Lack of wildfire has altered community structure.

Special Status Species, such as the grizzly bear, Canada lynx and wolverine are present. These three species are federally listed as Threatened under the Endangered Species Act. The grizzly bear is a generalist. Sows with cubs, and male grizzlies are year-round residents and den on low energy aspects (typically northerly aspects with a cool moist climate) at elevations between 5,000 and 6,000 feet. The Canada lynx is a habitat specialist and has been present since historic times, but at low population levels. The standards and guidelines of the Canada Lynx Conservation Assessment and Strategy dictate vegetation management. This habitat type group is within the designated Critical Habitat for Canda lynx. The entire assessment area is potential wolverine habitat. During the winter of 2022/2023 a verified wolverine detection occurred in the assessment area. The American wolverine is a habitat generalist and was listed as threatened under the Endangered Species Act as of November 2023. Big game utilizes this habitat type during the spring, summer and fall. See Maps 24-28 in Appendix C for all Threatened and Endangered species.

Cover types are different from historic conditions. Industrial logging has altered forest structure and fragmented lower elevation plant communities. Forest stands are in younger stages of growth than NRV. Refer to Section 5.4 for details on current conditions of vegetation. These stands are at heightened risk for high intensity wildfires as well as insects and diseases.

The extent of logging activities has been low over the past decade across the assessment area and limited to restoration treatments on the BLM managed lands. Livestock grazing for cattle is occurring.

Large western larch and Douglas-fir (diameters >20 inches) are not present due to old growth harvesting in the past. Much of this HTG is characterized by second growth stand structure resulting from past logging activities. Grassland vegetation composition, especially with the occurrence of noxious weeds, has been altered relative to historic times. Quaking aspen and black cottonwood are present, but uncommon. Mixed severity and lethal fire regimes have been altered since historic times. Fire suppression during the past 75 years has altered fire frequency and intensity.

Habitat Type Group 4: Cool and Moist Subalpine fir

Biodiversity is similar to historic times though community composition likely contains less diverse gene pools than historically present. The community structure and preponderance of terrestrial wildlife species historically present have changed due to heavy habitat alteration and fragmentation due to extensive logging, fire suppression, and weeds. Ecosystem processes have been compromised due to fire suppression. Lack of wildfire has altered community structure.

Special Status Species, such as the grizzly bear, Canada lynx and wolverine are present. These three species are federally listed as Threatened under the Endangered Species Act. The grizzly bear is a generalist. Sows with cubs, and male grizzlies are year-round residents and den on low energy aspects (typically northerly aspects with a cool moist climate) at elevations between 5,000 and 6,000 feet. The Canada lynx is a habitat specialist and has been present since historic times, but at low population levels. The Canada lynx is a year-round resident, foraging and denning in this habitat type group. Riparian areas with large woody debris are prime Canada lynx den sites. The standards and guidelines of the Canada Lynx Conservation Assessment and Strategy dictate vegetation management. This habitat type group is within the designated Critical Habitat for Canda lynx. However, the even-aged forest stands within this habitat type do not possess the characteristics of multi-age forests containing complex structure and dense horizontal cover preferred by lynx and their primary prey, the snowshoe hare. The entire assessment area is potential wolverine habitat. During the winter of 2022/2023 a verified wolverine detection occurred in the assessment area. The American wolverine is a habitat generalist and was listed as Threatened under the Endangered Species Act as of November 2023. Big game utilizes this habitat type during the summer.

Industrial logging and fire suppression have altered forest structure and composition. Forest stands are in younger stages of growth than NRV and tend to be even aged. Engelmann spruce and subalpine fir as a dominant cover type is less than 1% of the assessment area. Refer to Section 5.5 for details on current conditions of vegetation. These stands are at heightened risk for high intensity wildfires as well as insects and diseases events.

The extent of logging activities has been low over the past decade across the assessment area and limited to restoration treatments on the BLM and TNC managed lands. Very little new road construction has occurred on the BLM-managed lands within the assessment area.

5.7 Aquatic Species and Habitat

5.7.1 Aquatic habitat

General characterization

The Lower Blackfoot assessment area contains a high density of aquatic resources compared to other planning areas in the Missoula Field Office. These include approximately 24.4 miles of fish-bearing

streams flowing through BLM land, 19.4 of which are designated bull trout critical habitat by the U.S. Fish and Wildlife Service (USFWS). In addition to the streams there are numerous wetlands, ponds, springs, and seeps. These aquatic habitats support several native and many non-native fish, as well as native amphibians. Habitats in the assessment area vary widely in type and condition which is owed, in large part, to variation in past human influences in the area (see Chapter 4 for more information on the history of the area). Distributions of aquatic vertebrates have also been shaped by these human influences in the assessment area, as well as by natural barriers to movement. The following sections describe the current habitat and assemblages of aquatic vertebrates in our area using data from field surveys.

To investigate variation among aquatic habitats in the assessment area, the frequency of pools, water temperatures, amount and future potential of large woody debris (LWD), width-to-depth ratios, and substrate composition were measured. Water temperatures in streams are important to fish habitat as bull trout, westslope cutthroat trout (WCT), and other fish have narrow ranges for optimum development, feeding, and survival (Eby et al. 2014). The amount of sediment in streams is crucial because too much sediment can clog gravel beds where fish lay eggs and young first develop (Waters 1995, Muck 2010). Pools create hiding and resting places for fish. Beavers create pool habitat for fish and amphibians and drive floodplain connectivity, which in-turn drives storage of water in upland watersheds (Dittbrenner et al. 2022). Finally, large woody debris may be the most important component of aquatic habitat in streams, as it influences many of the above noted features: sediment, pool frequency, and water temperature (Schmetterling and Pierce 1999).

Separately, data from electrofishing, environmental DNA (eDNA), spawning, and visual encounter surveys conducted by both BLM fisheries technicians and Montana Fish, Wildlife, and Parks (MT FWP) was used to describe the distribution and abundance of aquatic vertebrates in the assessment area.

Habitat methods

Variables important for aquatic habitat in regard to fish and other aquatic vertebrates including stream temperatures, in-stream sediment loads and substrates, frequency of in-stream pools, beaver activity, and amounts of LWD in the riparian corridor were measured. To accomplish this, Missoula Field Office staff surveyed the habitat of fish-bearing streams in the assessment area during the spring and summers of 2022 and 2023. Each stream was divided into reaches defined by features of the underlying geomorphic template of streams such as valley width, channel form, stream order, and major changes in vegetation type. In total, 36 habitat surveys within 17 reaches were conducted to produce a quantitative and qualitative inventory of stream habitat.

Pools within streams are crucial components of quality habitat for native fish (Platts et al. 1982; Beschta and Platts 1986). Pools provide cover for hiding and the water currents associated with them sort substrates into gravel beds that are important for salmonid breeding. Standard methods were used to count, measure, and categorize pools in the surveyed stream reaches.

Within the assessment area, the in-stream structural elements driving pool-formation and maintenance typically are large woody debris (LWD) and boulders (Richmond and Fauseh 1995). The frequency and distribution of these features varies greatly among the stream reaches depending on channel types, historic disturbance regimes, and land use, especially recent timber harvest. While riparian vegetation has somewhat recovered from previous timber practices, the typical ages of standing trees within stream corridors in the assessment area are only 20-30 years; large, older trees are mostly absent. In this scenario, current overstory trees have much time before potential recruitment to the stream and, therefore,

expectations of recruitment of large woody debris (LWD) in the near-term is low. As current instream LWD decays over time, instream LWD deficiencies will increase. To determine the amounts of large woody debris in streams, down and dead wood in streams were categorized as either small (>3m length, 10-30 cm diameter) or large (>10m length, >30 cm diameter). The potential for future recruitment of LWD was assessed based on the relative number and size of standing trees along the riparian corridor.

Appropriate water temperatures are a crucial component of habitat suitability for salmonids and other fishes, and are especially important for bull trout (Al-Chokhachy et al. 2016). Though bull trout have been observed in warmer waters, sub-lethal and lethal responses are thought to begin for this species at temperatures as low as approximately 14–16°C (57–61°F), with steep declines in occurrence in streams with temperatures within and above this range (Rieman and Chandler 1999 Selong 2001). Bull trout are most likely to occur in waters less than 12°C, though there is some variation in this value among regions and life stages (Dunham et al. 2003, Isaak et al. 2017). To monitor stream temperatures in the assessment area, water temperatures were recorded every hour using Onset Corporation Tidbit v2 Temp Loggers enclosed in 6-inch sections of either PVC or steel tubing. Monitoring occurred in 2022 and 2023; the timing of our deployments varied among streams. Temperatures in Belmont and East Twin were monitored from 9 June 2022 through 10 Sept 2022. Stream temperatures in 5 additional streams were collected from 9 June 2023 through 10 Sept 2023 (Cow, Game Ridge, West Fork Gold, Wild Horse, and an unnamed tributary of Gold Creek). In Gold Creek, temperatures were monitored from 7 July 2023 through 10 Sept 2023 in all 4 reaches.

Pairs of temperature loggers were also deployed to assess the effects of beaver complexes on water temperature. Beaver complexes may lower water temperature downstream of ponds compared to upstream of the complexes by promoting the charging of ground water, which can create cold-water upwellings downstream (Dittbrenner et al. 2022). However, data from the field has been mixed with some studies showing the expected decrease and others showing an increase, or no difference (Dittbrenner et al. 2022). Three pairs of temperature loggers were deployed in streams as part of a pilot experiment to investigate the influence of beaver ponds on water temperatures in the assessment area. Specifically, loggers were placed above and below complexes of active beaver dams on West Fork Gold Creek, an inactive complex on Gold Creek, and a network of artificial beaver dams on Wild Horse Creek.

Data from 15 locations where temperature was monitored in 2022 and 2023 was used to calculate the 7-day moving average of daily maximum temperatures (i.e., the average of the maximum daily temperatures of each of the previous seven-day period). To determine the effects of beaver complexes on stream temperature, the mean and standard deviation of the differences in 7-day moving averages of daily maximum temperatures was used to compare upstream and downstream temperatures for each pair of loggers placed near beaver complexes.

Salmonids require substrates consisting of small- to medium-sized gravel to breed successfully. To asses the availability of these gravels in each reach, approximately 100 pebbles at 2 types of locations during each survey: 1 location in a riffle and 1 at the tail crest of a pool were measured. These pebble measurements were conducted at locations that appeared to provide the most adequate spawning gravels within each reach. Therefore, our pebble counts are not necessarily indicative of the pebble characteristics throughout the entire reach. Pebbles were measured using a gravelometer and grouped into categories of fines (< 2 mm), pea gravel (2–8 mm), gravel (9–64 mm), rubble (65–128 mm), cobble (129–256 mm), boulder (257–512 mm), or bedrock (solid rock) (modified from Guzevich and Thurow 2017). The average across surveys from within each reach is reported.

To determine the relative quantitative conditions of the streams in the assessment area, data from habitat surveys was compared to standards described by the Inland Native Fish Strategy (INFISH; USDA Forest Service 1995). The Resource Management Plan for the Missoula Field Office (2019) states that the INFISH Riparian Management Objectives (RMOs) are to be used to assess riparian and stream function. These objectives describe target values for habitat features that are expected to support suitable fish habitat including pool frequency (pools/mile), water temperature (7-day moving average of daily maximum), amounts of large-class LWD, and width-to-depth ratios (Tables 12 and 13). Though INFISH RMOs only consider large-class LWD, small-class LWD was considered in our results as materials of this size often promote similar habitat features as large-class LWD in our area. INFISH RMOs generally apply to watersheds in size from 3rd to 6th order. The only stream in the assessment area within this size range is Gold Creek (3rd order) and, thus, is the only stream these guidelines are explicitly applicable to. However, the same standards were applied to the 1st and 2nd order streams in our area with the understanding that the RMOs were not designed for streams of this size.

Table 12. INFISH Riparian Management Objectives used to evaluate fish habitat in the assessment area.

Habitat feature	INFISH Riparian Management Objectives (RMOs)
Pool frequency *Key feature*	Varies by channel width (see Table 13)
Water temperature *Supporting feature*	Maximum water temperatures below 59°F within adult holding habitat and below 48°F within spawning and rearing habitats, measured as the 7-day moving average of the maximum daily temperature of the warmest consecutive 7-day period (i.e., maximum 7-day moving average of the maximum daily temperature over the season measured).
Large woody debris (forested systems) *Supporting feature*	>20 pieces per mile that are >12 in (30 cm) in diameter and >35 ft (10 m) in length
Width/Depth Ratio *Supporting feature*	< 10, mean wetted width divided by mean depth

Additional features measured by fisheries staff in order to assess the INFISH targets included bankfull width, wetted width during base flow, wetted depth, and maximum depth in pools. At 5 transects in each reach, the wetted depth was measured by averaging the depth recorded at 4 locations in a riffle section; one measurement was on the shoreline and was always 0. Our width-to-depth ratios (mean wetted width divided by mean wetted depth) use only riffle habitat as mean depths in pool habitat was not collected. Because the deepest portions of streams was not included in our width-to-depth ratios, our values for this metric are likely skewed shallower than the actual condition. The wetted width averaged across all surveys in each reach was used to determine the target number of pools (Table 13). Each metric is reported as the average from across surveys within each reach.

Table 13. INFISH objectives for pool frequency for streams with various wetted widths. Equations that approximate the recommended relationship between wetted width and pools per mile using feet and meters as the x values follow, respectively: $y = 556.98x^{-0.763}$ and $y = 224.85x^{-0.763}$

Wetted width feet (meters)	10 (3.05)	20 (6.10)	25 (7.62)	50 (15.24)	75 (22.86)	100 (30.48)	125 (38.10)	150 (45.72)	200 (60.96)
Pools per mile	96	56	47	26	23	18	14	12	9

Riparian vegetation, invasive plant presence, beaver habitat, and low-tech restoration potential was also assessed. In addition, fisheries staff used expert opinion to assess the qualitative value of stream habitat for fish spawning and adult holding by judging the relative amounts of small gravels and pool habitat contained in reach, respectively. Survey intensity was calculated as simply the percent of the length of the reach surveyed. Stream gradients were assessed using digital topography maps and satellite imagery. The protocol and techniques used to assess fish habitat during these surveys were adapted from existing USFS protocols (USDA 2013).

5.7.2 Aquatic species

General characterization

The same human causes of change that influenced the habitat of the assessment area have also affected the current distribution and abundance of aquatic species (Pierce 1991). In addition to physical alterations of the landscape, the introduction of non-native fish likely had an even larger role in shaping the current fish assemblage than the stream-side events (Behnke 1992). Where they overlap in the assessment area, non-native fish species (e.g., rainbow, brown, and brook trout) may outcompete native fishes (e.g., westslope cutthroat trout and bull trout) for resources such as food and breeding locations (Seiler and Keeley 2009, Muhlfield et al. 2009a). Further, interbreeding may occur between rainbow and westslope cutthroat trout and brook and bull trout, leading to declining stocks of genetically pure native populations and lower fitness of native trout (Allendorf and Leary 1988, Muhlfield et al. 2009b). These risks are continuous to native trout throughout much of the assessment area, except where there are barriers to upstream movement of fish. At least 2 stream sections in the assessment have large physical barriers to upstream movement and provide places of refuge to native fish: Game Ridge Creek which is completely isolated from the Blackfoot River and approximately 8 miles of Belmont Creek above a waterfall. Other stream waters in the assessment area—except some small headwater reaches—lack physical barriers and are likely susceptible to continued incursion from non-natives.

For the purposes of this watershed assessment, the federally Threatened and BLM special status species present in the aquatic environment of the assessment area: bull trout, westslope cutthroat trout, and western toad was evaluated by fisheries staff. The presence of beaver (an important species for ecosystem functions) and the distribution and occurrence of other in the assessment area—and the distribution and occurrence of other amphibians. The BLM assumes that with proper management of these focal species, they will act as surrogates for healthy aquatic ecosystems in the assessment area.

Bull trout (*Salvelinus confluentus*) is a federally listed Threatened Species. Once the apex fish species in western Montana, the abundance and distribution of bull trout have declined in the region due to factors such as excessive sediment in streams (Muck 2010); competition and hybridization with introduced non-native fish species (Leary et al. 1993); higher stream temperatures due to climate change and degraded riparian habitat (Selong et al. 2001); and habitat loss and fragmentation due to dams, culverts, and other

in-stream barriers that reduce connectivity (Nearas and Spuell 2001, Nelson et al. 2002, Al-Chokhachy et al. 2008). Within the assessment area, the Blackfoot River and Gold, West Fork Gold, and Belmont Creeks, are categorized as Bull Trout Critical Habitat in the U.S. Fish and Wildlife Service's Bull Trout Recovery Plan (USFWS 2015).

Westslope cutthroat trout (*Oncorhynchus clarki lewisi*) is a BLM Sensitive species and, historically, the most abundant fish species in the assessment area. The decline in WCT abundance and distribution across their native range has been well documented and it is estimated they persist in only about 27% of their historical range in Montana (Young 1995). Like bull trout, the causes of WCT decline likely stem from habitat fragmentation from dams, culverts, and other barriers (Heckel IV et al. 2020); competition and genetic introgression from non-native fish, especially rainbow trout (Muhlfeld 2008); and warming water temperatures from climate change and other factors (Kovach et al. 2016).

Western/Boreal Toad (*Anaxyrus boreas*) is a BLM Sensitive species. There is little to no available information on historical western toad populations in the assessment area, but the world-wide decline of amphibian populations has been well documented (Stuart et al. 2004) and studies from other locations in western Montana have documented the extirpation of once robust toad populations (McCaffery et al. 2021). The regional declines in western toad populations are potentially attributed to chytrid fungus, climate change, and habitat degradation and fragmentation (Collins and Storfer 2003, Muths et al. 2003).

Beaver (*Castor canadensis*) are a keystone species and promote ecosystem biodiversity (Brazier et al. 2021). Beaver have a tremendous influence on the environment including creating wetlands, altering nutrient cycles, and promoting water retention in watersheds. Many species of plants and animals rely either partly or entirely on beaver created habitat. These habitats are crucial for many landscape-level processes including valley water retention, elevating water tables, repairing incised stream channels, floodplain connectivity, creating and maintaining open areas, and habitat complexity (Naiman et al. 1988). Historically, beavers were hunted and trapped for pelts or managed as a nuisance species and their habitats were intentionally degraded or converted for other uses (Baker and Hill 2003). As a result, abundance of beaver and suitable habitat has been substantially decreased range-wide compared to historic conditions (Scamardo et al. 2022). And the riparian habitat, water retention capabilities, and water temperatures in the streams of the assessment area are likely altered from historical conditions due to the reduction of beaver populations (Dittbrenner et al. 2022). The assessment area currently contains zones of high-quality beaver habitat in Gold, West Fork Gold, and Belmont Creeks.

Aquatic species methods

Information on the distribution and abundance of fish species was gathered through examination of public MT FWP electrofishing records (accessed through the FishMT database and other public reports) and electrofishing surveys conducted by BLM personnel. In addition, environmental DNA (eDNA) analysis results—part of the on-going USFS Range-Wide Bull Trout eDNA Project—and visual encounter surveys were utilized in determining fish presence and distribution.

Amphibian presence and distribution was assessed by conducting visual encounter surveys focused on detecting amphibian breeding. Our surveys were adapted from the U.S. Geological Survey Amphibian Research and Monitoring Initiative (ARMI) protocol (Corn 2005). Potential breeding sites w found through examination of satellite imagery, species observation information from the Montana Natural Heritage Program, and random-chance encounters on the ground during May through June of both 2022 and 2023. Larval and adult amphibians were identified to species and documented at each site. Large

beaver complexes in the assessment area were not thoroughly searched for amphibians due to poor accessibility.

5.7.3 Blackfoot River

Aquatic habitat

BLM ownership is adjacent to 11 miles of the Blackfoot River within the assessment area. Four streams in the assessment area are direct tributaries: Belmont, Gold, East Twin, and West Twin Creeks. Therefore, environmental conditions and management activities within the assessment area can have a significant effect on conditions in the Blackfoot River in the form of stream temperature, sediment load, and LWD recruitment. Aquatic habitat in this section of the Blackfoot River is dictated by geology, seasonal high flows, and other natural processes. No quantitative analysis of habitat was carried out for the Blackfoot River for purposes of this watershed assessment. However, recent mean daily discharge in cubic feet/second (cfs) (Figure 10) and summer water temperature (Figure 11) data serve as a current baseline of conditions in the Blackfoot River.

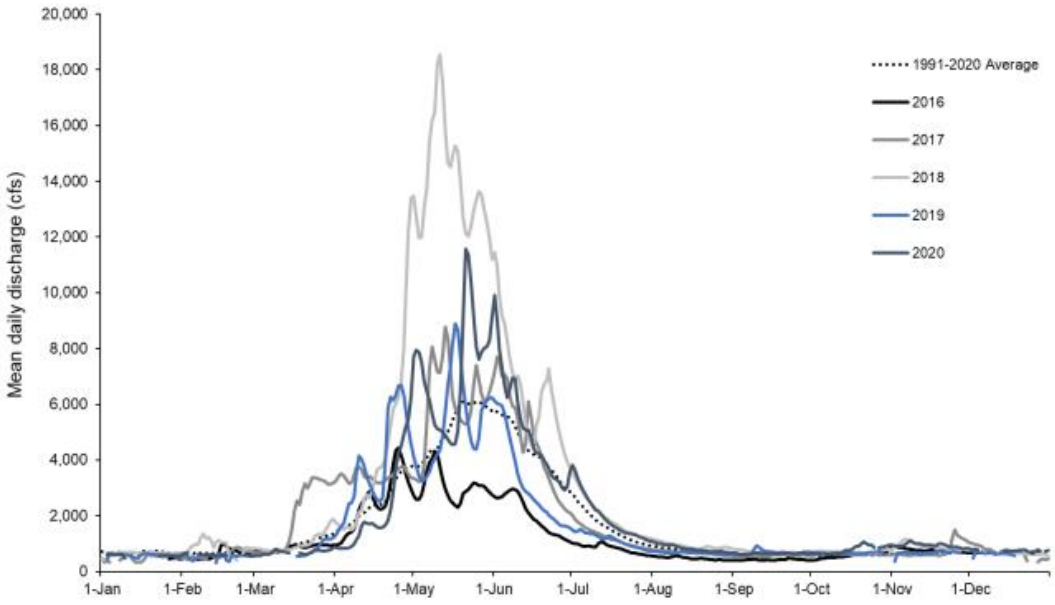


Figure 10. Mean daily water discharge (cubic feet per second) of the Blackfoot River measured at the USGS stream gage in Bonner, MT, 2016-2020 (Uthe et al. 2021).

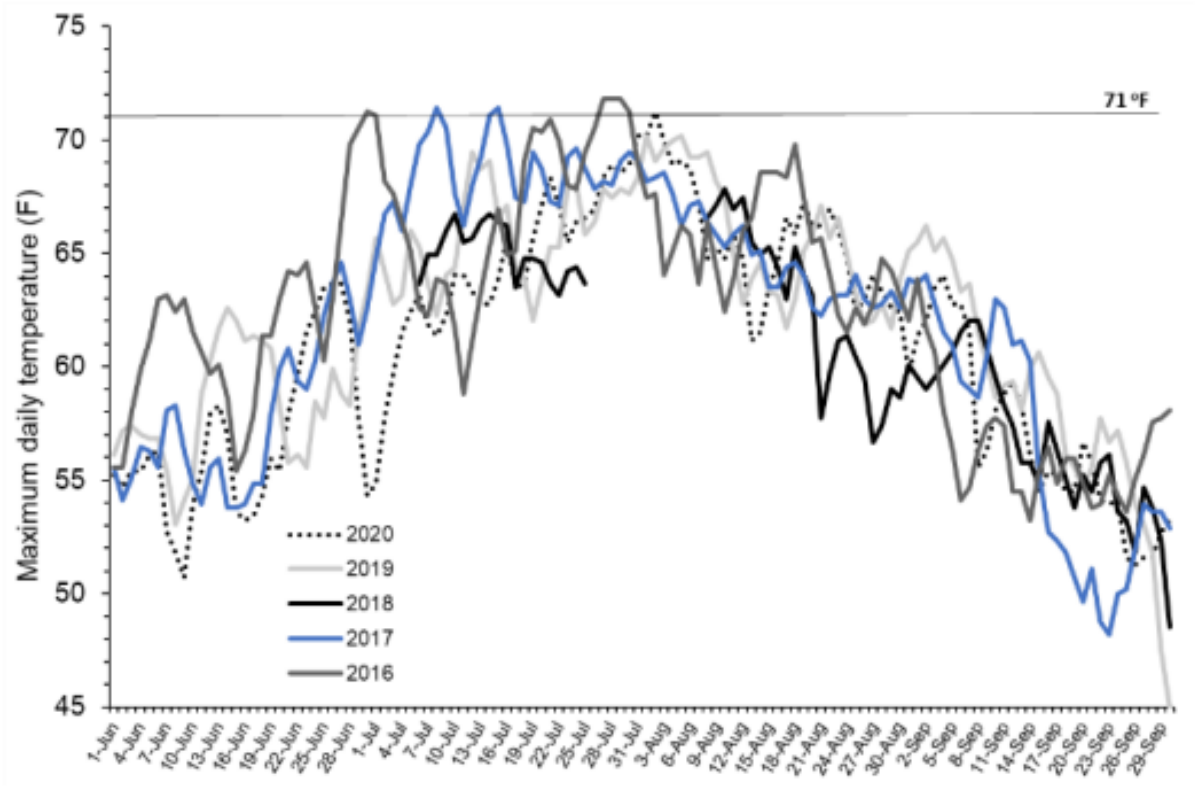


Figure 11. **Maximum daily water temperatures in the Blackfoot River near Bonner, MT, 2016-2020 (Uthe et al. 2021).**

Aquatic species

The Blackfoot River is a stronghold for migratory WCT and bull trout; it also supports a valuable sport fishery for non-native fish including rainbow and brown trout. Despite significant declines in bull trout abundance, the Blackfoot River is considered one of the most stable and robust metapopulations of the species in the upper Clark Fork Geographic Region of the Columbia River Headwaters Recovery Unit (USFWS 2015). Because of the connectivity between the river and the streams in the assessment area, fish assemblages in the Blackfoot River have a direct cause and effect on abundance and distribution of fish species in streams in the assessment area.

Montana Fish, Wildlife, and Parks electrofishing surveys conducted in the Johnsrud section of the Blackfoot River, located near the downstream boundary of the assessment area, show that rainbow trout are the dominant fish species and brown trout are also common (Figure 12). Westslope cutthroat trout have had an upward trend since the 1990s. Meanwhile, bull trout are consistently captured, but in low densities.

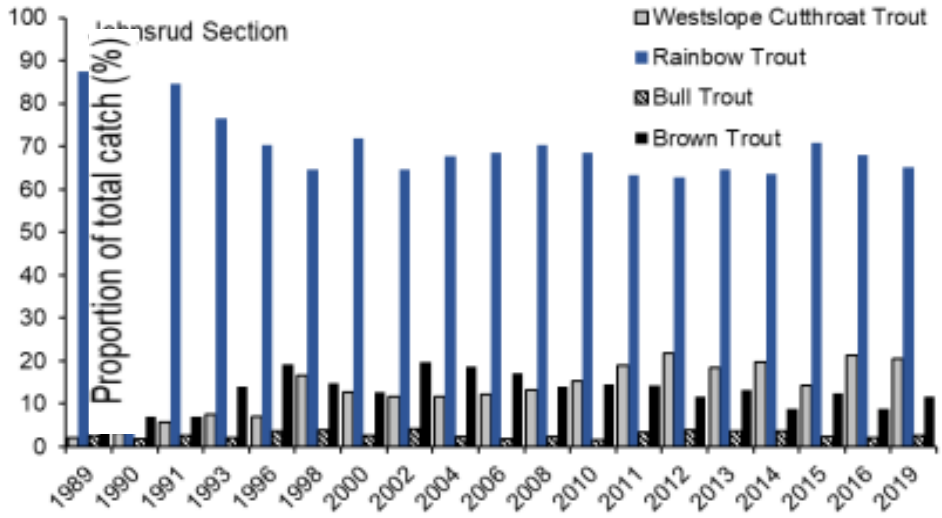


Figure 12. Species composition of trout (≥6 inches) from the Johnsrud section of the Blackfoot River, 1989-2019 (Uthe et al. 2021).

5.7.4 Gold Creek

Aquatic habitat

Gold Creek is a large 3rd order tributary of the Blackfoot River entering 13.5 miles upstream from the river's confluence with the Clark Fork River. Gold Creek flows 19.9 miles east and southeast from its origin at Boulder Lake in the Rattlesnake National Wilderness-Recreation Area and is the largest tributary to the lower Blackfoot River. Gold Creek has an average base discharge of 20 to 25 cfs at its confluence with the Blackfoot River. The future land acquisition by the Missoula BLM, in addition with existing BLM ownership, will encompass 8.5 continuous stream miles of lower Gold Creek.

BLM fisheries staff conducted nine habitat surveys on four defined reaches on Gold Creek beginning from the top of the future acquisition boundary near stream mile 11, down to the lower USFS boundary near stream mile 2 (Table 14).

Reach 4 begins from the future BLM acquisition boundary flowing roughly 4 miles downstream to the top of the large meadows near the confluence with West Fork Gold Creek. Average gradient is 98 ft/mile. This reach consists of mature riparian habitat interspersed with areas burned by the 2017 Liberty Fire. This reach had the most spawning gravels, pools per mile, and LWD of all the reaches surveyed on Gold Creek (Table 14). The presence of instream LWD and boulders maintain high quality cover for fish by forming deep pools and long glides with some undercut banks. There are beavers currently active in this reach and there is a large, historic beaver complex near the upper end, though it was non-active as of 2023. The highest 7-day average daily maximum temperatures in this reach were 56.4ºF and 57.7ºF at 2 temperature monitoring locations in 2023.

Reach 3 is characterized by lower gradient (72 ft/mile) and higher stream sinuosity (C-channel) compared to reach 4, as Gold Creek flows roughly two miles through a large meadow and active beaver dam complex. This reach also encompasses the confluences of West Fork Gold and Wild Horse Creeks where beavers are currently active. As a result, there are numerous dam-pools of considerable length and higher

amounts of accumulated sediment in this section. Because most of this section is non-forested, it had the lowest counts of small LWD of the reaches surveyed by Missoula BLM fisheries staff in Gold Creek, though it contained a fair amount of large-class LWD. Average maximum temperatures measured at the downstream end of the reach were higher than in reach 4 at 60.1ºF.

Reach 2 begins near the mouth of Cow Creek as Gold Creek enters a deep V-shaped canyon at approximately mile 5.7. The average gradient in this reach is 109 ft/mile. This section is highly valley confined and characterized by large boulders and bedrock substrate and has the deepest pools and highest average residual pool depth of all reaches surveyed. However, spawning habitat is limited because of the general lack of small gravel. Overall, large-class LWD in the reach is somewhat limited but there are areas where massive log jams (comprised of hundreds of smaller logs) have formed in the tight confines of the canyon. The highest 7-day average maximum temperature in 2023 was much higher in this reach (65.5ºF) compared to upstream measurements, likely due to a lack of cold tributary stream inputs in this reach. This temperature is much greater than the INFISH RMO thresholds for both adult holding habitat and spawning/rearing habitats of 59ºF and 48°F, respectively.

Table 14. Results from BLM habitat surveys in Gold Creek, Montana during 2022 and 2023. For number of pools, large woody debris, and temperature, whether or not the measured value meets the target INFISH standards is indicated, where a "Y" indicates the target is met and "N" indicates it was not. Temperature was tested against targets for both adult holding and rearing habitat. The value in the parentheses for the estimated number of pools is the minimum target value recommended by the INFISH RMO for a reach with the recorded wetted width. The maximum temperature is the maximum of the 7-day moving average of the maximum daily temperature over the season. Temperatures were monitored at 2 locations in reach 4 of Gold Creek.

Gold Creek	Reach 1	Reach 2	Reach 3	Reach 4
Reach length (m)	2172	3237	1794	6548
# surveys completed	2	2	1	4
Sampling intensity (%)	18	11	11	10
Average bankfull width riffle (m)	14.1	11.2	10.9	8.9
Average wetted width all (m)	10.0	8.7	7.3	7.4
Estimated pools per mile	$32^{N\ (39)}$	$17^{N\ (43)}$	$40^{N\ (49)}$	$50^{Y\ (49)}$
Average pool residual depth (m)	0.6	0.7	0.4	0.4
Est. small LWD/mile[1]	426	213	40	542
Est. large LWD/mile[1]	48^{Y}	17^{N}	24^{Y}	56^{Y}
Wetted width/depth ratio (riffles)	65.0	47.2	38.6	36.8
Current beaver activity status	Not active	Not active	Active	Active
Maximum temperature ºF	$65.0^{N/N}$	$65.5^{N/N}$	$60.1^{N/N}$	$56.4^{Y/N}$/$57.7^{Y/N}$

[1]small: >3m length, 10-30 cm diameter; large: >10m length, >30 cm diameter

Reach 1 begins as Gold Creek exits the deep canyon stretch and runs until the USFS boundary near stream mile 2. Stream gradient averages 133 ft/mile in this reach. This section is wider and shallower compared to other reaches in Gold Creek. In 1996, MT FWP and partners placed 66 instream LWD structures designed to improve fish holding habitat in this reach (Schmetterling and Pierce 1999), and the estimated number of 48 pieces of large-class LWD is over twice the target recommended by INFISH. Many of these structures persist and have likely increased habitat complexity in this reach, though the estimated number of pools was slightly lower than the INFISH target (32/mile vs 39/mile). Stream substrate in this reach consists mainly of large cobble and boulders and quality spawning habitat is somewhat limited. Temperatures were similar to those in reach 2 (65.0ºF).

Aquatic species

Gold Creek provides habitat for an array of trout species including bull, westslope cutthroat, rainbow, brown, and eastern brook as well as mountain whitefish, longnose dace, and sculpin species (MT FWP). As the largest tributary to the lower Blackfoot River, Gold Creek provides important spawning and rearing habitat for migratory WCT, rainbow trout, and brown trout. Resident eastern brook trout now inhabit much of the drainage and are the most numerous fish species in the upper reaches (Uthe et al. 2021) (Figure 13).

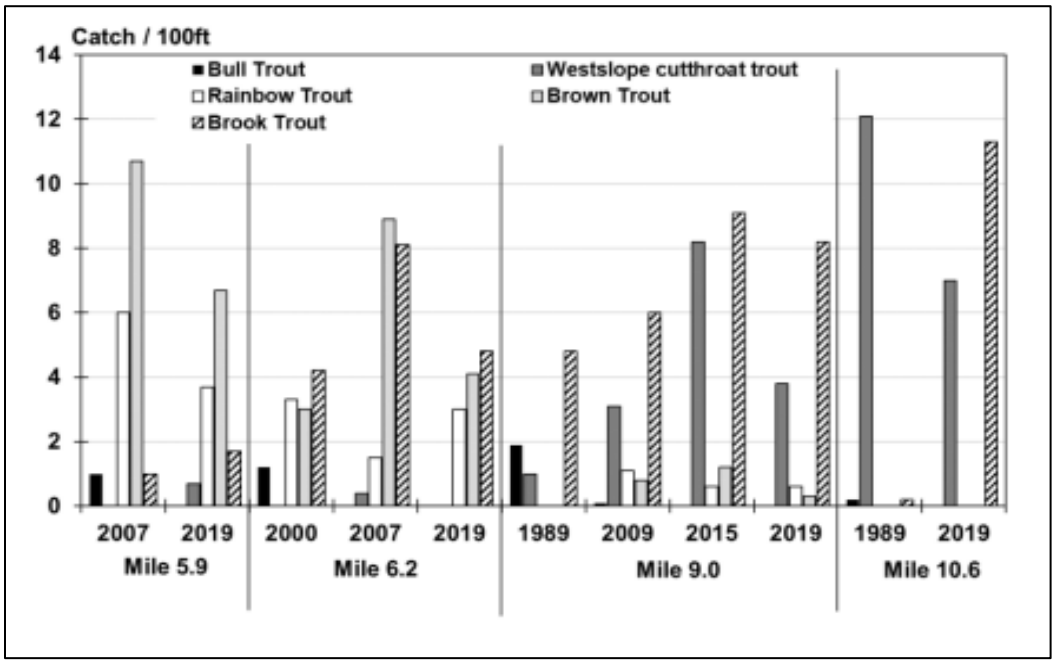


Figure 13. Catch per unit effort for age-1 and older trout at four locations in Gold Creek, Montana, 1989-2019 (Uthe et al. 2021).

Historically, bull trout occupied much of the drainage and exhibited migratory life histories, but abundance and distribution of the species have declined substantially over the past 10 to 15 years. MT FWP electroshocking surveys from 2015 and 2019 at four locations in Gold Creek failed to capture any bull trout, even at sites within the historic index reach for monitoring bull trout spawning. Nor were any detected in upstream sites where temperatures remain acceptable for the species. Redd count data from MT FWP show that no bull trout redds have been observed since at least 2017 in Gold Creek.

According to MT FWP:

> "Surveys in Gold Creek identified 7 redds in 2016 and one redd in 2017. However, no adult bull trout were observed and these redds may have been constructed by brook trout given that subsequent electrofishing surveys failed to locate bull trout. Furthermore, expanded redd survey sections in Gold Creek in 2019 and 2020 did not observe any evidence of bull trout spawning despite an abundance of high-quality spawning and adult holding habitat in the upper section. (Uthe et al. 2021)."

Montana Fish, Wildlife, and Parks has suggested that bull trout may be considered functionally extirpated from Gold Creek. However, they were detected at 13 locations by environmental DNA (eDNA) analysis as part of the USFS Range-Wide Bull Trout eDNA Project in 2018. And in 2023, MT FWP captured 2 bull trout approximately 900 yards upstream from the confluence with the Blackfoot River. These data points suggest that at least a small resident population remains upstream in the system and that bull trout may be entering the creek from the Blackfoot River.

5.7.5 West Fork Gold Creek

Aquatic habitat

West Fork Gold Creek originates from Bull Lake, north of Mineral Peak, in the Rattlesnake National Wilderness-Recreation Area and flows for approximately 7 miles before its confluence with Gold Creek at mile 6.8. It is the largest tributary of Gold Creek and is designated bull trout critical habitat. The future land acquisition by the Missoula BLM will encompass the lower 2 miles of the creek.

Fisheries staff conducted 4 surveys on 2 defined reaches on West Fork Gold Creek from above Primm Meadow to the confluence with Gold Creek (Table 15). Stream gradients on these reaches were similar, averaging about 120 ft/mile for the entire length. Large- and small-class woody debris is abundant in both reaches.

Reach 2 is characterized by a B-channel with low valley confinement as the creek passes through Primm meadow and braids out through the large beaver dam complex located there. The predominate substrate is large cobble and small boulders and some gravel where dam pools have formed, but spawning habitat is somewhat limited. The estimate of 75 pools per mile in this reach is just higher than the INFISH RMO of 70 for a stream with a wetted width of 4.7 m. The highest 7-day average maximum daily temperature in this reach was the highest in the assessment area at 70.2ºF, which is beyond the lethal limit for bull trout (Selong et al., 2001).

Reach 1 begins as the creek exits the beaver complex along Primm Meadow and enters a short step-pool section in a bedrock-contained channel. It then flows through a valley-confined B-channel for roughly a mile before entering another beaver influenced section near the confluence with Gold Creek. Abundant spawning gravels have accumulated in the large dam and step pools in this reach, providing excellent spawning habitat observed on the BLM managed portion of the creek. Besides the larger pools in this short step-pool section, fast and shallow riffle habitats characterize most of this reach. There are 51 pools estimated per mile in this reach, which falls short of INFISH RMOs for a stream of this size. In 2023, the highest 7-day average maximum daily temperature in this reach (57.2ºF) was noticeably lower than that from the reach above. This indicates that there is significant groundwater recharge in this area, but further investigation is needed.

