Middle Ruby River Watershed Assessment Report

Dillon Field Office

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Assessment Process

This document reports the findings of the 2013 land health assessment conducted on the public lands administered by the Bureau of Land Management (BLM) in the Middle Ruby River Watershed (MRRW).

The Assessment Report is the first step in the land health assessment process which requires the following documents:

- Watershed Assessment Report
- Authorized Officer's Determination of Standards
- National Environmental Policy Act (NEPA) documentation
- Proposed and Final Decisions

The Watershed Assessment Report conveys the condition and/or function of resources on BLM administered land within the MRRW to the Authorized Officer. The Authorized Officer will review the report to determine if the five Standards for Rangeland Health (Standards) are currently being met. The Authorized Officer then signs a Determination of Standards which documents where land health standards are, or are not, in compliance. The Standards are assessed on an allotment scale, with the exception of Air Quality, assessed at the watershed level.

The five Standards of Rangeland Health are:

- Standard #1-Upland Health
- Standard #2-Riparian/Wetland Health
- Standard #3-Water Quality
- Standard #4-Air Quality
- Standard #5-Biodiversity

The Standards are described in detail in the Record of Decision (ROD) Standards for Rangeland Health and Guidelines for Livestock Grazing Management (S&Gs) for Montana, North Dakota, and South Dakota-Western Montana Standards (USDI 1997).

Condition/function declarations regarding the Standards are made as proper functioning condition (PFC), functioning at risk (FAR) or nonfunctioning (NF). A declaration of FAR is further delineated with a trend of up, down, static, or not apparent. A Standard is met when conditions within an allotment are PFC or FAR with an upward trend. This is dependent on scope and scale and determined by the Authorized Officer.

The assessment will also report condition and/or function for forest health and fuels. Forest health and fuels have the potential to affect each of the five standards but are reported under Standard #5, Biodiversity. The condition of habitat supporting Special Status Species (e.g. westslope cutthroat trout), and the status of invasive plant species in the watershed is also described in the biodiversity section.

The Assessment Report also contains initial recommendations for management changes or resource-based projects developed by the interdisciplinary team (IDT) during field assessments. Proposed recommendations may address: livestock management, noxious weed control, conifer

expansion, commercial timber harvest, aspen restoration, recreational activities, road maintenance, wildlife and fisheries habitat, abandoned mine lands reclamation and travel management.

The assessed land health conditions and/or functionality are the basis for the IDT's management recommendations in this report and the Determination of Standards. As required by the National Environmental Policy Act (NEPA), an Environmental Assessment (EA) will be developed addressing resource concerns identified within 13 grazing allotments and on un-allotted or un-leased BLM administered public lands within the MRRW.

Alternative management will be analyzed wherever it is determined that:

- specific grazing allotments are not meeting the Standards
- allotments are meeting the Standards but have site specific concerns
- there are unhealthy forest conditions in the watershed
- fuels conditions are outside the natural range of variability
- there are other documented resources concerns and/or opportunities for habitat improvement/restoration

If existing grazing management practices or levels of grazing use on BLM administered lands are determined to be significant factors in failing to achieve one or more of the five Standards, the BLM is required by regulation (43 CFR 4180.1) to make grazing management changes.

It may take several years to fully implement revised grazing management plans, range improvement projects, forest treatments and/or fuels projects. Management changes will be developed in consultation and coordination with the affected lessees, agencies having lands or managing resources within the area and other interested parties. Affected parties will have an opportunity to protest and/or appeal these decisions.

The Dillon Field Office completed a Resource Management Plan (RMP) in February of 2006. This document will provide program guidance in the Dillon Field Office for the life of the document, intended to be approximately 20 years. The RMP replaced The Dillon Resource Area Management Framework Plan (1979) and the Mountain Foothills Environmental Impact Statement (EIS) - Rangeland Management Program Summary (1981).

Background

The MRRW is located in Madison County and drains the east slope of the Ruby Mountains and portions of the west slope of the Gravelly and Greenhorn ranges. The Ruby River bisects the watershed as it flows into the Ruby Reservoir before continuing downstream toward Alder, Montana. The entire MRRW contains approximately 160,869 acres of BLM, private, State of Montana and Forest Service land, of which 50,721 acres (32%) is public land administered by the BLM. Only BLM administered lands were assessed during this process. The MRRW contains thirteen grazing allotments with 42,866 acres of BLM land. In addition there are 7,819 acres of un-allotted public land located primarily within the Ruby Mountain and Axolotl Wilderness Study Areas (WSAs). The MRRW lies within Townships 5-8 South and Ranges 3-5

West, Montana Principal Meridian (Appendix B: Map #1, Middle Ruby River Watershed Assessment Area).

In some locations the watershed border follows BLM grazing allotment boundaries and includes some allotments that are only partially within the watershed. Watersheds are defined, and designated on maps, by natural topographical boundaries (ridgelines/drainages). Grazing allotments boundaries have been determined by previous BLM decisions and land ownership. These artificial boundaries may not follow topographical features. Therefore, some of the grazing allotments in the assessment area fall within one or more hydrologic unit or watershed.

It is the BLM's intent to implement watershed management cooperatively with all affected parties. By working on a watershed basis, resource issues or concerns can be mitigated on a landscape scale. Any changes in livestock management will be implemented through grazing decisions that address one or more grazing allotments. Forest health and fuels management treatments or projects, noxious weed management, and any other management projects or changes will be implemented through appropriate program specific Decisions.

Prehistory and History

In conjunction with the Mountain Foothills Grazing EIS in the late 1970s, a Class II cultural resource inventory was completed for a 10% sample of lands within the Dillon Resource Area. Results of the inventory located a mixture of prehistoric and historic sites throughout the watershed. Overall, the watershed exhibited a lower than normal likelihood for cultural sites. Prehistorically, the MRRW was occupied continuously from approximately 10,000 years ago. Prehistoric sites within the watershed consist primarily of small habitation and/or procurement sites (Earle 1980). Historic occupation of the MRRW began with the fur trapper trade in the 1830s and intensified with the discovery of gold in the region and the implementation of placer mining and eventually hard rock mining. The route for the Salt Lake City to Helena stage coach also crosses through the MRRW.

Placer mining started in Virginia City in 1863 and spread to outlying areas within the MRRW including the historic mining districts of Summit and Barton Gulch. Early hydraulic placer mining has channelized many of the streams in the watershed which has significantly impacted stream gradients. A number of mining and milling operations were started in the Virginia City area during the first half of the twentieth century, including some large operations during the economic depression of the 1930s. The biggest of the depression era mines was the Marietta, located in Barton Gulch.

Each mining town/camp brought their horses, mules and livestock (cattle and sheep). Grazing adjacent to these mining camps/towns was yearlong and unregulated prior to 1934. Use of timber and forest products to build these towns and mines, heat homes, etc. was also unregulated.

Special Management Designations

The Ruby Mountains and Axolotl Lakes Wilderness Study Area's (WSA) are public lands administered under special management designations. WSA's are managed according to the BLM Manual 6330 – Management of BLM Wilderness Study Areas dated July 13, 2012. Congress mandated WSA's are to be managed "so as not to impair the suitability of such areas

for preservation as wilderness". WSA's will be managed in this manner until Congress either designates those areas as part of the National Wilderness Preservation System, or releases them from further consideration for wilderness designation.

The 2006 Dillon RMP identified both the Axolotl Lakes and Ruby Mountain WSAs as a Special Recreation Management Area (SRMA) to be managed for semi-primitive non-motorized summer recreation use, and both motorized and non-motorized winter use. All SRMAs are also to be managed with an emphasis on specific recreation opportunities, which are outlined in the 2006 Dillon RMP. The RMP identified nine SRMAs in the Dillon Field Office.

> **Ruby Mountains WSA:** The Ruby Mountains WSA contains approximately 26,611 acres. 14,217 acres of the WSA are within the MRRW. A total of 15,615 acres of the WSA was recommended suitable for designation as wilderness as part of the National Wilderness Preservation System in the 1991 Montana Statewide Wilderness Study Report (USDI 1991). The wilderness qualities of naturalness, opportunities for solitude and primitive and unconfined types of recreation were identified as important attributes of this WSA. Other special features identified include scenic quality and variety, including steep canyons, rock walls, caves, etc.
>
> The 2006 Dillon RMP identified the Ruby Mountains WSA as a Special Recreation Management Area (SRMA) to be managed for primitive and semi-primitive non-motorized recreation opportunities if it is released by Congress from further consideration as wilderness. It is also identified as one of three priority areas in the Field Office for potential non-motorized trail construction to improve opportunities for horseback riding and hiking.
>
> **Axolotl Lakes WSA:** The Axolotl Lakes WSA covers approximately 7,804 acres, of which only 610 acres are within the MRRW. All of Axolotl Lakes WSA was recommended as not suitable for wilderness designation in the 1991 Montana Statewide Wilderness Study Report. That report stated, "The WSA has significant scenic value and wildlife features, and a diversity of primitive recreation opportunities. Human imprints reduce the WSA's wilderness qualities significantly, however."