Table 15. Summary of BLM habitat surveys in West Fork Gold Creek, Montana during 2022 and 2023. For number of pools, large woody debris, and temperature, whether or not the measured value meets the target INFISH standards is indicated, where a "Y" indicates the target is met and "N" indicates it was not. Temperature was tested against targets for both adult holding and rearing habitat. The value in the parentheses for the estimated number of pools is the minimum target value recommended by the INFISH RMO for a reach with the recorded wetted width. The maximum temperature is the maximum of the 7-day moving average of the maximum daily temperature over the season.

West Fork Gold Creek	Reach 1	Reach 2
Reach length (m)	1643	1564
# surveys completed	3	1
Sampling intensity (%)	30	10
Average bankfull width riffle (m)	8.0	9.3
Average wetted width all (m)	5.3	4.7
Estimated pools per mile	51$^{N\ (63)}$	75$^{Y\ (70)}$
Average pool residual depth (m)	0.4	0.3
Est. small LWD/mile[1]	303	258
Est. large LWD/mile[1]	29^{Y}	54^{Y}
Wetted width/depth ratio (riffles)	32.8	57.5
Current beaver activity status	Active	Active
Maximum temperature ºF	57.2$^{Y/N}$	70.2$^{N/N}$

[1]small: >3m length, 10-30 cm diameter; large: >10m length, >30 cm diameter

Aquatic species

Fish assemblages in West Fork Gold Creek are similar to those in the mainstem of Gold Creek. Electrofishing surveys from 2015 and 2019 show that brook trout, brown trout, and rainbow trout dominate the lower 1.5 miles of the creek with native WCT increasing in abundance and becoming the dominant fish species above the beaver dam complex at Primm meadow. Based on surveys conducted by Plum Creek fisheries staff, West Fork Gold Creek supported some fluvial bull trout spawning activity until at least 2004 (personal communication), the year after the Mineral Primm Fire, but more recent data suggests they may be completely extirpated from the drainage. Bull trout have not been observed in electrofishing surveys since 2000 and were not detected by eDNA analysis during 2018 at six locations.

5.7.6 Belmont Creek

Aquatic habitat

Belmont Creek is a 2nd order stream that flows southeast for 11 miles until its confluence with the Blackfoot River. Average baseflow is 10-12 cfs. The drainage is primarily managed by the BLM Missoula Field Office, except for a combination of USFS and State of Montana ownership in the upper two miles in the higher gradient headwater reaches. Belmont Creek is designated bull trout critical habitat.

The riparian undergrowth species (e.g., alder and red osier dogwood) along Belmont Creek have largely recovered from stream-side logging that occurred as recent as the 1990s, but the riparian corridor suffers from a lack of mature conifers and high levels of road encroachment compared to other streams in the assessment area. Since the early 1990s, restoration actions have been implemented on Belmont Creek to improve habitat conditions. In the early 2000s, the BLM implemented a project to enhance in-stream LWD in the lower section of the drainage. In 2016, TNC removed and replaced an undersized bridge with one large enough to accommodate high flows and passage of LWD. They also decommissioned an undersized crossing at mile 8.4. The Missoula Field Office and Trout Unlimited partnered in 2019 to remove a bridge at mile 1.7 and over a mile of associated stream-side road to reduce sediment input and facilitate natural channel processes along lower Belmont Creek. Though estimated LWD currently meets the INFISH targets in 3 of the 4 reaches surveyed, the potential for additional LWD is low because of the lack of standing timber in the area.

BLM fisheries staff conducted 8 surveys on 4 defined reaches of Belmont Creek beginning from the BLM boundary near the headwaters down to the confluence with the Blackfoot River (Table 16).

Reach 4 begins downstream of the confluence of the headwater forks of Belmont Creek to just below the bridge at mile 6.6. Roughly 3 miles in length, this reach is characterized by low gradient (122 ft/mile) and low valley confinement. This reach has high levels of LWD, pools, and abundance of gravels ideal for spawning. The substrates in this reach are mostly fines and small gravel (2-64mm), deposited by currents flowing in response to LWD. Beavers have recently (Spring, 2023) recolonized a section of the stream near mile 6.7 and are actively building dams. In 2022, the highest 7-day average daily maximum stream temperature was 53.5ºF.

Reach 3 extends roughly 1.5 miles and is characterized by an increase in valley confinement. The average gradient in this reach is 106 ft/mile. Belmont Creek's only major tributary, Burnt Creek, enters the reach at mile 5.3. This reach had the highest numbers of pools per mile (123) among the reaches surveyed in Belmont Creek and ample LWD. Estimated count of large-class LWD per mile was just above the target at 22 pieces.

Reach 2 is characterized by high valley confinement and higher gradient (242 ft/mile) than other BLM managed reaches of Belmont Creek. Near mile 4.7, the stream enters a bedrock confined canyon with small waterfalls, cascades, and step-pool features that largely acts as a barrier to upstream fish passage. This reach had the highest number of large-class LWD in Belmont Creek (84), likely due to the steep slopes of the canyon preventing the harvesting of streamside trees. This reach also holds the deepest pools of all stream reaches in Belmont creek and just meets the INFISH RMO target of 71 for number of pools per mile for a reach with a wetted width of 4.6 m.

Table 16. Summary of BLM habitat surveys in Belmont Creek, Montana during 2023. For number of pools, large woody debris, and temperature we, whether or not the measured value meets the target INFISH standards is indicated, where a "Y" indicates the target is met and "N" indicates it was not. Temperature was tested against targets for both adult holding and rearing habitat. The value in the parentheses for the estimated number of pools is the minimum target value recommended by the INFISH RMO for a reach with the recorded wetted width. The maximum temperature is the maximum of the 7-day moving average of the maximum daily temperature over the season.

Belmont Creek	Reach 1	Reach 2	Reach 3	Reach 4
Reach length (m)	2736	3360	2441	4604
# surveys completed	2	2	2	2
Sampling intensity (%)	11	8	12	7
Average bankfull width riffle (m)	5.3	5	5.3	3.8
Average wetted width all (m)	4.5	4.6	4.5	4.1
Estimated pools per mile	$54^{N\ (71)}$	$71^{Y\ (71)}$	$123^{Y\ (71)}$	$81^{Y\ (77)}$
Average pool residual depth (m)	0.2	0.4	0.2	0.4
Est. small LWD/mile[1]	22	521	380	606
Est. large LWD/mile[1]	5^{N}	84^{Y}	22^{Y}	22^{Y}
Wetted width/depth ratio (riffles)	27.3	25	33.1	25.5
Current beaver activity status	Active	Not Active	Not Active	Active
Maximum temperature ºF	$61.4^{N/N}$	NR	NR	$53.5^{Y/N}$

[1]small: >3m length, 10-30 cm diameter; large: >10m length, >30 cm diameter

Reach 1 extends from the mouth of the Belmont canyon 1.5 miles to the confluence with the Blackfoot River. This reach is characterized by low valley confinement and low gradient (101 ft/mile) as the creek flows through 2 historic hay meadows. In the 2000's, the BLM used draft horses to deposit LWD in the streambed in this reach. In this upper meadow, north of McNamara Rd, the stream has been recolonized by beavers in recent years, likely from the artificial addition of LWD. The new beaver structures appear to have expanded the floodplain and raised the water table considerably. Below McNamara Rd, the creek is bordered by a meadow on its eastern bank. As a result, this reach had the lowest numbers of instream large-class LWD (4) and pools (54) (aside from beaver dam influenced pools) of the reaches surveyed on Belmont Creek. Large rocks and boulders are the primary pool forming feature of this reach. In 2022, the highest 7-day average daily maximum stream temperature was 61.4ºF, over two degrees higher than the INFISH RMO for adult holding habitat.

Aquatic species

Belmont Creek provides habitat for a variety of trout species, including westslope cutthroat, bull, rainbow, brown as well as mountain whitefish and sculpin. A strong run of migratory rainbow trout uses the lower sections of the creek for spawning every spring. Adult bull trout can be routinely observed below the mouth of Belmont Creek in the Blackfoot River during the hottest weeks of summer,

apparently using the outflow from the creek for cold water refugia. The set of waterfalls and slides starting near mile 4.6 acts as a seasonal barrier to the upstream movement of non-native trout species making upper Belmont Creek especially important for a population of WCT that is 99.8% genetically pure and resident bull trout that reside there (Uthe et al. 2021).

Electrofishing surveys in 2019 by MT FWP show that the lower portion of the creek below the waterfall is dominated by non-native rainbow trout (Figure 14). Brown trout abundance increases near the falls and they were also found above the falls, but in low numbers, suggesting that the falls are not a complete barrier to upstream movement. Westslope cutthroat trout are the dominant fish species from just below the falls to the top of the drainage. Bull trout abundance continues to show a substantial decline, similar to patterns observed in other streams in the assessment area and other regional streams. During the 2019 surveys, only one bull trout was observed in the lower portion of the creek where they had been historically present and very low densities were detected above the falls. MT FWP captured 13 bull trout at the confluence of the headwater forks (USFS ownership) in 2022 which suggests that this area has the highest densities on the entire creek.

BLM staff have been conducting spring and fall redd counts on the lower 1.5 miles of Belmont Creek each year since 2014, and intermittently since the early 2000s. In some years, more than 100 rainbow trout redds are observed in this reach. No bull trout redds have been found in this section of the creek although fluvial spawning activity was observed in the early 2000s by BLM fisheries staff. The beaver dam network currently active in the meadow above McNamara Rd may pose some barriers to upstream movement for spawning migratory fish.

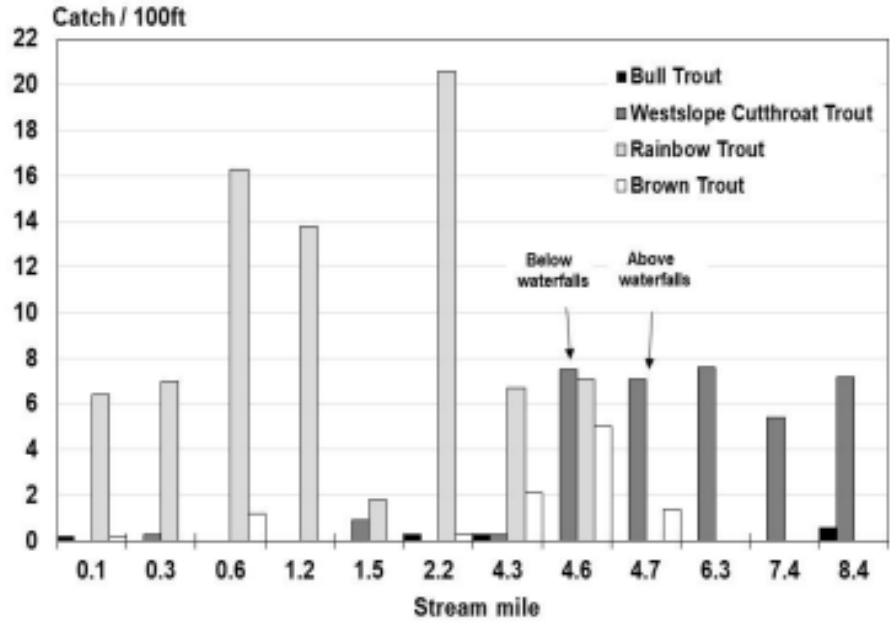


Figure 14. Catch per unit effort for trout sampled at twelve locations in Belmont Creek during 2019 (Uthe et al. 2021).

5.7.7 Burnt Creek

Aquatic habitat

Burnt Creek is a small 1st order stream, flowing south for approximately 3 miles before entering Belmont Creek near mile 5.6. BLM fisheries staff conducted 2 habitat surveys on Burnt Creek (Table 17). Burnt Creek provides good spawning habitat in its lower gradient, bottom reach before its confluence with Belmont Creek. Like Belmont Creek, riparian habitat on Burnt Creek has been affected by historic harvest of mature stream-side trees and road building, likely resulting in the low estimated number of large-class LWD (8/mile) in this creek. The estimated number of pools per mile (81) was just over half of the target for a stream of its size, but INFISH targets may not be appropriate for such a small stream (wetted width = 1.8 m). Burnt Creek passes through at least 3 culverts on its mainstem and there is a road encroaching the riparian corridor for almost the entire length of the creek. The substrate composition in Burnt Creek was similar to that of most of the streams in the assessment area. Water temperature of Burnt Creek was not monitored.

Table 17. Summary of habitat surveys from Burnt, Cow, East Twin, and West Twin Creeks, Montana during 2022 and 2023. For number of pools, large woody debris, and temperature, whether or not the measured value meets the target INFISH standards is indicated, where a "Y" indicates the target is met and "N" indicates it was not. Temperature was tested against targets for both adult holding and rearing habitat. The value in the parentheses for the estimated number of pools is the minimum target value recommended by the INFISH RMO for a reach with the recorded wetted width. The maximum temperature is the maximum of the 7-day moving average of the maximum daily temperature over the season.

	Burnt	Cow	East Twin	West Twin
Reach length (m)	5105	1938	5866	2128
# surveys completed	2	1	4	3
Sampling intensity (%)	4	5	7	14
Average bankfull width riffle (m)	2.2	2.2	4.0	5.1
Average wetted width all (m)	1.8	0.8	3.3	3.7
Estimated pools per mile	81$^{N\ (144)}$	48$^{N\ (267)}$	72$^{N\ (90)}$	64$^{N\ (83)}$
Average pool residual depth (m)	0.3	0.2	0.3	0.2
Est. small LWD/mile[1]	72	257	197	215
Est. large LWD/mile[1]	8^{N}	0^{N}	120^{Y}	32^{Y}
Wetted width/depth ratio (riffles)	28.2	25.9	30.3	31.8
Current beaver activity status	Not Active	Not Active	Not active	Not Active
Maximum temperature ºF	NR	60.1$^{N/N}$	56.3$^{Y/N}$	NR

[1]small: >3m length, 10-30 cm diameter; large: >10m length, >30 cm diameter

Aquatic species
Burnt Creek likely provides habitat for genetically pure WCT, inferred from its location upstream of the falls on Belmont Creek. No MT FWP electrofishing data exists but visual surveys conducted by BLM fisheries staff in 2022 confirmed fish were present from the mouth to near the headwater forks. Brown and bull trout may also occur in Burnt Creek based on their presence in Belmont Creek, but further investigation is required.

5.7.8 Cow Creek

Aquatic habitat
Cow Creek is a small 1st order stream providing about a mile of perennial flow before entering Gold Creek near mile 5.6. The average gradient in the reach is approximately 321 ft/mile. Due to its low volume, Cow Creek is only marginal habitat for fish in its incised, boulder laden channel (Table 17). The highest average 7-day maximum temperature in 2023 was 60.1ºF taken near the mouth to Gold Creek. No large-class LWD was observed and only 48 of the INFISH target of 267 pools per mile was estimated, though extrapolating the number of target pools to a stream of this size (wetted width = 0.8 m) may not provide accurate targets. The location of our riffle pebble count contained a high percentage of spawning sized gravel, but a suitable location to sample from a pool tail crest was not found.

Aquatic species
Cow Creek is considered habitat occupied by WCT by MT FWP, but due to its connectivity to Gold Creek, any species that occupies Gold Creek could be found in Cow Creek based on seasonal conditions. More investigation is needed to determine fish species presence and distribution.

5.7.9 East Twin Creek

Aquatic habitat
East Twin Creek is a small 2nd order stream originating northeast of Sheep Mtn and flows for approximately 6 miles before entering the Blackfoot River near mile 10.2. East Twin Creek is high gradient, averaging approximately 378 ft/mile throughout the BLM managed parcel.

The future BLM acquisition will contain approximately 3.6 miles of lower East Twin Creek. BLM fisheries staff conducted 4 surveys on 1 defined reach (Table 17). Riparian habitat is mature and well developed compared to other assessment area streams, lending to high numbers of large-class LWD and pools per mile. Spawning habitat is somewhat limited, but some gravels have accumulated in dam pools created by LWD. The highest 7-day average of maximum daily temperatures in 2022 was 56.3ºF.

Aquatic species
Montana Fish, Wildlife, and Parks electrofishing surveys from 2009 found the lower reaches (mile 0.2) of East Twin Creek to be dominated by non-native fish species, with brown trout being the most common, followed by rainbow trout and eastern brook trout. Electrofishing surveys from mile 4.9 found only WCT, indicating there may be physical barriers in East Twin Creek that limit upstream movement of nonnative fish. In 2022, Rocky Mountain tailed frog larvae were observed in East Twin Creek by BLM fisheries staff.

5.7.10 West Twin Creek

Aquatic habitat

West Twin Creek is a small 2nd order stream originating in the basin east of Sheep Mtn flowing roughly 5.5 miles before joining the Blackfoot River near mile 10. The future BLM land acquisition will encompass approximately 1.3 miles of lower West Twin Creek. The drainage is high gradient, averaging 516 ft/mile through the portion of the stream currently managed by the BLM. Flows are heavily dependent on snowpack, having very high flows in the spring compared to its baseflow in late summer (personal observation).

BLM fisheries staff conducted 3 surveys on 1 defined reach of West Twin Creek (Table 17). Stream bottom substrate is mostly large cobble and small boulder; spawning habitat is limited. The stream has high numbers of large-class LWD and a fair number of pools per mile. Temperature data is unavailable due to equipment error but should be monitored in the future.

Aquatic species

Surveys conducted by MT FWP during 2009 at mile 0.2 on West Twin Creek indicate that rainbow trout are the most prevalent fish species in this creek, followed by eastern brook trout. These were the only 2 fish species encountered, but WCT have been observed in previous sampling efforts. Westslope cutthroat trout are likely the dominant fish species in higher reaches of West Twin Creek, but more investigation is needed to confirm this. BLM fisheries staff observed Rocky Mountain tailed frog larvae in the headwater forks of the drainage in 2022.

5.7.11 Game Ridge Creek

Aquatic habitat

Game Ridge Creek is a small 1st order stream north of Nine Mile Prairie with no surface connectivity to any other stream. It has perennial flow for approximately 1.2 miles and the average gradient is 340 ft/mile. Among streams within the assessment area, Game Ridge Creek is the most affected by current livestock grazing practices; it is located within the Black Canyon grazing allotment administered by the Missoula BLM. Currently, there are no riparian fences or other measures in place to decrease negative impacts from cattle to riparian habitat. Both our pebble counts at the pool tail crest and in the riffle had the highest levels of fines and pea gravel of the streams sampled in the assessment area, respectively.

BLM fisheries staff conducted 1 habitat survey on 1 defined reach of Game Ridge Creek (Table 18). Estimates of large-class LWD and pools fell short of the INFISH targets, though again this stream is smaller than the streams INFISH targets are designed for. The highest 7-day average of maximum daily stream temperature was 66.2ºF in 2023.

Aquatic species.

Electrofishing surveys by MT FWP in 2020 found that Game Ridge Creek provides habitat for a low density (7 fish/1000ft) population of WCT (Uthe et al., 2021). Later genetic analysis showed that this population is genetically pure, but with extremely low genetic variation consistent with other naturally isolated populations in the Columbia River drainage (personal communication with MT FWP). Because there is no evidence of a stream channel beyond where the creek flows into Nine Mile Prairie, this population may have persisted in isolation since at least the last iteration of Glacial Lake Missoula (~13,000 years).

5.7.12 Blanchard Creek

Aquatic habitat

Blanchard Creek is a 2nd order tributary stream to the lower Clearwater River. The majority of Blanchard Creek is not included in the assessment area except for an approximately 0.5-mile BLM managed reach on the lower portion about a mile before its confluence with the Clearwater River. Lower Blanchard Creek provides spawning and rearing habitat for fish but has suffered from historical dewatering for irrigation via a diversion dam just below the BLM managed reach. BLM fisheries staff conducted 1 habitat survey on this reach (Table 18). This reach contained only an estimated 16 pieces of large-class LWD per mile, short of the target of 20. Pools per mile was estimated at 48, which is more than half of the INFISH target of 81 pools per mile. Temperature was not monitored in Blanchard Creek.

Aquatic species

According to the most recent (2002) MT FWP electrofishing surveys on lower Blanchard Creek, it is dominated by non-native rainbow and brown trout with some WCT and mountain whitefish. Electrofishing surveys from 2006 in the upper reaches of Blanchard (mile 9.4) found only WCT.

Table 18. Summary of habitat surveys from Game Ridge, Blanchard and Wild Horse Creeks, Montana during 2022 and 2023. For number of pools, large woody debris, and temperature, whether or not the measured value meets the target INFISH standards is indicated, where a "Y" indicates the target is met and "N" indicates it was not. Temperature was tested against targets for both adult holding and rearing habitat. The value in the parentheses for the estimated number of pools is the minimum target value recommended by the INFISH RMO for a reach with the recorded wetted width. The maximum temperature is the maximum of the 7-day moving average of the maximum daily temperature over the season. Temperature data was monitored at an unnamed tributary flowing into Gold Creek and at 2 locations in Wildhorse Creek.

	Game Ridge	Blanchard	Wild Horse	Unnamed tributary
Reach length (m)	1956	776	862	NA
# surveys completed	1	1	3	0
Sampling intensity (%)	5	13	23	NA
Average bankfull width riffle (m)	1.1	5.4	4.3	NR
Average wetted width all (m)	0.7	3.8	1	NR
Estimated pools per mile	48$^{N\ (295)}$	48$^{N\ (81)}$	48$^{N\ (232)}$	NR
Average pool residual depth (m)	0.2	0.3	0.2	NR
Est. small LWD/mile[1]	32	161	0	NR
Est. large LWD/mile[1]	16^{N}	16^{N}	0^{N}	NR
Wetted width/depth ratio- riffle	41.5	28.5	8.9	NR
Current beaver activity status	Not Active	Not Active	Active	NR
Maximum temperature ºF	66.2$^{N/N}$	NR	56.2$^{Y/N}$/53.6$^{Y/N}$	49.2$^{Y/N}$

[1]small: >3m length, 10-30 cm diameter; large: >10m length, >30 cm diameter

5.7.13 Wild Horse Creek

Aquatic habitat

Wild Horse Creek is a small 1st order stream with about 1.5 miles of perennial flow before entering Gold Creek near mile 6.6. From its headwaters south of Black Mtn to Gold Creek Rd, Wild Horse Creek is high gradient, averaging approximately 312 ft/mile, flowing intermittently through a forested system. The reach surveyed by fisheries staff was downstream of Gold Creek Rd. Here the creek decreases in gradient, to 240 ft/mile, passing through meadow and beaver influenced habitat before entering Gold Creek. The creek was historically redirected and channelized at this location to support livestock grazing activities. In 2022 and 2023, the Missoula Field Office installed approximately 40 beaver dam analog (BDA) structures to aid in floodplain function restoration and encourage beaver occupation. The highest 7-day average of daily maximum temperature for 2023 was 53.6ºF taken just below Gold Creek Rd, increasing to 56.2ºF after passing through the meadow reaches and BDA structures. Pebble counts at both the pool tail crest and riffle plots resulted in high levels of fines and pea gravel compared to other streams surveyed. No large-class LWD was observed. Pool frequency was estimated at only 48 pools per mile, well short of the of the target of 232. Wild Horse Creek was the only stream surveyed that met the INFISH target of 10 for width-to-depth ratios. This is likely due to the entrenched nature of this reach. Because pools were not included in this calculation reported values are likely skewed shallow.

Aquatic species

According to data provided by MT FWP, Wild Horse Creek is considered occupied by WCT, but due to its connectivity to Gold Creek, any species that occupies Gold Creek could potentially be found in here, depending on seasonal conditions. More investigation is needed to determine fish species presence and distribution. Western toad and Columbia spotted frog larvae were observed in beaver ponds of Gold Creek adjacent to the confluence with Wild Horse Creek.

5.7.14 Unnamed Tributary to Gold Creek

Aquatic habitat

This small 1st order unnamed tributary enters Gold Creek near UTM 12T 294252 E 5211951 N. Based on the stable water temperatures observed in the creek in 2023, it appears to be primarily spring fed. The length of perennial flow is unknown but sufficient flow for supporting fish was found at the lower USFS 4224 Rd crossing. This stream had the coldest temperatures of all assessment area streams; the highest average 7-day maximum temperature in 2023 was 49.2ºF. A formal habitat survey was not conducted in this stream.

Aquatic species

BLM fisheries staff observed only eastern brook trout and Rocky Mountain tailed frog larvae in the stream during electrofishing surveys in 2022.

5.7.15 Amphibians

The Lower Blackfoot assessment area has the highest diversity and concentration of quality amphibian habitat compared to other BLM Missoula Field Office planning areas. There is a variety of lentic habitat types within the assessment area providing resources for all stages of amphibian life cycles: forested and unforested ephemeral and permanent wetlands, active and inactive beaver ponds, bogs, fens, and stagnant or backflowing stream margins. Streams in the assessment area provide summer foraging habitat for adult and juvenile amphibian species as well as breeding and rearing habitat for Rocky Mountain tailed frogs.

Due to the high diversity and quality of amphibian habitat available, the assessment area also has the greatest diversity of amphibian species compared to other BLM Missoula planning areas (Table 19). BLM fisheries technicians conducted surveys for breeding amphibians on 21 sites in the assessment area from May–June in 2022 and 2023. Western toads were observed to be breeding at 3 locations and the Sierran treefrog breeding at 5 locations. Long-toed salamander and Columbia spotted frog larvae were commonly observed during surveys. Larvae of the Rocky Mountain tailed frog were found in several assessment area streams.

Table 19. Amphibian species, conservation status, and locations of occurrence within the assessment area.

Common name	Scientific name	Species conservation status	Occurrence in assessment area
Western toad	*Anaxyrus boreas*	BLM Sensitive	Breeding observed in perennial wetland and seasonal wetland north and east of Primm meadow, respectively. Larvae observed in beaver-associated habitat in mainstem of Gold Creek, near confluence with West Fork Gold Creek.
Long-toed salamander	*Ambystoma macrodactylum*	None	Larva found widespread across the assessment are in a variety of habitats ranging from spring seeps to permanent wetlands.
Columbia spotted frog	*Rana luteiventris*	None	Widespread across the assessment area in a variety of aquatic habitats.
Sierran treefrog	*Psuedacris sierra*	None	Five breeding sites identified in the Spring Creek drainage, south of Primm Meadow. Eastern edge of range
Rocky Mountain tailed frog	*Ascaphus montanus*	None	Found in the higher gradient, headwater tributaries and mainstems of East Twin, West Twin, and Gold Creeks.

5.7.16 Stream Temperature

Day-to-day variations of temperature throughout 2023 were consistent across all locations, with temperature fluctuations occurring on roughly the same days across locations. Specifically, all thermographs for 2023 show the maximum average temperature occurred during the 7-day period ending between July 21 and 26, with an additional period of slightly lower maximums over period ending August 17–19. For Belmont and East Twin Creeks, where the temperatures were recorded during 2022, the maximums occurred during the period ending August 2–3.

In only one location was the 7-day average of daily maximum temperatures near the threshold of 48°F prescribed by INFISH for suitable rearing habitat (Figure 15). In this stream, an unnamed tributary to Gold Creek, the maximum of the 7-day averages of daily maximums was 49.2°F. At 4 of our locations the average maximum temperatures remained above 59°F during a large portion of the sampling period, the

maximum temperature target for adult rearing habitat described by the INFISH. Maximum average temperatures crossed the 59°F threshold occasionally at 3 locations. And maximum average temperatures at the remaining 7 locations remained at or below approximately 59°F throughout the monitoring period, suggesting that at least portions of the assessment area provide thermally acceptable temperatures for adult fish.

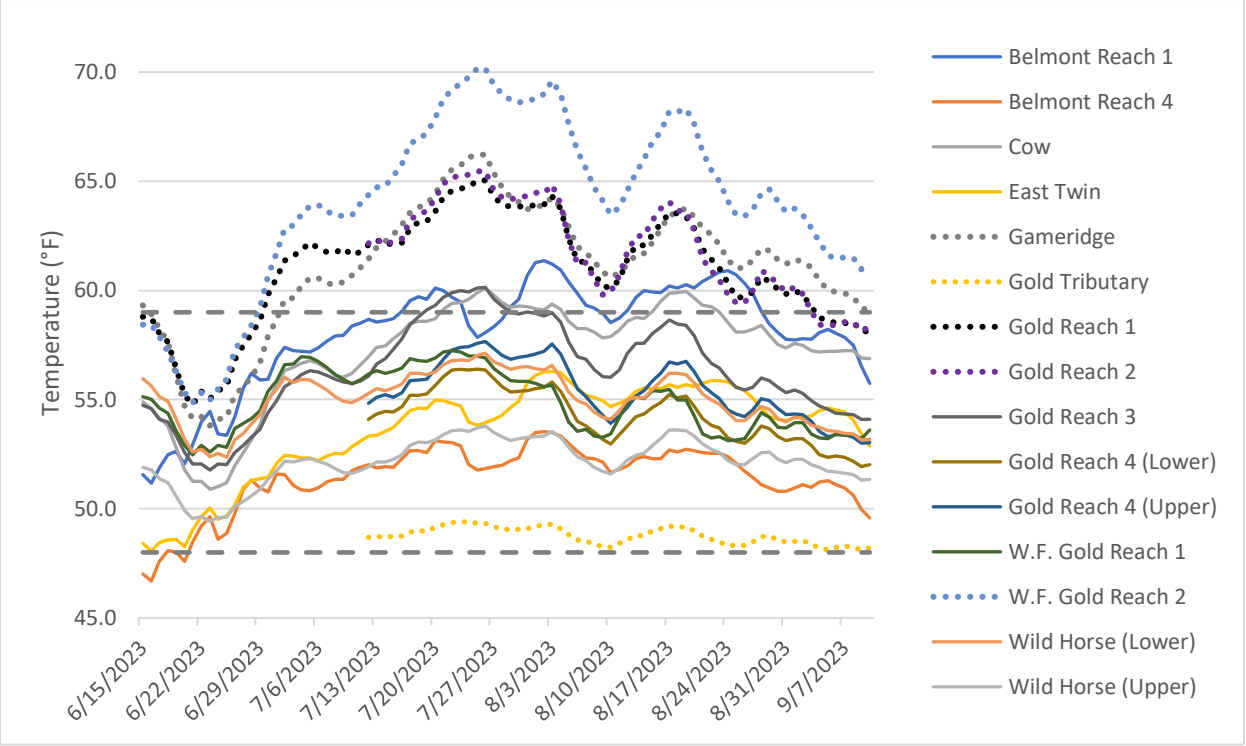


Figure 15. Moving averages of the previous 7 daily maximum temperatures at 15 stream locations in the lower Blackfoot Region, Montana during 2022 and 2023. For easier identification, streams consistently measuring with the highest and lowest average temperatures are represented by dotted lines. The dashed horizontal lines indicate 48°F and 59°F. W.F. Gold is an abbreviation of West Fork Gold Creek.

The Missoula BLM pilot project examining the effect of beaver and artificial complexes on water temperature was consistent with past data in that mixed results were recorded, though the characteristics of our replicates varied greatly (Figure 16). The maximum temperatures above the active beaver complexes in West Fork Gold were consistently higher than those below the complexes (mean difference = 9.1; standard deviation = 3.44). While the temperatures below the beaver analogs in Wild Horse Creek were somewhat higher than those above the analogs in the same stream (mean difference = 2.9; standard deviation = 0.61). On the mainstem of Gold Creek where our stations were separated by an older inactive complex, the maximum temperatures were similar between the locations, though the temperatures upstream were consistently somewhat higher (mean of 7-day max) (mean = 1.2; standard deviation = 0.30). In future work, multiple loggers should be used in each treatment (e.g., 3 above and 3 below) to account for any microsite variability that may exist within streams because of features such as shaded pools and shallower slow-moving runs that may affect temperature readings.

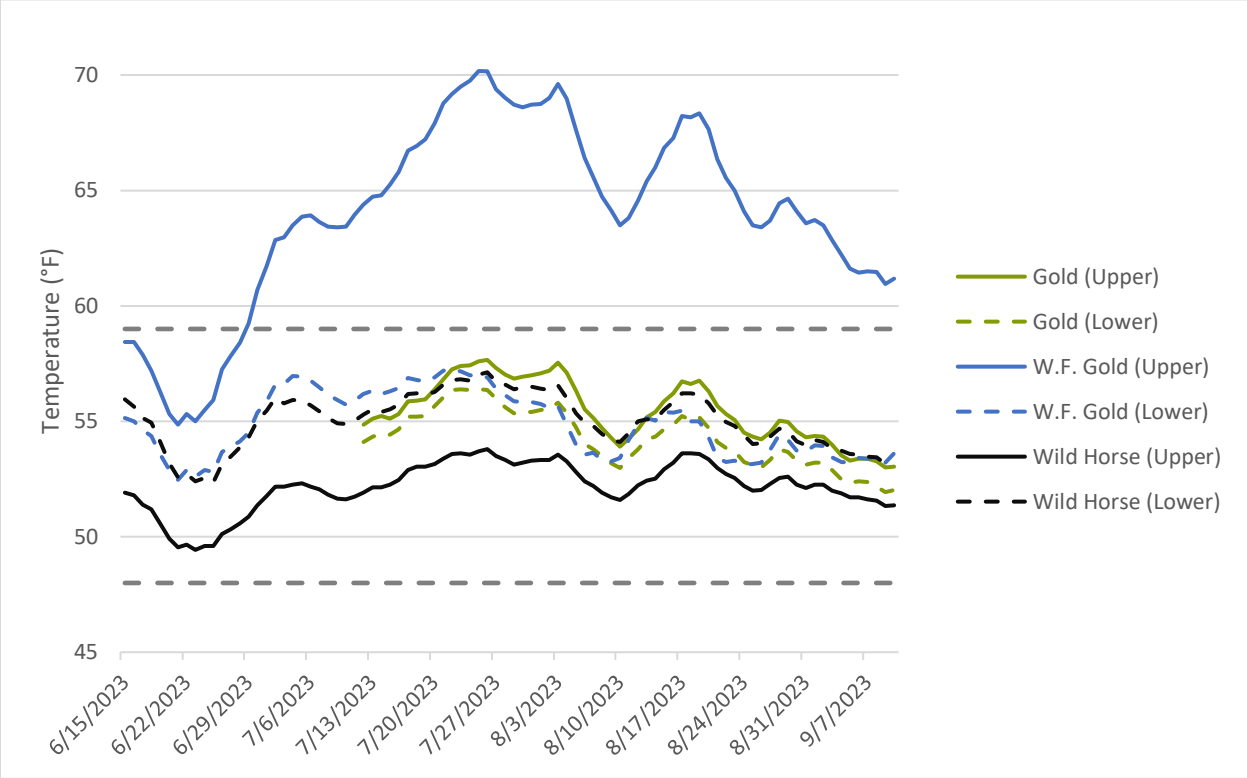


Figure 16. Moving averages of the previous 7 daily maximum temperatures at 3 paired locations from 3 streams in the assessment area during 2022 and 2023. Temperatures were monitored above and below beaver complexes, or in the case of Wild Horse Creek, above and below artificial beaver complexes. The dashed horizontal lines indicate 48°F and 59°F. W.F. Gold is an abbreviation of West Fork Gold Creek.

5.7.17 Stream Substrates

Substrate compositions based on pebble counts at both riffles and tail crests of pools were similar across most of the stream reaches surveyed (Figures 17 and 18). Gravel was overwhelmingly the most common substrate in our counts. This suggest substrates suitable to salmonid spawning may be available in most steams of the assessment area. Only in Game Ridge and Wild Horse Creeks were counts of pea gravel higher than for gravel. Across all pebble counts, high amounts of fines were only observed in the pool tail crest plot in Game Ridge Creek.

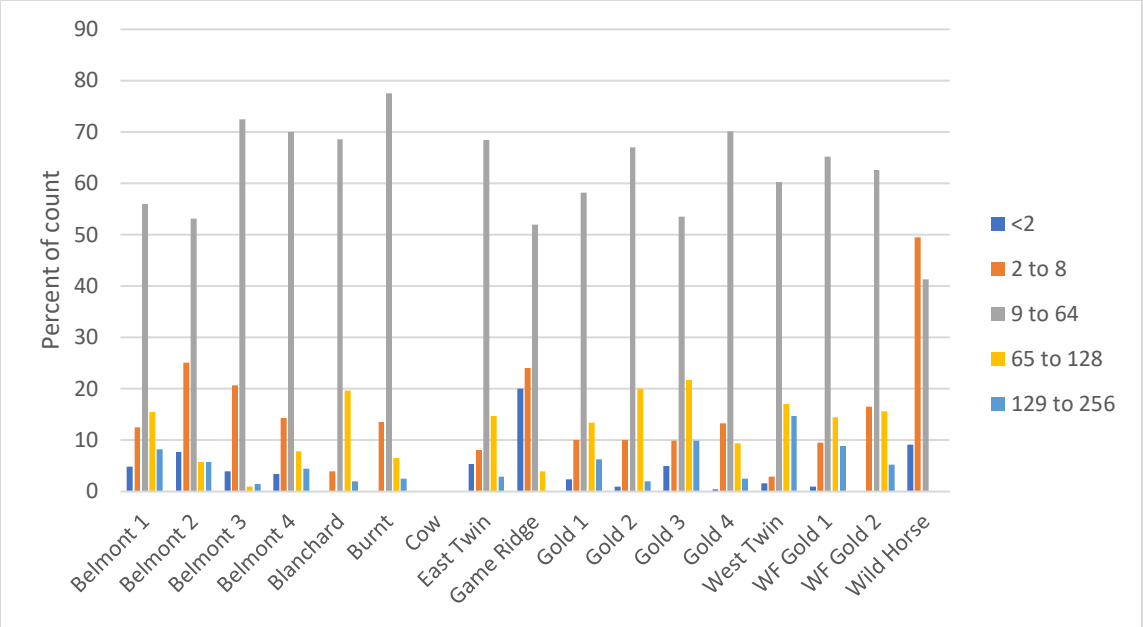


Figure 17. Percentages of substrate sizes in pool tail crests in stream reaches of the assessment area during 2022 and 2023. Substrate ranges are in millimeters. Percentages of substrates in classes larger than 256 mm were not included as the numbers were low and similar across reaches. A pebble count was not conducted in Cow Creek because no suitable pool tail crest was located.

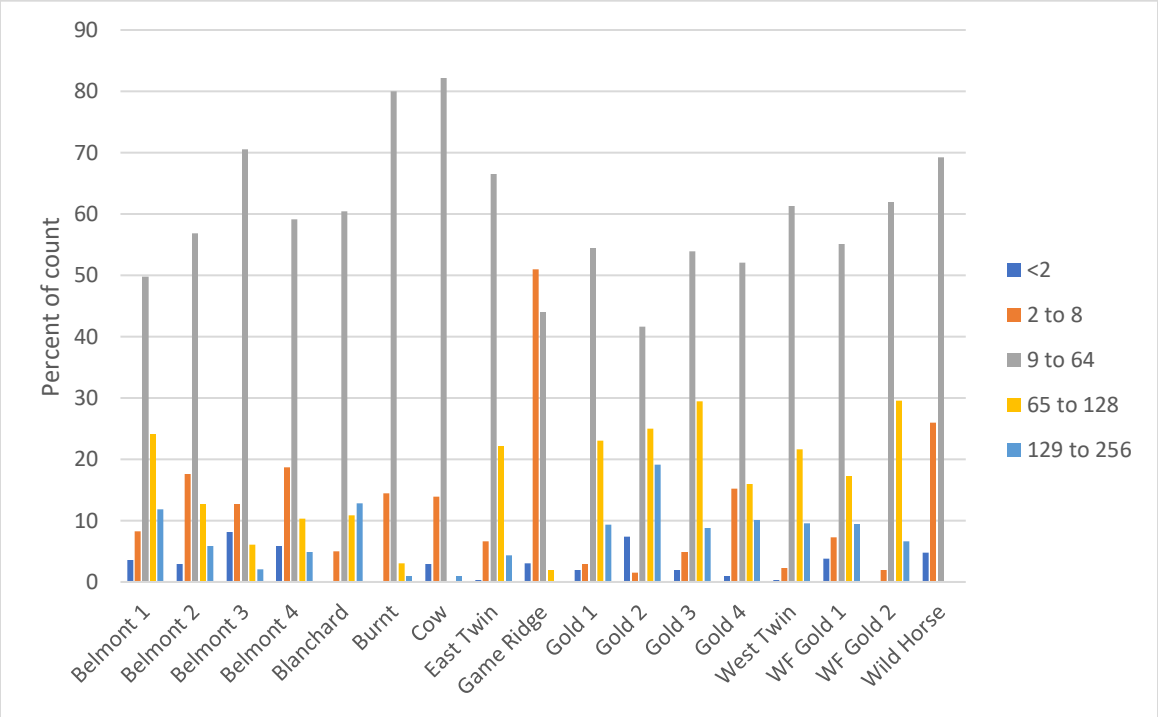


Figure 18. Percentages of substrate sizes in riffles in stream reaches of the assessment area during 2022 and 2023. Substrate ranges are in millimeters. Percentages of substrates in classes larger than 256 mm were not included for clarity, as the numbers were low and similar across reaches.

5.8 Cultural Resources

The examination of existing records on file with the BLM Missoula Field Office and the Montana State Historic Preservation Office provides information on the number of known cultural resources and the previous cultural resource inventories that have been conducted on BLM administered land within the watershed.

A total of sixty-three inventories totaling 24,159 acres have been completed across the entire EAWS study area boundary since 1981, of which 20,450 acres are on BLM administered lands (see Map 3 Appendix C). Of the inventories conducted on BLM administered lands 28% were completed more than ten years ago (1981-2012) and 72% (2013-2023) were completed within the last 10 years. The inventories have been specific project compliance related and were conducted primarily in advance of small to large scale projects (i.e., timber sales, right of ways, land exchanges, prescribed burns, etc.). These surveys have resulted in 52 pre-contact and historic sites being recorded in the study area, 50 of which are on BLM administered land, many of which are located along the river corridor. Of these sites, 7 are eligible, 30 are unevaluated, and 13 are not eligible for inclusion on the National Register of Historic Places.

The number of sites that exist along the Blackfoot River Corridor at lower elevations versus the number of sites that have been located at higher elevations is likely due to the large scale and significantly impactful logging practices used by Anaconda and other timber companies dating as far back as the 1880s. Long flat ridgelines, saddles, and meadows were travel corridors, encampments, and resource procurement and harvesting areas used by generations of Indigenous groups. The same areas in the landscape have been disturbed by log decks, skidding, road building, and equipment staging during the industrial age of logging in the region. These modern and historic activities have caused significant disturbance to much of the precontact cultural surface, likely resulting in a “negative” survey in areas where subsurface deposits are still present.

5.9 Recreation

The assessment area is one of two areas of high concentrated recreational use that the Missoula Field Office manages, the other being Garnet Ghost Town. The vast majority of this use is centered around the Blackfoot River however the uplands receive a fair amount of hunters, dispersed campers, and snowmobilers. As such, the area was designated as a Special Recreation Management Area in the 2021 Missoula RMP (see Map 15 in Appendix C). A Special Recreation Management Area (SRMA) is an administrative unit where the existing or proposed recreation opportunities and recreation setting characteristics are recognized for their unique value, importance, and/or distinctiveness, especially as compared to other areas used for recreation.

The objective of the Blackfoot SRMA is to provide a wide array of outcome focused recreation opportunities for all skill levels and users while maintaining the scenic values. Activities may include but are not limited to rafting, fishing, hiking, mountain biking, hunting, scenic driving and snowmobiling. As part of designating the Blackfoot SRMA management actions and allowable uses were developed for various resource programs. Some of these management actions and allowable uses highlighted in the RMP revision include continuing to work with partners to manage recreation and to develop recreation opportunities, continue working with landowners in the management of the River Recreation Corridor, continue supporting block management with MT FWP, consider a scenic driving loop, work with partners to develop a regional connecting trail or trails, work with partners to develop biking trails, and consider developing more float-in camp sites.

Within the assessment area, on BLM administered public lands there are 8 day use sites, 1 boat launch, 1 campground, 3 float-in campsites, designated snowmobile trails and designated bike trails. Dispersed camping is not allowed ¼ from the river and/or the road, however it is allowed outside of that area. Also within the assessment area is the Morrison Peak Block Management Area (BMA). The BMA encompasses approximately 21,500 acres of private and public lands and is available starting September 1 and runs through January 1. Primary hunting opportunities include white-tailed deer, mountain lions, mule deer, elk and black bear. Per the 2021 Missoula RMP, the BLM will continue working with MT FWP to provide this walk-in hunting opportunity.

The BLM works cooperatively with MT FWP to manage the recreation on the river. Through a Cooperative Management Agreement, MT FWP provides all the maintenance to the day use sites and campground including the vault toilets and water system. In addition, MT FWP monitors the use at these sites and collects the fees. Further, MT FWP administers the Special Recreation Permits for the entire river including the BLM portions.

Similar to past landowners, The Nature Conservancy (TNC) continues to allow recreational uses on their lands. In fact, the public considers these lands as public lands even though they are not. These activities include hunting, camping, fishing, snowmobiling, hiking and other types of non-motorized recreation. Hunting, though, is the dominant activity. According to MT FWP, these lands receive approximately 24,738 hunter days on average. In addition, TNC has been providing recreation opportunities, specifically they have developed hiking/walking trails, have groomed cross country ski trails and groomed winter fat tire bike trails. The groomed cross country ski trails and winter fat tire bike trails are authorized through a land use permit (see Map 14 Appendix C). In addition, TNC allows dispersed camping. One large dispersed camping area is located up Gold Creek Road near the 7 mile bridge. During the winter, TNC allows snowmobiles to ride on all of their roads.

Also within the assessment area are lands managed by the Forest Service some of which have also been recently acquired. These lands abut the Rattlesnake Wilderness and the lands of the Confederated Salish and Kootenai Tribes. While these Forest Service lands were not analyzed in detail for this assessment, they do provide recreation opportunities with those opportunities being more primitive in nature, including four popular trailheads that provide access the Rattlesnake National Recreation Area. In addition, the Forest Service controls several roads in the area including Gold Creek Road. The Forest Service partners with a local snowmobile club to groom trails and provide warming shelters.

In the past few years, various groups have approached either TNC or the Forest Service asking for opportunities for long distance events such as running and biking. The routes for proposed events usually start in and around the Gold Creek drainage and head in the direction of Seeley Lake. Some of the routes of the proposed events loop back while others end around Seeley Lake. In addition, local UTV groups have approached TNC and the State inquiring about long distance trail rides. Proposed routes for these potential trail rides are located on the eastern side of the watershed.

Current motorized winter recreation is dispersed across the assessment area and includes mountain lion hunters. Two areas have more concentrated use, Wisherd Ridge and designated snowmobile trails out of Seeley Lake. Wisherd Ridge is a popular backcountry skiing destination accessed by snowmobile and skis, and while the bowls are on Forest Service the parking area is on TNC in Twin Creek. The designated snowmobile trails are in the north part of the assessment area and include both groomed trails, non-

groomed trails, and a warming shed. The Driftriders, part of Scenic Montana Trails maintains and groom the trails and warming shed.

See existing recreation Map 14 in Appendix C for all existing recreation sites.

5.10 Visual Resources

In 2011 the lands in the assessment area were inventoried for their visual characteristics. Based on the inventory, all the lands within the assessment area fell into Category II and III. During the RMP revision, the public lands were put into Visual Resource Management (VRM) categories. Approximately 14,856 acres are in VRM Class II and 4,859 acres are in VRM Class III.

VRM Class II objectives are to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color and texture found in the predominant natural features of the characteristic landscape.

VRM Class III objectives are to partially retain the existing character of the landscape. The level of change to the character landscape should be moderate. Management activities may attract the attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

The lands that were not under BLM jurisdiction at the time of the RMP revision were not put into management categories, however they were inventoried. These lands will be managed per their Visual Resource Inventory (VRI) category until Visual Resource Management decisions can be made through an amendment to the RMP. Of the of acquired lands, 16,246 acres are in VRI Class II category and 8,195 acres are in VRI Class III category. Of the TNC lands that are potentially to be acquired, 16,219 acres are in the VRI Class II category and 1,862acres are in the VRI Class III category.

The same management objectives as above apply.

5.11 Wildland Fire Management

The 2021 Missoula RMP allocated all BLM lands into three Fire Management Zones (FMZ), and the assessment area includes all three (see Map 4 in Appendix C). FMZs are defined as:

FMZ1: High values at risk, or areas at high risk of catastrophic fire due to current vegetation conditions, where an unplanned wildland fire is likely to cause negative effects. These lands would generally be under a full suppression strategy. These lands are adjacent to and close proximity to the wildland urban interface (WUI), intermingled with private and state lands, and contain important cultural, recreational, economic, or biological resources. Fuels treatments including mechanical and prescribed fire will play a major role in these areas.

FMZ2: Wildland fire is desired to manage ecosystems, but there are constraints to using wildland fire. Constraints are many and vary greatly including current vegetation conditions time of year, condition of fuels, risk management, resource availability, safety, protection agency, geographical area and national wildland fire activity, and smoke impacts. Prior vegetation treatments will aid in allowing wildland fire to be utilized to manage vegetative communities, and wildland fire is needed to maintain some of these prior

vegetation treatments. The full range of fuels treatments including mechanical and prescribed fire on lands in this category will be important to the success of wildland fire management.

FMZ3: Wildland fire is desired to manage ecosystems, and there are fewer constraints to using wildland fire. In these areas, wildland fire could be allowed to play its natural role on the landscape. These lands include wilderness study areas, protected lands with wilderness characteristics, areas geographically far from values at risk, and where current vegetation conditions are favorable to meet resource objectives by carefully managing wildfire. While fuels treatments can and could occur here, management of wildfire would be the preferred treatment method.

FMZ1 (6,975 acres, 15 % of BLM) is at the southern end of the assessment area adjacent to homes, ranches, and private land, FMZ3 (12,316 acres, 28% of BLM) is on the northern boundary and FMZ2 (24,837, 57% of BLM) is in the middle.

DNRC is currently the protection agency for most lands in the assessment area including all BLM, TNC, and most Forest Service lands. The Forest Service does have some of its own protection in the upper northwest corner of the assessment area. As the jurisdictional agency, the BLM ensures that management of wildland fires is consistent with direction in the Western Montana District Fire Management Plan and the Missoula RMP.

The assessment area includes several recent designations aimed at cross-boundary wildfire risk reduction efforts. The Montana Forest Action Plan designated Areas of Risk, which cover most of the southern half of the assessment area (44,632 acres, 36% of assessment area) as well as Wildfire Adapted Missoula which covers all of the southeast corner of the assessment area (47,777 acres, 39% of assessment area). See Map 4 in Appendix C for location of these designations. BLM, TNC, USFS, UM, Blackfoot Challenge, and private landowners just finished a successful cross boundary risk reduction project in the lower Twin Creek area utilizing grant funds from the MT-Forest Action Plan.

Recently an interagency effort was completed to establish Potential Operational Delineations (POD) that included the assessment area. PODs are pre-identified lines that help during wildland fire management planning and implementation. A group of subject matter experts using tools such as snag hazard, suppression difficulty, ground evacuation time, and local knowledge of the terrain, roads, and vegetation determined the best location that would offer the highest probability of success to manage a wildland fire. These are also on Map 4 in Appendix C.

The assessment area is within the area assessed in the Missoula County Community Wildfire Protection Plan (CWPP), drafted in 2018. The Missoula County CWPP is a county level document emphasizing collaborative efforts to reduce hazardous fuels. The county level CWPP efforts are directly tied to the Healthy Forests Restoration Act of 2003 (HFRA). The HFRA effort asked communities to assume a greater role in identifying lands for priority fuels reduction treatment and proposed treatment recommendations. The CWPP defines wildland-urban interface (WUI) as a 1.5-mile zone around areas of high population density. Most of the BLM managed lands in the southern part of the assessment area are within the WUI (see Map 5 in Appendix 6). The designated WUI matches BLM's FMZ1. The CWPP has an overall rating for communities based on two subcomponents: wildfire risk and human safety factors. Wildfire risk is based on critical infrastructure, water supplies, transportation corridors, fuels, slope, and facilities. Human safety risk factors are based on population density, critical egress, and fire response

capabilities. The combination of these two risk factors establishes the overall risk rating. The overall risk rating for the residences adjacent to BLM lands in the assessment area are rated as moderate.

5.12 Lands/Realty/Access

The watershed has several Right-Of-Way access grants, as well as BLM easements on the land of neighboring organizations/landowners.

5.13 Facilities and Assets

Roads in the watershed are in the process of being inventoried and incorporated into the Facility Asset Management System (FAMS) with their existing travel management. Many roads and trails are closed year-round to motorized access (except snowmobiles in the winter) and have not seen much administrative access or maintenance. Bridges in the finished acquisition areas have been inspected and added to FAMS. The Johnsrud road has been paved and is being maintained with a chip seal in summer 2024. The recreation sites along the Blackfoot river are being maintained in the same 2024 contract and the Whitaker bridge parking area is being better delineated and graveled. Other facilities and assets within the assessment area include the boat ramp at Whitaker, several day use sites, and Thibodeau campground and water system. According to MT FWP, water sampling in the spring results in positive results for *E. Coli* due to high water every year. As a result, water isn't available at the campground until July.

Table 20. FAMS Recreation sites.

Description	Location ID	CRV	Deferred Maint.	Fci Value	Status	Uom	Uom Qty	Maint Resp	Maint Level	Condition
Thibodeau Rapids Day Use	L61103	$ 77,688	$ -	0	operating	ACR	1	BLM	Level 2	GOOD
Whitaker Bridge Day Use	L61100	$ 434,792	$ 110,556	0.25	operating	ACR	4	BLM	Level 4	POOR
Belmont Day Use	L61129	$ 83,513	$ -	0	operating	ACR	1	BLM	Level 2	GOOD
Daigles Eddy Day Use	L61120	$ 179,767	$ -	0	operating	ACR	1	BLM	Level 3	GOOD
Darrell Sall Memorial	L61119	$ 59,722	$ 88,833	1.49	operating	ACR	1	BLM	Level 3	POOR
Sheep Flat Day Use	L61105	$ 339,704	$ 56,340	0.17	operating	ACR	3	BLM	Levl 3	POOR
Thibodeau Campground	L61104	$ 738,205	$ 78,241	0.11	operating	ACR	16	BLM / Shared	Levl 5	FAIR
Red Rock Day Use	L61111	$ 106,687	$ -	0	operating	ACR	0.5	BLM	Level 3	GOOD
Riverbend Day Use	L61109	$ 161,691	$ -	0	operating	ACR	0.25	BLM	Level 2	GOOD
Blackfoot River Float in Campsites	L2127605	$ 39,136	$ -	0	operating	ACR	1	BLM	<Null>	GOOD

5.14 Lewis and Clark Trail Corridor

The 2021 Missoula RMP designated a trail corridor for the Lewis and Clark National Historic Trail (see Map 15 in Appendix C). The trail corridor set up a boundary around the trail and management objectives and guidance for the trail. Recreation use and opportunities are to be oriented toward preserving and enjoying the trail experience – wildlife viewing, floating, fishing, hunting, hiking, biking and sightseeing are compatible with those values and are to be emphasized. Forest management, road building and other

activities may occur within the corridor boundary as long as they are compatible with preserving, restoring and enhancing the key values of the Trail.

The railroad grade along the river is considered the trail for recreational purposes. Lewis and his men followed an old trail created and used by Indigenous people that meandered through the area. In the 1900s the area was heavily logged by the Anaconda Company which more than likely destroyed parts of the trail. As such a distinct trail is not visible on the ground. Further, in order to protect any identified trail segments, it was determined that the railroad grade would serve as a representative sample of the trail since it is in the general location rather than have people walking on remnants of trail. Currently the trail is not advertised in any way for public use other than a couple of signs on the gates on the railroad grade, but no other identification or information exists for the trail. In addition, a bridge is needed over Belmont Creek in order to provide a more continuous, longer experience.

As the trail administrator, the NPS is currently working on a 360 degree imagery and mapping project along the entire Lewis and Clark National Historic Trail. It is unsure what the final product will be, but they have already done this for this portion of the trail.

5.15 Socioeconomics

With the exception of a slight dip in 2020, Missoula County's population continues to grow. The population has increased by more than 25% in the last two decades. The largest racial or ethnic group is white (non-Hispanic) at 89% of the population, which is similar with the State of Montana (Headwaters 2024). The area is also seeing an increase in residents that is 65 years and older (17%). Approximately 30 percent of the population meets BLM's definition of low income, which is also similar to the State's statistics. Based on these data points, the County is not identified as an environmental justice population per Executive Order 12898. However, cities like Missoula may mask the socioeconomic conditions in the rural parts of the county, so BLM will continue to assess if any decisions are disproportionately impacting low-income or minority residents. Additionally, Tribes are considered an environmental justice population and the assessment area abuts the lands of the Confederated Salish and Kootenai Tribes.

While timber production and agriculture are still important to Missoula County, the economy has transitioned to more jobs in healthcare, education, tourism, construction and other professional and technical services. Missoula County reported that rural parts that have relied on natural resource extraction (e.g., timber) have been the hardest hit in the transition and that ways to promote economic development in remote communities is an important goal (Missoula County 2019). Montana's population growth is associated with a greater emphasis on public lands as a place where residents can recreate and find solace. Communities want healthy and resilient landscapes to support their quality of life with scenic amenities and recreational opportunities.

Chapter 6 – Potential Conditions and Trends

6.1 Geology and Mineral Resources

Under current climate conditions, the assessment area is geologically stable and does not appear prone to mass wasting or floods that would significantly change the landscape. Structural geology and geomorphology are described in Chapter 2, Section 2.1.3, and geologic history is provided in Chapter 4, under section 4.1.1. Together, these two sections from Chapters 2 and 4 describe the conditions as they relate to geology and landforms.

Section 5.1 describes how most of the public surface in the analysis area is underlain by privately owned subsurface mineral estate that is a result of BLM acquisitions over the last 25 years. A summary of this subsurface estate beneath public lands is provided in Map 12 Appendix C and Tables 27 and 28 in Appendix D. When the BLM acquired the lands within assessment area, the mineral rights to explore and develop either federal locatable (mainly metallic minerals) or leasable (oil, gas, phosphate etc.) were not. With the surface, BLM did attain "rock and gravel." Because of the availability of lands for potential acquisition within the assessment area, BLM is anticipated to continue acquiring surface estate to be manage as public lands. This trend will continue to increase the amount of complex, mixed subsurface estate beneath public lands.

Neither hardrock nor placer mine development is anticipated in the next 20 years on federal minerals. Based on the ongoing survey and sampling efforts in the last five years by one private subsurface mineral owner, WRH Nevada Properties, LLC, there may be some potential surface disturbance of public lands related to exploratory work, such as trenching or drilling. As described above, this exploratory work would not be subject to federal locatable or leasable minerals regulations due to being non-federal mineral estate. Because the BLM still has an obligation under 43 U.S.C. 1732(b) to prevent unnecessary and undue degradation, the owner or operator would likely need to obtain a special use lease, permit, or easement under 43 CFR 2920 before using the public lands to develop the private mineral estate, and the project proponent may be required to provide a financial guarantee for reclamation before commencing surface-disturbing activities.

The need for roads within the assessment area is anticipated to continue, and the use of these roads is likely increasing with the interest of recreation in the newly acquired public lands. As a result of this trend, the need for road and related infrastructure will also continue to require maintenance, and in some cases, development and repair.

6.2 Landforms, Soils, and Site Productivity

The underlying landforms and soil conditions in the assessment area are geologically stable and unlikely to see significant change in site forming factors and soil productivity within the reasonably foreseeable future.

Erosion regimes are stable, with incidental areas of high sediment production related to roads and recently burned areas. As new landscape level wildfires occur, there may be new areas of temporary soil instability and increased erosion. As BLM becomes a significant landowner in the Lower Blackfoot area with additional land acquisitions, on-going management has provided for opportunities to improve soil stability and long-term soil productivity. For example, in the Liberty Fire burned area, on-going reforestation treatments of conifer species will continue to stabilize soils as these trees mature over time. Other treatments, including weed spraying and native seeding along roads are benefiting soil stability and capturing road related erosion. As BLM continues restoration treatments in this landscape there will be additional opportunities to improve soil health and manage for anthropogenic erosion sources.

Like erosional regimes, soil health and soil productivity can often be improved with specific management treatments, including retention of coarse woody debris on hillslopes and through low intensity prescribed fire treatments to facilitate accelerated biogeochemical cycling (Graham et al. 1994, Switzer et al. 2012). These treatments can help improve soil carbon, hold additional soil moisture, and functionally release important minerals, like Calcium, Magnesium, and Phosphorus into soil systems that are relatively

deficient of these key nutrients. These treatments also make soils more resilient to greater periods of drought and low soil moisture deficits associated with climate variability into the future.

6.3 Water Resources

6.3.1 Water Quality

The BLM and MT DEQ manage for water quality using a memorandum of understanding that ensures BLM will not contribute to further water quality impairment from pollutant sources on BLM lands. Through bi-annual reporting, data shows that implementation of forestry, road, mining, and grazing best management practices are resulting in improvements to impaired waterways with causal factors from BLM lands.

6.3.2 Riparian Wetlands and Streams

PFC Trends

Where evaluated stream conditions do not meet Properly Functioning Condition standards, BLM is required to pursue remediation treatments to improve stream function. In the EAWS area, 7 streams currently were rated as "Functional-at Risk" and have opportunities for improvement of stream conditions. BLM's recommended actions for treatment for each reach are summarized in section 5.3.2, Table 8, Stream Reaches Not Meeting PFC with Causal Factors and Recommended Remediation Actions. As BLM acquires additional TNC managed lands, BLM will continue to conduct PFC surveys and evaluate stream conditions. Because these acquired lands have a heavy industrial logging road footprint, it is anticipated that new stream miles may be impacted.

Riverscape Health Trends

The "riverscape" landscape within the project area, as denoted by inactive floodplain in the Valley Bottom Extraction Tool, shows that over time there has been a downward trend in total riparian acres that are annually used; approximately 2648 acres of valley bottom lands are no longer seeing routine floodplain inundation. This reduction in floodplain activity is likely related to changes in alluvial geomorphology; impacts from anthropogenic factors such as roads and grazing can lead to destabilized stream channels that have vertical incision and disconnection from their floodplains. Changes in riverscape conditions are also likely influenced by long-term changes in annual water quantities, including changes in annual snowpack, changes in seasonal water discharge patterns, and other climatic influences like water temperatures and greater evapotranspiration. With less available water, riverscapes are prone to continue shrinking; however, opportunities exist to stabilize riverscape water holding capacity and even increase floodplain extent.

6.3.3 Hydrology

Stream conditions such as PFC ratings and impacts from roads are closely tied to management; these conditions are considered relatively stable pending adjustments in management. Historic water discharge data for the Blackfoot River at the USGS gage at Bonner, MT shows that the seasonal runoff for the river is peaking much earlier than the 88-year historic peak; in 2023 the peak discharge occurred almost one month ahead of this historic norm, in early May rather than June (Figure 19). The river is also reaching base flow conditions earlier in the season and seeing earlier spikes in river temperatures.

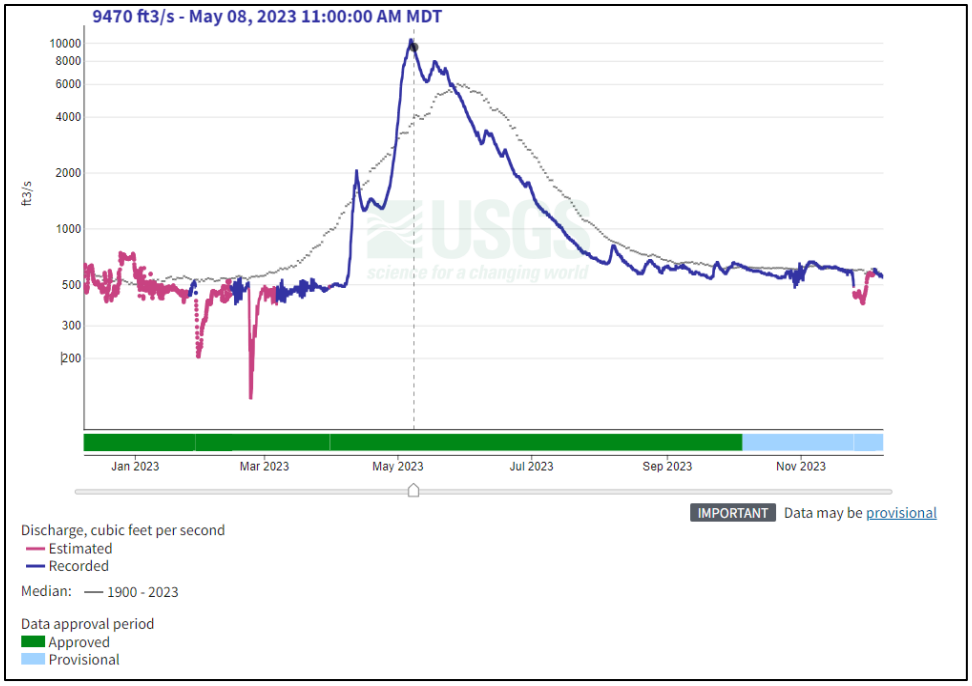


Figure 19. USGS annual discharge data for the Blackfoot River near Bonner, Montana. Data shows that the 2023 peak run off (blue line) occurred much earlier than the historic median (grey line).

6.4 Vegetation

6.4.1 Forest Vegetation

Potential Conditions for Forest Vegetation are described in terms of Natural Range of Variability (NRV) which provides a window for understanding the set of conditions and processes that historically sustained ecosystems and biodiversity and provides a reference against which to evaluate current ecosystem trends. (Aplet 1999, Morgan et. al. 1994).

Appropriate disturbance should be restored or emulated by vegetation management across the EAWS landscape. As stated by Harvey and Morgan (2001), "A continuing lack of appropriate disturbance is probably the greatest single threat, with the possible exception of more exotic pests, to the future sustainability and productivity of interior western forests." Arno and Fiedler (2005) suggest that fire suppression has led to a reduction or "loss" in biological diversity while creating homogenized conditions across the forest landscape. Treatments should be designed to emulate historic non-lethal to mixed severity fire regimes in natural patterns. For example, thinning and removing seedling/sapling and pole sized Doulgas-fir or other shade tolerant trees species would create the same outcome in terms of growing space and residual tree species that would occur during a naturally occurring fire cycle. If lack of appropriate disturbance continues, seral species will eventually be unable to produce seed or seed germination sites will be unavailable. This would exacerbate the trend of more Douglas-fir across the landscape. The management approach to reintroduce fire aligns with the Missoula RMP Forest Vegetation Goal to "Restore or maintain forests within the natural range of variability (NRV) for each habitat type group in terms of species composition, structure, density, and disturbance patterns. Emulate disturbance patterns in terms of intensity, frequency, and scale."

Continued disruption of fire regimes from historical intensity and frequency will allow understory coniferous trees to out compete the older, overstory trees for both moisture and nutrients. This

competition increases stress on the larger diameter trees creating higher susceptibility to insect and disease, as well as lower resistance to fire stress even from low and moderate intensity fires that historically occurred within these types (Arno and Fiedler 2005). Restoration of historic fire disturbance cycles in the low to mixed severity fire regimes will require cooperative effort with multiple landowners to develop the appropriate level of disturbance within the temporal and spatial scales to reduce understory conifer density, increase the biodiversity of the understory forb, graminoids and shrubs while minimizing stress to the older overstory.

The BLM will continue to implement vegetation treatments from the 2017 Lower Blackfoot Corridor Ecosystem Maintenance, Forest Restoration and Fuels Reduction EA and the 2020 Belmont Gold Forest Restoration and Fuels Reduction EA. TNC also has several ongoing vegetation management projects that will continue.

6.4.2 Rangeland Vegetation

The potential of natural vegetation of rangelands is limited to soil type, precipitation, slope and aspect. Each soil type supports characteristic native vegetation which comprises of grasses, forbs, and shrubs that make up most of the Potential Natural Community (PNC). Comparing current species composition with the Natural Resources Conservation Service Soil Survey, PNC listings can assist in determining approximate seral stage of each sampling plot. Listed below are some examples of common soil types for rangeland in the Blackfoot watershed and displays expected species composition under PNC conditions.

Grassland communities will vary in species composition throughout the years resulting from human and natural events. In association with these events, species composition will remain in a state of flux.

Monitoring livestock grazing levels along with best management practices are strategies to manage resources and promote ecological and economic sustainability. Some slight changes in livestock management may be implemented to assist in the progression or continue to meet rangeland standards and guidelines. Ideal conditions would be to maintain native grassland communities in mid to late seral stage.

Table 21. NRCS Soil and Plant Relationship.

Soil Type	Plant Species	Percent Composition
25 Winkler	Bluebunch wheatgrass	20
	Arrowleaf balsamroot	15
130 Winkler	Elk sedge	15
	Pinegrass	10
131 Winkler	Common snowberry	5
	Idaho fescue	5
	Rough fescue	5
	Heartleaf arnica	2
	Saskatoon serviceberry	2
	Oregon grape	1
	Rocky mountain juniper	1
	Skunkbush sumac	1
	White spirea	1

6.4.3 Special Status Plants and Habitat

Though Howell's gumweed has been found in no more than 7 locations within the analysis area, it could very easily establish along road systems and other disturbed areas. According to the Montana Natural Heritage Program's 2022 Predicted Suitable Habitat Modeling done for Howell's gumweed, more than 75% of the EAWS area is considered either low or moderately suitable habitat. 47% is considered moderately suitable habitat while only 7% of the EAWS area is considered not suitable. If Howell's gumweed does establish in the Lower Blackfoot Watershed, it will likely come into contact with curlycup gumweed and could possibly hybridize. Studies are needed to understand the genetic distinctness of the two species.

Camas and bitterroot could continue to be negatively affected by habitat alteration. Activities contributing to habitat alteration include grazing, forest management, fire suppression, introduction of non-native plants, road construction, and plant community fragmentation. Competition with non-native plants is the biggest challenge for camas and bitterroot in the Lower Blackfoot. BLM treatments such as prescribed burns, weed treatments, riparian restoration, and thinning should benefit both camas and bitterroot habitat.

6.4.4 Noxious Weeds

Noxious weeds will continue to spread at the current rate if human activity remains at the current level. An increase in human activity would increase the spread of noxious weeds.

Vehicular traffic has been found to increase the spread of noxious weeds. This transport may result in deposition of seeds in areas where noxious weeds did not previously exist, this is especially important on newly acquired lands as many previously closed roads could be opened to public increasing the likelihood of weed spread. This would contribute to an overall increase in noxious weed spread within the assessment area.

Ongoing weed management activities are expected to reduce the current noxious weed population along the roadsides and high public use areas, also monitoring of un-infested roads will reduce the chance of noxious weed invading into "weed free" areas. Biological control will continue to be used in areas that can not be easily reached, over time biocontrol will start to decrease noxious weed populations and density. Noxious weed education efforts directed toward land managers, private landowners, and the general public can play a vital role in the prevention, detection, and inventory components of integrated weed management. Education efforts directed toward the general public would serve the purpose of creating both awareness and concern over the threat of noxious weeds.

6.5 Forest Resources

The forest products industry in Western Montana includes multiple manufacturing centers for dimensional lumber, post and rails, firewood and paper chips. This existing wood products manufacturing infrastructure enables managers to utilize local markets and product values to reduce the cost of forest restoration treatments, and to leverage those goods to get acres treated without additional appropriated funding. Several sawmill closures in recent years (in Townsend, MT in 2020, St. Regis, MT in 2021 and Livingston, MT in 2023) have proven that the industry is surviving but not thriving (the sawmill in Livingston has since been bought but remains inactive). To a degree the mill closures can be attributed to natural attrition as the timber supply which has been dropping since the early 1990s, normalizes and the market adjusts. It is also indicative of a shift in public values from extractive resource production to conservation of natural resources.

As stated in the Montana Business Quarterly:

> *In 2000, wood and paper jobs were 28 percent of the state's manufacturing employment and 31 percent of labor income. In 2016, only 13 percent of jobs and 11 percent of income was generated by wood products manufacturing.*
>
> *The long decline of the wood products industry in Montana began in response to vigorous harvesting from the 1960s through the 1980s. Public campaigns to protect forest habitats, water and soil quality, and endangered species became national news.*
>
> *In response, the U.S. Forest Service and the Bureau of Land Management drastically reduced timber harvests on federal forests nationwide – nearly every western state was affected. Montana's total timber harvests retreated from 1.3 billion board feet in 1987 to less than 300 million board feet in 2016. In the same time period, lumber production fell from 1.6 billion board feet to barely 500 million board feet, and wood product sales declined from $1.8 billion to less than $565 million* (Smith et al. 2018).

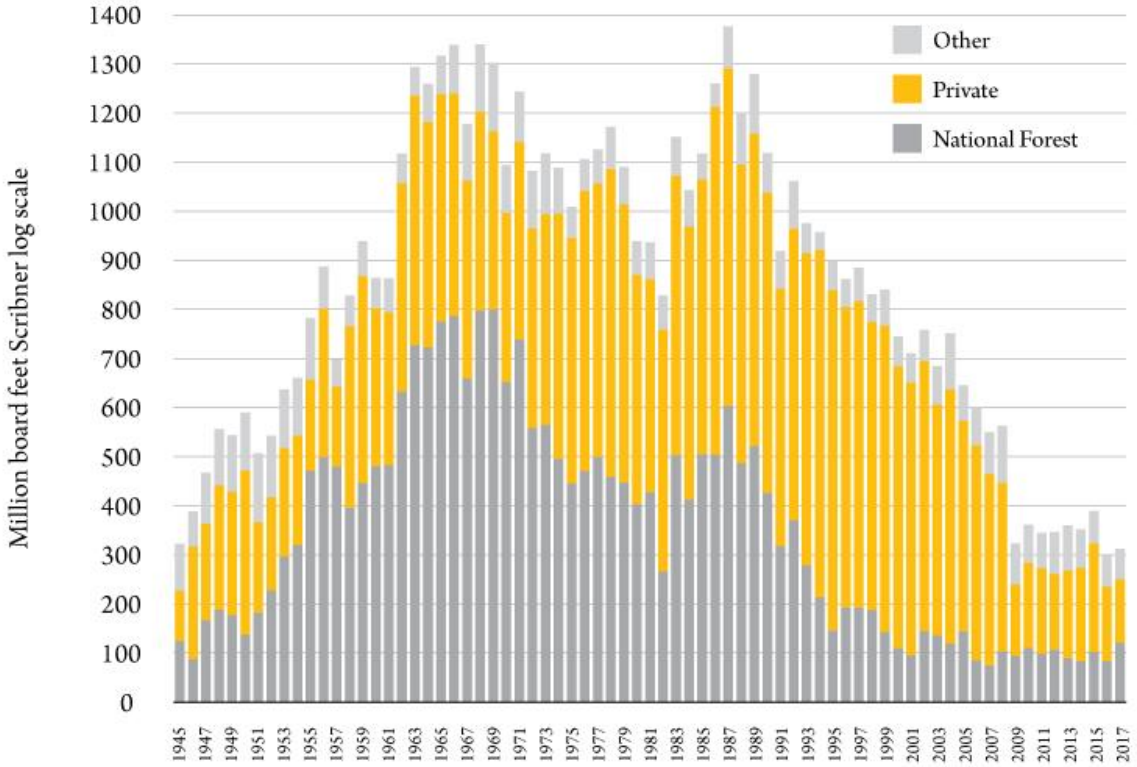


Figure 20: Montana timber harvest by ownership, 1945-2017. (Morgan et al. 2018)

Because of those increased uses and expectations, forest resource production remains a necessity in the near-term (10 – 50 years) as well as the long-term (50 – 100 years). Forest resiliency and management

toward midpoint NRV as discussed in the Forest Vegetation section as well as fuels reduction as discussed in the Wildland Fire Management sections requires use of large equipment and skilled operators. The cost associated with these treatments were it to be fitted solely by the agency would be upwards of $1500 - $2000 per acre (based on recent solicitations), meaning that to treat even 25% of the BLM managed lands in the study area would cost many millions of dollars (50,000 acres / 4 = 12,500 acres, * $2,000 = $25,000,000). Whereas with the current vibrant forest products industry, those costs per acre can be cut in half or even more by utilizing the value of the material. Additionally, the markets encourage treatments on private lands where financial constraints are likely even greater than on public lands, and the operators have a greater pool of work to remain solvent. Without a viable and vibrant forest products industry in Western Montana, forest restoration would not be possible now, or in the future.

Newer, developing forest resource markets include carbon offsets or credits which can be bought and sold, and at least one forest owner in the assessment area (The University of Montana's Lubrecht Experimental Forest) has taken steps in that direction. This may be an area explored going forward by the BLM, especially in areas where traditional products cannot be produced, such as Wilderness Study Areas or areas otherwise prohibited from timber harvest. The carbon credits for such areas could be sold with the true assertation that those trees would not be harvested.

6.6 Terrestrial Wildlife and Habitat

The goal is to restore ecological integrity within the natural range of variability, reduce and/or eliminate adverse effects associated with past human disturbances, and maintain social and economic integrity. Latest management standards and guidelines for the habitats of Threatened species including Canada lynx, grizzly bear and wolverine as well as big game habitat needs will help inform vegetation management. Needs of other Special Status Species (SSS) including bald eagle, golden eagle, flammulated owl, gray wolf and western bumble bee will further inform management decisions. These management decisions could include recreation, travel management, mineral development and range management. Managing the assessment area under this approach should provide sound management for all terrestrial wildlife.

Habitat Type Group 1 -2: Warm and Dry Douglas-fir & Moderately Warm and Dry Douglas-fir

The goal is to restore open-grown savannah-like conditions and to reduce the adverse effects of potential catastrophic wildfire. Timber harvest, pre-commercial thinning, prescribed fire, road decommissioning, and weed reduction are the primary treatments necessary to accomplish desired future conditions. Grizzly bear, American wolverine, Canada lynx, and big game habitat would be managed to restore and enhance vegetation conditions. This is especially important to conservation and recovery of the grizzly bear, American wolverine and Canada lynx. Although these habitat types do not provide preferred denning habitats of these species, they do provide connectivity to suitable denning habitats and important foraging opportunities. These habitat groups make up some of the designated Critical Habitat for Canada Lynx. Winter range for elk, deer, and to some extent moose would be enhanced.

Habitat Type Group 3: Moderately Cool and Dry Douglas-fir

The goal is to reduce tree density and reestablish species composition, structure and age to within the historic range of variability and to reduce the adverse effects of past human disturbances and potential catastrophic wildfire events. Tree thinning, prescribed fire, road decommissioning, and weed reduction are the treatments necessary to accomplish desired future conditions. Grizzly bear, wolverine, Canada lynx, and big game habitat would be managed to restore and enhance vegetation conditions. This is especially important to conservation and recovery of the threatened grizzly bear, American wolverine and

Canada lynx. This habitat type group is within the designated Critical Habitat for Canda Lynx. Summer and winter range for elk, deer, and moose would be enhanced.