Lands with Wilderness Characteristics

BLM Manual 6310- Conducting Wilderness Characteristics Inventory on BLM Lands (released 3/15/2012) clarified BLM's obligation to continue to inventory and identify lands with wilderness characteristics on an ongoing basis, especially through the land use planning process. Section 201 of FLPMA requires the BLM to maintain on a continuing basis an inventory of all public lands and their resources and other values, which includes wilderness characteristics. Regardless of past inventory, the BLM must maintain and update as necessary, its inventory of wilderness resources on public lands. The primary function of an inventory is to determine the presence or absence of wilderness characteristics. A wilderness characteristics inventory is the process of determining the presence or absence of wilderness characteristics. The BLM must document existing conditions as opposed to potential future conditions. The inventory will evaluate wilderness characteristics as defined in Section 2(c) of the Wilderness Act and incorporated in FLPMA. In order for an area to qualify as lands with wilderness characteristics,

it must possess sufficient size, naturalness, and outstanding opportunities for either solitude or primitive and unconfined recreation. In addition, it may also possess supplemental values.

Two areas of land within the MRRW were identified as potentially meeting the requirements for lands with wilderness characteristics (See Map 1). These areas will be called the Sweetwater unit (inventory # MT- 076-070) and the Jasmine Creek unit (inventory # MT-076-068) for the purpose of this report. Both units were inventoried for wilderness value in the past, and were determined to lack wilderness characteristics at that time but will be reevaluated in their current condition. The Sweetwater unit is located within all or parts of: Township 8 South, Range 6 West, Sections 13, 24 and 25; and Township 8 South, Range 6 West, Sections 19, 20, 21, 22, 30, 29, 28, 31 and 32; and Township 9 South, Range 5 West, Sections 4, 5, 6, 7 and 8. The Sweetwater unit totals approximately 7,856 acres. The Jasmine Creek unit is located within all or parts of the following: Township 8 South Range 4 West Sections 1, 2, 11, 12, 13, 14, 23, 24 and 25; and Township 7 South Range 4 West Sections 23, 24, 25, 26 and 35; and Township 7 South, Range 3 West Sections 19 and 20. The Jasmine Creek unit totals 16,910 acres. The findings of the evaluation of wilderness characteristics for these two areas will be disclosed in the associated NEPA document for this report.

Visual Resource Management

The lands within Ruby Mountains WSA and Axolotl Lakes WSA are within Visual Resource Management (VRM) Class I. Preservation of the landscape is the primary management goal in Class I areas. This class provides for natural ecological changes; however it does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention. If either or both of these WSA's should be released by Congress from further wilderness consideration they would then lay within VRM Class II. VRM Class II objectives are to retain the existing character of the landscape. Activities or modifications of the environment should not be evident or attract the attention of the casual observer. The remainder of the MRRW is within VRM Class III. VRM Class III objectives require partial retention of the existing character of the landscape and allow for moderate changes to the existing landscape. Management activities may attract attention, but should not dominate the view of the casual observer. Changes may be evident but may not detract from the existing landscape.

Geology

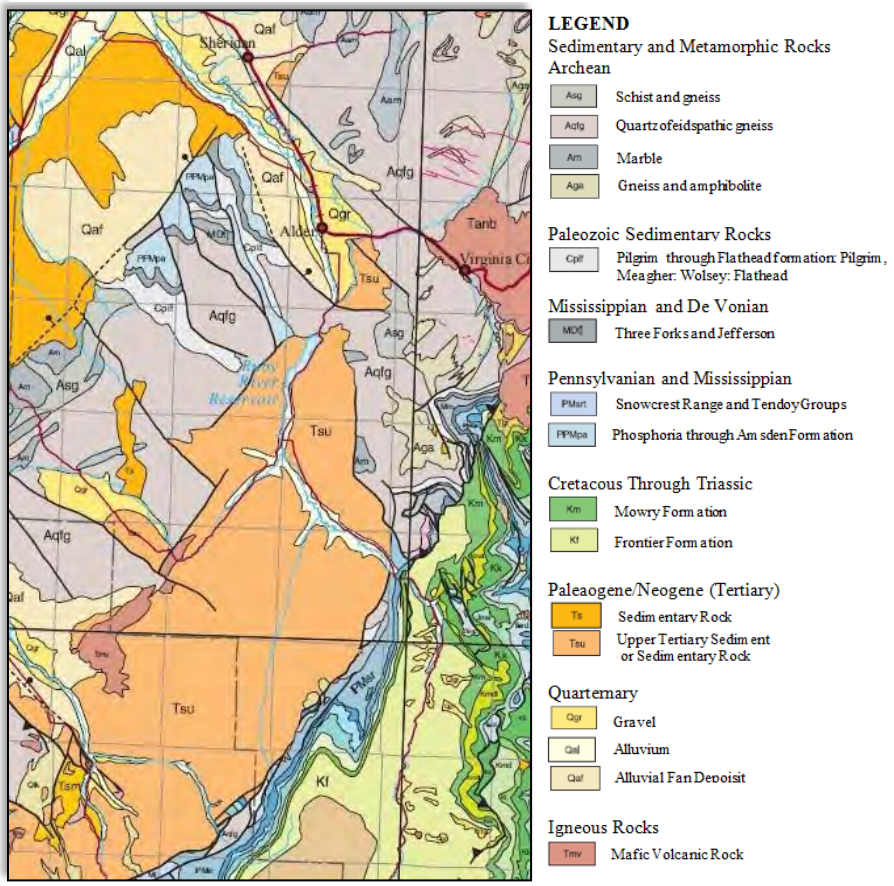
Geology of the Middle Ruby area is quite complex and includes igneous, metamorphic and sedimentary rocks that cover virtually the entire Montana geologic section ranging from nearly 3 billion year old metamorphic rocks in the core of the Ruby Mountains to recent alluvial sediments along the Ruby River and Alder Gulch valleys. The oldest rocks in the area, and some of the oldest rocks in Montana, are the Achean schists, marbles and gneisses in the core of the Ruby Mountains. These rocks date to over 2 billion years old and are overlain by Paleozoic sedimentary rocks in the northwest portion of the planning area. Paleozoic and later sedimentary rocks also occur to the south and east of the MRRW. Much of the area to the east of the core of the Ruby Mountains is undifferentiated Paleogene (Tertiary) sediments.

In the southeast portion of the planning area late Paleozoic sedimentary rocks are in fault contact with the Paleogene sediments and are conformably overlain by Paleogene sedimentary rocks.

Quaternary sediments include extensive gravel deposits along the flanks of the Ruby Mountains and more recent alluvial deposits along major drainages.

Igneous rocks are limited to Paleogene mafic volcanic rocks along the southeast flank of the Ruby Mountains.

Figure 1: Geology of MRRW



The Middle Ruby River area has had very limited metal mining exploration and mining activity as the rocks in the planning area are not typically favorable hosts for metallic mineralization. Economic activity has focused on the Archean marble units for extensive deposits of talc. Major permitted talc mines occur along the crest of the Ruby Mountains to the southwest of the planning area. Other major economic resources in the area are also associated with the Archean schists and gneisses which can include substantial garnet as an accessory mineral. These garnets have been concentrated along drainage ways and can be an economic resource. The other major historical economic resource was the major occurrence of placer gold deposits along Alder Gulch along the east side of the planning area. These deposits were one of Montana's first major placer finds and lead to the establishment of Virginia City as the territorial capital of Montana early in the state's history.

There are no permitted locatable or salable activities in the Middle Ruby area.

Authorized Uses

Forest Products

Forest Management History: Forest resources in the watershed have been utilized since the beginning of European settlement during the 1880's. Evidence in the form of old stumps can be found across all ownerships through many of the forested habitats in the assessment area.

The BLM sells permits authorizing firewood removal and Christmas tree cutting which may be utilized in areas of the MRRW. Approximately 703 acres were commercially harvested in the MRRW over the last 45 years on BLM-administered lands.