Habitat Type Group 4: Cool and Moist Subalpine fir

The goal is to reestablish ecological succession by creating spatial and temporal arrangements of early, middle, and late forest succession stages and to reduce the adverse effects of past human disturbances and potential catastrophic wildfire events. Thinning, prescribed fire, road decommissioning, and weed reduction are the treatments necessary to accomplish desired future conditions. Canda lynx, grizzly bear, wolverine and fisher habitat would be managed to restore and enhance vegetation conditions. This habitat type group is within the designated Critical Habitat for Canda Lynx and is particularly important because it can provide denning and preferred foraging habitats for lynx. With forestry treatments, the current condition can be shifted to multi-aged forests with complex structures and dense horizontal cover required by the Canada lynx. Summer range for elk and deer would be enhanced. Summer/winter range for moose would be enhanced.

6.7 Aquatic Species and Habitat

6.7.1 Aquatic Habitat

The overall health and function of aquatic habitats depends on riparian conditions adjacent to streams and wetlands, conditions in headwater and tributary streams, as well as in-stream elements like large woody debris (LWD), temperature, hiding cover, pool frequency, and substrate composition. Well-developed riparian habitat (undergrowth and canopy) along streams are natural buffers against sediment runoff and environmental toxins, provide shade that reduces the amount of solar radiation streams receive (i.e., lower temperatures), and provide a source for LWD inputs to streams. It is important to examine the combination of these elements to predict potential conditions and future trends in the assessment area.

The Missoula RMP requires a riparian habitat conservation area (RHCA) with a 300-ft slope-distance along each side of fish bearing streams and a 150-ft buffer on non-fish-bearing streams, wetlands, lakes, ponds, and reservoirs for any management activities with allowable modifications based on site-specific, project-level analysis. These widths are adequate to protect streams from non-channelized sediment inputs and sufficient to allow for properly functioning riparian processes, including delivery of organic matter and LWD to streams, stream shading, and bank stability. Therefore, few anthropogenic management activities are likely to occur in RHCAs that would adversely affect future supplies of LWD or stability of stream habitats on assessment area streams.

Livestock grazing does have some potential to adversely affect riparian habitat in the assessment area. Game Ridge Creek, which has a low volume of water flow and has no surface connection to any other stream, is the most vulnerable fish bearing stream in the assessment area within a grazing allotment. Riparian habitat on Game Ridge Creek, and subsequently aquatic habitat, will continue to degrade if livestock management does not implement changes to make improvement. Belmont Creek is the only other fish bearing stream within an allotment in the assessment area and receives little to no impacts from livestock grazing.

Natural occurrences, such as wildfire, could have adverse effects on aquatic habitat and vertebrates in the assessment area, but it is challenging to predict the likelihood and severity of effects to stream channels should fire occur, and the effects on stream inhabitants is challenging to measure. For some aquatic vertebrates, like the Rocky Mountain tailed frog, the initial effects of wildfire may be negative, but

populations can quickly recover to pre-fire conditions (Hossack and Honeycutt 2017). Fires could affect future supplies or rate of input of LWD which would in turn affect stream structure such as the number and size of pools and substrate sorting. Fires in the assessment area could also destabilize soils, leading to erosional events and increased sediment loads to streams. Increased water temperatures due to increased solar radiation because of reduction of streamside vegetation can persist for many years after fires, especially in areas that are severely burned (Dunham et. al 2007). However, parts of the assessment area, including much of Gold and West Fork Gold Creeks, were heavily affected by the 2003 Mineral Primm Fire resulting in consumption of much of the available fuel. These areas should be less susceptible to drastic effects from fire, at least for the near future.

The overall condition of aquatic habitat in the assessment area has been trending in a positive direction since purchase by TNC—and now by BLM—after over 40 years of high intensity forestry practices. In 2023, the BLM designated 21 Restoration Landscapes focused on ecosystem restoration that will create or maintain upland and aquatic intactness and connectivity; ensure proper watershed function; support the growth and maintenance of native plant communities; and limit or mitigate disturbance (the assessment area is within the Blackfoot-Clark Fork Restoration Landscape). The goal of Restoration Landscapes being to improve the health of these places to better provide clean water, habitat for fish and wildlife, opportunities for recreation, and more resilience to wildfire, drought, and climate change. Specifically for aquatic habitat, positive improvements might be seen as lower sediment loads, increased stream complexity in the form of higher frequency of pools, sufficient amounts of LWD and potential LWD, and stable or cooler water temperatures. With proper management guidelines and practices, and a focus on restoration, the positive trend in aquatic habitat health is likely to continue.

6.7.2 Aquatic Species

Improvements to aquatic habitat have potential to increase biomass and abundance of fish species currently occupying assessment area streams. Increases in factors such as hiding cover, numbers of pools, and quality spawning and rearing habitats could lead to higher fish densities, more mature populations, and greater reproductive success. These habitat improvements have potential to promote native fish, but also may promote less desirable non-native fish species.

Bull trout populations in assessment area streams have shown significant declines over the last 15 years, except for in the Blackfoot River which has a stable but low-density population. Bull trout populations in Gold and West Fork Creeks are close to extirpation and the Belmont Creek population is very low density based on recent data (Uthe et al. 2021). Redd count data from these streams suggest that migratory bull trout are likely already extirpated from these systems (Uthe et al. 2021).

The bull trout that remain are mostly composed of isolated populations of resident fish with little or no genetic flow among populations. Isolated populations are more vulnerable to extinction from stochastic (i.e., random chance) events, such as wildfire (Rieman and McIntyre 1993). It is uncertain if the life history tendencies (migratory versus resident) of bull trout are genetic or if the loss of migratory bull trout populations is the result of pressures against the migratory life-form through habitat fragmentation. Nelson (1999) demonstrated that outmigration by juvenile bull trout is rare in exclusively resident bull trout populations. Hence, the potential for reestablishing migratory type bull trout from resident populations is low or, at least, a very slow process. It is likely that bull trout populations in the assessment area will continue the downward trend without some form of augmentation. And as cool water is essential for survival of juvenile and adult bull trout, if the climate continues to warm in the near term, cool water

refugia in high elevation headwater sections will become even more critical refugia for maintaining bull trout populations (Pierce et al. 2019).

Populations of westslope cutthroat trout (WCT) are likely more stable in the assessment area than those of bull trout. Despite declines in range-wide distribution and abundance relative to historical conditions, WCT remain widespread, and conservation actions beginning in the early 1990's in the Blackfoot have contributed to stabilizing and even increasing populations in portions of the assessment area (Shepard et al. 2005, Uthe et al. 2021) (Figure 21).

Non-native fish will likely continue to be the biggest potential threat to WCT populations looking forward (Behnke 1992, Shepard et al. 1997). Non-natives such as rainbow, brown, and brook trout can out-compete WCT for breeding and feeding resources (Seiler and Keeley 2009, Muhlfield et al. 2009a). Interbreeding between rainbow and WCT leads to declining stocks of genetically pure native populations and lower fitness of WCT (Allendorf and Leary 1988, Muhlfield et al. 2009b). Headwater stream sections existing above barriers to upstream movement of fish (e.g., small dams and waterfalls) may provide WCT with refugia from competition with non-natives into the future. These more isolated stream areas offer opportunities for natives to persist, but this may require monitoring and management to maintain as risks remain. For example, in upper Belmont creek, a stream section above a waterfall where WCT appear to thrive, brown trout have been detected above the falls and could potentially impact this WCT population in the future (see Figure 14). Populations in streams of the assessment area that lack sufficient barriers to incursions from non-natives may obviously be more susceptible to impacts from non-native fish. For example, in Gold Creek brook trout have become more common in the upper reaches while WCT have declined, and this trend may continue (see Figure 21).

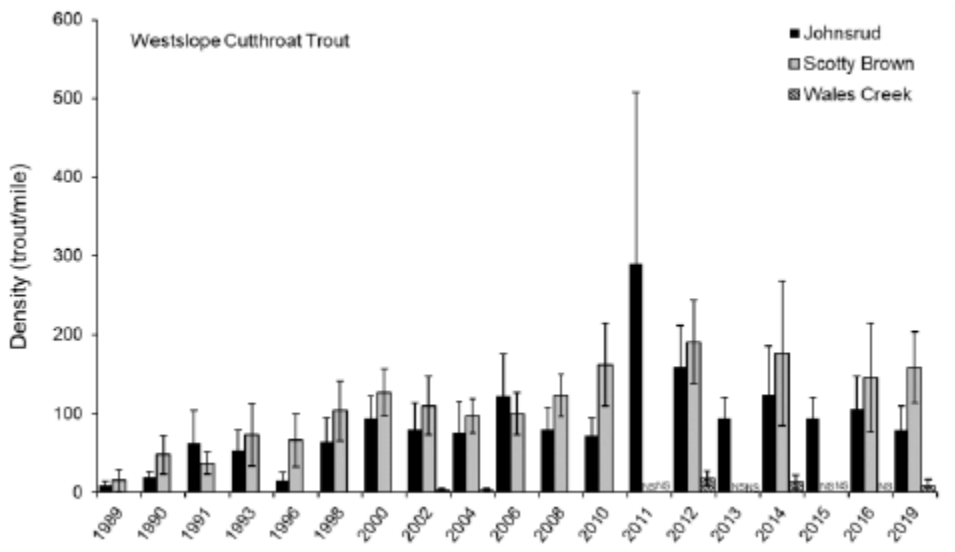


Figure 21 Densities of westslope cutthroat trout observed by Montana Fish, Wildlife, and Parks in sections of the Blackfoot River and Wales Creek from 1989 through 2019 (from Uthe et al. 2021).

The trend in populations of western toad in the assessment area is mostly unknown because of the lack of long-term data from the immediate area. However, populations of western toads in other locations in

western Montana have experienced declines in recent years (e.g., McCaffery et al, 2021). And even with benefit from management protections such as RHCAs, toads in the assessment area could still be at risk from unknown stressors as western toad populations even in protected areas may experience declines in occupancy. Hossack et al. (2015) investigated trends in wetland occupancy by pond breeding amphibians in Yellowstone and Glacier National Parks from 2002–2011. They found that western toads experienced a decline in occupancy of wetlands in Yellowstone National Park during monitoring period. On the contrary occupancy of wetlands by toads remained similar or slightly increased in Glacier National Park during the same period.

The Rocky Mountain tailed frog inhabits some streams of the assessment area. Anecdotally, and though not specifically targeting the species, few Rocky Mountain tailed frogs were found during stream habitat surveys. This species prefers a similar thermal niche as bull trout and may be sensitive to increasing temperatures (Hossack et al. 2013). Because of this, head water reaches with cool water will remain important for the stability of this species.

Other amphibian species in the assessment area are the Sierran tree frog, Columbia spotted frog, and long-toed salamander. The eastern edge of the Sierran tree frog's range is near the assessment area and it is relatively uncommon in the assessment area, being observed at only 5 locations. Hence, in the assessment area, the BLM may have a part in monitoring for changes to the boundaries of this species' range. The Columbia spotted frog and long-toed salamander are common in the assessment area and are widespread in the surrounding regions. However, declines in both species have been documented in the northern Rocky Mountain region. Specifically, occupancy of wetlands by long-toed salamanders and Columbia spotted frogs declined in Glacier and Yellowstone National Parks, respectively, over the period of 2002–2011 (Hossack et al. 2015). Interestingly, occupancy by Columbia spotted frogs increased in Glacier National Park over the same time period. Abundance and occurrence of these species across a landscape—and amphibians in general—are highly dependent on the amount of available breeding habitat, which may be altered by the presence and abundance of beavers whose dams can increase the amount of habitat available to amphibians (Hossack et al. 2015).

Beaver populations in the assessment area appear to be trending in a positive direction. It is difficult to determine the year-to-year variation of the family group populations located in the large beaver complexes on Gold and West Fork Gold Creeks, but they appear stable and potentially expanding. Construction of beaver dam analogues (BDA) by the BLM and TNC in the assessment area has the potential to encourage the expansion of nearby individuals to build in this new habitat and this effort may have already paid off. The BLM and TNC installed BDAs on a section of Wild Horse Creek in 2022 and 2023. Anecdotally, BLM staff observed beaver working in the area of these new BDAs during summer of 2023. Populations of beaver in Belmont Creek appear to be growing, with the recolonization of two historic locations in the last 4-5 years. Recolonization of beavers in Belmont Meadows follows installment of large-scale LWD in the stream channel by BLM during 2003 and 2004. Further potential for beavers to expand in the assessment area is high. BLM staff estimate 72 beaver dams are currently established in the assessment area and computer modeling suggests the area can support roughly 880 dams (see section 2.3.2, Riparian Wetlands & Streams). Though the benefits to increases in beaver populations are many, one likely outcome would be an increase of habitat opportunities for amphibians and potential increases in amphibian abundance.

6.8 Cultural Resources

Potential Conditions

There are 52 previously known and recorded sites within the Lower Blackfoot EAWS area. Additional cultural resource inventories will need to be conducted within the EAWS area as various undertakings are proposed and new lands are acquired. Previous inventories that have expired or are not up to Class III standards will need to be updated. It is expected that with additional and updated inventories that the number of cultural sites within the EAWS will increase. Although industrial logging has significantly disturbed the ground surface in areas of high probability for cultural sites, there is potential for project work, including road improvements and construction, road material procurement, and mining activities to reveal subsurface components relating to Indigenous use of this landscape.

Potential Trends

It is anticipated with the acquisition of privately held lands public use will increase within the Lower Blackfoot assessment area. This trend may increase impacts to cultural sites from recreationists particularly along the river corridor. Increased visitation may require outreach to educate the public and raise awareness about the Aboriginal and historic use of the area. This could be achieved through educational outreach efforts. An additional trend includes increased wildfire activity. A strategy is needed to protect cultural sites from damages associated with wildfire and associated suppression activities. In addition, a post burn inventory strategy would facilitate further identification of cultural resources.

As former private timberlands are acquired into federal ownership and Indigenous people have improved access for treaty rights, there may be increasing presence of Indigenous people for activities such as camping and harvesting wild foods. This improved access opens the door to opportunities for Indigenous people to reconnect with Indigenous lands and share traditional knowledge.

6.9 Recreation

It is likely that recreation will continue to be a significant resource in the assessment area. In BLM's Public Envisioning for the Lower Blackfoot Ecosystem (Kearns and West 2023), the public brought forward a desire for highly developed recreation experiences as well as quiet experiences focused on solitude.

More consistent data needs to be collected pertaining to recreation use in the assessment area. Areas of the western portion of the assessment area have greater proximity to Missoula with easy access points off of Highway 200, which could make it highly desirable place to use as it moves into public lands. Also, a monitoring plan needs to be developed as stakeholders have raised a concern that this area could be "loved to death" which has happened in other high use recreational areas. Additionally stakeholders request that potentially conflicting recreational activities (e.g., motorized trails vs equestrian trails) be located in different areas.

6.10 Visual Resources

There is a potential need to start managing the use of signage in order to prevent sign clutter as well as to ensure adequate, appropriate and consistent messaging. Signs can detract from the visual characteristics of the area. Thoughtful and coordinated sign/interpretation efforts need to be done.

The opportunity exists to improve the visual quality of this area through future forest management activities, road rehabilitation and weed management. In particular, forestry projects will create a more natural range of variability of tree species unlike the current, even-aged stands that exist on the landscape currently. Road rehabilitation will reduce the road and skid trail scars on the landscape, as well.

6.11 Wildland Fire Management

The assessment area will continue to experience wildland fires. Recently discussions have started over protection exchange in western Montana. The current protection agency delineations were determined in the 1980s, and reflect the land ownerships and jurisdictions from that time. Since that time 500,000 acres of former private industrial timber lands that were protected by the DNRC have moved into federal and state ownership. In some places the protection agency from the 1980s doesn't make sense anymore in terms of efficiency, closest resources, and management direction. It is likely that these discussions will lead to protection exchanges and delineations that better match current ownership and jurisdiction.

It is likely that the Potential Operational Delineations (POD) in the assessment area will have some sort of treatment along them so that they are more effective in the management of wildland fires.

6.12 Lands/Realty/Access

Public access has rapidly increased over the last decade as people look to find more recreational experiences. More road and backcountry traffic are to be expected in this area.

6.13 Facilities and Assets

The recreation sites along the Blackfoot River are all getting overdue maintenance. All assets require routine maintenance, or they will fall into disrepair and have consequences of varying degrees. With new recreation sites and opportunities being developed more maintenance will be required.

6.14 Lewis and Clark Trail Corridor

This section of the Lewis and Clark trail will likely attract the same visitation and interest as it has in the past.

6.15 Socioeconomics

The city of Missoula continues to be the focal point of population growth, although communities adjacent to the city are also seeing some growth. The State projects that the County will see a 14% population increase (~16,000) from 2020 to 2030, while Montana is expected to grow about 10% (MT CEIC, 2024). The growth in an aging population may require consideration of how to support senior recreational activities (e.g., motorized access to hunting grounds; handicap accessible river access).

BLM land management objectives are designed under a multi-use framework, which often sets up potential conflicts given the local population's differing views on resource use (e.g., resource development vs resource protection; motorized vs quiet recreation).

Both the Missoula RMP (USDI-BLM 2021) and the Public Envisioning for the Lower Blackfoot (Kearns and West 2023) provides more information about different stakeholder interests. One key outcome from the Visioning was a shared perspective by participants to create public land connectivity, to heal the land for wildlife and fish habitat, expand recreational opportunities and support a working lands approach.

Chapter 7 – Management Recommendations

7.1 Geology and Mineral Resources

Based on field observance, the road system of the assessment area is not subject to significant issues resulting from surface water runoff, erosion, or slope stability. As described in section 2.1.2, the argillite and siltite of the McNamara, Mount Shields, and Snowslip Formations are the best for roadbuilding. The red argillite is better than the less durable green argillite. The Shepard Formation is the most erodible rock unit in the assessment area and weathers readily, forms dusty roads, and can be a source of sedimentation in adjacent streams (Lewis 1998b). Along faults and flat areas, the Bonner Quartzite weathers to clay-rich soils, which is not conducive to roadbuilding. Alluvial and glacial outwash in deposits outside of riparian areas are recommended for development to support road maintenance. To support western road systems within the assessment area, the most likely source of gravel and boulders would be along Gold Creek Road, just below 7-mile Bridge before the valley widens. On the eastern side of the assessment area, the area of the old TNC cache site is located on glacial outwash and outside of riparian and could also be developed as a source of mineral materials.

The 2021 Missoula Resource Management Plan provides emphasis on historic features and trail experience within the Lewis and Clark National Historic Trail corridor (0.5 mile buffer, about 6,830 acres). The corridor is not closed to mineral material development but is subject to VRM class II restrictions and most development would be avoided.

7.2 Landforms, Soils, and Site Productivity

Soil management is guided by the Missoula Resource Management Plan and includes references to the Federal Land Policy and Management Act to "maintain soil productivity." The RMP includes goals to manage for nutrient cycling and energy flow to attain and support healthy biotic populations and communities (SWR – G- 2, Missoula RMP 2021), and support soil water infiltration, soil and plant productivity, and soil moisture storage in balance with normal "climate and landform" (SWR – G -1, Missoula RMP 2021). The plan also provides management actions to maintain soil productivity and develop restoration treatments to correct soil problems (SWR – MA -14). For the Lower Blackfoot EAWS area, meeting those objectives includes opportunities to continue information gathering and monitoring of soils and pursuing a suite of soil restoration treatments.

Information and Monitoring Recommendations:

- Support additional landform mapping efforts with NRCS to determine common operating picture with best available data across all federal ownerships.
- Continue to monitor recently burned areas for mass wasting events and any needed triage treatments, especially within the 2017 Liberty Fire burned area.
- Continue field identification of sensitive soil locations during project layout for vegetation management activities and rangeland health surveys.

Soil Productivity Recommendations:

- Support soil productivity improvement projects including treating compacted soils, reducing anthropogenic factors that accelerate erosion, and managing for improvements to soil organic matter. Priority efforts should include:

- Road and skid trail decommissioning to improve soil-water infiltration.
- Recreation site delineation of high use dispersed recreation sites, focusing on Gold Creek dispersed camping areas to minimize off road access.
- Complete landing rehabilitation projects on landings and pile burning locations, prioritizing projects within riparian conservation areas (Cow Creek, Belmont Creek, and Dunnigan areas). Projects can include slash removal/dispersal, weed spraying, mechanical soil decompaction, seeding, and tree planting/shrub planting.

7.3 Water Resources

7.3.1 Water Quality

Water quality in the project area has continued to improve through habitat conservation and TMDL management since the 1990s. Recent reports have removed TMDL listed streams in the EAWS analysis area from the 303d list and are no longer considered impaired by Montana DEQ standards. To continue making improvements related to water quality and impairment sources, BLM recommends continuing to pursue reduction of sediment sources, including considering road decommissioning and stream crossing upgrades. Additionally, continued additions of woody material through restoration projects, either low-tech process-based restoration or excavator designed large wood jams, will continue to help manage fluvial erosion and deposition regimes over time.

For water rights and water utilizations, BLM recommends continuing efforts to validate water uses, which were last updated in 2012, and to manage for aquatic habitat and instream flow where feasible.

7.3.2 Riparian Wetlands & Streams

Properly Functioning Condition Recommendations

The summary of current PFC ratings and conditions for the EAWS area that are not currently meeting PFC is available in section 5.3.2 “Table 8. Stream Reaches Not Meeting PFC with Causal Factors and Recommended Remediation Actions” and includes existing documented causal factors and opportunities for site specific remediation are included.

In the majority of the assessment area, stream conditions meet the standards of Properly Functioning Condition and management should continue to support healthy riparian conditions through the use of Riparian Management Objectives and project design features for lotic and lentic areas.

Riverscape Health Recommendations

Using the Valley Bottom Extraction Tool and through knowledge of the existing riparian extent, valley bottom restoration opportunities were identified for large-scale riverscape health improvements. In the EAWS area, there are many opportunities for riparian expansion across all land ownerships. Table 22 summarizes historic and current valley bottom conditions and the opportunities for restoration by HUC12 sub-watersheds and ownership within the project area.

Table 22. Restoration Opportunities for HUC12 sub-watersheds by Ownership from Valley Bottom Extraction Tool analysis.

Land Manager	Sub-Watershed (HUC12)	Historic Extent	Current Extent	Percent of Riverscape Currently Active	Inactive Floodplain Acres (Restoration Opportunity)
BLM	Blackfoot River-Lost Prairie Cr	10	3	32%	7
	Fish Creek-Blackfoot River (Woodchuck)	83	44	52%	40
	Blanchard Creek	20	13	64%	7
	Buck Creek-Blackfoot River	1135	740	65%	395
	Lower Gold Creek	139	97	70%	42
	Belmont Creek	378	284	75%	94
	West Twin Creek-Blackfoot R.	17	14	81%	3
	Lower Union Creek	52	42	82%	9
	BLM Subtotal	*1833*	*1236*	*67%*	*597*
Forest Service	Lower Gold Creek	83	35	42%	48
	West Fork Gold Creek	387	240	62%	147
	Upper Gold Creek	537	374	70%	163
	Belmont Creek	67	48	71%	19
	Buck Creek-Blackfoot River	14	11	78%	3
	West Twin Creek-Blackfoot R.	131	116	88%	15
	Forest Service Subtotal	*1224*	*829*	*68%*	*395*
Private	Lower Elk Creek	60	24	40%	36
	Blanchard Creek	30	12	42%	17
	Fish Creek-Blackfoot River (Woodchuck)	71	32	44%	40
	Blackfoot River-Lost Prairie Cr	38	17	46%	21
	West Twin Creek-Blackfoot R.	165	78	47%	87
	Lower Union Creek	313	160	51%	153
	Buck Creek-Blackfoot River	1346	707	53%	639
	Lower Gold Creek	37	21	57%	16

Land Manager	Sub-Watershed (HUC12)	Historic Extent	Current Extent	Percent of Riverscape Currently Active	Inactive Floodplain Acres (Restoration Opportunity)
	Private Subtotal	*2063*	*1054*	*51%*	*1009*
State - DNRC	Fish Creek-Blackfoot River	26	14	52%	13
	Lower Union Creek	112	59	52%	54
	Lower Gold Creek	7	4	64%	3
	Belmont Creek	18	12	68%	6
	Lower Elk Creek	3	2	72%	1
	West Twin Creek-Blackfoot R.	3	2	73%	1
	MT DNRC Subtotal	*172*	*96*	*55%*	*77*
Lubrecht Experimental Forest U of M	Buck Creek-Blackfoot River	272	169	62%	102
	Lower Elk Creek	78	38	49%	40
	Lower Union Creek	61	33	55%	27
	Lubrecht Subtotal	*410*	*241*	*59%*	*169*
The Nature Conservancy	Belmont Creek	27	19	72%	7
	Fish Creek-Blackfoot River (Woodchuck)	5	2	44%	3
	West Fork Gold Creek	176	86	49%	89
	Upper Gold Creek	267	137	51%	130
	Lower Gold Creek	277	153	55%	124
	West Twin Creek-Blackfoot R.	194	129	66%	65
	Blanchard Creek	10	8	79%	2
	Buck Creek-Blackfoot River	8	6	84%	1
	TNC Subtotal	*970*	*548*	*57%*	*421*

This valley bottom analysis shows that, on BLM lands, there is significant opportunity to enhance riparian habitats particularly in the eastern portion of the assessment area, especially in the recent Ninemile and Woodchuck acquisition areas. This landscape includes several intermittent and perennial streams that are currently incised and losing connectivity to their floodplains. Opportunities exist to improve valley bottom function in these areas, particularly by recontouring roads adjacent to the streams and fencing streams with significant hoof shear compaction and bank erosion issues. A fence or cattle management plan for Game Ridge Creek would allow riparian restoration.

Beaver Restoration
To support riverscape health, including opportunities to increase floodplain acres and add additional structural elements to streams, the BLM is recommending developing and analyzing for beaver relocation areas in future environmental documents. Using the Beaver Restoration Assessment Tool (BRAT, Utah State University), the BLM has identified several "beaver relocation refugia" (locations for beaver restoration on public managed lands). Initial EAWS recommendations for refugia areas include Upper Gold Creek on BLM and Forest Service lands above the main Gold Creek Bridge, the Cow Creek – Gold Creek confluence area near the 7-mile Bridge, West Fork Gold Creek above Primm Meadow, and the Burnt Fork of Belmont Creek. These locations are away from private property where human – beaver conflict could occur, and these identified areas have excellent existing riparian vegetation and hydrologic conditions to support beaver relocation. Future beaver relocations will be subject to Montana Fish, Wildlife, and Parks management direction and decisions; this analysis was only reviewed for opportunities to consider habitat for nuisance beavers to be relocated to.

It is recommended that BLM continues to coordinate with Montana Fish, Wildlife, and Parks on beaver population management, including monitoring beaver census data and monitoring for bear management in the newly acquired lands in Gold Creek and Twin Creeks. As needed, BLM will work in coordination with MT FWP for species management.

7.3.3 Hydrology
Many stream conditions in the EAWS assessment area are meeting desired stream conditions, though sedimentation from roads and loss of floodplain habitat are noted. BLM recommends considering improvement projects such as low-tech process-based restoration, mechanized stream stabilization, riparian fencing, and road restoration treatments to support hydrologic function, retain this landscape as an important late-season cold water source, and improve soil water infiltration. These restoration efforts can reduce impacts from drought.

7.4 Vegetation
7.4.1 Forest Vegetation
Management recommendations by Habitat Type Groups will be discussed first followed by management recommendations that apply to forest vegetation across the EAWS area or in specific areas.

HTGs 1 and 2 (Dry DF Habitat Types)
Creation and/or maintenance of existing grassland ponderosa pine/grassland habitat (HTG 1) is needed and would be accomplished through prescribed burning, thinning small diameter trees, timber stand improvement (such as tree planting), timber harvest (if feasible), weed spraying or any combination of these treatment methods. Vegetation management within HTG's 1 and 2 should include a focus on movement towards natural range of variability in terms of disturbance regimes, stand structures and species composition. Where most stands are currently dominated by two or multiple storied pole to medium size class Douglas-fir, create movement towards widely spaced multi-layered large and very large size classes dominated by ponderosa pine and lesser amounts of Douglas-fir which historically occurred across these HTGs on the landscape. Reduction of conifer density on many of the sites within these HTGs while shifting species composition away from Douglas-fir to seral, more resilient ponderosa and Western larch (in HTG 2) would be the primary focus during initial management efforts. Reducing density on these sites would reduce conifer competition for nutrients and moisture. This is important for increasing ponderosa pine resiliency to insects, disease and fire. Over time, size classes of the ponderosa pine, Douglas-fir and western larch would shift to the larger size classes that would occur given an

uninterrupted disturbance regime. Prescribed burning is an essential tool for accomplishing movement towards natural range of variability.

Potential treatments would also focus on stimulation of herbaceous and shrub layers within the understory to maintain and improve wildlife habitat components. Any restoration treatments would, if possible, involve altering a portion of the current patch sizes within HTGs 1 and 2 from small, fragmented patches to larger, more historical patch sizes. These treatments, if feasible, are recommended over the next ten years due to the desire to maintain and enhance large to very large size classes of ponderosa pine on BLM lands within these HTGs on the landscape. Additionally, in order to initiate movement towards the natural range of variability at the desired scale, any projects which can be conducted jointly with neighboring landowners within these HTGs is desired. Treatments adjacent to private lands, homes and other values at risk should be prioritized. Maintenance of past forest management treatments implemented by BLM or land management partners in the EAWS should be maintained by prescribed burning (as opposed to mechanical treatments) whenever possible.

HTGs 3 and 4

Design treatments to emulate a mixed fire regime in terms of the pattern and scale historically occurring within HTG 3. Vegetation management that would create a mosaic of age and corresponding size classes that naturally occurred within the mixed to lethal severity fire regimes is recommended. Most treatments would be designed to maintain or enhance old stand structure by promoting retention of or assisting in development of larger diameter size classes and greater structural complexity that has been shown to exist historically within these types but is currently lacking due to previous fire suppression and management practices. Silvicultural methods to emulate disturbance creating mosaics across these HTGs would include harvest, prescribed burning, thinning small diameter trees and timber stand improvement (including planting among other methods). Initiation of action toward natural variability of landscape patchiness and spatial arrangement within these HTGs would increase and maintain habitat diversity while improving resiliency of the mixed-conifer type on the landscape.

Priority treatments within HTGs 3 and 4 include sites containing remnant patches of large to very large western larch which have been unable to regenerate due to the disturbance cycle and western larch seed periodicities. The younger age classes in these stands are dense, single-storied small diameter Douglas fir and/or lodgepole with very limited understory vegetation development. Reduction of the Douglas-fir and lodgepole pine while promoting western larch recruitment and establishment in the understory is recommended. Work to enhance and perpetuate whitebark pine on the landscape where it historically occurred or where it could occur in the past given changing climactic conditions.

- In highest elevation forests, creation of fuel breaks and a reduction in canopy continuity to create a mosaic of age classes and structure across the upper portions of watersheds is recommended.
- Where dwarf huckleberry occurs within this type, potential treatments would be designed to enhance this shrub for wildlife forage.
- Support additional landform mapping efforts with NRCS to determine common operating picture with best available data across all federal ownerships.

Across the entire assessment area:

- Continue working with partners such as the Rocky Mountain Research Station, the Pacific Northwest Climate Adaptation Science Center and the National Technology and Development Program interested in doing research in the assessment area so that it will continue to be a living laboratory.

- Work with the Confederated Salish and Kootenai Tribes to restore traditional cultural practices in the assessment area including seasonal prescribed burning and to move forest vegetation conditions to those that existed prior to Euro-American settlement.
- Work with wildlife biologists to create vegetation management treatments that create, enhance or maintain quality wildlife habitats.
- Create or maintain wildlife habitat linkage corridors along valley bottoms, ridgetops or other areas identified as important for wildlife movement across the assessment area to other geographic areas.
- Facilitate reforestation in burned areas that were historically forested through planting or natural regeneration. Apply efforts and funding of these activities based on the probability of successful seedling establishment and growth.
- Work to restore more natural forest vegetation conditions across the assessment landscape regardless of land ownership. Create and maintain partnerships with adjacent landowners to implement jurisdictionally seamless vegetation management.
- Work with adjacent landowners to implement Potential Operational Delineation (PODs) features when they are within the assessment area. PODs have boundaries defined by potential control features that can be leveraged for fire containment during a wildfire or prescribed fire. Typical POD boundaries are a combination of roads, rivers, major ridges, barren areas, waterbodies, major fuel changes, or other locations that facilitate control.
- Utilize naturally occurring fire when conditions allow according to Missoula RMP guidelines.
- Minimize timing limitations on forest vegetation management operations to the extent possible. Operational feasibility is important to enable timber to be sold and thinning contracts to be awarded. Spring mud season and summer fire season require operational shut downs to protect natural resources. Additional timing restrictions would make contracts less appealing to purchasers/contractors.
- Maintain timber sale haul routes in areas that also have recreation usage (including winter recreation) through a combination of signage, interpretation and/or temporarily re-routing either the timber sale haul routes or the recreation usage, which ever option would be more easily implemented.
- Reduce fuels in the wildland urban interface, working closely with landowners and partners.
- Continue to implement vegetation treatments from the 2017 LBC EA and the 2020 Belmont Gold EA.
- Digitize historic treatment data from Anaconda, Champion, Plum Creek, and add to BLM vegetation treatment databases.
- Collect all TNC treatments and add to BLM vegetation treatment databases.
- In the image depicted below construct new road segments shown in red in Section 31 near Cow Saddle between Gold Creek and Belmont Creek. This road construction would allow for long term forest management access that would alleviate use of the nearby road that is partially constructed in an intermittent stream channel.

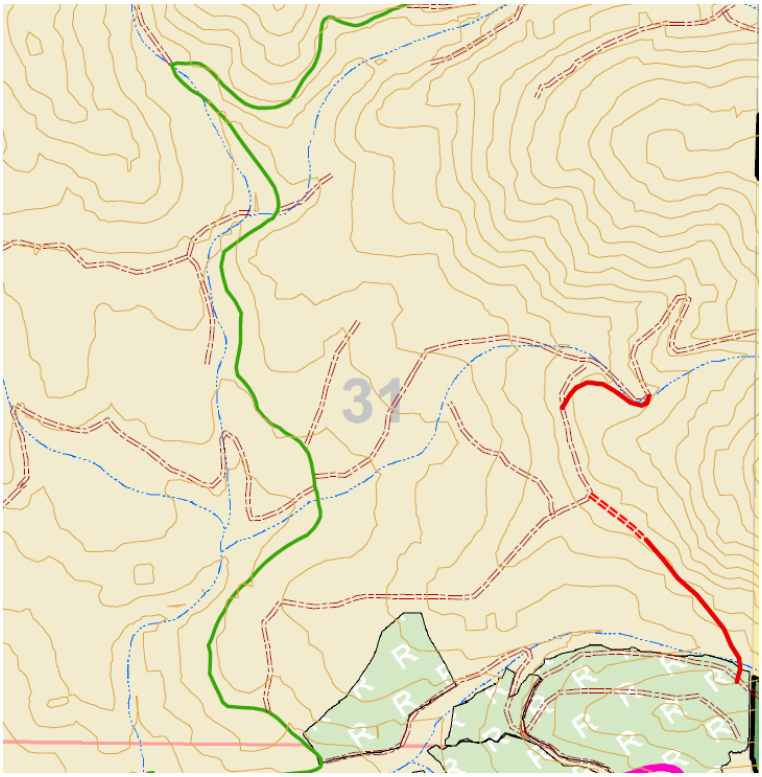


Figure 22. Proposed Road Construction, shown in red, near Cow Saddle Between Gold Creek and Belmont Creek.

7.4.2 Rangeland Vegetation

The overall objective for rangelands is maintain or improve vegetative condition to achieve healthy rangelands for a sustained yield. The following management recommendations should be implemented to maintain or assist in the progression to meet rangeland health standards and guidelines.

- Continue to map, monitor, and treat noxious weeds.
- Conduct a rangeland health assessment on the Black Canyon allotment.
- Establish vegetation monitoring plot(s) on acquired lands (Black Canyon allotment).

Please note, season of use, carrying capacity, along with terms and conditions specific to each allotment may be analyzed under a separate environmental assessment at the time the term grazing lease expires.

7.4.3 Special Status Plants and Habitat

The following is recommended for the conservation and enhancement of Howell's Gumweed in the assessment area:

- Support research to determine the genetic distinctness of Howell's gumweed to curlycup gumweed and other related species.
- Survey the entire assessment area for Howell's gumweed
- Work with other agencies, Tribes, universities, and private groups on monitoring and research projects for Howell's gumweed.

The following is recommended for camas in the assessment area:

- Work with other agencies, Tribes, universities, and private groups to develop and implement a conservation strategy for camas. As part of a camas conservation strategy:

- Develop a meaningful monitoring protocol to monitor the effectiveness of restoration activities.
- Support efforts towards camas restoration and education.
- Minimize impacts of management activities to known camas populations.
- Restore stream and riparian health in a way that creates more camas habitat
- Implement restoration activities including planting camas, seeding camas, and fall prescribed burning in camas habitat.

The following is recommended for bitterroot in the assessment area:

- Monitor and minimize impacts of management activities to bitterroot populations.
- Work with other agencies, universities, and private groups on monitoring, research, restoration, and education projects for bitterroot.
- Survey the entire assessment area for bitterroot.
- Map all bitterroot populations within the assessment area.

The following is recommended for all Special Status and Culturally Important Plants:

- Avoid the use of native species from non-local sources that may be a threat to local genetic diversity.
- Develop a sustainable and economical local native seed source for future reseeding efforts.
- Use, when available and feasible, local native species for all vegetation and re-vegetation projects.
- Utilize thoughtful integrated weeds management to control noxious weeds and aggressive non-native grasses that typically outcompete gumweed, camas, bitterroot and other native species.

7.4.4 Noxious Weeds

Management recommendations focus on BLM lands in the assessment area. Management of state and private lands is also considered, because of the possibility of future acquisition of adjacent lands and potential for partnerships to accomplish "Over the Fence" weed management. The following is recommended for noxious weed management in the assessment area:

- To the extent possible, human activity should be reduced or maintained at current levels.
- Reduce road density by permanent closure of unused or roads not needed for administrative use, with pre-closure treatments to reduce existing infestation.
- Education of the public on the importance of reducing the spread of noxious weeds and use of weed seed free forage.
- Support educational programs at local level, that educate the public about noxious weeds and the problems they cause.
- Enforcement of existing regulations on unauthorized motor vehicle use and weed-seed-free forage would have a positive impact in reducing noxious weed spread.
- Continue treatment of high priority species and continue monitoring of infestation sites, and inventory adjacent areas for presence or absence. Inventory all roads, trails, primitive camp sites and other spread vectors for the presence of invasive plant species. Inventory priority should be given to areas that have cultural or botanical importance.
- Forest vegetation treatments such as harvest, or thinning should be surveyed prior to project implementation for presence of priority weed species.
- Review and implementation of project design features and noxious weed mitigation measures found in the Missoula Field Office RMP.

- All timber harvest or thinning equipment should be inspected at a designated site approved by appropriate project leads and the Missoula Field Office invasive species specialist prior to equipment entering BLM lands or roads.
- Continue on going partnerships and develop new partnerships with adjacent landowners. Coordinate management efforts with partners for successful "Over the Fence" management of noxious weeds.
- An inventory and mapping of noxious weeds is recommended on newly acquired lands in the analysis area, to identify areas with priority noxious weed species. Some areas in the analysis area are weed-free. These areas are a high priority for inventory and prevention of noxious weed invasion.