Livestock Grazing

The assessment area includes 13 grazing allotments which contain about 42,866 acres of BLM administered public land. Twelve individuals or business entities hold grazing authorizations to utilize 3,719 animal-unit months (AUMs) of forage allocated for livestock use on BLM administered lands within the allotments. The stocking rate on the public land within the allotments ranges from 7 acre/AUM to 67 acres/AUM. This variance is influenced by soils, vegetative type, topography (aspect, elevation, and slope), geology and local climatic conditions. Cattle are designated as the kind of livestock authorized to graze in twelve allotments and indigenous species (bison) are authorized in one. Grazing allotments were assigned to a management category during the resource planning process. All grazing allotments in the Dillon Field Office have been categorized as either *Improve (I), Maintain (M)* or *Custodial (C)* based on resource values, opportunities for improvement and the BLM's level of management. Allotment categorization is also used to establish priorities for distributing available funds and personnel during plan implementation to achieve cost-effective improvement of rangeland resources. Improve *(I)* category allotments are managed more intensively and are monitored more frequently. Maintain *(M)* category allotments are usually at a desired ecological condition and are managed to maintain or improve that condition. Custodial *(C)* category allotments are generally isolated parcels of BLM administered land that comprises a relatively small portion of the total grazing unit. Frequently these isolated parcels have limited or no public access. These small allotments are managed in conjunction with the lessee's normal livestock operation and monitored less intensively. Six allotments in the MRRW are categorized as *I* allotments, two are *M*, and the remaining five are *C* allotments. Table 1 summarizes grazing allotment information.

Table 1: Grazing Allotments Summary

Allotment number category	Grazing Authorization Number	Livestock Number and Kind	Season of Use	Grazing System	Stocking Rate on BLM	BLM Active AUMs	BLM Acres	Acres in Other Ownerships	Total Acres
Barton Gulch #10490 (I)	2505741	138 cattle	06/15/ 07/30	seasonal	67 acres/ AUM	52	3467	2739	6206
Belmont #10469 (I)	2505705	varies by pasture; 20 to 488 cattle	05/10- 12/15	partial rest rotation	9 acres/ AUM	1288	12034	9922	21956
Belmont South Isolated #20320 (C)	2500150	70 cattle	07/01- 11/15	seasonal	7 acres/ AUM	38	255	5620	5875

Allotment number category	Grazing Authorization Number	Livestock Number and Kind	Season of Use	Grazing System	Stocking Rate on BLM	BLM Active AUMs	BLM Acres	Acres in Other Ownerships	Total Acres
Davey Creek #10497 (I)	2505748 & 2505770	172 cattle	07/01-10/15	seasonal	17 acres / AUM	351	5983	3632	9615
Fossil Basin # 10667 (I)	2500182	6 cattle	05/15-11/01	seasonal	34 acres/AUM	31	1066	3191	4257
Garden Creek #20479 (I)	2505730	1200 cattle	08/01-09/15 08/26-10/10	seasonal	10 acres/ AUM	1062	10414	10606	21020
Garnet #20492 (M)	2502481	23 cattle	08/01-12/01	seasonal	8 acres/ AUM	93	744	510	1269
Idaho Jack #20499 (I)	2505750	varies during season from 375 to 125 cattle	07/01-09/28	seasonal	12 acres/ AUM	400	4881	2501	7382
Idaho Jack Isolated #20676 (C)	2505750	13 cattle	07/01-09/30	seasonal	8 acres/ AUM	39	318	2200	2518
Laurin Canyon #10463 (C)	2504136	28 cattle	08/15-12/16	seasonal	9 acres/ AUM	114	1061	800	1861
North Fork AMP #10482 (M)	2505733	371 bison	12/01-04/30	seasonal	8 acres/ AUM	222	1736	5587	7323
Pierce Canyon #10493 (C)	2502495	12 cattle	06/01-07/31	seasonal	25 acres/ AUM	24	602	242	844
Ruby Dam Isolated #30682 (C)	2505768	1 cattle	05/10-12/31	seasonal	61 acres/ AUM	5	304	0	304

Recreation

Recreation use within the MRRW occurs year round and includes; hunting (big game, birds, and mountain lion), fishing, hiking, wildlife viewing, camping, recreational driving and rock hounding. Ruby Reservoir is a popular recreational site providing the opportunity for summer camping and fishing, and ice fishing in the winter. Some off road vehicle use occurs at Ruby Reservoir. Also, some recreational mining occurs in the watershed.

One outfitter is permitted to hunt mountain lions in the watershed. They typically hunt less than 25 user days a year, during the winter months. One outfitter is permitted for commercial horseback rides in the Axolotl Lakes WSA. These are day trips that occur during the summer months.

As discussed above, the Ruby Mountains and Axolotl WSA's are designated as Special Recreational Management Areas (SRMAs).

Travel Management
The 2006 Dillon Field Office RMP limited motorized vehicle use to those routes designated as open. The RMP also states that the BLM will work on updating and maintaining the road and trail databases to correct errors and refine decisions. The watershed assessment process provides an appropriate avenue to refine those decisions due to the area specific focus across multiple resources. Any potential modifications will be considered and analyzed in a subsequent environmental assessment.

Mining, Minerals and Abandoned Mine Lands
The Mining and Minerals Policy Act of 1970, the Federal Land Policy and Management Act of 1976 (FLPMA), and the Natural Materials and Minerals Policy, Research and Development Act of 1980 direct that the Public lands be managed in a manner that recognizes the Nation's needs for domestic sources of mineral production. Under the 1872 Mining Law, claimants have a statutory right to develop their mineral deposits consistent with applicable environmental laws. Mining activities are addressed under Causal Use, Notices, or Plans of Operations.

There are currently no active Plans of Operation or Notices in the MRRW, however, there is always interest in metals, garnet, talc and other commodities throughout this area. There are also no mineral material sites in the watershed.

The BLM Abandoned Mine Lands (AML) program is responsible for cleaning up sites determined to be hazardous to human health, to the environment, or those which present physical safety hazards to the public. This program addresses mine sites abandoned prior to January 1, 1981, the effective date of the BLM's surface management regulations (43 CFR 3809) that implement the "unnecessary or undue degradation" provisions of the Federal Land Policy and Management Act of 1976 (FLPMA).

Early mining prior to 1981 did not require reclamation or bonding, therefore, many of these abandoned mines have legacy features such as eroding dumps, abandoned tailings, or open mine features. As mining activity is directly related to the demand for materials, commodity price, and advancing technologies, it is a cyclic activity. Relationships between abandoned mines and active mines/exploration vary throughout time as demand for the resources changes. Changes in reclamation standards, technology, and bonding prohibit mining problems of the past from developing in the future. Mining activity after 1981 is administered by the 3809 Mineral Program.

The MRRW does not contain as many abandon mines as some of the other watersheds, however, legacy features do exist. BLM will continue to inventory abandoned mine sites and close features as funds and personnel allow.

Film Permits
There is one current Categorical Exclusion (CX), active through March 2014, which allows the Warm Springs Production Company to apply for filming permits in the Ruby Mountains. Each

permit is issued for a specific period of use through an application process. Filming is not authorized within the Ruby Mountain WSA.

Uplands

Western Montana Standard #1: *"Uplands are in Proper Functioning Condition."*

Affected Environment

The vast majority of the watershed assessment area is classified as uplands. The uplands in the MRRW are comprised of a wide range of plant communities that provide a diversity of habitats and niches occupied by an abundance of wildlife species.

Elevations in the watershed range from 5,400 feet at the reservoir to about 9,500 feet on Mt. Baldy in the northern Gravelly range. Average annual precipitation within the watershed varies from about 12 to 24 inches depending on elevation.

Soils

Soils in the MRRW are primarily affected by climate (temperature and precipitation), topography (slope and aspect), and parent material (geology and geomorphology). The soils in this watershed are in the Frigid (generally below 6,400 feet elevation) and Cryic (generally above 6,400 feet elevation) soil temperature regimes. Lands administered by BLM within the MRRW receive about 12 to 24 inches of average annual precipitation and fall into the Aridic and Ustic soil moisture regimes.

The soils within the watershed as a whole formed in alluvium, colluvium, residuum, and glacial till mainly from quartzite, limestone, sandstone, andesite, rhyolite, and granitic rock sources. Quartzite is the dominate parent material origin. Surface textures associated with this till parent material can vary, but lie predominately within the sandy loam to loam textural classes. Due to the large amount of surface fragments inherent to glacial till, soil surface fragments range from gravelly to soils dominated by cobbles. The moraines eventually give way to low hills composed of uplifted sedimentary beds that run parallel to the main drainageway. The beds themselves are composed of siltstone, mudstone and a minor component of sandstone at the margins of the landform. Soil surface textures existing within these landforms are generally heavy loam to clay

loam. Soil depth within the glacial till is almost all very deep, with the sedimentary beds showing a mix of shallow to very deep, due to surface bedrock expression near the soil surface in some areas. A mix of limestone and tertiary volcanic uplift make up the majority of the east side parent materials. Limestone dominated areas within the watershed have silt loam to loam surface textures and exist on mountain slope, escarpment and hill slope landforms. Calcium carbonate levels high enough to affect plant growth are restricted mainly to convex and linear/convex landform positions. These areas are the most prone to erosion through a combination of water and prevailing wind. Surface clay percentages above 40% exist in several pockets on the lower margins of east side hill slope landform with these clay rich soil surfaces combining with a predominately south facing aspect limiting overall plant production.

Landforms within the Middle Ruby River drainage way include flood plains, flood plain steppes, and low terraces. Soils formed within the flood plain and flood plain steppe landforms are generally poorly drained with a large percentage of the soil surface texture classified as clay loam or clay. Sandy-skeletal substratum underlays the majority of these finely textured soil surfaces and is indicative of a fluctuating water table and variable alluvial parent material deposition through time. Ecosites within the drainage way include Riparian Wet Meadow within the very poorly drained flood plain. Wet Meadow or Riparian Sub-irrigated are generally restricted to the flood plain steppe and low terrace landforms and reflect poorly drained to somewhat poorly drained soil drainage classes. Within the watershed as a whole, slopes range from nearly level and undulating (1 to 8 percent), rolling and hilly (8 to 30 percent), to steep and very steep (25 to more than 45 percent). Soil properties outside the areas previously discussed include sandy loam, loam, and clay loam soil surface textures; soil depths vary from shallow (less than 20 inches to a root restrictive layer) to very deep (more than 60 inches to a restrictive layer); the relative amount of lime or calcium carbonate within the rooting zone, as measured by observable effervescence with hydrochloric acid, ranges from none to more than 40 percent; salinity and sodicity (alkalinity) occur within the assessment area to a minor extent.
Rock fragments, both on the soil surface and within the soil profile, range from none to more than 65 percent.

Soil classifications and ecological sites within the assessment area reflect the physical and chemical properties and associated variables. The main soil Orders encountered within the MRRW are: Alfisols, Entisols, Inceptisols, and Mollisols. Major upland Ecological Sites include: Shallow, Shallow Limy Droughty, Droughty, Clayey, Silty, Loamy Steep, and Loamy. Primary Ecological Sites in the river and stream areas include: Wet Meadow, Riparian Wet Meadow, Riparian Sub irrigated, Sub irrigated, and Overflow.

Vegetation

As is the case across all landscapes, the upland plant composition in the MRRW is changing as the result of ecological succession. The natural progression from early seral stage plant communities towards a climax plant community is inevitable without disturbance. The abundance of Douglas-fir *(Pseudotsuga menziesii)* and Rocky Mountain juniper *(Juniperus scopulorum)* in the watershed can be partially attributed to the reduced frequency of wildfire. Less fire on the landscape has changed the relative dominance of species within the vegetative community, resulting in shifts in the habitat types on some public land administered by the BLM

in the MRRW. Expansion of conifers is discussed in more detail in the Biodiversity section (Standard #5) below.

Approximately 44% of BLM administered uplands in the MRRW are dominated by forest habitats (Table 2, G*eneral Cover Types*). Forested habitats dominate the higher elevations of the MRRW. Large stands of Douglas-fir, lodgepole pine *(Pinus contorta)*, limber pine *(Pinus flexilis)*, Englemann spruce *(Picea engelmannii)*, subalpine fir *(Abies lasiocarpa)*, whitebark pine *(Pinus albicaulis)*, and Rocky Mountain juniper are present on much of the public land in the watershed. Also, numerous aspen *(Populus tremuloides)* stands, black cottonwood *(Populus balsamifera)* and thin-leaved alder *(Alnus icana)* contribute to structural diversity and canopy cover. Forest and woodland habitats are further discussed under Standard #5, Biodiversity.

Fifty one percent of the BLM uplands are sagebrush and mountain shrub habitat type. Sagebrush species and subspecies occupy different niches based on habitat type, elevation, annual precipitation and soil types. Mountain big sagebrush *(Artemisia tridentata vaseyana)* is found in the higher elevations in habitats that receive greater than 14 inches of annual precipitation. Several other sagebrush subspecies: Wyoming big sagebrush *(Artemisia tridentata wyomingensis)*, tall threetip sagebrush *(Artemesia tripartita tripartita)* and black sagebrush *(Artemisia nova),* grow in the foothills that receive about 10-14 inches of rainfall each year. And the subshrub, fringed sage *(Artemesia frigida),* is found primarily in the foothills growing in a variety of soils that are in the 10-14 inch precipitation zone.

Scattered patches of curl-leaf mountain mahogany *(Cercocarpus ledifolius)* are found on rocky slopes and ridges throughout the watershed. It provides year-round cover and forage for deer and is a crucial source of winter forage for many wildlife species.

Grasslands make up only about 2% of the total vegetative cover on the public lands. Some of the prominent herbaceous species are bluebunch wheatgrass *(Pseudoroegneria spicata)*, western wheatgrass *(Pascopyrum smithii)*, needle and thread *(Hesperostipa comata)*, Sandberg bluegrass (*Poa secunda)*, prairie junegrass (*Koeleria macrantha)*, and Idaho fescue *(Festuca idahoensis)*. Native shrubs found on numerous ecological sites throughout the watershed are: winterfat *(Krascheninnikovia lanata),* rubber rabbitbrush *(Ericameria nauseosa)*, green rabbitbrush *(Ericameria teretifolia)*, grey horsebrush *(Tetradymia canescens),* broom snakeweed

(Gutierrezia sarothrae), Gardner's saltbush *(Atriplex gardneri)* and greasewood *(Sarcobatus vermiculatus).*

Current vegetative cover was calculated using satellite imagery (LANDFIRE 2011b). Table 2 summarizes the different cover types within the MRRW.

Table 2: Vegetation Cover Types

Cover Type	BLM Acreage	% of BLM Acreage in Cover type	Total Acreage in Watershed	% of Total Watershed in Cover Type
Forested	21,961	44%	44,176	27%
Grasslands	1,072	2%	3,376	2%
Sagebrush/Mountain Shrubs	26,084	51%	91,638	57%
Riparian/Mesic Shrubs	1,245	2%	7,258	4%
Mountain Mahogany	6	< 1%	23	< 1%
Aspen	163	< 1%	479	< 1%
Other	190	< 1%	13,919	9%
Totals	**50,721**	**100**	**160,869**	**100**

Vegetative Treatments

Prescribed Fire: The BLM has implemented approximately 772 acres of prescribed burn treatments since 2008 on the north side of the MRRW. The burn treatments (587 acres), located between Laurin Canyon and Pierce Canyon, were prescribed to reduce conifers expanding into existing mountain big sagebrush habitat. The objectives of the prescribed burns were to kill 60% or more of the conifers less than 30 feet in height using mechanical means and/or fire, while killing no more than 10% of mature trees. Decreasing sagebrush cover or increasing the grass composition or cover was not part of the BLM's treatment objectives. The remaining 185 acres of prescribed fire treatments occurred in Barton Gulch, in conjunction with a timber sale. The objectives of that burn were to reduce residual surface fuel loads and conifer canopy cover for restoration of Douglas-fir savannah habitat type.

In 2009, two hundred acres, within the Pierce Canyon prescribed burn, were aerially treated to reduce the size of several scattered spotted knapweed infestations. An additional three hundred and four acres were treated in 2013, in cooperation with the Mule Deer Foundation, to reduce the size of the spotted knapweed infestations and to improve the habitat for local mule deer populations. In 2009, the BLM and the State of Montana Department of Natural Resource Conservation joined forces to aerially spray 117 acres of spotted knapweed in the Barton Gulch allotment.