The above recommendations are suggested for large scale management such as watersheds or region wide areas, at the project level mitigation measures and project design features that minimize the introduction and spread of noxious weeds will be designed.

7.5 Forest Resources

Missoula Field Office RMP (USDI-BLM 2021) Forest Product Goals and Objectives as follows:

- FP-G-1. Manage forest resources to provide a sustainable flow of timber to support local economies through timber harvest.
- FP-G-2. Manage forested lands for multiple uses including commercial timber and other forest products commodity production, wildland fire resiliency, terrestrial and aquatic wildlife habitat, recreational uses and cultural resources.
- FP-G-4. Provide sales opportunities for special forest products that maintain a balance between public demand and desired vegetation conditions. Examples of special forest product sales include but are not limited to firewood, Christmas trees, house logs, posts and poles, vegetative cuttings, and conifer boughs.
- FP-OBJ-4. Build new permanent roads, if necessary, to facilitate long-term management of areas to meet forest resource objectives, and close temporary roads upon completion of project implementation. Replacement, maintenance, and decommissioning of existing roads to meet transportation planning and management objectives could also occur during forest product management projects if deemed appropriate at the project level.
- FP-OBJ-5. Consider salvaging dead or dying trees resulting from wildland fire, forest insects and
- diseases, weather-induced or other forest mortality events, and salvage dead or dying merchantable timber in designated WUI or Fire Management Zone 1 areas within 2 years of when the tree mortality causing event started.
- FV-MA-4. Maintain adequate access for management activities and treatments including permanent or temporary roads as necessary. Determine road locations based on topography, drainage, soil type, and other natural features to minimize erosion. Rehabilitate skid trails and temporary roads by appropriate methods that disperse runoff, reduce erosion, and promote revegetation as needed.
- Seek opportunities to benefit multiple resources through the sale of forest products such as with stewardship contracting. Examples would include but are not limited to using vegetation management to achieve Riparian Habitat Objectives within Riparian Conservation Areas, instream placement of logs for fisheries improvement, or to speed development of quality habitat components such as multi-story structure for Canada lynx.

- Manage the forest resources in such way as to facilitate the implementation of FMZ direction as per the Missoula Field Office RMP (DOI – BLM 2021).
- Maintain and continue to build relationships with forest industry partners, local schools, universities and outdoor education organizations, Non-Governmental Organizations such as The Nature Conservancy and The Blackfoot Challenge, and other stakeholders such as recreational groups.
- Continue to pursue creative solutions to implement marginally economical though highly beneficial treatments, such as through timber sale contracts, service contracts, stewardship contracting, Good Neighbor Authority contracts, Interagency agreements, force account / in house crews and similar.
- Target stands for hand thinning treatments while the treatment will be most effective: when trees are 10 – 15 feet tall (Reukema 1975). In larger stands, implement commercial thinning treatments that achieve resource objectives of increasing growing space and reducing inter-tree competition while producing forest products.
- Digitize historic treatment data from Anaconda, Champion, Plum Creek, and add to BLM vegetation treatment databases.

7.6 Terrestrial Wildlife and Habitat

- Implement forest treatments to actively manage for Canada lynx habitat as described in the Spatial and Management Framework to Conserve Canada Lynx Habitat (USDA & USDI 2022).
- Support Adaptive Complexity Thinning (ACT) research to determine if ACT could be utilized as a beneficial active management option for Canada lynx habitat.
- Implement vegetation treatments to move forest vegetation within subalpine fir habitat type to late successional conditions having mature trees and sufficient Dense Horizontal Cover.
- Improve big game habitat by eliminating weeds and utilizing forb seed mixes to replant, include early-greening grasses and forbs to be available early in spring (south and west facing slopes are priority). Preferred summer forbs include dandelion, geranium, asters, clovers and milkvetches. Browse is the primary winter food and the preferred browse species include quaking aspen, mountain maple, serviceberry, ceanothus, chokecherry, red-osier dogwood, mountain mahogany, willow and winterfat. Choice grass species include rough and Idaho fescue, bluebunch and western wheatgrass and sandberg bluegrass.
- Return fire to the landscape and create small openings with irregular edges. Within winter range and above (where mature bulls avoid herd and therefore predation) design forest openings to include grassy hillsides that will be more easily accessible during winter (windward and south facing), exposed knobs and ground shrub that provide woody forage in the winter.
- Reduce barriers to movement by converting all fences to wildlife-friendly designs and removing obsolete fences. A fence inventory will likely be necessary.
- Design forestry treatments to be compatible with wildlife movement and maintain habitat connectivity through corridors. Focus on improving wildlife corridors in key areas that can connect large areas of habitat across various ownerships. This includes the BLM-managed lands along and south of Gold Creek close to the State and TNC lands north of I-90, Belmont Creek and the southeastern portion of the assessment area adjacent to the Lubrecht Experimental Forest which could facilitate wildlife movement into the Garnet Mountains as well as along Game Ridge to the west connecting the Game Range.
- Design and implement pollinator habitat improvement projects.

- Create winter recreational opportunities with wildlife energy expenditure in mind. Avoid snowmobile routes through big game winter range when possible. Establish on-trail only guidance for existing snowmobile routes while passing through big game winter range.
- Improve habitat security, particularly for grizzly bears, by selecting legacy roads currently closed to the public to be obscured, obliterated or closed by other means in such ways that access by mechanized modes of travel such as e-bikes would not be encouraged.
- Increase huckleberry recruitment for grizzly bear forage.
- Organized special events (races, runs, etc.) should take proactive steps to mitigate human-wildlife conflict.

7.7 Aquatic Species and Habitat

- Identify Desired Future Conditions for aquatic habitats and prioritize stream and riparian reaches based on potential effectiveness to achieve the DFCs (desired habitat and fish assemblage conditions).
- Identify, plan and implement site specific projects to enhance or restore aquatic habitat to Desired Future Conditions in order to conserve and enhance priority aquatic species.
    - Aquatic Habitat Restoration/Enhancement
    - Riparian Habitat Restoration/Enhancement
    - Road Decommissioning and BMP attainment
    - Aquatic Organism Passage
- Work closely with partners, chiefly MT FWP and USFWS, to plan bull trout recovery actions in Gold and Belmont Creeks.
- Work closely with partners, to include MT FWP, USFS and NGOs, to plan activities designed to enhance Westslope cutthroat trout habitat and populations.
- Use Low Tech Process Based Restoration to promote water storage and floodplain activation at an unconventional scale, ie: use BDAs in intermittent and ephemeral drainages to “fill the sponge”, allowing for the slow release of winter precipitation into perennial streams throughout the summer.
- Use best available science to apply design features to projects for conserving and enhancing wetland resources throughout the Lower Blackfoot assessment area to benefit amphibian populations.
- Refer to Missoula 2021 RMP for additional Goals, Objectives and Management Actions. Key takeaway is to ensure fisheries biologist actively participates on IDT during project development to ensure Riparian Management Objectives are met through appropriate Design Features.

7.8 Cultural Resources

There is extensive modern use of the assessment area for recreation, forestry, wildlife, water management, and maintenance of road systems. As such, cultural resources also need to be managed and protected in accordance both the National Historic Preservation Act (NHPA) and the Archaeological Resource Protection Act (ARPA) to maintain the integrity of the cultural landscape. The recommendations are as follows:

- Continue Class III inventories in preparation for projects and implementations within the assessment area.
- Update previous inventories and bringing them to modern Class III inventory standards.
- Establish more defined site boundaries if required and evaluating unresolved or unevaluated sites.

- Continue monitoring sites for degradation, looting, and vandalism. This includes possible site stabilization if required.
- Maintain the integrity and protection of cultural sites such as Culturally Modified Trees, that are susceptible to certain threats like wildfire and beetle kill.
- Develop common mitigation measures for particular project types and treatments.
- Develop wildfire recommendations for particular site types and actions that would be taken to protect sites during wildfire.
- Design interpretive signs for cultural resources in the assessment area; Cokahlarishkit Trail (Road to the Buffalo), Lewis & Clark Trail, etc.
- Facilitate and continue to develop relationships with Tribal partners about culturally important places within the assessment area, including traditional plant gathering places.
- Support ethnographic research targeted to the assessment area conducted by local Tribes.

7.9 Recreation

Below are recommendations/ideas to be considered for improvements to the recreational experiences within the Blackfoot SRMA. These recommendations/ideas will be further fleshed out to determine feasibility of implementation through future planning efforts, including but not limited to, Travel and Transportation Management and Lower Blackfoot EAWS Environmental Assessment. Feasibility depends on the potential concerns to other resources (cultural resources, T & E species, soils, engineering, etc) as well as funding limitations/realities. In addition, the implementation of some recommendations depends on active help from partners. Not all recommendations/ideas may be able to be brought forward for implementation due to these reasons, however they are listed here for the future reference.

- Develop a new campground to include vault toilets as necessary and a water system on the flat area to the southwest of and across the road from Thibodeau Campground near Gate/Road 0430.
- Eliminate camping on west end of Thibodeau Campground and replace with picnic area/river access.
- Acquire more bear proof food storage containers and install them at the campsites.
- Develop/maintain Wild Horse-Gold Peak trail for non-motorized summer use.
- Create parking area at Wild Horse saddle trailhead and install kiosk.
- Expand snowmobile opportunities.
- Create winter parking area at 7 mile bridge.
- Work with and/or partner with USFS to plow/groom Gold Creek Road to 7 mile bridge.
- Work with and/or partner with USFS to develop/maintain West Twin-Wisherd trail.
- Create a parking area along Gold Creek Road below 7 mile bridge for winter recreation.
- Develop non-motorized route from Gold Creek to Seeley Lake.
- Develop UTV trail to Seeley Lake.
- Create a scenic driving loop.
- Work with Forest Service to create an area for Special Recreation Permit (SRP) long distance events (i.e.endurance runs, bike rides/races), develop programmatic SRP for this area.
- Install vault toilet or toilets at 7 mile bridge in Gold Creek.
- Maintain walk-in hunting at Morrison Peak Block Management Area.
- Ask Missoula County to relinquish Ninemile Prairie road from Whitaker bridge to Ninemile Prairie.
- Create seasonal restrictions on Johnsrud Road, close it to motorized vehicles, snowmobiles allowed, from January 1 to March 30.

- Promote backcountry experiences in the upper Belmont area.
- Restore Buck Creek Cabin and include it in the cabin rental program.
- If more campgrounds are needed in the assessment area, consider changing Sheep Flat from a day use site to a campground.
- Redesign Thibodeau Rapids Day use to provide more parking and better access to the river.
- Install vault toilet at Thibodeau Rapids Day Use.
- Create another boat launch on the south side of the river somewhere between Whitaker Bridge and Sheep Flats Day use, possibly even at Thibodeau Campground at the proposed picnic area/river access site.
- Delineate campsites to avoid campsite creep at Thibodeau Campground.
- Create designated dispersed campsites in Twin Creek and lower Gold Creek.
- Move Belmont Day Use sign from current location to the Ninemile Prairie Road.
- Redesign triangle area near gate and road 0446 so that there is only one access road and to stop unauthorized camping/illegal dumping.
- Remove the gate at the bottom of road 0437 to provide more access during the fall. The gate currently is open most of the year, but closes 9/1 to 12/1.
- Remove the River Road Gate 0448A. The road is currently open 5/1 to 11/30.
- Continue working with MT FWP to not only provide collaborative, cross-boundary recreation opportunities, but also to provide collaborative, cross-boundary management of the river corridor including hiring river rangers to support MT FWP river management efforts.
- Retain and maintain parking area and trailhead at Twin Creeks, mainly for winter recreation.
- Work with partners to provide winter fat tire biking opportunities.
- Work with partners to provide Nordic skiing opportunities.
- Work with partners to develop a river ambassador program.
- Create consistent messaging throughout the corridor, be thoughtful on the number and placement of signs.
- Develop strategies to reduce conflicts including parking and dumping in lower Gold Creek and Twin Creeks.
- Consider moving Woodchuck gate further back from highway 200.

7.10 Visual Resources

- Maintain or improve visual resources along the River Corridor, Johnsrud Road and Ninemile Prairie Road.
- Work with Engineers and forestry staff to implement visual improvements through proper road design and layout, road maintenance and forestry projects.
- Management decisions need to be made through an RMP amendment on the acquired lands as to how the visual resources will be managed.

7.11 Wildland Fire Management

- Create seamless FMZs with the Lolo National Forest and Confederated Salish and Kootenai Tribes (CSKT) Division of Fire. The Lolo National Forest is currently in Plan Revision, thus a great opportunity to make sure BLM FMZ matches with USFS FMZ.
- Maintain access on roads for wildland fire management.
- Work with Lolo National Forest, DNRC, CSKT Division of Fire on Potential Operational Delineation (POD) lines and build fuel breaks along POD lines.

- If DNRC and USFS discuss suppression protection exchange, make sure BLM is involved. Parts of this area may be better suited for USFS protection than DNRC.
- Work with protection agency to manage wildland fires with goals and objectives of the FMZs.
- Develop a complete resource database to easily share with protection agency and Incident Management Teams.
- Manage vegetation so that wildland fires can be managed per FMZ direction.

7.12 Lands/Realty/Access

- Continue to pursue easements that maintain, improve, or create new access to public land.
- Use BIL/GAOA/LWCF or other means of funding to acquire land adjacent to BLM parcels or within the watershed as they become available.
- Continue to foster relationships with neighboring landowners to maintain and improve access.
- When possible, add recreational access such as snowmobiling trails or riverfront land.
- Continue to improve co-stewardship with CSKT and facilitate access for Tribes exercising their treaty rights.

7.13 Facilities and Assets

- Consider redesigning/redeveloping the water system at Thibodeau Campground.
- Install road numbers.
- Acquire boulders and find a place to store them for future management such as road closures, delineating recreation sites, etc.
- Evaluate the need for new vault toilets.

7.14 Lewis and Clark National Historic Trail

- Use Inventory, Assessment and Monitoring (IAM) contract for help with inventories and layout design for trailhead improvements and interpretation along the trail.
- Create handicap parking to access railroad grade.
- Improve trail surfacing from Whitaker Bridge to River Bend Day Use site.
- Install bridge on railroad grade at Belmont Creek. Seek Federal Lands Transportation Program grant for bridge.
- Improve trail access to the railroad grade at Red Rocks Day Use site.
- Reclaim trail at Red Rocks Day Use site that goes overland.
- Create an interpretive sign plan – highlighting the Buffalo Hunt Road/Road to the Buffalo Trail.
- Consider removing administrative use on the railrioad grade to the west of Whitaker Bridge.
- Redesign Riverbend Day Use site to create a trail/access hub of sorts – for Road to the Buffalo/roilroad grade users and hand carried watercraft users (advertise hand carried watercraft access to reduce conflicts at Corrick's River Bend Campground).
- Work with the National Park Service and Lewis and Clark National Historic Trail non-profit organizations to help secure funding for trail development.
- Promote the importance of the trail within the Missoula Field Office and the great potential for the outstanding recreation and interpretive opportunities the trail can provide in the Field Office in order to garner more support and increase funding for the trail.

7.15 Socioeconomics

- Continue stakeholder engagement particularly with land acquisitions and major management changes in land use.
- Continue discussions with land owners within the watershed about their and BLM management objectives to proactively identify and resolve potential conflicts.

Chapter 8 – Data Gaps, Inventory, and Monitoring

8.1 Geology and Mineral Resources

No further data is needed for AML or mineral resources in the assessment area.

8.2 Landforms, Soils, and Site Productivity

There are several opportunities for additional data gathering and mapping updates for soil and landform information in the Lower Blackfoot EAWS area. Though the majority of this landscape has been inventories by the Natural Resource Conservation Service, approximately 17,000 acres of additional survey work is needed and recent SSURGO data updates were not completed consistently across the entire landscape. BLM will continue to support mapping efforts as resources allow.

A helpful tool to understand soil erosion regimes, landform characteristics, and site potential is bare earth data from LiDAR mapping products; BLM will soon acquire LiDAR for the majority of this project area and will additional information from these products into future environmental analysis documents. Additional remote sensing products for soil analysis, such as evaluation of biophysical factors that may influence soil productivity, were not readily available for this project area and additional analysis may be conducted during future land health assessments.

8.3 Water Resources

8.3.1 Water Quality

The BLM uses Montana DEQ monitoring and reporting to assess water quality conditions for TMDLs; this data is collected frequently and updated on a 2-year cycle. An updated Blackfoot River Nutrient and TMDL report is anticipated to be published soon.

BLM does not have capacity to support a significant monitoring record for sedimentation tracking within the Blackfoot River basin. The BLM relies on neighboring sites from PacFish/InFish Biological Opinion (PIBO) monitoring to assess road conditions and sediment potential, along with Forest Service Rocky Mountain Research Station modeling tools- including the Geomorphic Road Analysis and Inventory Package (GRAIP) and the Watershed Erosion Prediction Project (WEPP). These tools do not provide specific and accurate data but do help BLM managers determine what suite of conditions are most likely to result in higher sediment potential.

8.3.2 Riparian Wetlands and Streams

While PFC assessments were completed as part of the EAWS effort, not all stream reaches were fully assessed and there is a need to complete PFC assessments (either new surveys or updates) with new project proposals, including vegetation restoration and rangeland health assessments. BLM interdisciplinary teams, led by hydrology staff, will continue PFC assessments as these lands are acquired.

There is a need to develop restoration project effectiveness monitoring within the EAWS area to assess how future projects, including low-tech process-based restoration and road decommissioning, are benefitting water and riparian resources. It is recommended to work with other state and federal agencies and partners to develop restoration monitoring techniques to understand the benefits of this work within the Blackfoot River watershed. Example projects could include studying changes in riparian extent (greenline to greenline surveys), monitoring stream discharge with flow measurements and stream gages (before and after project completion), and water temperature monitoring.

8.3.3 Hydrology

Hydrologic conditions including snow data, discharge, and stream temperatures are closely monitored at several Blackfoot River stream gages and SNOTEL sites by federal partners with USGS and NRCS. These data sets provide invaluable information about hydrologic conditions at the landscape scale, but finer scale water discharge information is not readily available. Montana DNRC periodically conducts synoptic discharge studies, assessing several tributary streams for discharge simultaneously during low water periods to understand drought. A similar, small-scale study of stream conditions would be a useful tool to understand water quantities during low water; stream gage installations should be considered in Upper Gold Creek and Belmont Creek.

8.4 Vegetation

8.4.1 Forest Vegetation

Whitebark pine inventory is needed on recently acquired lands. Habitat type and general forest inventory is needed on lands across the EAWS area prior to vegetation management so that ecologically appropriate management actions can be taken. LiDAR inventory will create new stand boundaries which will require updating existing information across the EAWS inventory. A forest health assessment was conducted by the Forest Service's Forest Health Protection group and a report based on that assessment was not yet available when this EAWS was completed. Recommendations from that report should be considered when conducting forest management activities in the EAWS area.

Implementation and effectiveness monitoring to measure attainment of project level and landscape level objectives is ideal but is often difficult to obtain due to time and budget constraints.

8.4.2 Rangeland Vegetation

Recently acquired lands pertaining to the Black Canyon allotment does not have established vegetation monitoring transects. Establish pace or Daubenmire transects for recently acquired lands and to include percent forage utilization data collection.

8.4.3 Special Status Plants and Habitat

Data gaps:

- Surveying for bitterroot populations
- Surveying for Howell's gumweed populations
- Revisit recorded Howell's gumweed occurrences

Monitoring:

- Bitterroot and Camas short and long term response to management activities
- Monitor effectiveness of bitterroot and camas restoration treatments

8.4.4 Noxious Weeds

- Complete inventory of noxious weed species, roadside spread data, such as distance from road edge. Inventory for noxious weeds will be on going
- Historical data on past weed management efforts.

8.5 Forest Resources

The forest stands within the subject area have been well mapped and monitored since the earliest timber interests entered the area. Anaconda, Champion, and Plum Creek all kept meticulous records of harvest areas and follow up treatments including planting areas. Later, The Nature Conservancy added to these records, conducting their own inventory for prioritization of treatments and restoration activities. The BLM, as the newest manager of this landscape has benefited greatly from this legacy and have added to it by conducting Habitat Type Group inventory across much of the landscape (see forest vegetation sections). This is a great foundation that can be built upon with new and emerging technology, where the importance of trained personnel on the ground is not diminished but focused with enhanced understanding of forest conditions. In 2023 the BLM solicited LiDAR and multi-spectral imaging of the analysis area, for individual tree level forest inventory including tree species, height, (inferred) diameter, social order (structural layer) and canopy density. This level of inventory has never been available before and the implications across the resource areas are exciting, to say nothing of forest resources. That said though even the best inventory is merely a snap-shot, and the true power of a tool such as LiDAR is only realized through follow-up application where trends can be established and the effectiveness of treatments evaluated.

8.6 Terrestrial Wildlife and Habitat

- Complete the existing data set of present habitat conditions by collecting stand inventory data for lands not yet evaluated. This includes the lands to be acquired in FY24 and west of Gold Creek.
- Inventory parts of the designated Canada lynx Critical Habitat that contain suitable species composition to provide snowshoe hare and denning habitats to determine if they are truly suitable based on Dense Horizontal Cover.
- Conduct regular winter carnivore surveys to determine baseline of use and impacts (if any) of forestry treatments and recreation.
- Monitor voluntary compliance of motorized winter recreation with guidance to protect big game within winter range.
- Establish long-term monitoring of forestry treatments designed for habitat enhancement on regular intervals. Monitoring intervals should be commensurate with specific projects and established by an IDT including at minimum Forestry and Wildlife.
- Inventory and monitor pollinators and pollinator habitat in assessment area.
- Inventory and monitor waterbird special status species on the Blackfoot River and other appropriate water bodies.
- Inventory and monitor special status amphibian species.

8.7 Aquatic Species and Habitat

- Determine current fish distribution and presence in assessment area streams that have limited or no survey information available: West Twin Creek, East Twin Creek, Unnamed Tributary to Gold Creek, Wild Horse Creek, Cow Creek, and Burnt Creek.
- Determine WCT genetic integrity in upper reaches of East Twin and West Twin Creeks.

- Monitor brown trout distribution and abundance above the waterfall section in Belmont Creek and Burnt Creek.
- Monitor western toad and Sierran treefrog breeding sites in the assessment area on an annual or every other year basis.
- Monitor stream temperatures to identify overall trends as well as continue to examine the relationship between stream temperatures and beaver influenced habitats.
- Monitor beaver populations and activity in the assessment area.
- Continue to inventory habitat to determine what reaches are most important for future restoration activities.

8.7.1 Inventory

Although most of the previously cultural resource inventories on BLM administered land within the EAWS were conducted to Class III standards, many of these inventories were conducted in a manner that does not meet the Class III standards of today. Issues with this include the following:

- Many of the previous inventory reports do not specifically indicate the standards used or describe the methodology employed. The methods followed by earlier inventories may not qualify as Class III inventories today.
- Modern data collection tools like GPS, digital photography, and standardized data collection methods were not available or developed at the time. Due to this, some sites have no more than a handwritten description and an estimated location. In addition, the lack of photographs, site/artifact drawings, and site boundaries make these sites difficult to relocate. Modern data availability such as digitized historic maps, property/mining records, and other information that is relied on for background literature searches, artifact identification, and other archaeological/cultural information was not available during these earlier inventories. Those site and artifact identifications were likely less comprehensive than what is possible today.
- These previously recorded sites often lack site evaluation determinations, which indicates eligibility for the National Historic Preservation Act (NHPA).
- The condition of the earliest recorded sites from the 1970s through 2000 may have significantly changed due to natural processes, industrial logging, and public use.
- Section 106 of the NHPA states that ‘Historic Properties are no less than 50 years old, with the exception of properties/places that possess exceptional importance’. There are sites that are considered historic now, that were not considered historic when inventories in the late 1970s and early 1980s were first conducted. There is the potential for unrecorded cultural sites from the historic period that are not being protected because their provenience was not established during these earlier inventories.
- Inventories are required by SHPO standards to be updated 10 years after completion. This is to account for the following:
    - Natural degradation of historic sites (cabins, wooden structures, ditch networks, etc.) due to erosion, wildfire, or other natural forces.
    - New cultural deposits can be exposed and observed on the ground due to natural erosional processes in areas where deposits were not observable before.
    - To account for changes due to destruction of sites as a result of vandalism and looting.
- Continued Class III cultural resource inventory (in accordance with modern quality standards) will be conducted on BLM administered land in support of project level undertakings within the assessment area.

8.8 Cultural Resources

8.8.1 Monitoring

As stated in Chapter 5, most of the identified cultural and archaeological sites within the study area are near the Blackfoot River, which is the most utilized landscape in the assessment area. Tourism and recreation use put stress on all resources, and cultural resources are no exception. Historic artifacts and materials left from the 1800s and early 1900s are often overlaying Aboriginal sites and artifacts like lithic scatters. Both site types usually occur on top of each other in places that are most desirable for habitation and travel, such as flat meadows, ridge tops, saddles, and wide gentle areas along the river. Artifact collecting, purposeful vandalism, and neglect damage the integrity of sites. Regular and continued monitoring of cultural sites should be conducted with special focus on sites that see regular visitation and use by recreationists.

8.8.2 Data Gaps

Data Gaps in Cultural are as follow:

- Areas of the watershed that have not seen previous or recent cultural inventory, including new land acquisitions.
- Sub-surface testing in areas likely to contain cultural material where the surface has been disturbed by logging or other activities.
- Cultural sites that now qualify as historic when they were not in the archaeological period (50+ years) at the time of previous inventories.
- Determine eligibility of undetermined cultural sites.
- Identify presence of additional segments or braiding of the Cokahlarishkit Trail (Road to the Buffalo).
- Investigate possible Corps of Discovery Expedition camp location within newly acquired land along Twin Creek.
- Continued collaboration with SHPO to determine and correct GIS data discrepancies.
- Identify and develop spatial data of areas containing traditionally important plants, such as bitterroot and camas.

8.9 Recreation

- Establish monitoring plan for roads, trails and developed recreation areas.
- More information is needed in order to assess impacts from recreation on natural resources.
- There is a need to continue monitoring and gathering data as to the amount of dispersed use in the Blackfoot.

8.10 Visual Resources

- VRI data is up to date.
- Monitor forestry and road projects after implementation to determine if VRM objectives are being met.
- Modify standard operating procedures if not being met.

8.11 Wildland Fire Management

- Research BFPA records and record all fires in the assessment area in a database.

- Research the BFPA records focusing on any historic large fires in the area such as the 1961 Elk Creek Fire.

8.12 Lands/Realty/Access

- Data, inventory, and monitoring are all sufficient.
- Undertake comprehensive travel and transportation management planning to ensure public access is acceptable or identify room for improvement.

8.13 Facilities and Assets

- Water information from Thibodeau Campground, determine need for new water system at Thibodeau campground.
- All acquired facilities, roads and trails need to be entered into the Facility Asset Management (FAMS) database in their existing condition.
- Ground Transportation Linnear Feature (GTLF) needs to be updated with all routes in their existing travel management.
- Routes slated for decommissioning would need to have a contract for decommissioning or be implemented with the vegetation management.
- The baseline needs to be calculated for the existing condition of miles of road in the area.
- Bridges and major culverts in the more recent acquisitions need to be inspected and added into FAMS.
- Continue to work with Missoula County via the Cooperative Road Maintenance Agreement on the public roads that are though the area and leading out of the area.
- Develop a Cooperative Road Maintenance Agreement with the Forest Service for the roads that are jointly used or controlled.

8.14 Lewis and Clark Trail Corridor

- Continue monitoring the landscape elements of the trail corridor to ensure management objectives are being met.
- Install trail counters to determine amount of use on the railroad grade.

8.15 Socioeconomics

- Continue to understand local perspectives and vision for, particularly recreational opportunities and access.
- Understand BLM's role within the larger watershed assessment objectives (i.e., collaboration with USFS, Tribal Nations, and other adjacent land owners).

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Appendices

Appendix A - Blackfoot EAWS Habitat Type Groups (BLM Lands Only)

Habitat Type Group 1 (HTG-1); Warm Dry; 13,030 acres

PIPO/AGSP	130
PIPO/FEID	140
PIPO/FEID-FEID	141
PIPO/SYAL	170
PSME/AGSP	210
PSME/FIED	220
PSME/FESC	230
PSME/SYAL-AGSP	311
PSME/CARU-AGSP	321
PSME/CARU-CARU	323
PSME/CAGE	330

Habitat Type Group 2 (HTG-2); Moderately Dry and Warm; 16,299 acres

PSME/CARU	320
PSME/CARU-PIPO	324
PSME/SYAL	310
PSME/SYAL-CARU	312
PSME/SYAL-SYAL	313
PSME/PHMA-CARU	262
PSME/PHMA-PHMA	261

HABITAT Type Group 3 (HTG-3); Moderately Moist and Cool; 11,055 acres

PSME/CARU-ARUV	322
PSME/VAGL	280
PSME/VAGL-VAGL	281
PSME/VAGL-ARUV	282
PSME/VAGL-XETE	283
PSME/VACA	250
PSME/PHMA	260
PSME/LIBO	290
PSME/LIBO-SYAL	291
PSME/LIBO-CARU	292
PSME/LIBO-VAGL	293
PSME/SPBE	340
PSME/ARUV	350

Habitat Type Group 4 (HTG-4); Cool Moist; 2,383 acres

ABLA/LIBO-LIBO	661
ABLA/LIBO-XETE	662
ABLA/CLUN-MEFE	625
ABLA/XETE-VAGL	691

Riparian with trees 357 acres

Scree or non-forested 588 acres

No Data 416 acres

Appendix B - Blackfoot Habitat Type Group NRV/Existing/Desired Condition Tables

Table 23. HTG 1 – WARM DRY DOUGLAS-FIR SERIES

Historic Cover Type : PP and PP (DF) Fire Group 4 : Nonlethal Fire Regime 13,030 Acres, 30%	**Natural Variability1**	**Current Condition**	**Desired Condition**
Mean Disturbance Interval (in years) 2 Nonlethal severity	5-25 years	> 50 years	10-30 years
Primary Structural Component: % total acres,			
Grass/Forb/Shrub	5-10	1	5-10
Seedling-Sapling (0-5" dbh)	5-15	4	5-10
Pole (5-9" dbh)	5-15	14	5-15
Medium (9-15" dbh)	15-25	48	15-25
Large (15-21" dbh)	25-35	27	25+
Very Large (> 21" dbh)	25-35	6	25+
Cover Type: Dominant Species in % of total acres			
Ponderosa Pine (PP) cover type total	>80	56	>80
Douglas-fir (DF) cover type total	<20	40	<20

1 Natural variability is based upon the context of historic vegetation conditions described in Losensky, 1997.
2 Mean Disturbance Interval:
Natural- historic mean fire frequency which maintained vegetation composition, structure and pattern prior to Euro-American settlement
Current- current mean disturbance-free interval (disturbance can be human-induced but must emulate natural fire severity)
Desired- disturbance mean interval necessary to maintain the desired vegetation condition (disturbance: silvicultural treatment including RX fire)
Disturbance Severity:
Nonlethal- < 20% mortality in the dominant overstory tree canopy layer
Lethal- > 80% mortality in the dominant overstory tree canopy layer
Mixed- Intermediate severity disturbance which commonly alternates between nonlethal and lethal severity events

Table 24. HTG 2 - MODERATELY WARM AND DRY DOUGLAS-FIR SERIES

Historic Cover Type : PP (DF) or WL (DF) Fire Groups 4 and 6: Nonlethal and mixed **16,299** Acres, 37%	**Natural Variability**	**Current Condition**	**Desired Condition**
Mean Disturbance Interval (yrs) 1/ Nonlethal severity Mixed severity	 5-25 years 10-50 years	 > 50 years > 50 years	 10-20 years 10-30 years
Primary Structural Component: % total acres Grass/Forb/Shrub Seedling-Sapling (0-5" dbh) Pole (5-9" dbh) Medium (9-15" dbh) Large (15-21" dbh) Very Large (> 21" dbh)	 5-10 5-15 5-15 15-25 25-35 25-35	 1 5 14 39 32 6	 5-10 5-10 5-15 15-25 25+ 25+
Cover Type: Dominant Species in % of total acres PP or WL Dominant DF	 >75 <25	 36 61	 >75 <25

1 Mean Disturbance Interval:
Natural- historic mean fire frequency which maintained vegetation composition, structure and pattern prior to Euro-American settlement
Current- current mean disturbance-free interval (disturbance can be human-induced but must emulate natural fire severity)
Desired- disturbance mean interval necessary to maintain the desired vegetation condition (disturbance: silvicultural treatment including RX fire)
Disturbance Severity:

Nonlethal- < 20% mortality in the dominant overstory tree canopy layer
Lethal- > 80% mortality in the dominant overstory tree canopy layer
Mixed- Intermediate severity disturbance which commonly alternates between nonlethal and lethal severity events

Table 25: HTG 3 - MODERATELY COOL AND DRY DOUGLAS-FIR SERIES

Historic Cover Type : DF and WL Fire Group 6: Mixed Fire Regime 11,055 Acres, 25%	**Natural Variability**	**Current Condition**	**Desired Condition**
Mean Disturbance Interval (yrs) 1/ Mixed Severity	10-50 years	> 50 years	10-50 years
Primary Structural Component: % total acres			
Grass/Forb/Shrub	5-10	0	5-10
Seedling-Sapling (0-5" dbh)	5-15	6	5-15
Pole (5-9" dbh)	5-15	44	5-15
Medium (9-15" dbh)	30-40	40	30-40
Large (15-21" dbh)	15-25	7	15-25
Very Large (> 21" dbh)	0-5	1	0-5
Cover Type: Dominant Species in % of total acres			
WL Dominant	>50	26	>50
DF Dominant	<50	56	<50

1 Mean Disturbance Interval:
Natural- historic mean fire frequency which maintained vegetation composition, structure and pattern prior to Euro-American settlement
Current- current mean disturbance-free interval (disturbance can be human-induced but must emulate natural fire severity)
Desired- disturbance mean interval necessary to maintain the desired vegetation condition (disturbance: silvicultural treatment including RX fire)
Disturbance Severity:
Nonlethal- < 20% mortality in the dominant overstory tree canopy layer
Lethal- > 80% mortality in the dominant overstory tree canopy layer
Mixed- Intermediate severity disturbance which commonly alternates between nonlethal and lethal severity events

Table 26: HTG 4 - COOL AND MOIST SUBALPINE FIR SERIES

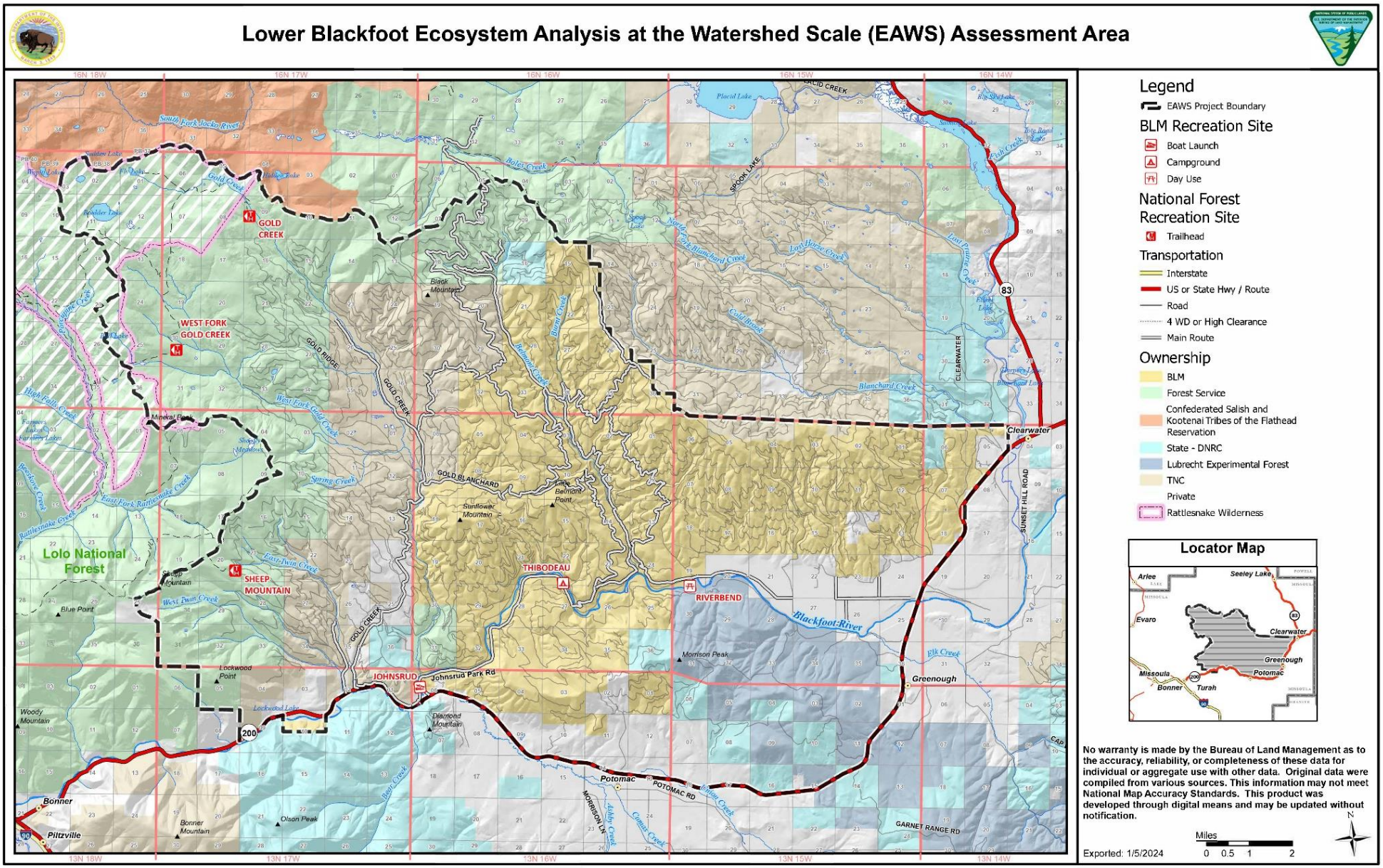
Historic Cover Type : DF, ES, LP, SAF Fire Group 9: Lethal and Mixed Severity Fire Regimes 2,383 Acres, 5%	**Natural Variability**	**Current Condition**	**Desired Condition**
Mean Disturbance Interval (yrs) 1/ Mixed Severity Lethal Severity	 50-100 years 100-200 years	 > 75 years < 75 years	 75-125 years
Primary Structural Component: % total acres Grass/Forb/Shrub Seedling-Sapling (0-5" dbh) Pole (5-9" dbh) Medium (9-15" dbh) Large (15-21" dbh) Very Large (> 21" dbh)	 5-10 15-25 25-45 20-35 10-15 0-5	 0 15 62 19 3 0	 5-10 15-25 25-45 20-35 10-15 0-5
Cover Type: Dominant Species in % of total acres DF Dominant	 >50	 61	 >50

1 Mean Disturbance Interval:
Natural- historic mean fire frequency which maintained vegetation composition, structure and pattern prior to Euro-American settlement
Current- current mean disturbance-free interval (disturbance can be human-induced but must emulate natural fire severity)
Desired- disturbance mean interval necessary to maintain the desired vegetation condition (disturbance: silvicultural treatment including RX fire)
Disturbance Severity:
Nonlethal- < 20% mortality in the dominant overstory tree canopy layer
Lethal- > 80% mortality in the dominant overstory tree canopy layer
Mixed- Intermediate severity disturbance which commonly alternates between nonlethal and lethal severity events
Appendix XX Subsurface Ownership