Findings, Analysis and Recommendations

Procedure to Determine Conformance with Standard

The uplands were assessed on an allotment basis according to Interagency Technical Reference 1734-6 *Interpreting Indicators of Rangeland Health*. This technical reference is available to read or download on the BLM Library webpage, http://web.nc.blm.gov/blmlibrary. The process is qualitative and evaluates 17 "indicators" of relative condition (e.g., water flow patterns, plant

community composition) to assess three interrelated components or "attributes" of rangeland health: soil/site stability, hydrological function, and biotic integrity. The IDT visits specific ecological sites and rates each indicator based on the degree of departure, if any, from what is expected for that indicator at that specific site. The rating for each indicator (none to slight, slight to moderate, moderate, moderate to extreme or extreme) is then weighed to ascertain the attribute rating justification. Table 3: *Upland Indicators Evaluation Summary,* reviews the findings from the completed field forms.

The Natural Resource Conservation Service (NRCS) has developed Ecological Site Descriptions based on specific soil types, precipitation zones and location. They describe various characteristics and attributes including what vegetative species, and relative percentage of each, are expected on a given site. The IDT refers to these site descriptions while completing the upland evaluation matrix. Copies of the field forms are available for review at that Dillon Field Office.

Table 3: Upland Indicators Evaluation Summary

Allotment Name & Number	Ecological Site Name	Habitat Type (based on Ecological Site Descriptions)	Degree of Departure from Expected for the three Upland Health Attributes		
			Soil Site Stability	Hydrologic Function	Biotic Integrity
Belmont 10469 (3)	Shallow 15-19" precipitation zone	Mountain big sagebrush/Idaho fescue	none to slight	none to slight	none to slight
	Slity-Limy 10-14" precipitation zone	Mountain big sagebrush/Idaho fescue	slight to moderate	slight to moderate	slight to moderate
	Silty 10-14" precipitation zone	Mountain big sagebrush/Idaho fescue	slight to moderate	slight to moderate	slight to moderate
Belmont South Isolated 20320	Silty 10-14" precipitation zone	Mountain big sagebrush/Idaho fescue	none to slight	none to slight	none to slight
Davey Creek 10497 (2)	Thin-Silty 15-19" precipitation zone	Mountain big sagebrush/Idaho fescue	none to slight	none to slight	none to slight
	Silty 10-14" precipitation zone	Mountain big sagebrush/Idaho fescue	none to slight	none to slight	slight to moderate
Fossil Basin 10667	Slity-limy 10-14" precipitation zone	Mountain big sagebrush/Idaho fescue	slight to moderate	moderate	slight to moderate
Garden Creek 20479 (3)	Silty-Shallow 15-19" precipitation zone	Mountain big sagebrush/Idaho fescue	slight to moderate	slight to moderate	none to slight
	Silty-Shallow 15-19" precipitation zone	Mountain big sagebrush/Idaho fescue	none to slight	none to slight	slight to moderate
	Silty-Shallow 15-19" precipitation zone	Mountain big sagebrush/Idaho fescue	none to slight	none to slight	none to slight

Allotment Name & Number	Ecological Site Name	Habitat Type (based on Ecological Site Descriptions)	Degree of Departure from Expected for the three Upland Health Attributes		
			Soil Site Stability	Hydrologic Function	Biotic Integrity
Garnet 20492	Silty-Limy 10-14" precipitation zone	Mountain big sagebrush/Idaho fescue	slight to moderate	moderate	slight to moderate
Idaho Isolated 20676	Silty 10-14" Precipitation Zone	Mountain big sagebrush/Idaho fescue	none to slight	none to slight	slight to moderate
Idaho Jack	Silty 15-19" precipitation zone	Mountain big sagebrush/Idaho fescue	none to slight	none to slight	slight to moderate
Laurin Canyon 10463	Silty 10 -14" precipitation zone	Mountain big sagebrush/Idaho fescue	slight to moderate	slight to moderate	slight to moderate

In July and August of 2013 the IDT assessed 13 grazing allotments and the un-allotted and un-leased BLM administered land in the MRRW. Thirteen rangeland health indicator evaluation matrices were completed in the field. Established Daubenmire and Nested Frequency vegetation trend studies were re-read in 2012 to help determine vegetative trend. Previously established photo sites were also visited in 2012 and the updated photos provide visual evidence of change on the landscape over time. The data collected from the Daubenmire and Nested Frequency studies was summarized and compared to baseline data providing supporting information, along with the photographic record, for interpreting the upland indicators. The data forms and photographs are available for review in the Dillon Field Office.

Weeds

The MRRW was evaluated for weed infestations using treatment records and inventories from the Dillon Field Office, the Madison County Weed Coordinator and our collective inventories and observations during the field assessments. A more comprehensive discussion of noxious weeds in the MRRW is in the Biodiversity section below.

Findings and Analysis

A moderate departure from expected conditions for any one of the three rangeland health attributes is analogous to a functional-at-risk (FAR) rating (USDI BLM, 2005a). Upland sites are considered to be in proper functioning condition (PFC) if they are rated none-to-slight or slight-to-moderate departure from expected conditions. Ratings of PFC or FAR with an upward trend indicate stable or improving ecological conditions that generally match or are trending towards what is expected for the ecological site. Based on the evaluation methodology and process, comparative analysis of quantitative data collected at long term trend study sites, and extensive field observations and discussions by the IDT, the uplands in 11 grazing allotments (85%) were rated either PFC or FAR with an upward trend. Also, the uplands in the un-allotted portions of the watershed including the Ruby

Mountain and Axolotl Lakes WSAs were rated PFC. However, two allotments, Garnet and Fossil Basin, rated FAR with a static or downward trend.

In 2003 the MRRW was also assessed for the five Standards of Rangeland Health (43 CFR 4180) by an inter-disciplinary team (IDT) of BLM specialists. Three of ten allotments assessed in 2003, Belmont South, Laurin Canyon, and Idaho Isolated, were determined to be out of compliance with the upland health standard. However, in 2013 the uplands in these allotments were found to be improving. Although the functional structural plant communities in the Idaho Isolated allotment are not in desired condition, there has been noticeable improvement of many key indicators such as, soil surface resistance to erosion, small and isolated water flow patterns, litter amount and the reproductive capability of the perennial plants. Also, decreased bare ground combined with an increase in the number of plant species present was observed. The Belmont South allotment was combined with the Belmont allotment in 2004 and re-named the South #1 pasture. It has been rested every other year since and the uplands are presently in an upward trend. Overall the three attributes, based on the 17 indicators, rated as slight to moderate departure from expected. Even though the allotment as a whole rated FAR with an upward trend there are still some areas of concern. Heavy utilization by livestock on some public land acres in the South # 2 pasture is the result of winter and spring pasturing of cattle on private land that is fenced in with BLM ground. Measures to mitigate these localized impacts will be evaluated in a watershed scale environmental assessment. The health and condition of the uplands in the Laurin Canyon allotment has improved significantly since last evaluated in 2003. Annual plant production and reproductive capability was excellent in 2013 in spite of recent drought conditions. Monitoring data indicate that overall vegetative cover has increased from 18% in 2003 to 48% in 2013. And the key grass species Bluebunch wheatgrass accounted for 16% of the total vegetative cover in the study transect, more than any other herbaceous or shrub species encountered. The grazing management in the Laurin Canyon allotment was changed to late season (8/15-12/15) in 2004 and has subsequently been rested in 2007, 2012 and 2013 which has contributed to improved upland condtions.

In 2013 the IDT's rating of the seventeen indicators of upland health confirmed that 11 allotments do not have substantial departures from expected conditions for the three attributes of upland health. These allotments are: Barton Gulch, Belmont, Belmont Isolated South, Davey Creek, Garden Creek, Idaho Isolated, Idaho Jack, Laurin Canyon, North Fork AMP, Pierce Canyon and Ruby Dam Isolated.

Two allotments, Fossil Basin and Garnet, do have moderate departures in at least one of three biotic attributes and therefore are not in proper functioning condition. The Garnet allotment rated a moderate departure from expected for the hydrologic function attribute. Nine of the seventeen indicators failed to match what is expected for the site. Water flow patterns are slightly longer and minor erosion and instability is occurring as a result. There is slight active pedestalling in the flow patterns. The amount of bare ground is elevated which facilitates increased litter movement. The soil surface stability, i.e. resistance to erosion, is reduced in about half the plant interspaces. Changes in the plant community and vegetative cover are moderately reducing the site's capacity for precipitation infiltration resulting in increased run off. The number of expected species in the functional structural plant group for the site has been moderately reduced. And the annual total plant production on the site rated as less than 60% of

potential. In the Fossil Basin allotment the IDT rated the hydrologic function attribute moderate departure from expected for the site. Five indicators for the hydrologic function attribute were rated moderate departure and one attribute rated moderate to extreme departure. The soil/site stability and biotic integrity attributes rated slight to moderate departure but there are some indicators in these areas that are at moderate or moderate to extreme departure also. Overall the uplands in Fossil Basin are in a degraded condition. For many years this allotment-which is comprised largely of private land-was grazed heavily in spring. About ten years ago the grazing season on the public land portion was changed to late summer and fall use. Although there have been improvements to the upland and riparian resources in the allotment there are still areas of concern. Water flow patterns between obstructions (plants, litter, rocks etc.) are larger and numerous which contribute to pedestaling around plant basal area due to increased levels of soil erosion. The amount of litter on the ground is limited by decreased vegetative cover and large areas of bare ground. Precipitation infiltration is being adversely affected because of an increase in juniper and decrease in perennial cool season bunch grasses. This in turn has led to a decreased potential in herbaceous plant production which was estimated at roughly 50% in 2013. Also, the reproduction capability of the plants on the site was rated by the IDT as moderately lower than expected.

Recommendations for Upland Health

Consider grazing management alternatives in allotments, and/or in localized areas within allotments or pastures, in which one or more of the three upland health attributes (soil-site stability, hydrologic function, biotic integrity) are currently not functioning properly.

Grazing management changes that would be considered in allotments or specific pastures/areas in which resource concerns were identified include:

- changes in the season of use (timing and/or duration)
- reducing the number of authorized livestock
- mandatory periods of rest
- pasture rest-rotation or deferred-rotation grazing plans
- construction of rangeland improvement projects (fences, water developments, exclosures etc.) designed to more effectively distribute cattle across the landscape, reduce localized impacts and harvest upland forage efficiently.
- Maintain or improve rangeland projects that are currently not functional but still have management value.
- Remove dysfunctional or unnecessary improvements, e.g. down fences, unwanted fences, or old water troughs and headboxes.

Riparian and Wetland Areas

Western Montana Standard #2: *"Riparian and wetland areas are in proper functioning condition"*

Affected Environment

Streams

Stream flow in the MRRW fluctuates annually and seasonally in response to precipitation in the form of rain and snow. The major streams within the assessment area are Barton Gulch, Cottonwood Creek, Dark Hollow Creek, Davey Creek, Garden Creek, Greenhorn Creek, Hinch Creek, Idaho Creek, Jack Creek, Mormon Creek and Peterson Creek. The major creeks are fed by numerous small perennial and intermittent tributaries, springs and seeps.

Springs and Wetlands

Numerous isolated springs and wetlands exist within the assessment area. The Dillon Field Office has not developed its own wetland inventory, but rather supports the Montana Natural Heritage Program wetland mapping program. See discussion below under National Wetland Inventory (NWI).

Developed springs within the MRRW were inventoried and assessed. All the developed springs in the watershed are listed and described in the Findings, Analysis and Recommendations section.

National Wetland Inventory

The National Wetland Inventory (NWI) was developed by the US Fish and Wildlife Service to conduct a nationwide inventory of wetlands. The Inventory was developed to facilitate conservation efforts by identifying various wetland types and their distribution throughout the U.S. To do this a wetland classification system (Cowardin et al. 1979) was developed that is now the Federal standard (see glossary). The Montana Natural Heritage Program (MNHP), with financial assistance from the BLM, is in the process of mapping riparian and wetland resources to NWI standards. Wetland and riparian mapping within the MRRW has been verified and approved by the United States Fish and Wildlife Service (USFWS) for the following USGS 7.5 minute Quadrangles: Laurin Canyon, Alder, Red Canyon, Mine Gulch, Metzel Ranch, Ruby Dam, Cirque Lake, Belmont Park Ranch and Home Park Ranch. According to the NWI, there are 3,768 acres of wetlands in the assessment area. Of these acres, 169 (4.5%) are on public land administered by the BLM. Information regarding the mapping program is available on the MNHP webpage at: http://mtnhp.org/nwi/index.asp. The Cowardian wetland classification system is accessible at: http://mtnhp.org/nwi/051809_Cowardin.pdf

Soils

Hydric soils are a small (<1%) component of the landscape but play an important role in ecological processes. Hydric soils have prolonged exposure to water and are poorly drained. They are commonly found in depressions, swales, floodplains, springs, wet meadows and marshes.

Findings, Analysis and Recommendations

Procedure to determine conformance with Standard

BLM policy specifies using several complimentary monitoring and evaluation methodologies to determine conformance with the Riparian Health Standard. The IDT used the Lotic and Lentic Riparian Area Management Assessment Methodologies (TR 1737 15 and 16), also known as Proper Functioning Condition (PFC) Assessment Methodologies, to evaluate riparian systems and wet meadows. The lotic methodology is used for flowing water systems. The lentic methodology is used for ponds and still water systems. Applicable portions of the lentic methodology are used to assess springs and wet meadows. A Guide to Managing, Restoring, and Conserving Springs in the Western United States (TR 1737-17) is also used for springs. These technical references are available to read, or download, on the BLM Library webpage, http://web.nc.blm.gov/blmlibrary.

Proper Functioning Condition (PFC) is a range of conditions (continuum), not a single point. A high PFC rating may be analogous to Desired Future Condition (DFC), however a low PFC rating, while meeting the Riparian Health Standard, may not necessarily meet site specific objectives. "Riparian-wetland areas can function properly before they achieve their potential" (USDI 1998). The lotic PFC assessment utilizes attributes and processes that can be judged visually to evaluate riparian wetland areas with flowing water against their capability and potential. Some of these attributes and processes include the stream channel's physical characteristics or stream geometry (dimension, pattern and profile). To function properly, adequate vegetation, landform or woody debris should be present to dissipate energy associated with relatively frequent high flow events and to filter sediment, capture bed load and aid floodplain development so the stream does not excessively aggrade or degrade (down-cut). The IDT also uses the Rosgen Stream Classification System as a tool to help determine stream potential. The Rosgen classification system is available online at http://www.wildlandhydrology.com/assets/A_Classification_of_Natural_Rivers-Catena_Paper.pdf.

During the summers of 2012 and 2013, the BLM assessed 92 stream reaches flowing through 57.6 miles of BLM administered land (see Table 4 below). The IDT also visited most of the springs and wetlands within the watershed and applicable portions of the lentic methodology were used to assess springs and wet meadows. Monitoring data was collected on all the streams in the MRRW using the Montana Riparian Wetland Association (MRWA) methodology during the 2012 field season prior to the IDT's PFC assessments. In accordance with the Dillon Resource Management Plan, the MRWA methodology has been adapted and modified by the Dillon Field Office to include channel morphology parameters. The MRWA methodology includes inventories of physical and vegetative characteristics and streambed materials, and measurements of channel dimensions (bank full width, mean bank full depth, flood prone width). Physical measurements are utilized to assess channel morphology and stability and tentatively classify streams at Rosgen Level II. The MRWA also includes inventories and observations of the composition, cover, vigor and the amount of recruitment, regeneration and utilization of vegetative species within the riparian zone. The data gathered was used by the IDT in conjunction with the PFC assessment process to ascertain riparian health and trends on a reach by reach basis.

Riparian coverboards, greenline transects, cumulative width/depth transects, woody browse transects, and Rosgen Methodology monitoring were also used to measure various riparian attributes in the MRRW. Riparian coverboards were established in the MRRW in the 1980's. Coverboard data measures relative change in canopy cover of woody species in the riparian zone. Greenline transects are also used to measure changes in the relative abundance of different plant community types in the riparian area. Greenline data tracks changes in vegetative composition and cover within the narrow green vegetation ribbon adjacent to the channel. Cumulative width/depth is used to monitor changes in stream geometry. Woody browse, short for woody browse regeneration, is used to monitor age classes and recruitment of deciduous woody shrubs. Rosgen monitoring, similar to cumulative width/depth, is conducted to track changes in channel morphology. Photographs are also taken at the various monitoring sites to record current conditions and relative changes over time. All the monitoring data used to aid the IDT in its assessment are included in the MRRW project file and available for review at the Dillon Field Office.

Many of the riparian areas in the assessment area were originally described, and mapped, based on aerial photos and U.S. Geological Survey (USGS) topographical maps. This information was the basis for GIS mapping. In recent years springs and wetlands have been added to the GIS inventory and mapping effort. Subsequent ground-truthing has verified that a number of drainages previously mapped as riparian habitat are actually dry washes which lack riparian characteristics. These reaches have been removed from the stream/wetland inventory. During the 2013 MRRW assessment process, 8 reaches were removed from the database either because they are ephemeral, wetlands, not streams, or located on patented mining claims (private land). Conversely, several stream reaches, springs and wetlands not previously identified, were added to the BLM riparian-wetland database during the assessment process.