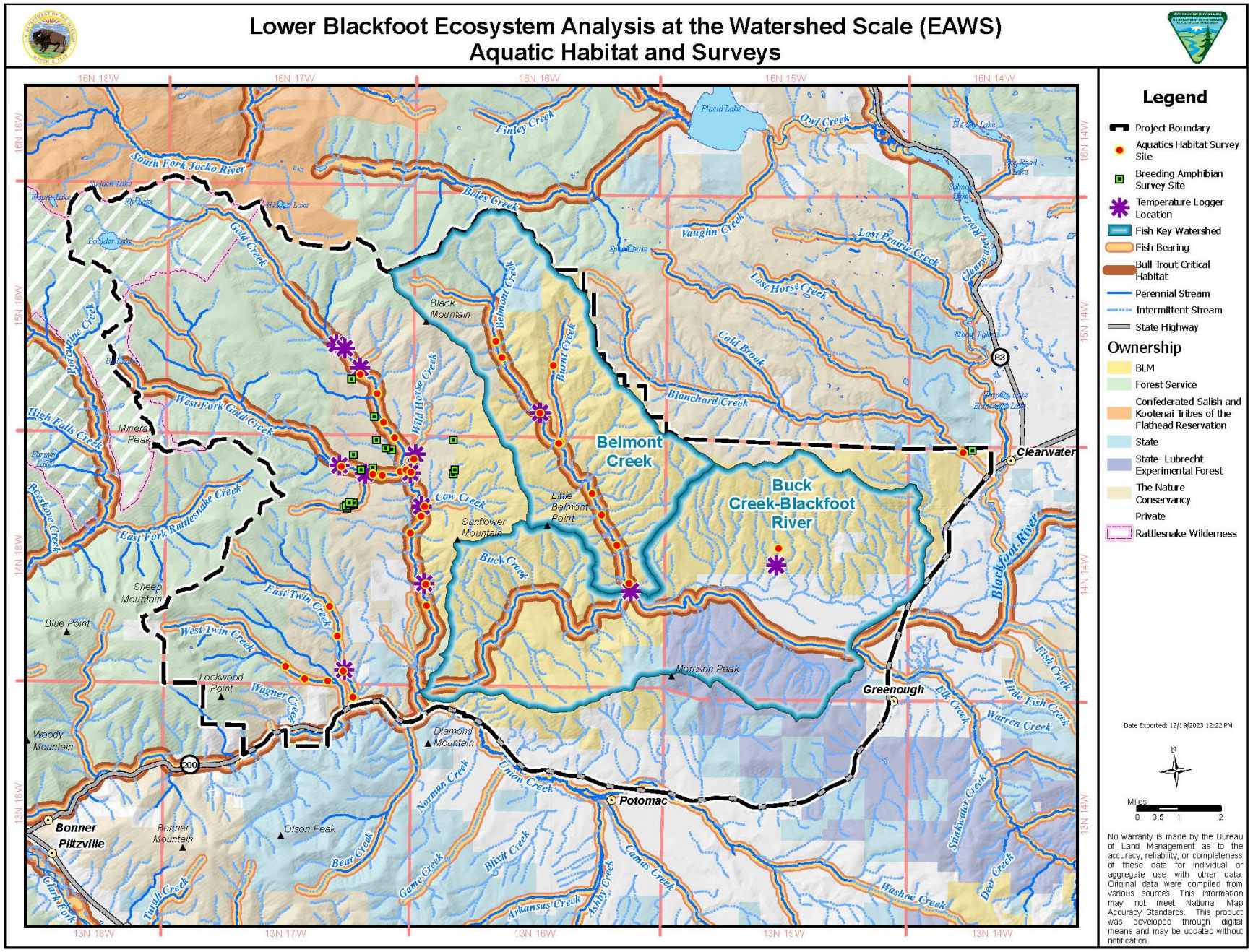
Appendix C - Maps

Map Number	Map Title
1	Assessment Area Overview
2	Aquatic Habitat and Surveys
3	Cultural Inventories
4	Wildland Fire Management
5	Wildfire History
6	Wildland Urban Interface
7	Simplified Geology Map
8	Beaver Dam Building Capacity on Main Streams
9	Stream Properly Functioning Condition (PFC) Ratings and Culvert Improvement Needs
10	Valley Bottom Extraction Tool (VBET) Floodplain Potential Model
11	Ownership and Acquisition History
12	Subsurface Ownership
13	Range Allotments
14	Existing Recreation
15	Special Recreation Management Area
16	Visual Resources
17	SSURGO Soil Taxonomic Classes
18	Forest Vegetation Canopy Cover
19	Forest Vegetation Cover Type
20	Habitat Type Groups
21	R1 VMap Cover Type (DOM40)
22	Forest Vegetation Structure
23	Whitebark Pine Locations
24	Lynx Critical Habitat
25	Northern Continental Divide Ecosystem Grizzly Bear Management Zones
26	Lynx Relative Habitat Probability
27	Wolverine Female/Male Dispersal
28	Wolverine Primary and Maternal Habitat
29	Treatment History

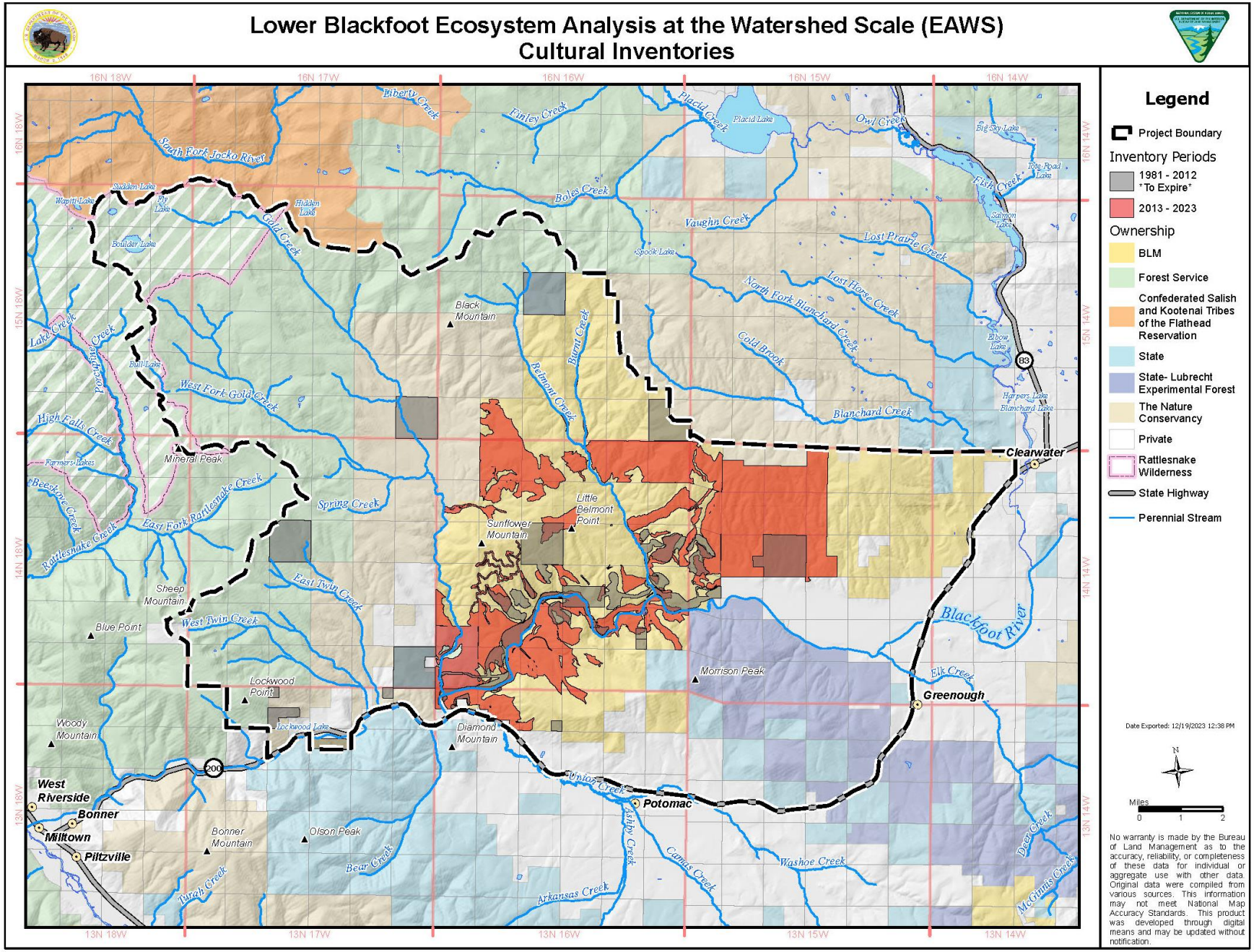
Map 1: Assessment Area Overview.



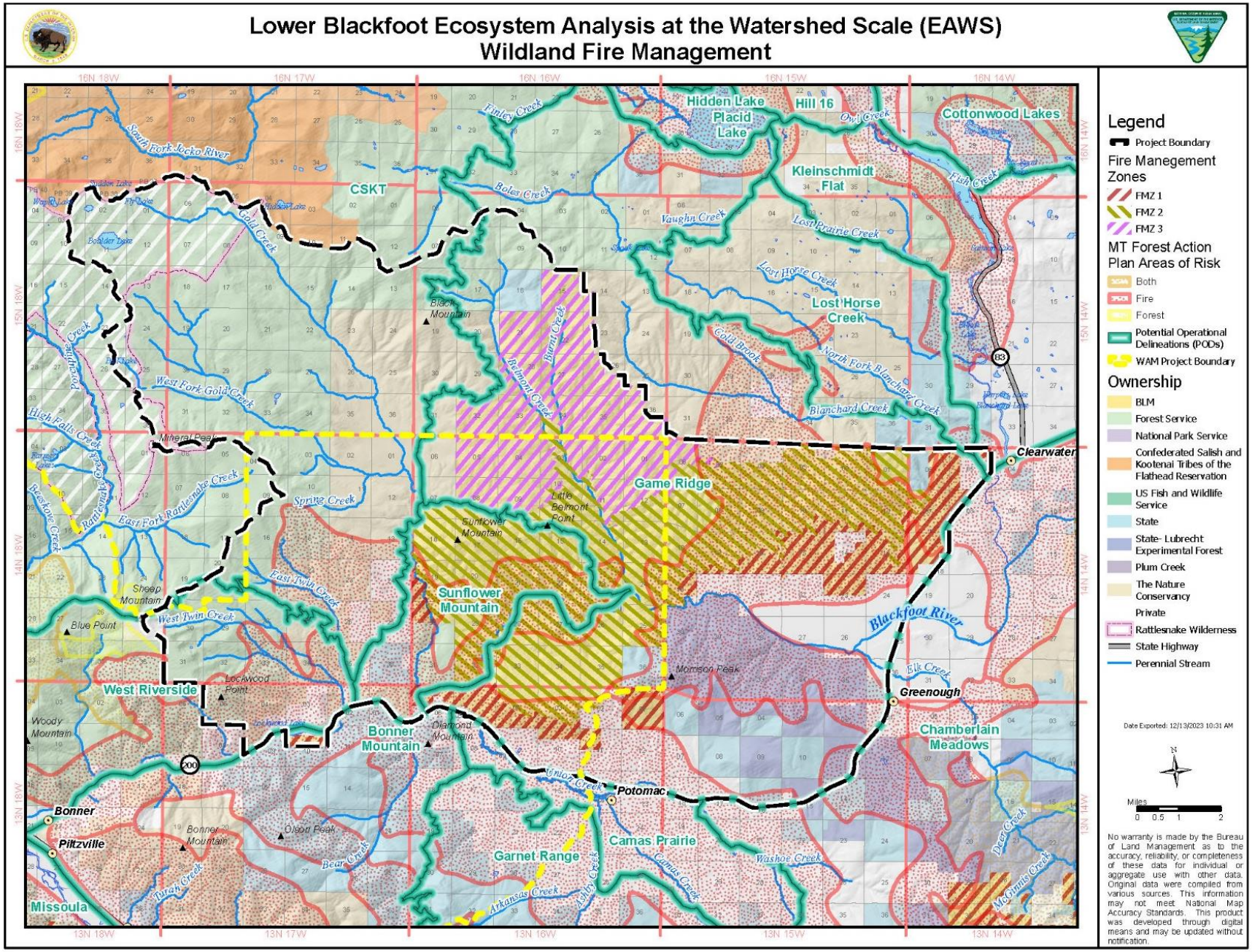
Map 2: Aquatic Habitat and Surveys.



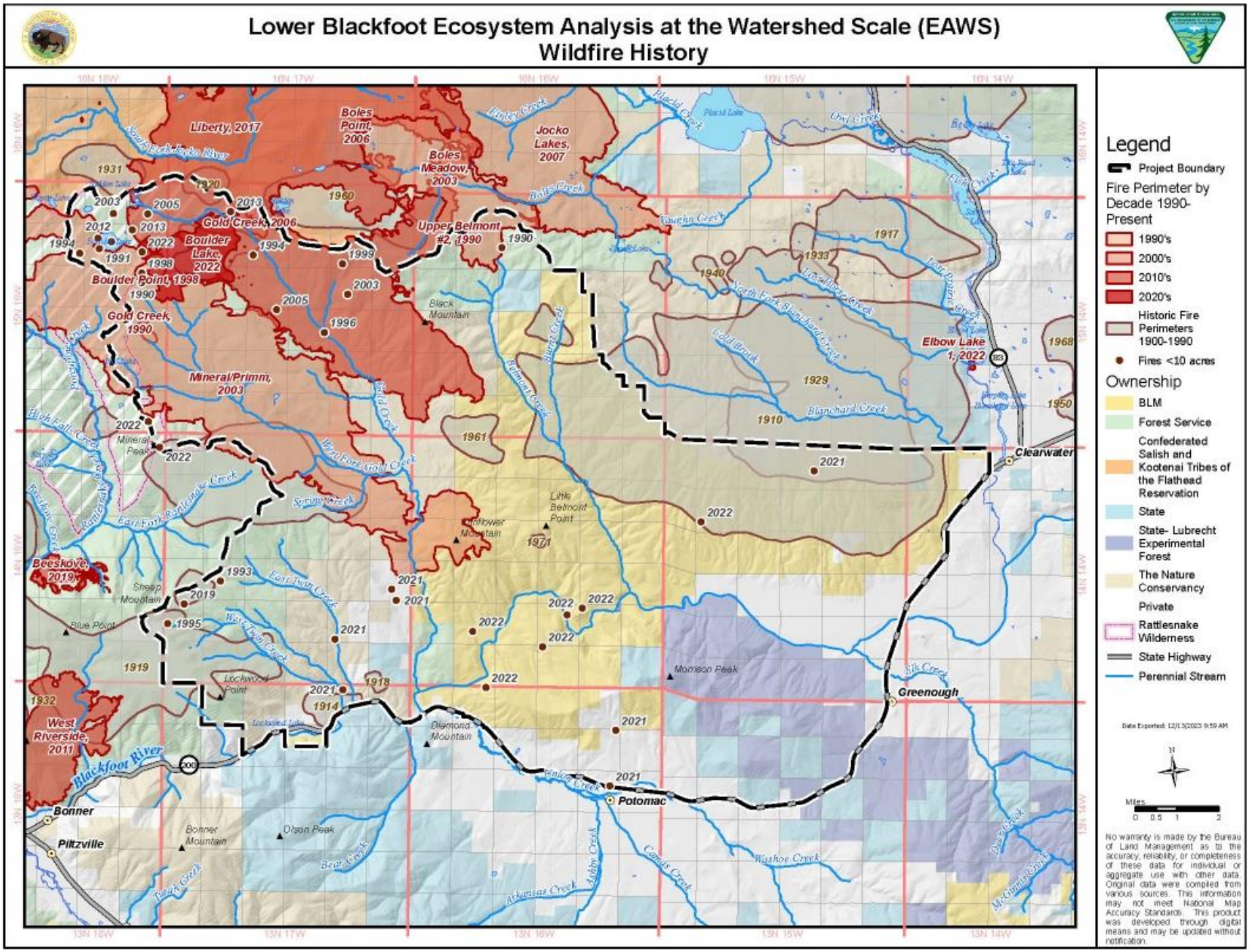
Map 3: Cultural Inventories.



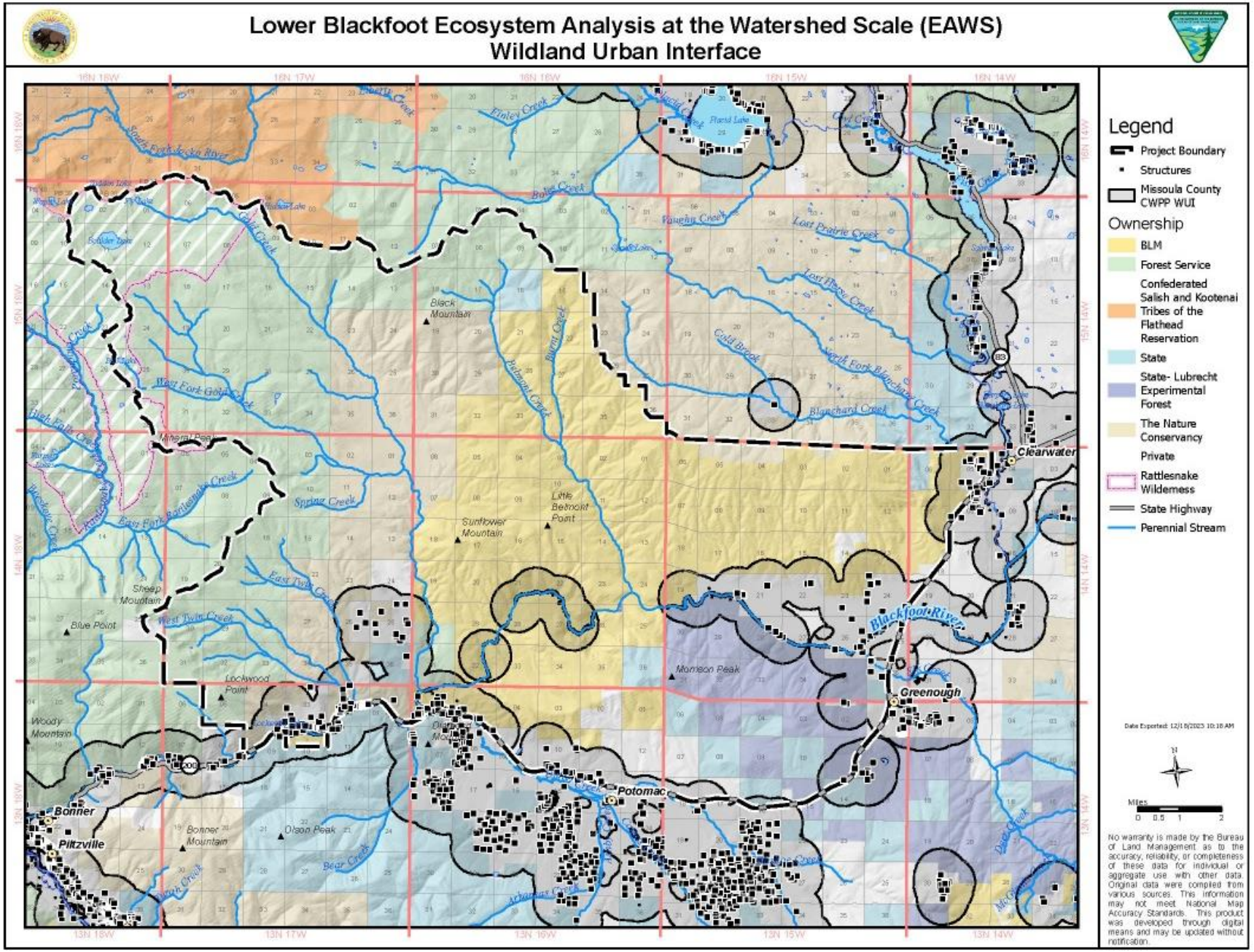
Map 4: Wildland Fire Management.



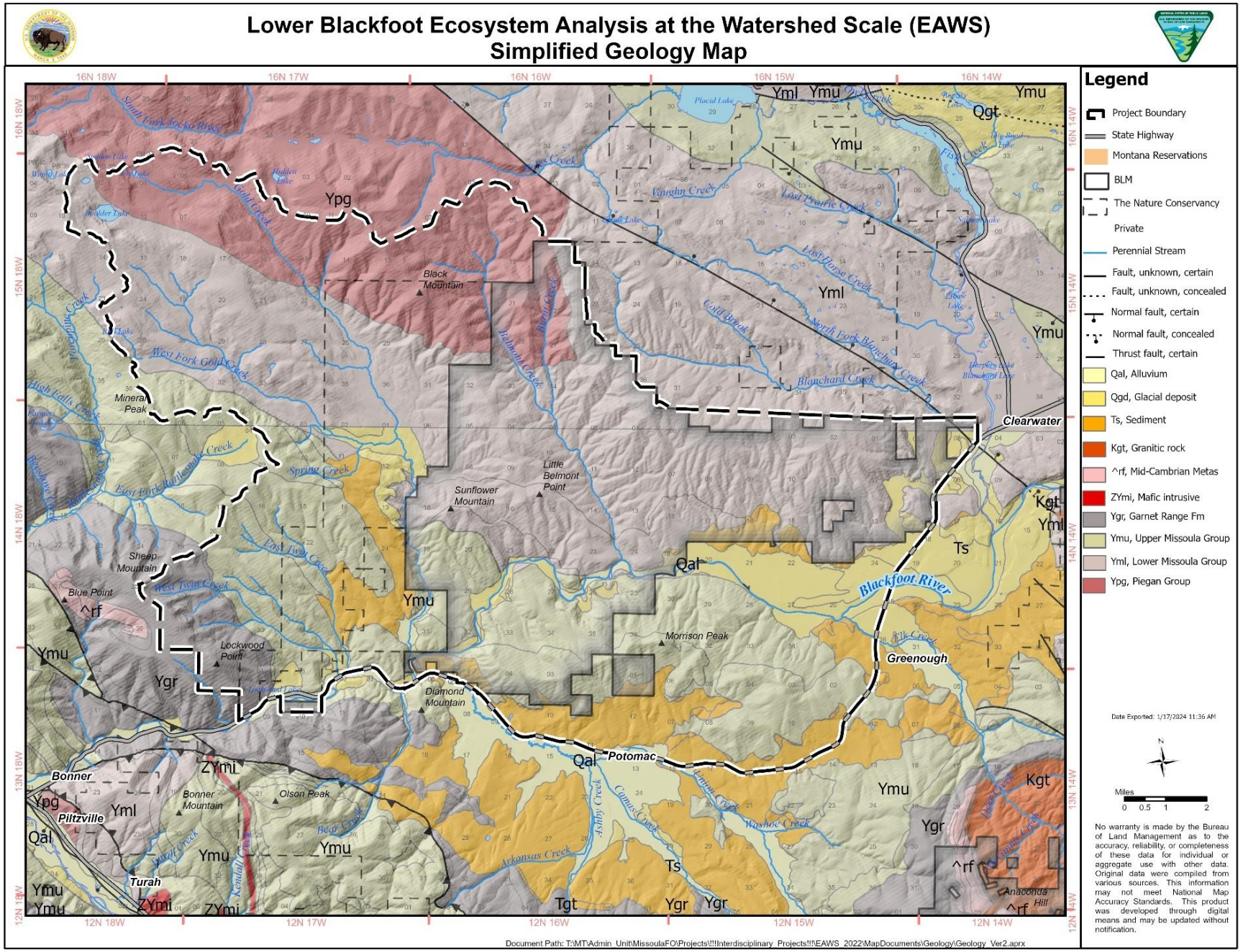
Map 5: Wildfire History.



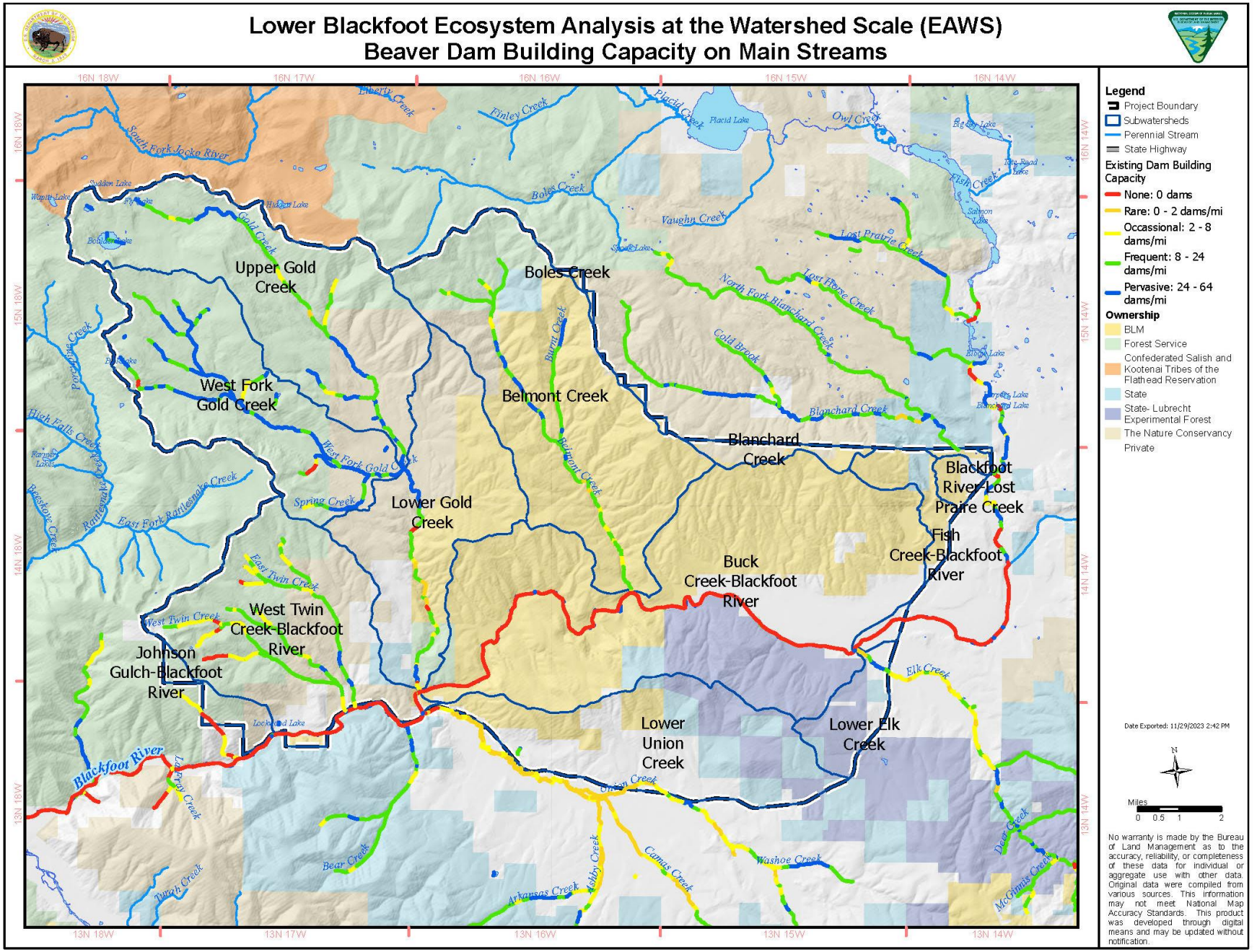
Map 6: Wildland Urban Interface.



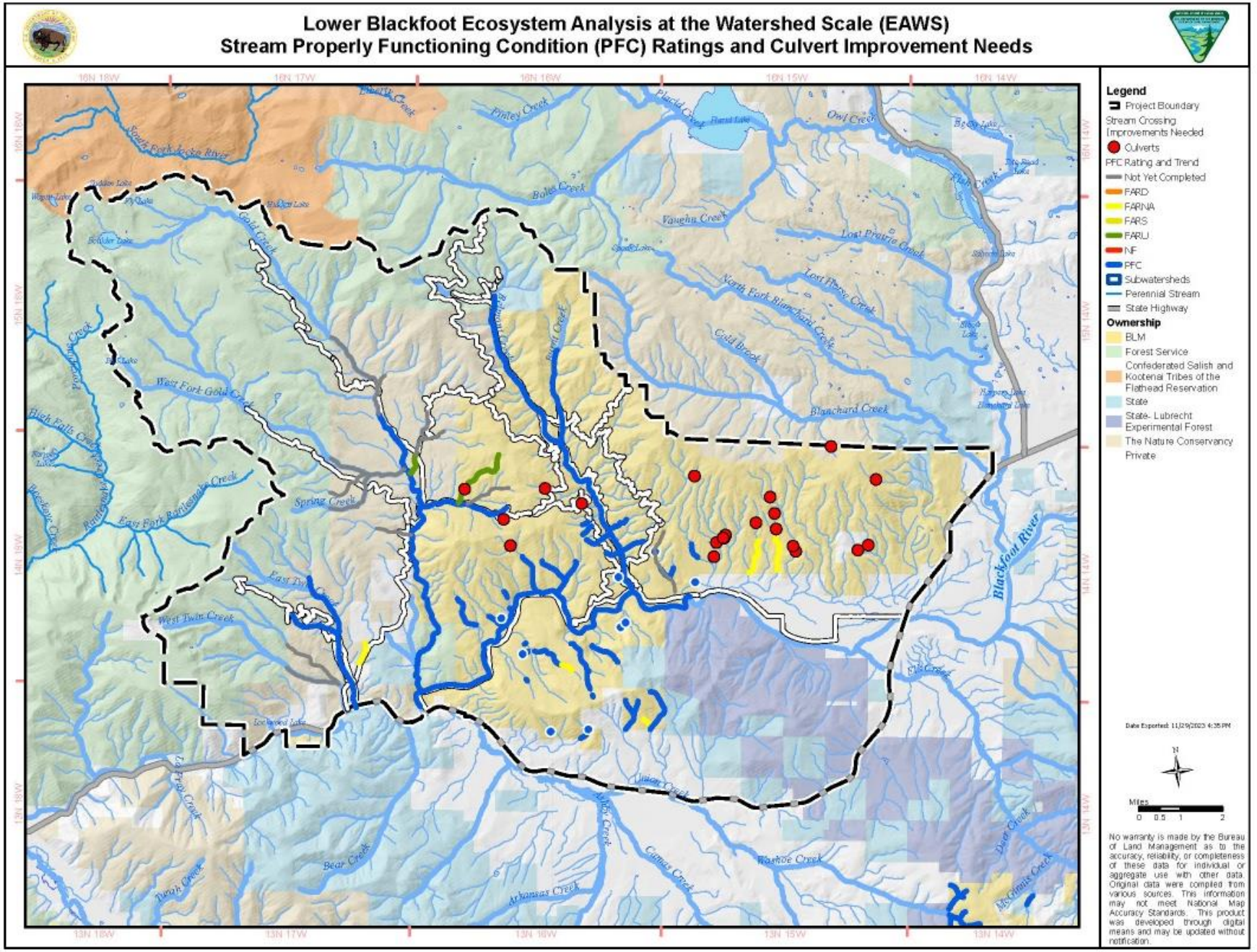
Map 7: Simplified Geology Map.



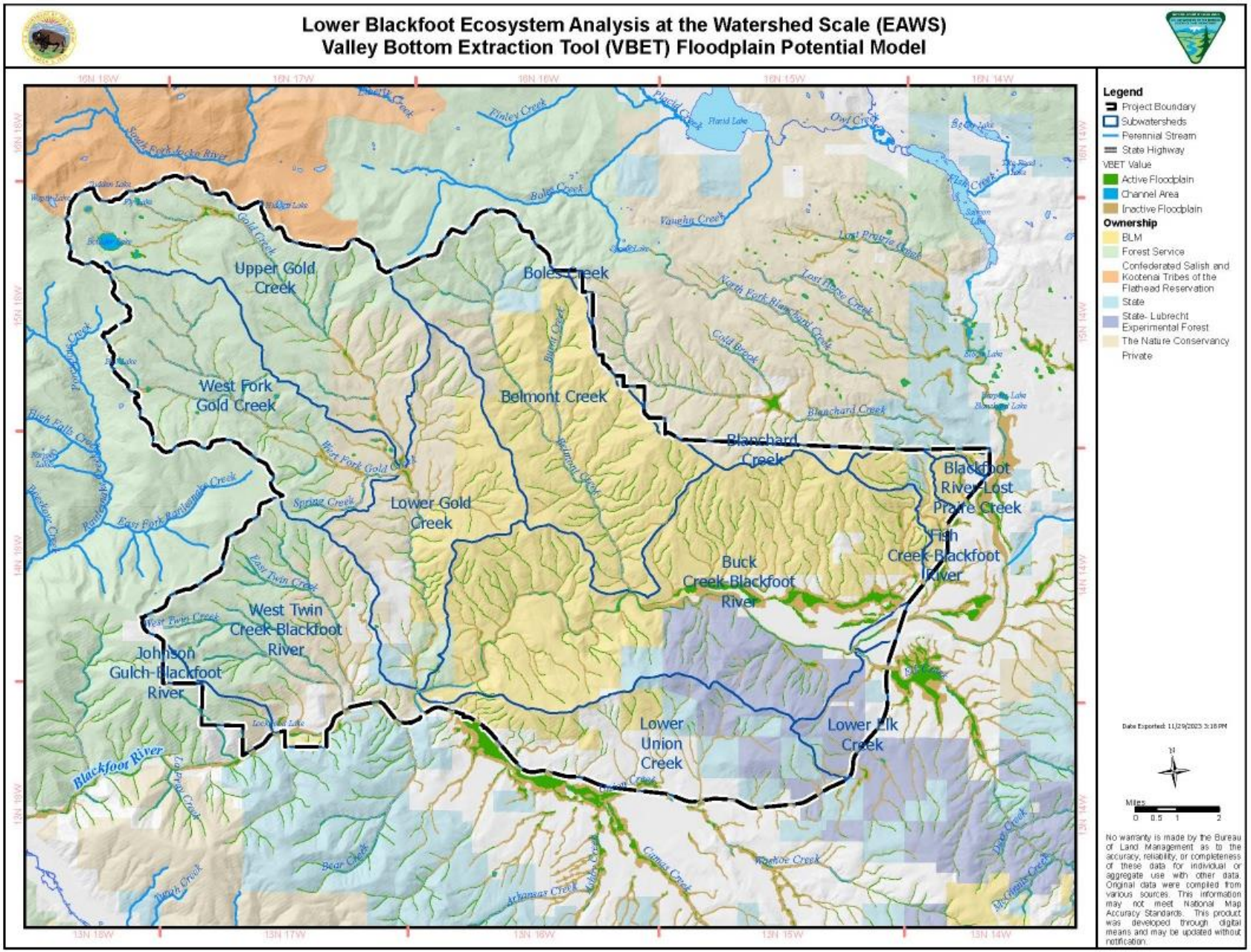
Map 8: Beaver Dam Building Capacity on Main Streams.



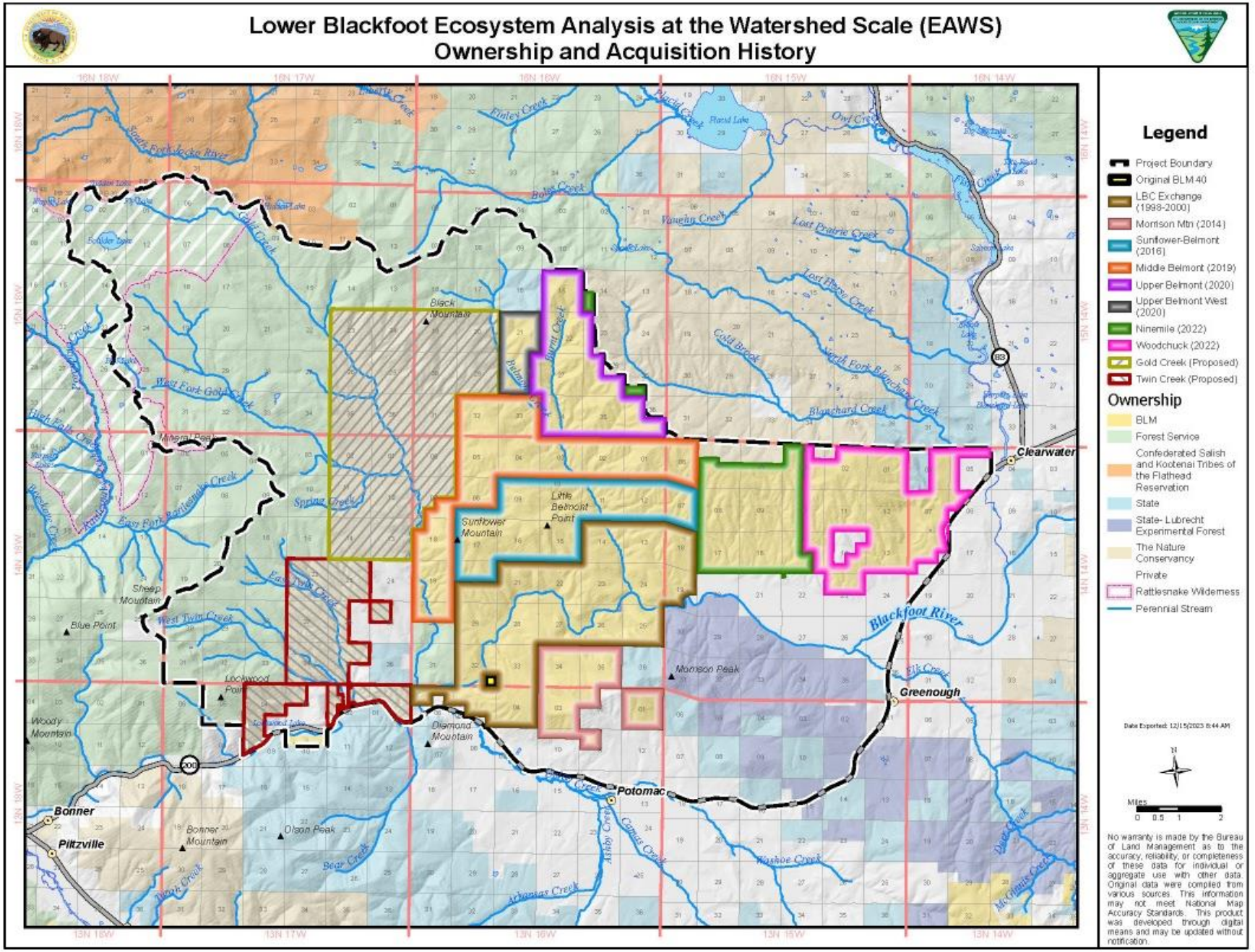
Map 9: Stream Properly Functioning Condition (PFC) Ratings and Culvert Improvement Needs.