Findings and Analysis

Streams

Ninety-two stream reaches, totaling 57.6 miles, were assessed for functional condition. Forty-seven reaches, totaling 26.2 miles, were rated PFC. Eighteen reaches, totaling 13.8 miles, were rated FAR with an upward trend. Twenty one reaches, totaling 15.2 miles, were rated FAR with a static or no apparent trend. Four reaches, totaling 1.5 miles, rated FAR with a downward trend. Two reaches, totaling 0.90 miles were rated NF.

Where streams were not PFC, some of the concerns included: alteration of stream morphology, reduced access to floodplains, down cutting, reduction in species diversity and composition, reduced vegetative cover, limited vegetative species recruitment and regeneration, reduced structural diversity, and/or decreased vigor of streamside vegetation. Generally, ungulate grazing and browsing, issues related to roads and irrigation and conifer expansion were the causal factors. The IDT observed remnants of willows and aspen on most of the streams within the watershed that are now dominated by conifers

Stream morphology (channel shape and dimensions, including width and depth, and gradient) and bed materials provide important information to determine a stream's function. Critical shear stress must be achieved before a stream channel is capable of reshaping and maintaining itself.

Stream power is reduced as a channel becomes wider. With reductions in critical shear stress and stream power, the ability of a stream to maintain riffles and pools and move channel materials is diminished. As these reductions continue, sediments often accumulate which force the stream to widen even more. The BLM's regulations require streams to have the ability to maintain stable dimensions, patterns and profiles. Table 4 summarizes the functional status of all the stream reaches in the MRRW that were either evaluated.

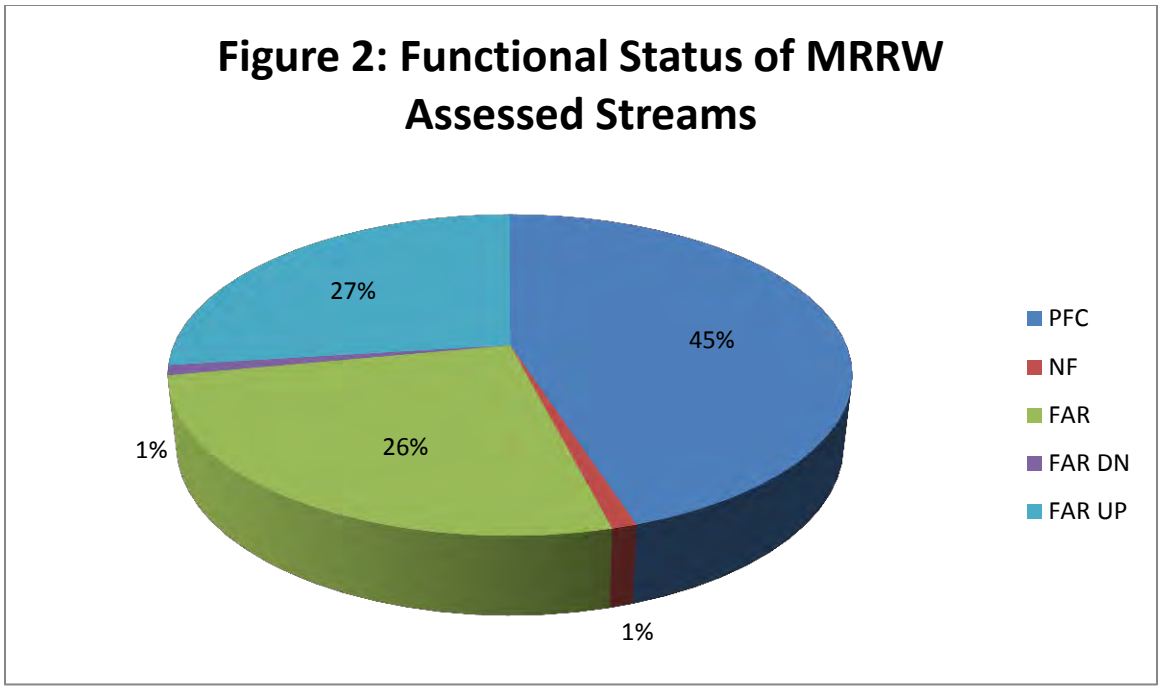
Table 4: Functional Status of Stream Reaches

Stream Name	Allotment	BLM Reach ID	Vegetative Community Type	Functional Rating & Trend	Miles
Barton Gulch trib.	Barton Gulch	800	Englemann spruce/red-osier dogwood	FAR static	0.93
Barton Gulch trib.	Barton Gulch	801	Englemann spruce/red-osier dogwood	PFC	0.42
Barton Gulch trib.	Barton Gulch	802	Englemann spruce/red-osier dogwood	PFC	0.79
Barton Gulch	Barton Gulch	803	Englemann spruce/red-osier dogwood	FAR static	1.30
Barton Gulch	Barton Gulch	804	Englemann spruce/red-osier dogwood	PFC	0.57
Barton Gulch	Barton Gulch	805	Englemann spruce/red-osier dogwood	PFC	0.65
Barton Gulch trib.	Barton Gulch	813	Englemann spruce/red-osier dogwood	FAR static	0.25
Barton Gulch trib.	Barton Gulch	898	Englemann spruce/red-osier dogwood	PFC	0.36
Barton Gulch trib.	Barton Gulch	899	Englemann spruce/red-osier dogwood	PFC	0.29
Barton Gulch trib.	Davey Creek	812	Englemann spruce/red-osier dogwood	PFC	0.24
Barton Gulch	Davey Creek	809	Englemann spruce/red-osier dogwood	FAR static	1.12
Barton Gulch trib.	Davey Creek	2401	Englemann spruce/red-osier dogwood	PFC	0.90
Barton Gulch trib.	Davey Creek	810	Englemann spruce/red-osier dogwood	PFC	0.60
Barton Gulch trib.	Davey Creek	2400	Englemann spruce/red-osier dogwood	PFC	0.14
Barton Gulch trib.	Davey Creek	808	Englemann spruce/red-osier dogwood	PFC	0.62
Barton Gulch trib.	Davey Creek	806	Englemann spruce/red-osier dogwood	PFC	0.71
Barton Gulch	Davey Creek	807	Englemann spruce/red-osier dogwood	PFC	1.34
Barton Gulch trib.	Davey Creek	811	Englemann spruce/red-osier dogwood	PFC	0.23
Bum Creek	Belmont	867	Rocky mountain juniper/red osier dogwood	FAR static	1.78
Bum Creek trib.	Belmont	865	Geyer willow/beaked sedge	PFC	0.41
Cottonwood Creek	Belmont	822	Englemann spruce/red-osier dogwood	FAR static	0.43
Cottonwood Creek tributary	Belmont	816	Englemann spruce/red-osier dogwood	FAR static	0.51
Cottonwood Creek	Belmont	891	Englemann spruce/red-osier dogwood	FAR down	0.22
Cottonwood Creek	Belmont	820	Douglas-fir/red-osier dogwood	FAR down	0.85
Cottonwood Creek tributary	Belmont	821	Englemann spruce/red-osier dogwood	FAR static	0.48
Cottonwood Creek tributary	Belmont	815	Douglas-fir/red-osier dogwood	FAR static (2012 MRWA)	0.15
Cottonwood Creek Tributary	Belmont	814	Douglas-fir/red-osier dogwood	FAR up	0.57