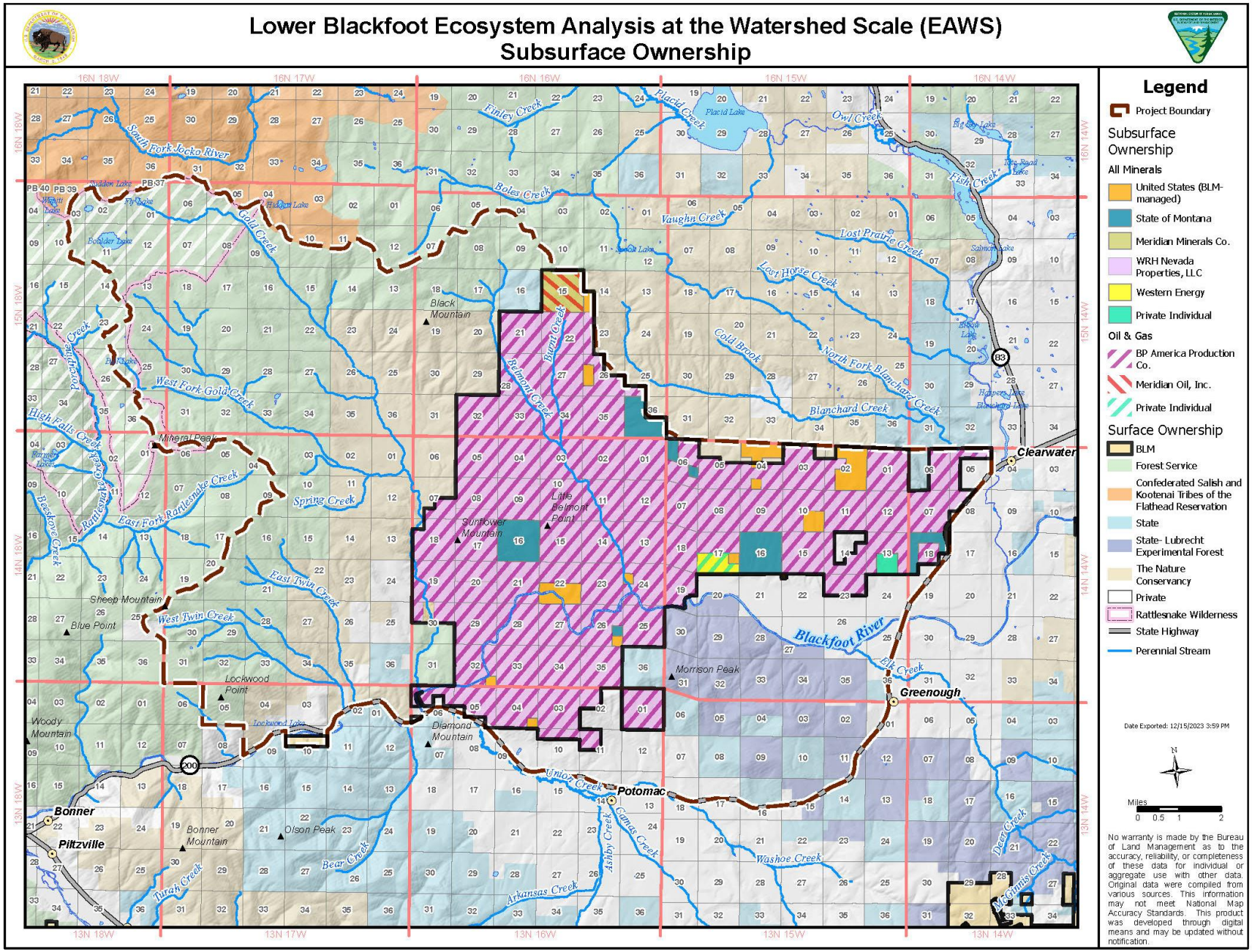
Map 10: Valley Bottom Extraction Tool (VBET) Floodplain Potential Model.



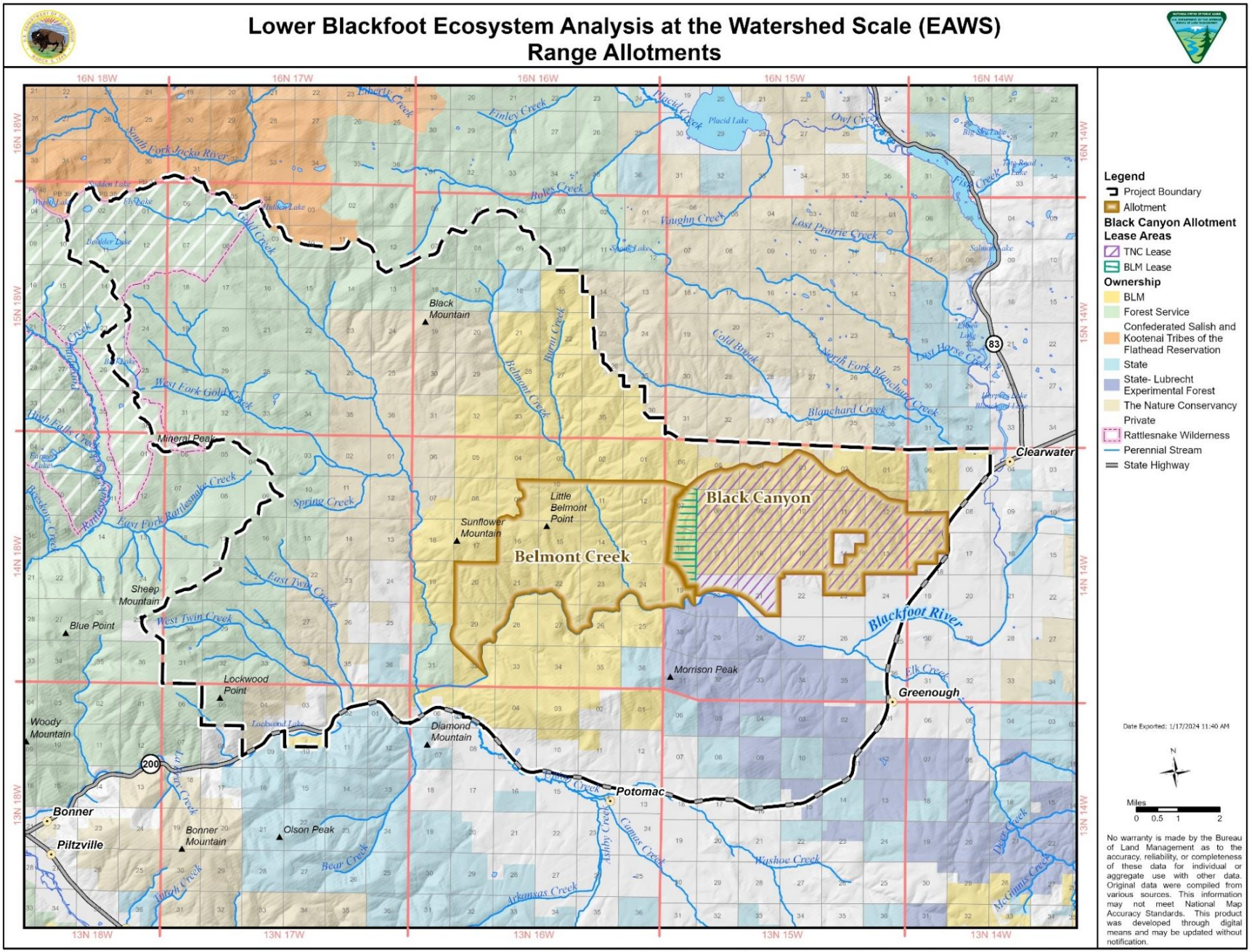
Map 11: Ownership and Acquisition History.



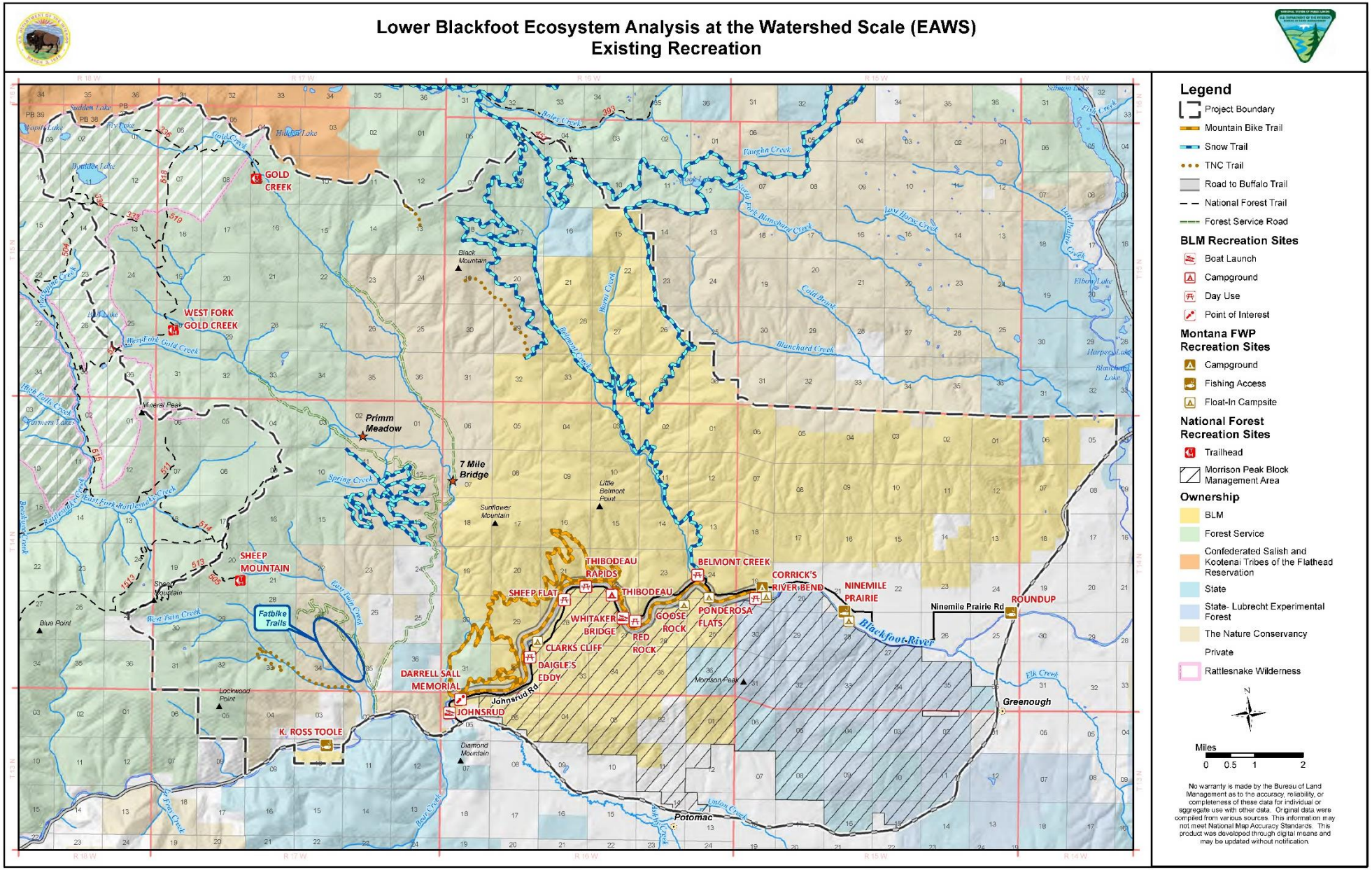
Map 12: Subsurface Ownership.



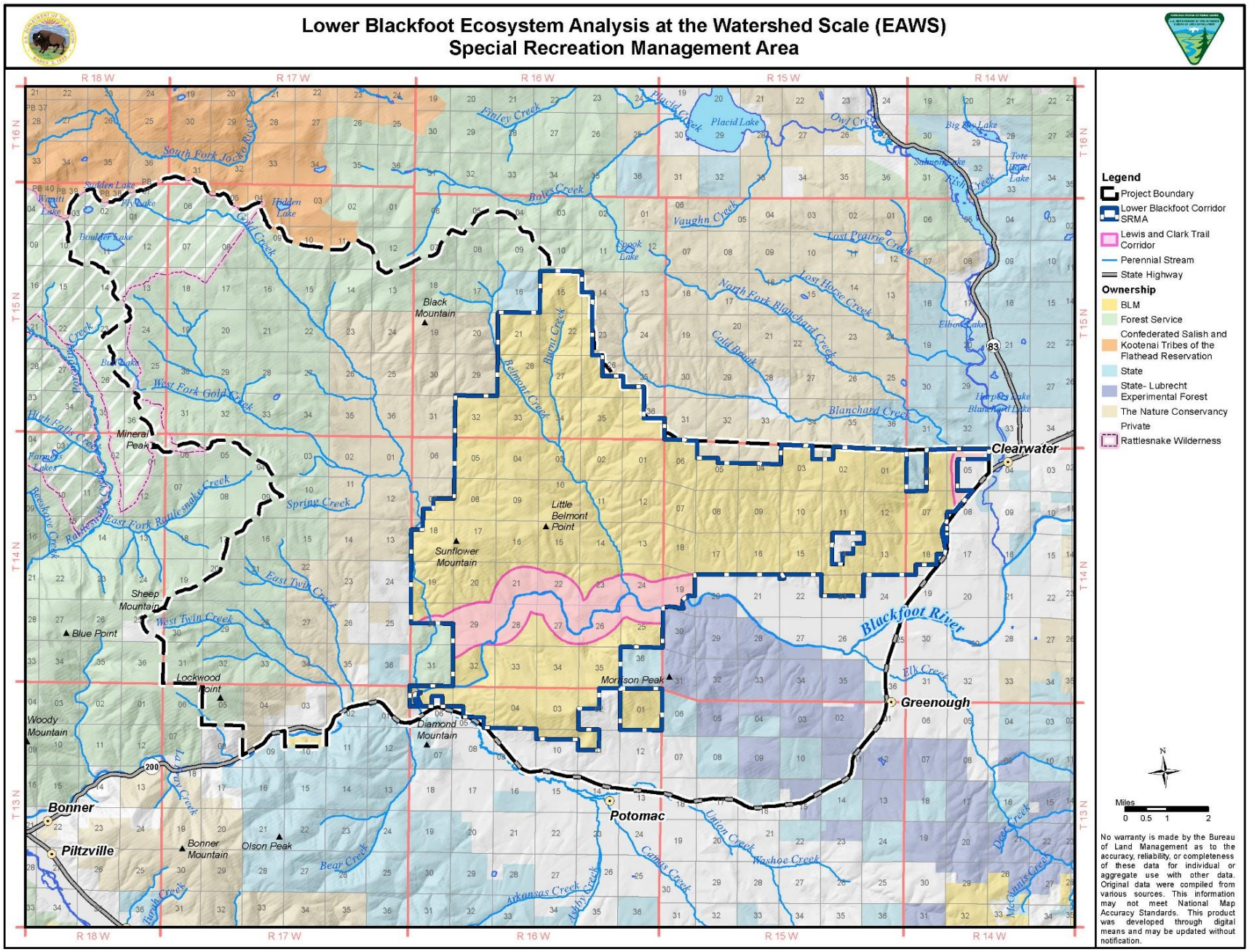
Map 13: Range Allotments.



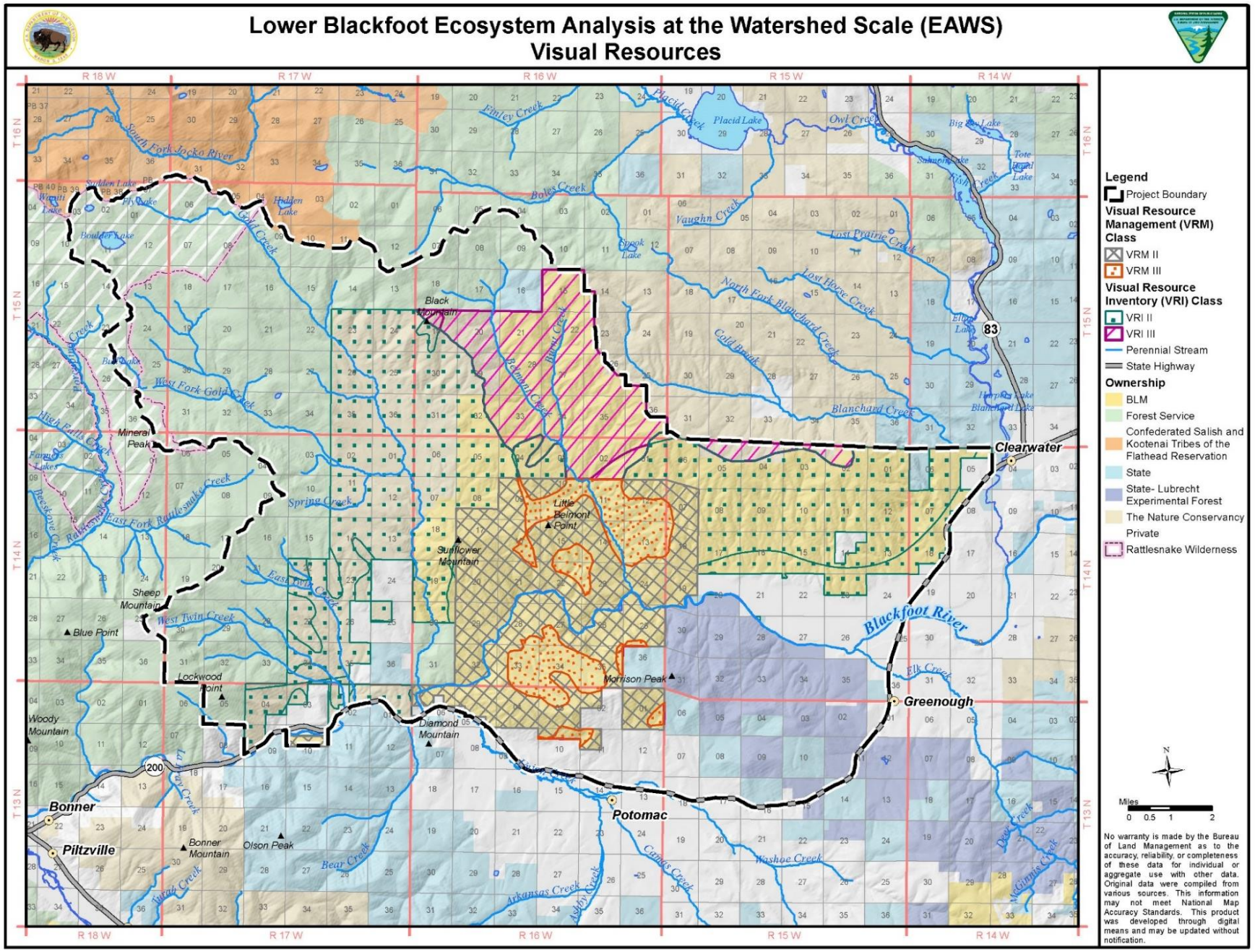
Map 14: Existing Recreation.



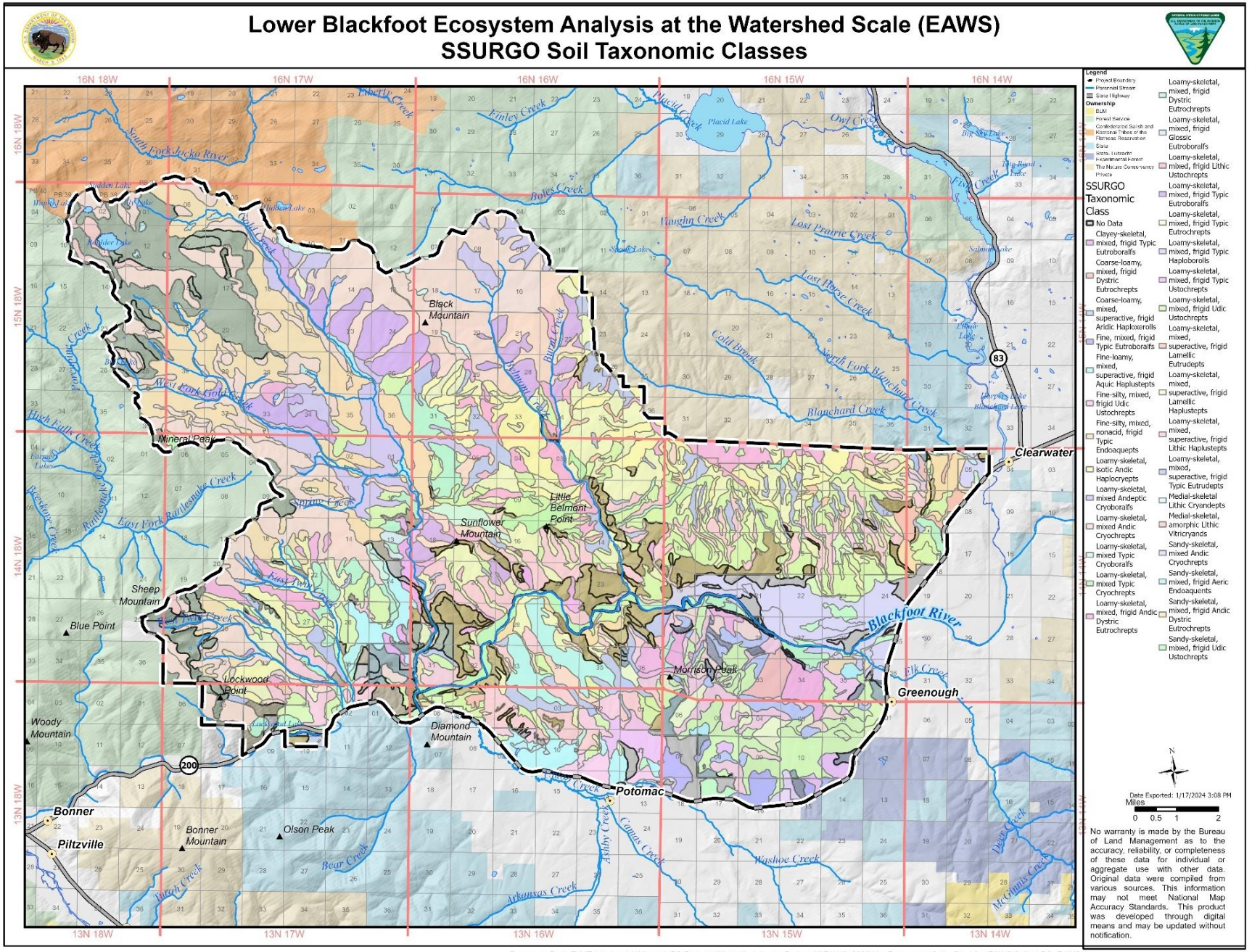
Map 15: Special Recreation Management Area.



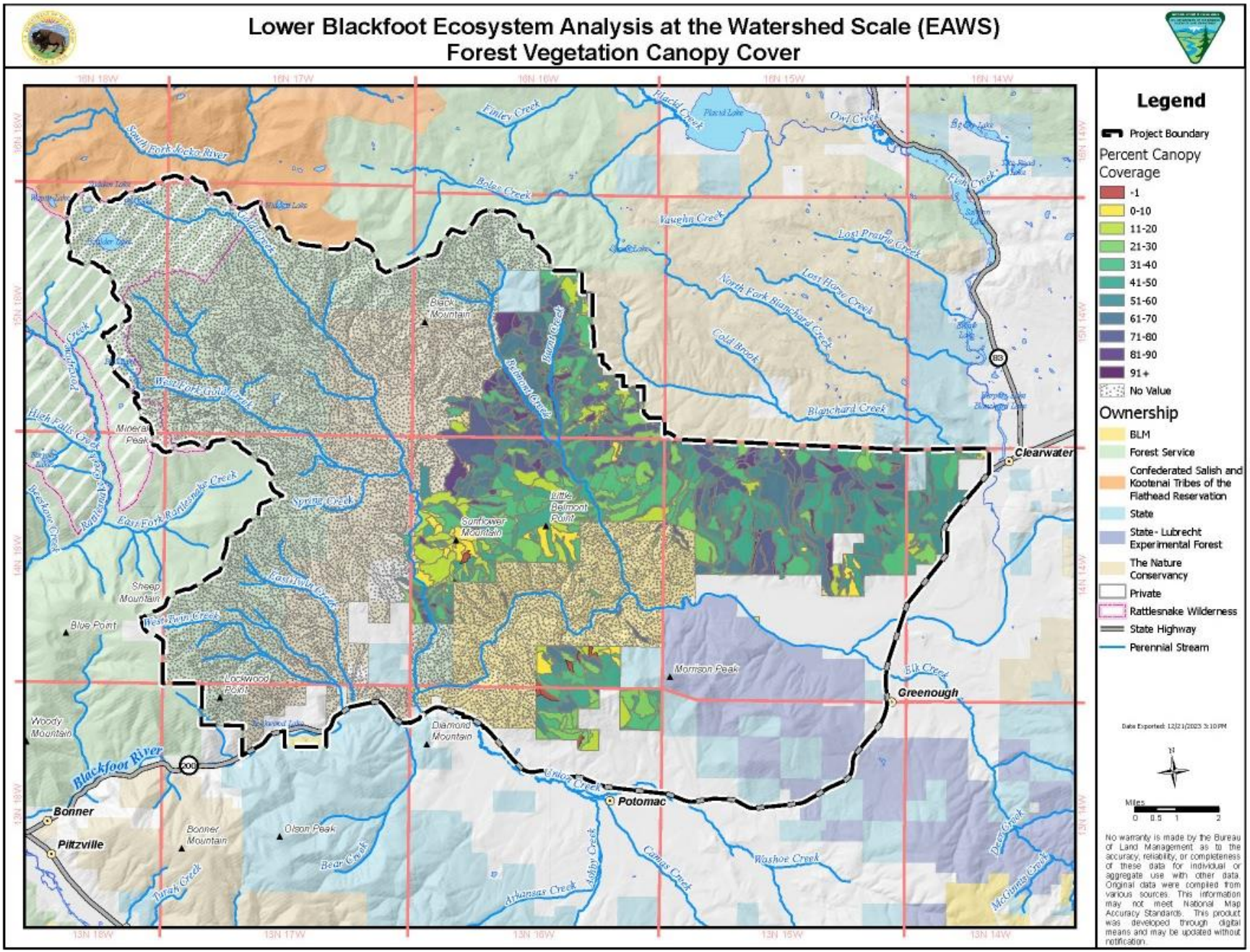
Map 16: Visual Resources.



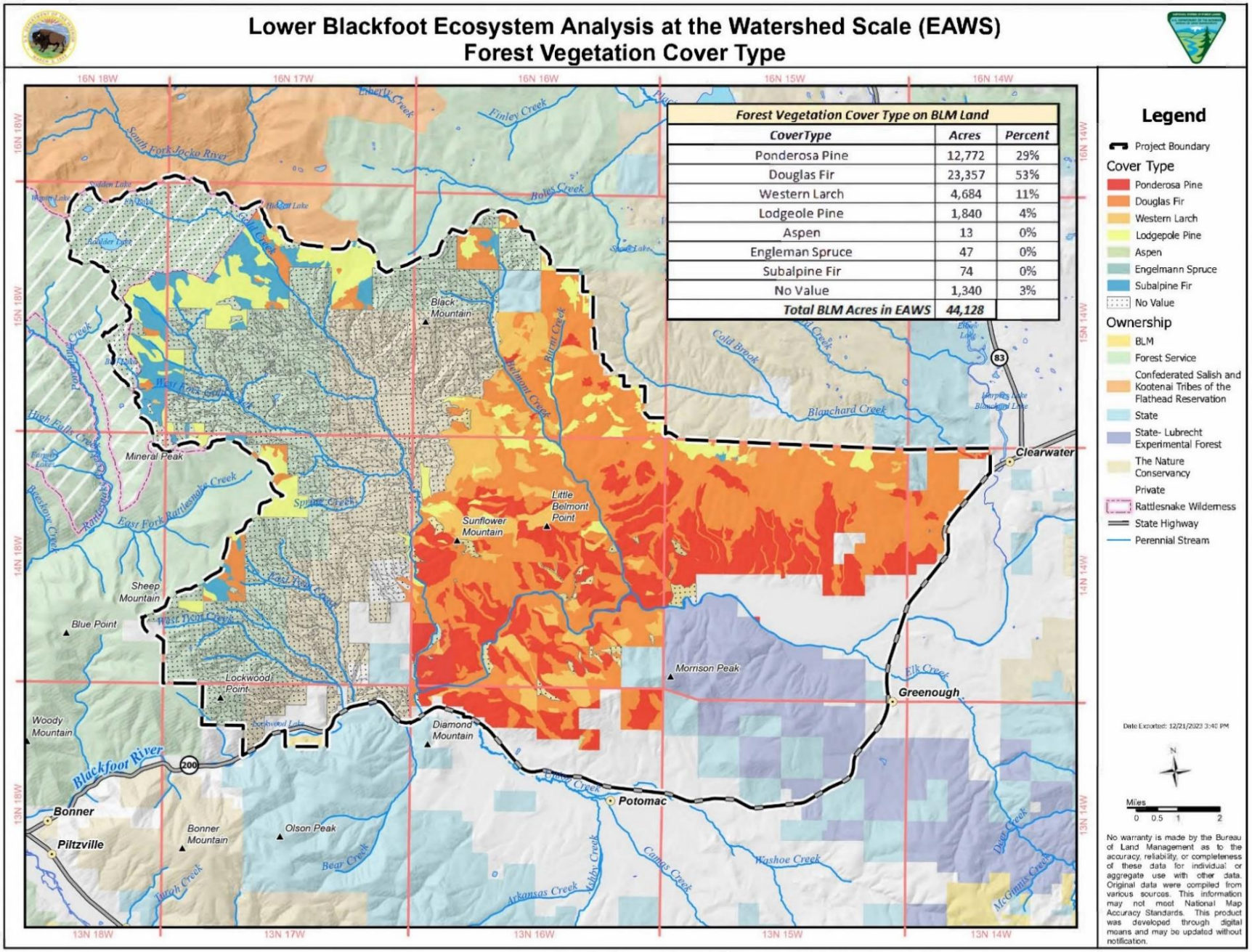
Map 17: SSURGO Soil Taxonomic Classes.



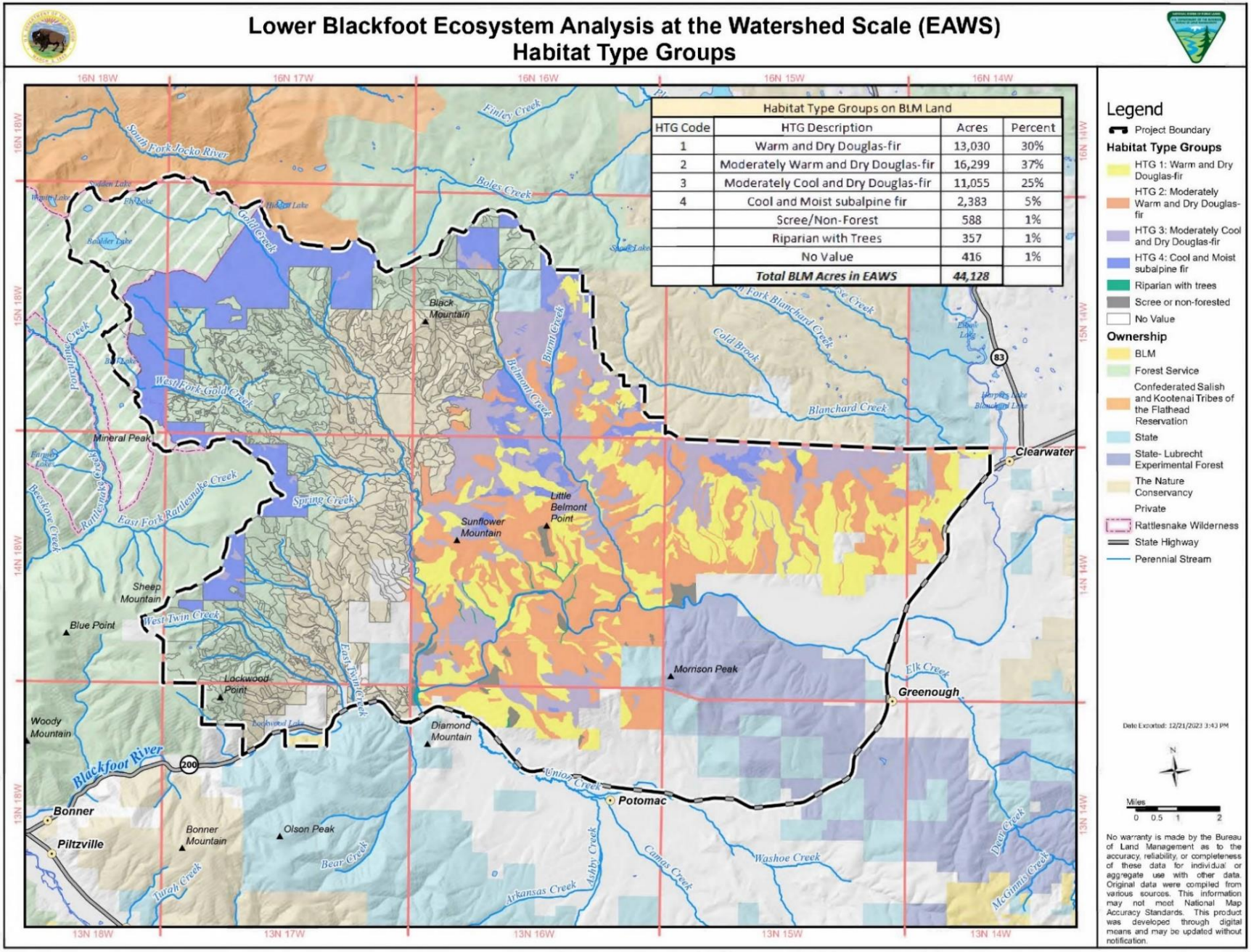
Map 18: Forest Vegetation Canopy Cover.



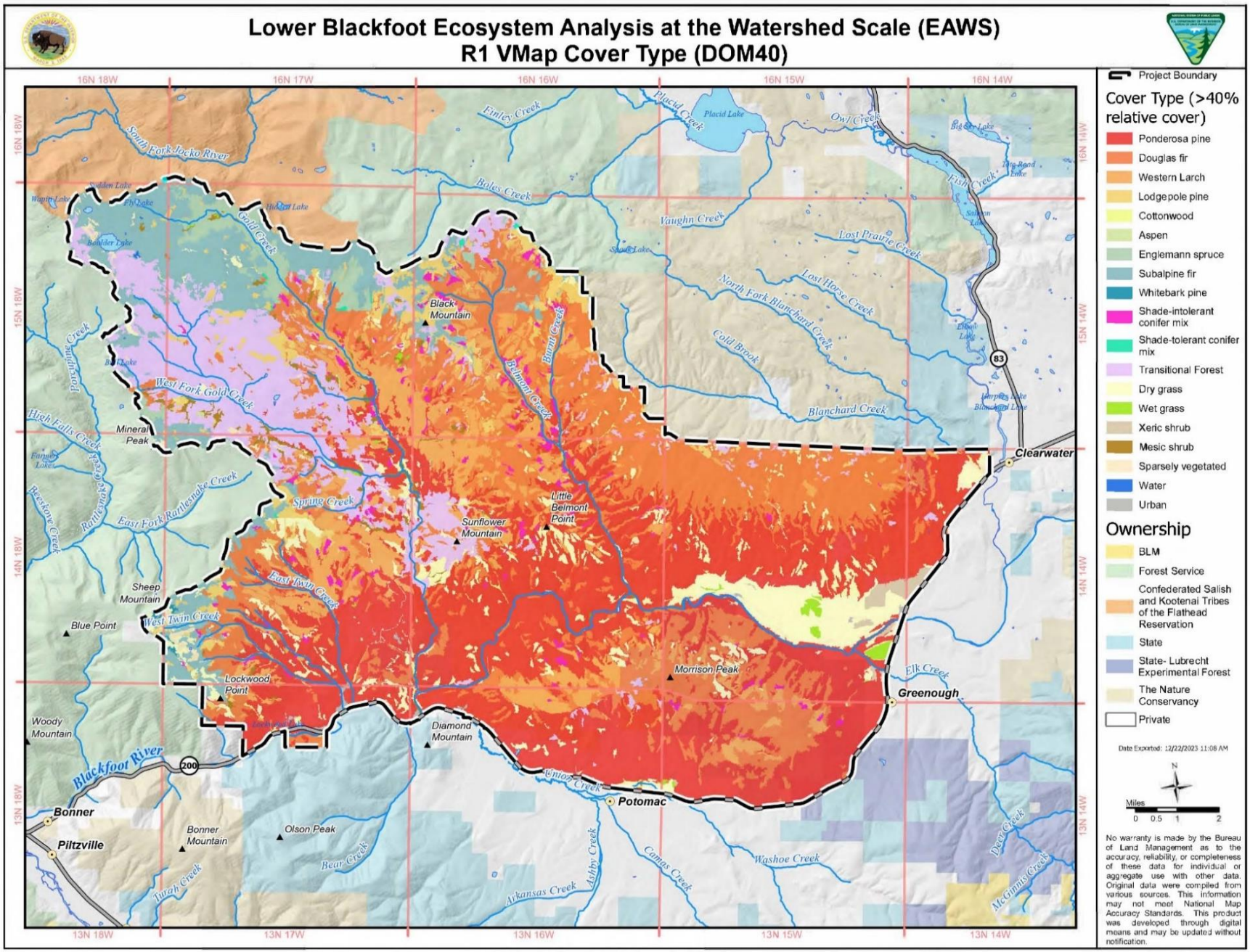
Map 19: Forest Vegetation Cover Type.



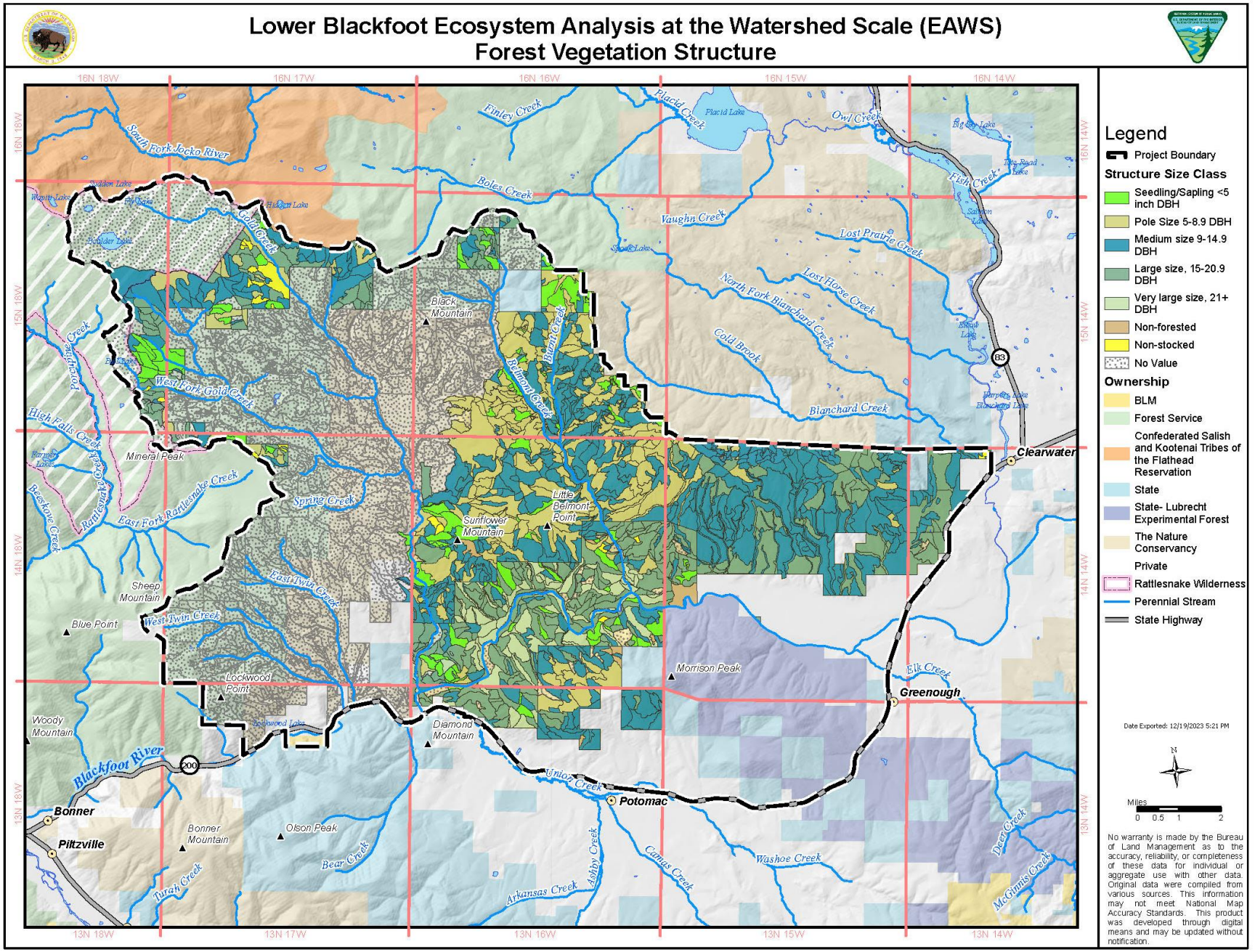
Map 20: Habitat Type Groups.



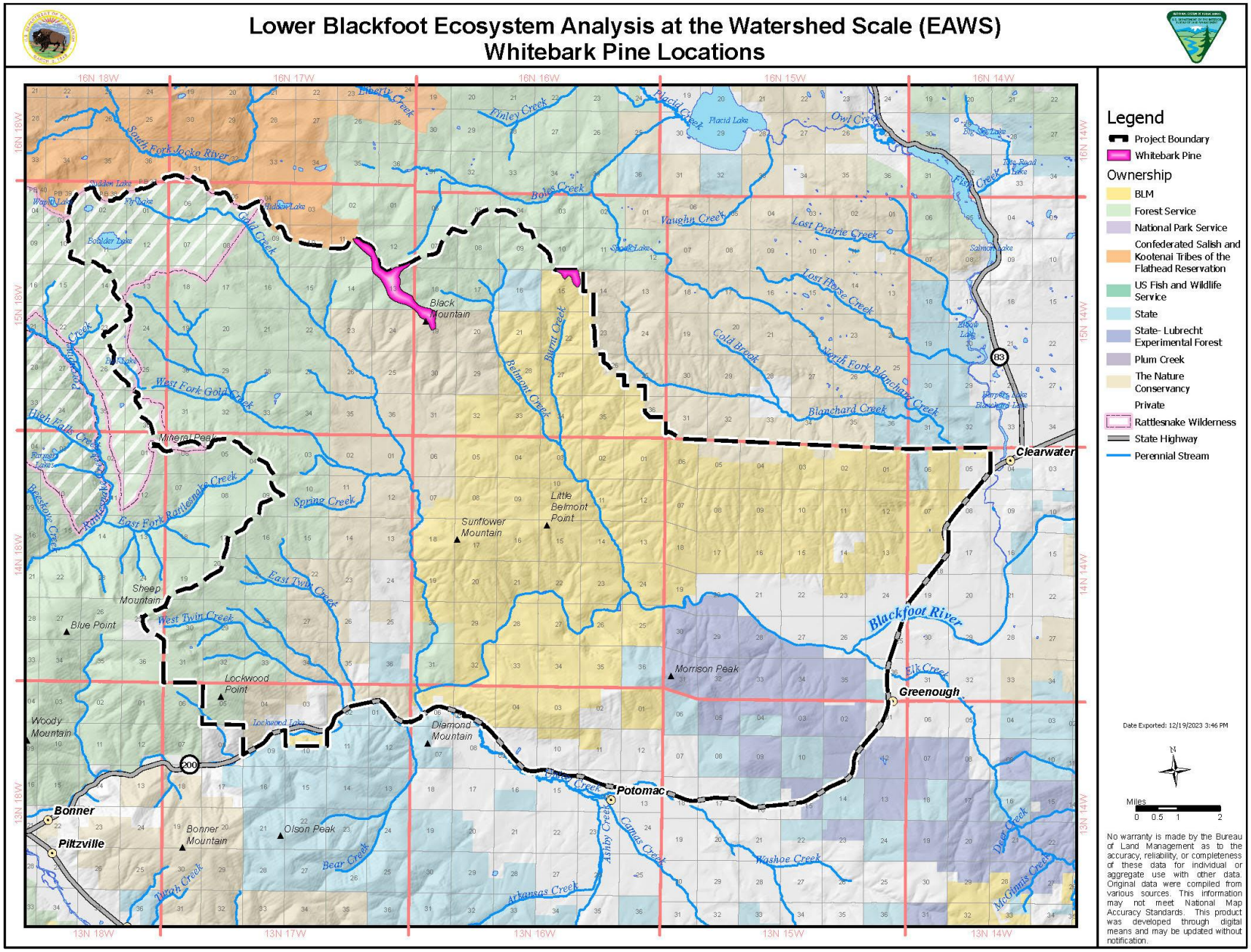
Map 21: R1 VMap Cover Type (DOM40).



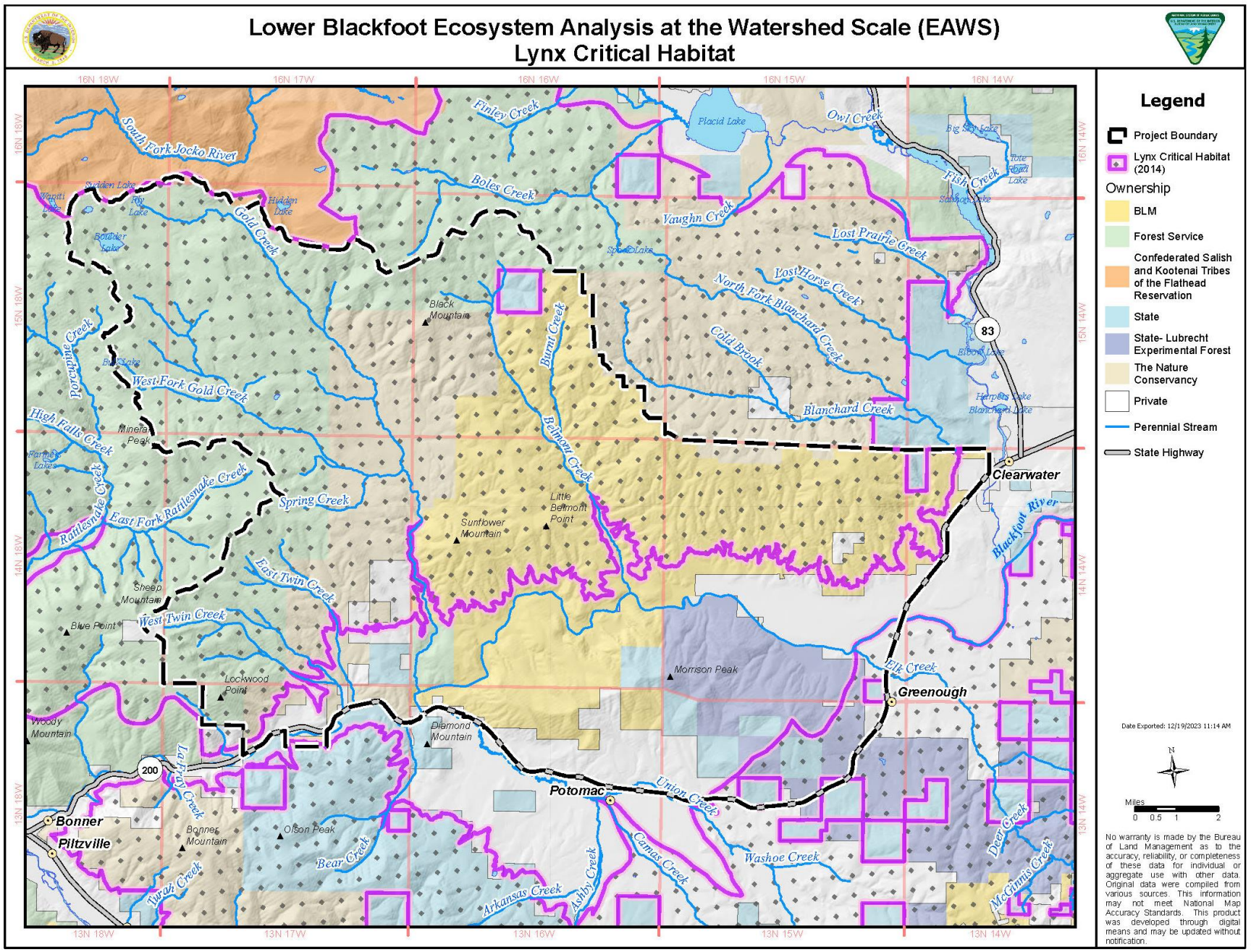
Map 22: Forest Vegetation Structure.



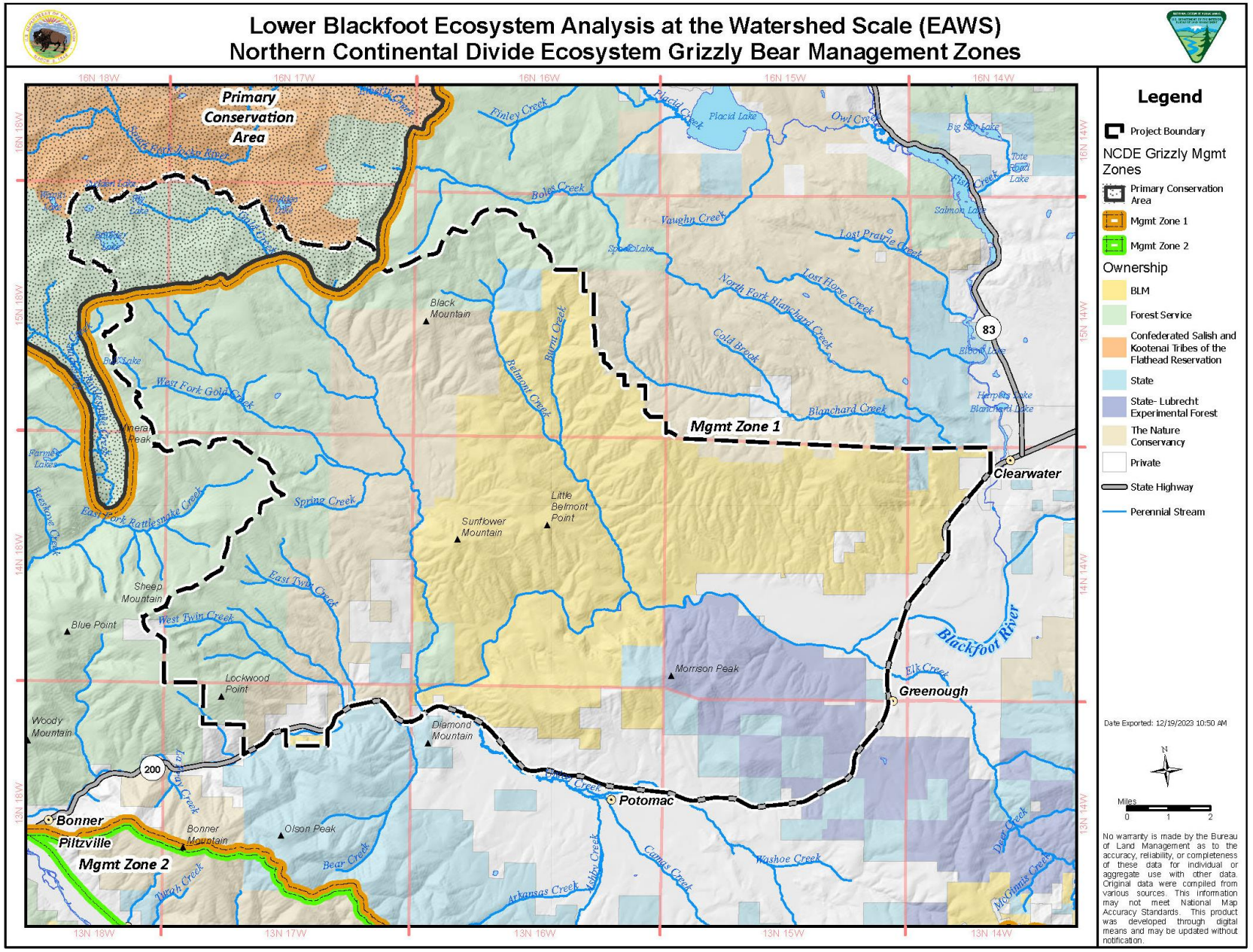
Map 23: Whitebark Pine Locations.



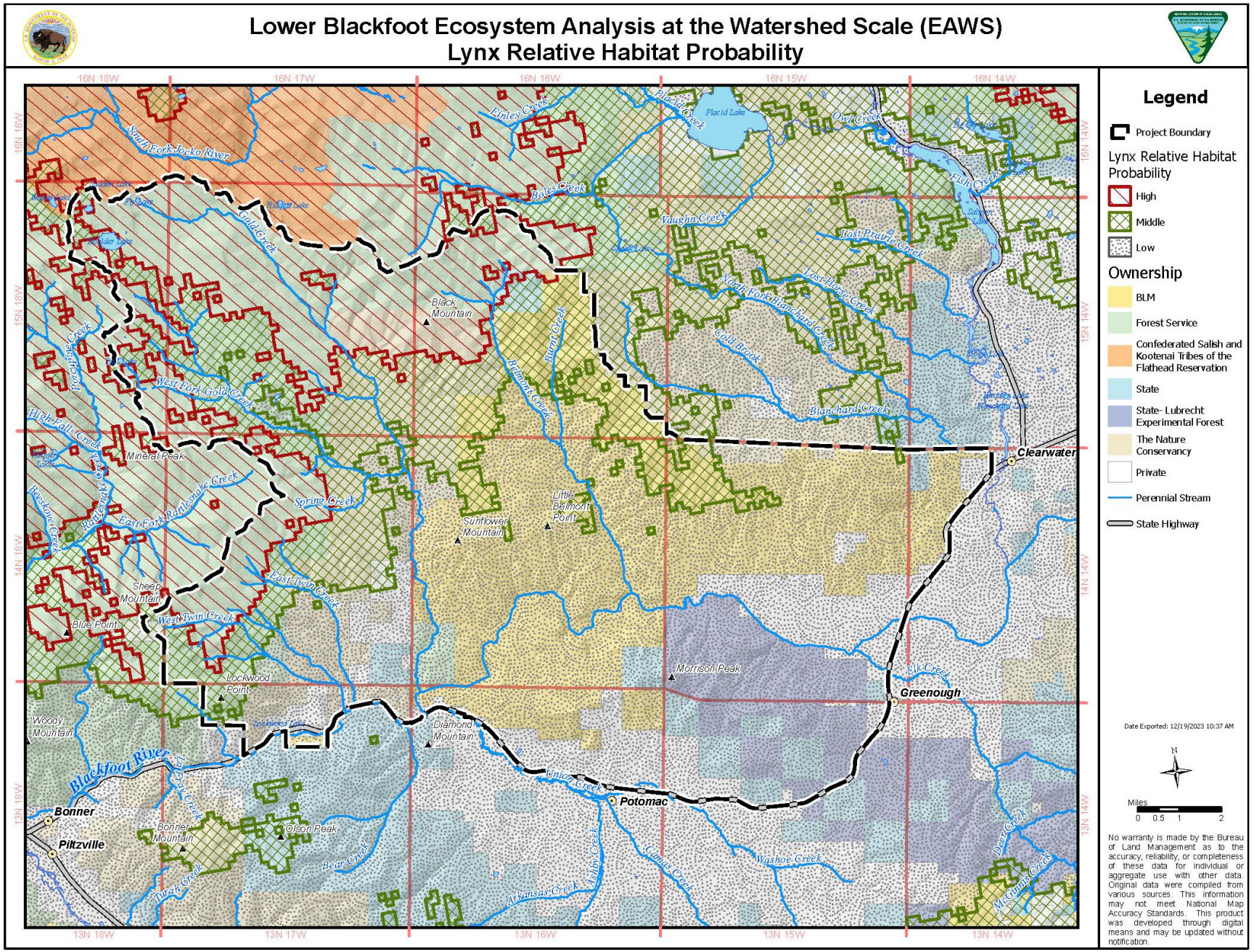
Map 24: Lynx Critical Habitat.



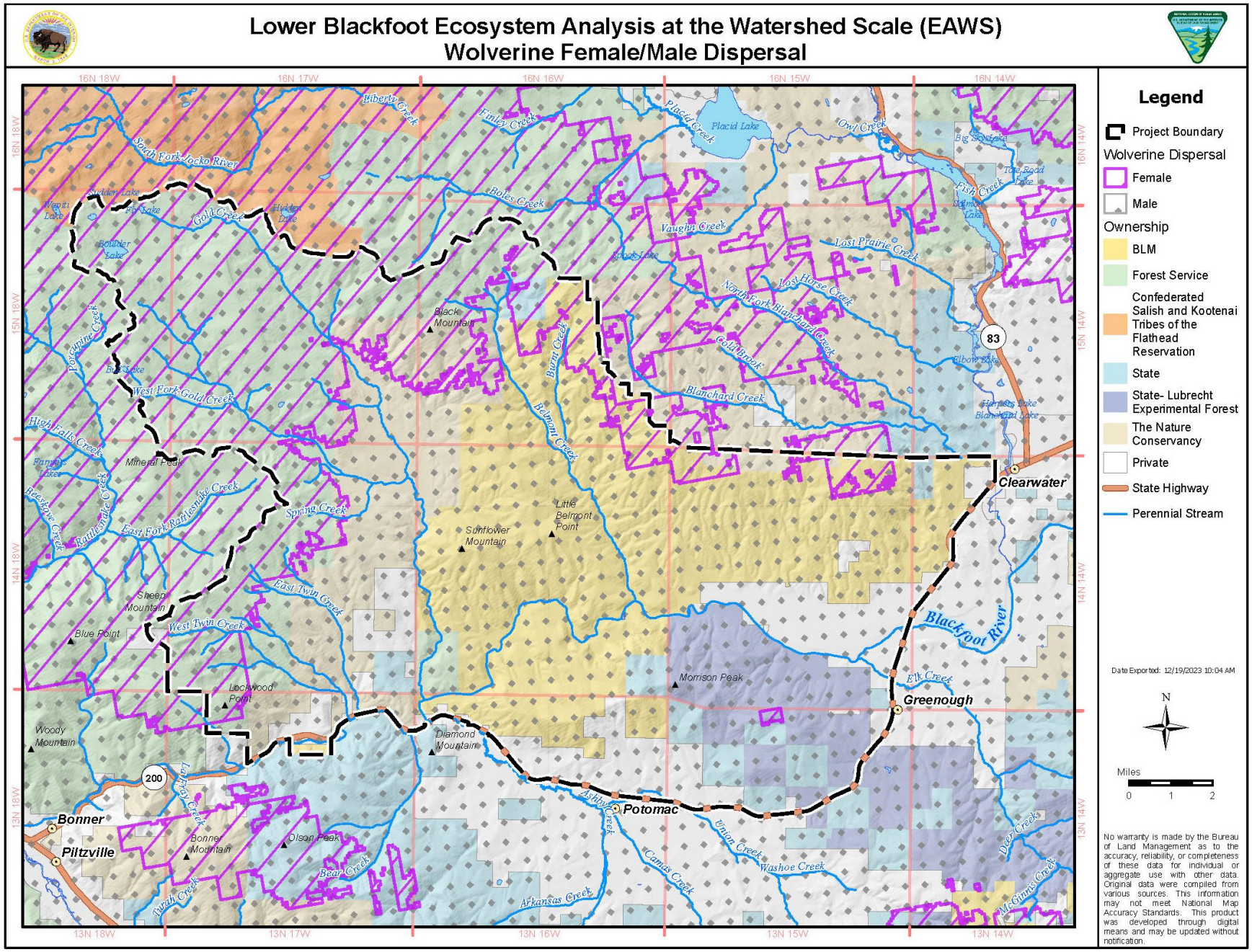
Map 25: Northern Continental Divide Ecosystem Grizzly Bear Management Zones.



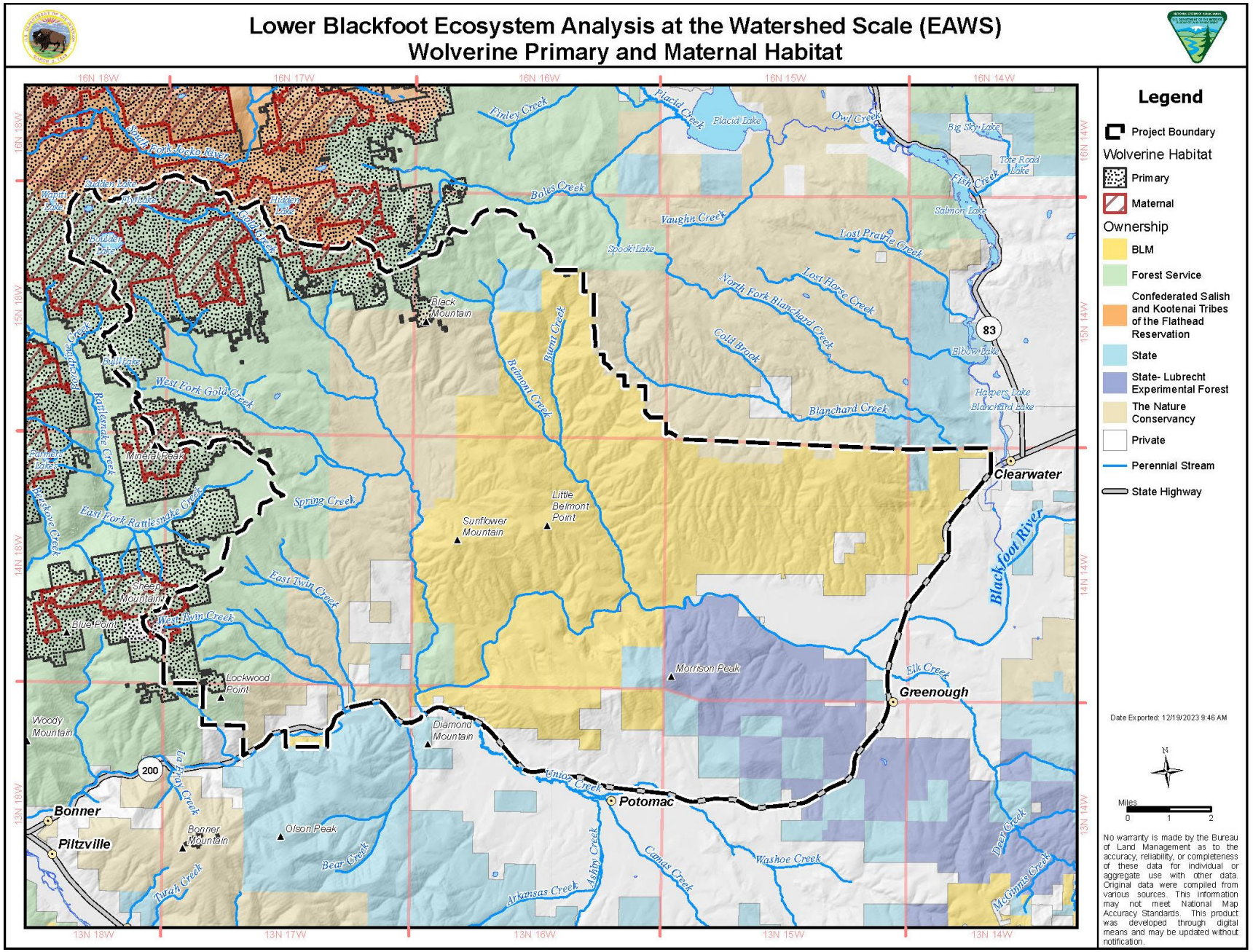
Map 26: Lynx Relative Habitat Probability.



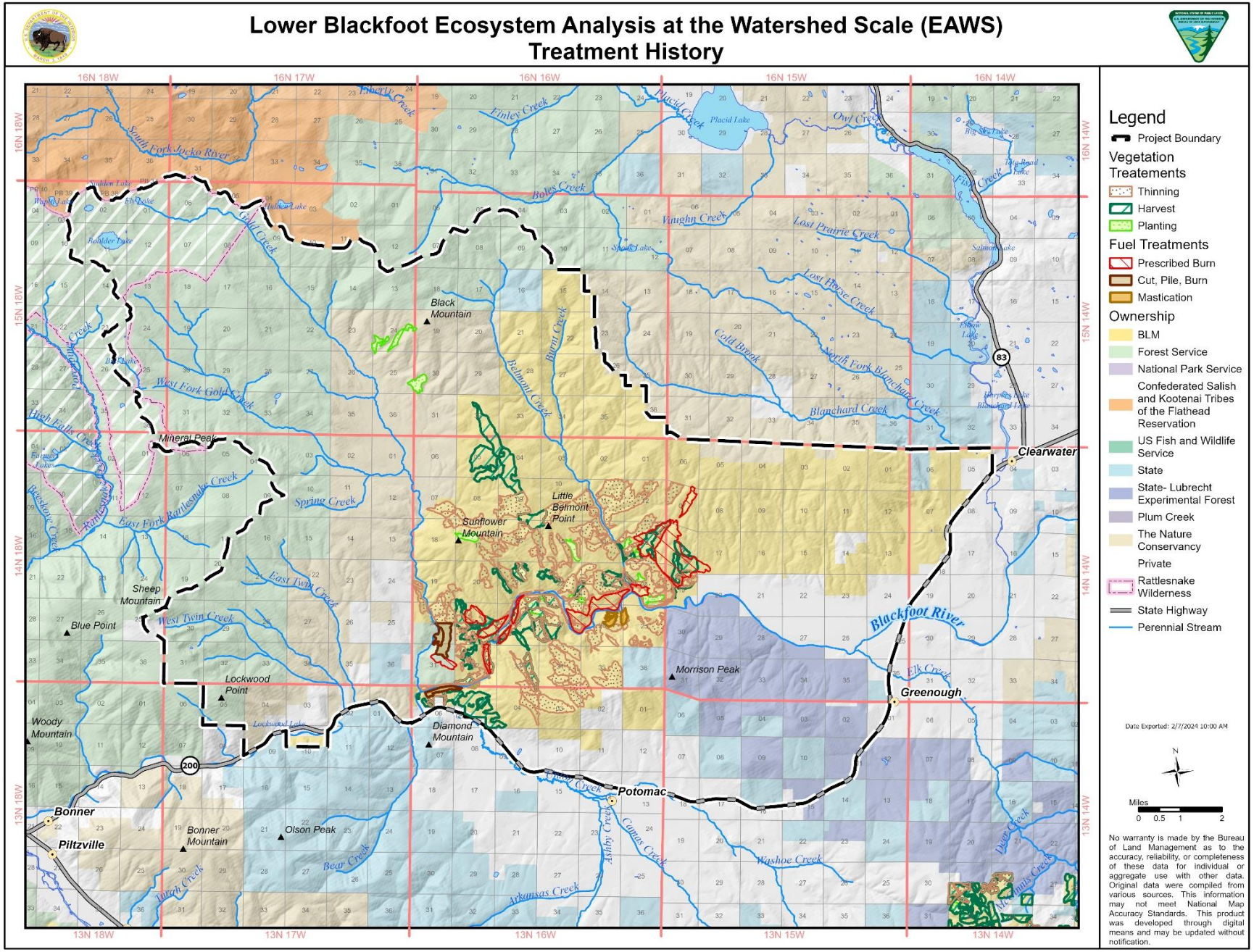
Map 27: Wolverine Female/Male Dispersal.



Map 28: Wolverine Primary and Maternal Habitat.



Map 29: Treatment History.



Appendix D - Subsurface Ownership

Table 27. Subsurface Ownership

Subsurface Reservation/Owner	Township	Section	Subdivision	Section	Subdivision
All minerals except oil and gas and "rock and gravel"/**WRH Nevada Properties, LLC** Oil & gas/**BP America Production Co.** Rock and gravel/**United States (BLM-managed)**	T. 13 N., R. 16 W., P.M.M.	1	All	5	lots 1-4, S½NE¼, S½NW¼, NE¼SW¼, N½SE¼, and SE¼SE¼
		2	NW¼	6	lots 1-5, SE¼NE¼, SE¼NW¼
		3	All	10	N½N½
		4	lots 1-4, S½NE¼, S½NW¼, SW¼, N½SE¼, and SW¼SE¼	11	NW¼
	T. 14 N., R. 14 W., P.M.M.	5	lots 1-4, SW¼NW¼, W½SW¼	8	Tract A, C.O.S. 5457
		6	lots 1 and 2, S½NE ¼, SE¼	18	NE¼SW¼, NW¼SE¼, SW¼NE¼, SE¼NE¼
		7	lots 1-4; NE¼, E½NW¼, E½SW¼, SE¼		
	T. 14 N., R. 15 W., P.M.M.	1	All	11	All
		2	S½NW¼, W½SW¼	12	All
		3	lots 2-4, S½NE¼, S½NW¼, S½	13	N½, W½SW¼, E½SE¼
		4	S½SW½NE¼, S½SE½NE¼, S½SW½NW¼, N½SW¼,	14	SE¼NW¼, W½NW¼, W½SW¼, SE¼SW¼, SE¼
		5	S½S½NE¼, S½NW¼, S½	15	All
		6	lots 1, 2, 5, 6, and 8-12	17	N½
		7	All	18	All
		8	All	19	lots 1-9, lots 11 and 12
		9	All	23	N½
		10	N½, SW¼		
	T. 14 N., R. 16 W., P.M.M.	1	All	19	All
		2	All	20	S½
		3	All	20	N½
		4	All	21	All
		5	All	22	All
		7	SE¼SW¼ and SE¼	23	All
		8	N½, N½SW¼ and N½SE¼	24	All
		8	S½SW¼ and S½SE¼	25	All
		9	All	26	All
		10	All	27	All
		11	All	28	All
		12	All	29	All
		13	All	30	lots 1 and 2; NE¼ and E½NW¼
		14	All	32	All
		15	All	33	All
		17	All	34	All
		18	lots 2, 3, and 4; E½, E½NW¼, and E½SW¼	35	All
	T. 15 N., R. 16 W., P.M.M.	14	W½SW¼	27	All
		21	All	28	All
		22	All	32	All
		23	W½NW¼, W½SW¼	33	All
		25	S½SW¼	34	All
		26	W½ and SE¼	35	All

Table 28. Subsurface Ownership continued

Subsurface Reservation/Owner	Township	Section	Subdivision
All minerals/**United States (BLM-managed)**	T. 13 N., R. 16 W., P.M.M.	4	SE¼SE¼
	T. 14 N., R. 15 W., P.M.M.	2	lots 1-3, S½NE¼, E½SW¼, SE¼
		4	S½SE¼NW¼, SE¼SW¼
		10	SE¼
		17	NE¼SE¼
		22	Small tract in NW¼NW¼ (metes/bounds)
		14	W½SW¼
	T. 15 N., R. 16 W., P.M.M.	26	SW¼NW¼, NW¼SW¼,
All minerals/**State of Montana**	T. 14 N., R. 14 W., P.M.M.	18	lots 1-4, E½NE¼, NW¼NE¼, NE¼NW¼
	T. 14 N., R. 15 W., P.M.M.	6	lots 3, 4, & 7
		16	All
	T. 14 N., R. 16 W., P.M.M.	16	All
	T. 15 N., R. 16 W., P.M.M.	36	W½ and SE¼
All minerals/**Private Individual**	T. 14 N., R. 15 W., P.M.M.	13	E½SW¼, W½SE¼, E½SE¼
All minerals except oil and gas/**Western Energy** Oil & gas/ **Private Individual**	T. 14 N., R. 15 W., P.M.M.	17	SW¼, W½SE¼, SE¼SE¼
All minerals except oil and gas/**Meridian Minerals Co.** Oil and gas/**Meridian Oil, Inc.**	T. 15 N., R. 16 W., P.M.M.	15	All

Appendix E - Facilities and Assets Listing

Roads table is in the project file.

Table 29. Recreation Sites.

Description	Location ID	Asset Type	Cost code	CRV	Def Maint	Fci Value	Status	Uom	Uom Qty	Juris	Maint Resp	Maint Level	Condition
THIBODEAU RAPIDS DAY USE	L61103	RECSITE	RST	$ 77,688	$ -	0	OPERATING	ACR	1	BLM	BLM	2	GOOD
WHITAKER BRIDGE DAY USE	L61100	RECSITE	RST	$ 434,792	$ 110,556	0.25	OPERATING	ACR	4	BLM	BLM	4	POOR
BELMONT CR DAY USE	L61129	RECSITE	RST	$ 83,513	$ -	0	OPERATING	ACR	1	BLM	BLM	2	GOOD
DAIGLE'S EDDY DAY USE	L61120	RECSITE	RST	$ 179,767	$ -	0	OPERATING	ACR	1	BLM	BLM	3	GOOD
DARRELL SALL MEMORIAL	L61119	RECSITE	RST	$ 59,722	$ 88,833	1.49	OPERATING	ACR	1	BLM	BLM	3	POOR
SHEEP FLAT DAY USE	L61105	RECSITE	RST	$ 339,704	$ 56,340	0.17	OPERATING	ACR	3	BLM	BLM	3	POOR
THIBODEAU CAMPGROUND	L61104	RECSITE	RST	$ 738,205	$ 78,241	0.11	OPERATING	ACR	16	BLM	BLM	5	FAIR
RED ROCK DAY USE	L61111	RECSITE	RST	$ 106,687	$ -	0	OPERATING	ACR	0.5	BLM	BLM	3	GOOD
RIVERBEND DAY USE	L61109	RECSITE	RST	$ 161,691	$ -	0	OPERATING	ACR	0.25	BLM	BLM	2	GOOD
BLACKFOOT RIVER FLOAT IN CAMPSITES	L2127605	RECSITE	RST	$ 39,136	$ -	0	OPERATING	ACR	1	BLM	BLM	<Null>	GOOD

Table 30. Building

Description	Location ID	CRV	Deferred Maint	Fci Value	Status	Uom	Uom Qty	Maintenance Resp	Maintenance Level	Condition
WHITAKER BRIDGE DAY USE TOILET	L2507	$ 94,360	0	0	OPERATING	SF	102	BLM	3	GOOD
DAIGLE'S EDDY TOILET	L2401	$ 76,784	0	0	OPERATING	SF	83	BLM	4	GOOD
THIBODEAU CAMPGROUND EAST TOILET	L2491	$ 75,858	0	0	OPERATING	SF	82	BLM	5	GOOD
THIBODEAU CAMPGROUND WEST TOILET	L2398	$ 75,858	0	0	OPERATING	SF	82	BLM	5	GOOD

Table 31. Trail Bridges

Description	Location	Asset Type	Cost code	CRV	Def Maint	Fci Value	Status	Uom	Uom Quan	Juris	Maint Resp	Maint Level	Condition
GOING-TO-THE-BUFFALO FOOTBRIDGE	L2123075	BRIDGETRL	BTI	$ 433,453	$ 823,680	1.9	NOT READY	SF	600	BLM	BLM	<Null>	POOR

Table 32. Bridges

Descript	Location ID	Asset Type	Cost code	CRV	Def Maint	Fci Value	Status	Uom	UomQuan	Juris	Maint Resp
WHITAKER BRIDGE	L59190	BRIDGE	BRE	$ 1,560,797	$ 6,498	0	OPERATING	SF	2739.8	BLM	BLM
LOWER BELMONT BRIDGE (OLD BRIDGE)	L59189	BRIDGE	BRI	$ 265,166	$ 715,183	2.7	DECOMMISSIONED	SF	470.4	BLM	BLM
UPPER BELMONT BRIDGE	L59212	BRIDGE	BRI	$ 252,567	$ -	0	DECOMMISSIONED	SF	465	BLM	BLM
LOWER BELMONT BRIDGE (NEW BRIDGE)	L2126964	BRIDGE	BRI	$ 442,659	$ 1,446	0	OPERATING	SF	619	BLM	BLM

Table 32: Bridges continued.

Descript	MaintLev	Condition	Brdgnbi	Brdgpost	Brdgpubl	Fltp	Strcmat	Strcdsgn	Dsgnload
WHITAKER BRIDGE	5	GOOD	Y	5	YES	YES	STEEL	STRINGER/MULTI-BEAM OR GIRDER	UNKNOWN
LOWER BELMONT BRIDGE (OLD BRIDGE)	5	POOR	Y	1	YES	NO	WOOD/TIMBER	STRINGER/MULTI-BEAM OR GIRDER	UNKNOWN
UPPER BELMONT BRIDGE	5	GOOD	NO	YES	NO	NO	STEEL	OTHER	UNKNOWN
LOWER BELMONT BRIDGE (NEW BRIDGE)	<Null>	GOOD	Y	5	YES	NO	STEEL	STRINGER/MULTI-BEAM OR GIRDER	HL93

Appendix F - Acronyms

ACM	Anaconda Copper Mining
ACT	Adaptive Complexity Thinning
AML	Abandoned Mine Land
ARMI	Amphibian Research and Monitoring Initiative
ARPA	Archaeological Resource Protection Act
BBMC	Big Blackfoot Milling Company
BDA	Beaver Dam Analog
BFPA	Blackfoot Forest Protection Association
BMA	Block Management Area
BMP	Best Management Practices
BRAT	Beaver Restoration Assessment Tool
CMT	Culturally Modified Tree
CSKT	Confederated Salish and Kootenai Tribes
CWAIC	Clean Water Act Information Center
CWPP	Community Wildfire Protection Plan
DEQ	Department of Environmental Quality
DFC	Desired Future Conditions
eDNA	environmental DNA
DNRC	Department of Natural Resources and Conservation
DOI	Department of the Interior
EA	Environmental Assessment
ESA	Endangered Species Act
EAWS	Environmental Analysis at the Watershed Scale
FAMS	Facility Asset Management System
FAR	Functioning at Risk
FLPMA	Federal Land Policy and Management Act of 1976
FMZ	Fire Management Zone
MiFO	Missoula Field Office
FTB	Fold Thrust Bolt
GLM	Glacial Lake Missoula
GRAIP	Geomorphic Road Analysis Inventory Package
GTLF	Ground Transportation Linnear Feature
HCP	Habitat Conservation Plan
HFRA	Healthy Forests Restoration Act
HTG	Habitat Type Group
HUC	Hydrologic Unit Code
IDT	Interdisciplinary Team
INFISH	Inland Native Fish Strategy
LCFZ	Lewis and Clark Fault Zone
LWCF	Land and Water Conservation Fund
LWD	Large Woody Debris

MT FWP	Montana Fish Wildlife & Parks
NEPA	National Environmental Policy Act
NF	Nonfunctional
NHPA	National Historic Preservation Act
NPR	Northern Pacific Railroad
NPS	National Park Service
NRCS	National Resource Conservation Service
NRV	Natural Range of Variability
PCTC	Plum Creek Timber Company
PFC	Proper Functioning Condition
PIBO	PacFish/InFish Biological Opinion
PNC	Potential Natural Community
POD	Potential Operational Delineations
RMO	Resource Management Objective
RMP	Resource Management Plan
RTRL	Reserve Treaty Rights Lands
SMZ	Streamside Management Zones
SNOTEL	Snow Telemetry
SRMA	Special Recreation Management Area
SRP	Special Recreation Permit
SSS	Special Status Species
SSURGO	Soil Survey Geographic Database
TMDL	Total Maximum Daily Load
TNC	The Nature Conservancy
USFS	US Forest Service
USFWS	US Fish and Wildlife Service
USGS	US Geological Survey
UTV	Utility Task Vehicle
VBET	Valley Bottom Extraction Tool
VRI	Visual Resource Inventory
VRM	Visual Resource Management
WBP	Whitebark Pine
WCT	Westslope Cutthroat Trout
WUI	Wildland Urban Interface