Stream Name	Allotment	BLM Reach ID	Vegetative Community Type	Functional Rating & Trend	Miles
Cottonwood Creek tributary	Belmont	817	Englemann spruce/red-osier dogwood	FAR static (2012 MRWA)	0.15
Cottonwood Creek tributary	Belmont	892	Douglas-fir/red-osier dogwood	PFC (2012 (MRWA)	0.13
Cottonwood Creek	Garden Creek	823	Englemann spruce/red-osier dogwood	FAR up	1.03
Cottonwood Creek tributary	Garden Creek	819	Geyer willow/beaked sedge	FAR up	0.46
Cottonwood Creek tributary	Garden Creek	818	Englemann spruce/red-osier dogwood	PFC	0.39
Davey Creek	Barton Gulch	827	Englemann spruce/red-osier dogwood	FAR static	2.22
Davey Creek	Barton Gulch	825	Englemann spruce/red-osier dogwood	PFC	0.10
Davey Creek trib.	Barton Gulch	882	Englemann spruce/red-osier dogwood	PFC	0.20
Davey Creek	Davey Creek	2403	Englemann spruce/red-osier dogwood	PFC	1.31
Davey Creek trib.	Davey Creek	2402	Englemann spruce/red-osier dogwood	PFC	0.62
Davey Creek trib.	Davey Creek	824	Englemann spruce/red-osier dogwood	PFC	0.19
Davey Creek	Davey Creek	826	Englemann spruce/red-osier dogwood	PFC	0.73
Dryden Creek	Davey Creek	828	Englemann spruce/red-osier dogwood	FAR up	0.35
Dryden Creek	Davey Creek	829	Quaking aspen/red-osier dogwood	NF	0.66
Dryden Creek	Davey Creek	2405	Quaking aspen/red-osier dogwood	PFC	0.55
Garden Creek	Garden Creek	831	Englemann spruce/red-osier dogwood	FAR up	2.08
Garden Creek trib.	Garden Creek	832	Englemann spruce/red-osier dogwood	FAR up	0.97
Garden Creek East Fork	Garden Creek	830	Douglas-fir/red-osier dogwood	FAR up	1.50
Garden Creek trib	Garden Creek	833	Geyer willow/beaked sedge	FAR up	0.33
Garden Creek trib	Garden Creek	834	Geyer willow/beaked sedge	FAR static	0.34
Garden Creek trib	Garden Creek	835	Beaked sedge	FAR up	1.34
Garden Creek trib	Garden Creek	836	Geyer willow/beaked sedge	FAR up	0.47
Garden Creek trib	Garden Creek	837	Geyer willow/beaked sedge	FAR up	0.60
Garden Creek trib	Garden Creek	838	Englemann spruce/red-osier dogwood	PFC	0.43
Garden Creek trib	Garden Creek	873	Englemann spruce/red-osier dogwood	FAR static	0.50
Garden Creek trib	Garden Creek	874	Englemann spruce/red-osier dogwood	FAR static	0.43
Garden Creek trib	Garden Creek	2411	Douglas-fir/red osier-dogwood	PFC	0.53
Dark Hollow Creek	North Fork AMP	839	Douglas-fir/red-osier dogwood	PFC (2012 MRWA)	1.87
Greenhorn Creek South Fork	North Fork AMP	840	Douglas-fir/red-osier dogwood	PFC (2012MRWA)	0.58
Greenhorn Creek North Fork	North Fork AMP	841	Douglas-fir/red-osier dogwood	PFC (2012 MRWA)	1.51
Hinch Creek	Garden Creek	872	Englemann spruce/red-osier dogwood	PFC	1.24
Hinch Creek	Garden Creek	850	Englemann spruce/red-osier dogwood	PFC	1.05
Hinch Creek	Garden Creek	2407	Englemann spruce/red-osier dogwood	PFC	0.62
Hinch Creek North Fork	Garden Creek	844	Englemann spruce/red-osier dogwood	FAR up	0.77

Stream Name	Allotment	BLM Reach ID	Vegetative Community Type	Functional Rating & Trend	Miles
Hinch Creek trib	Garden Creek	843	Shrubby cinquefoil/tufted hairgrass	PFC	0.17
Hinch Creek trib	Garden Creek	2406	Englemann spruce/red-osier dogwood	PFC	0.29
Hinch Creek trib	Garden Creek	845	Englemann spruce/red-osier dogwood	PFC	0.53
Hinch Creek trib	Garden Creek	846	Englemann spruce/red-osier dogwood	PFC	0.40
Hinch Creek trib	Garden Creek	847	Englemann spruce/red-osier dogwood	PFC	0.23
Hinch Creek trib	Garden Creek	848	Englemann spruce/red-osier dogwood	PFC	0.20
Hinch Creek trib	Garden Creek	2410	Englemann spruce/red-osier dogwood	PFC	0.10
Hinch Creek trib	Garden Creek	842	Englemann spruce/red-osier dogwood	FAR up	0.31
Hinch Creek trib	Garden Creek	849	Englemann spruce/red-osier dogwood	PFC	0.26
Idaho Creek	Idaho Jack	851	Douglas-fir/red-osier dogwood	PFC	1.16
Idaho Creek trib.	Idaho Jack	852	Douglas-fir/red-osier dogwood	PFC (2012 MRWA)	0.38
Jack Creek	Idaho Jack	858	Douglas-fir/red-osier dogwood	PFC	0.33
Jack Creek	Idaho Jack	857	Douglas-fir/red-osier dogwood	FAR static	1.38
Jack Creek trib	Idaho Jack	853	Douglas-fir/red-osier dogwood	PFC	0.42
Jack Creek trib	Idaho Jack	854	Douglas-fir/red-osier dogwood	FAR up	0.59
Jack Creek trib	Idaho Jack	855	Englemann spruce/red-osier dogwood	PFC	0.32
Jack Creek trib	Idaho Jack	856	Douglas-fir/red-osier dogwood	FAR static	0.53
Mormon Creek	Garden Creek	861	Englemann spruce/red-osier dogwood	FAR up	1.20
Mormon Creek trib	Garden Creek	860	Englemann spruce/red-osier dogwood	FAR static	0.69
Mormon Creek trib	Garden Creek	859	Beaked sedge	PFC	0.29
Mormon Creek trib	Garden Creek	862	Douglas-fir/red-osier dogwood	FAR up	0.30
Peterson Creek North Fork	Garden Creek	879	Geyer willow/beaked sedge	FAR up	0.63
Sage Creek West Fork	Belmont	864	Rocky mountain juniper/red-osier dogwood	FAR up	0.32
Sage Creek trib	Belmont	888	Rocky mountain juniper/red-osier dogwood	FAR static	0.48
Spring Creek	Fossil Basin	877	Rocky mountain juniper/red-osier dogwood	FAR static	0.87
Stone Creek Upper Left Fork	Belmont	422	Beaked sedge	FAR static	0.51
Stone Creek Middle Fork	Belmont	420	Geyer willow/beaked sedge	PFC	0.80
Sweetwater Creek	Belmont	887	Narrowleaf cottonwood	NF	0.23
Sweetwater Creek trib	Belmont	885	Rocky mountain juniper/red-osier dogwood	FAR down	0.29
Williams Creek	Davey Creek	2404	Quaking aspen/red osier dogwood	FAR down	0.16
Williams Creek	Un-allotted	869	Geyer willow/beaked sedge	FAR static	0.12

The percentage of the total stream miles in each functional class is illustrated in Figure 2. The locations and functional class ratings for streams in the MRRW are also shown on maps 2-4, Appendix B.



This is the second watershed assessment in the MRRW, the first taking place in 2003. Approximately 26 miles of lotic streams were evaluated in 2003. At that time, 20 miles were in PFC or FAR with an upward trend condition, and six miles were rated either NF or FAR with a static, down or not apparent trend. The Garden Creek and Fossil Basin allotments were not included in 2003 because they had been assessed separately in 1998. Table 5 shows the 2003 riparian health calls by allotment and miles.

Table 5: 2003 MRRW PFC Calls

Allotment	Miles PFC/FAR b(upward trend)	Miles NF/FAR (static, down, not apparent)
Barton Gulch	2.0	5.4
Davey Creek	6.4	0.6
Belmont North	3.8	0.0
Idaho Jack	5.0	0.0
North Fork AMP	3.0	0.0
TOTALS	20.2	6.0

Allotment-specific riparian health concerns are discussed below. Allotments in which riparian and wetland resources rated as PFC or FAR with and upward trend are not discussed in this section, but information on these resources is available upon request. Additional stream reach specific data for any of the riparian/wetland areas in the MW is available at the Dillon Field Office.

Barton Gulch

Twelve reaches covering almost eight miles flow through the Barton Gulch allotment. Four of these reaches, 4.7 miles, were rated FAR with a static trend by the IDT.

- Reach # 800 is about a mile long and flows through a narrow constricted drainage under a spruce dominated over-story. This low energy system was rated FAR with a static trend

due to over-widening of the channel caused by livestock trailing. These impacts on the lower half of the reach have raised the sediment inputs slightly. The upper half of the reach is well armored and in very good condition.

- Reach # 803 is 1.3 miles long and was also rated FAR static. The lower portion of the reach is in PFC, but the upper portion has been impacted by historic mining and roads. The upper portion is over-widened in places, and the roads, trails and an undersized culvert are resulting in extraordinary sediment inputs and deposits. The historic impacts to this stream have changed its potential and are outside the control of the BLM.
- Reach # 813 is steep and flows through forested habitat. Decadent willows in the riparian area have been crowded out by the spread of conifer species (mostly spruce) into drainage from above. Several livestock crossings and trailing have over-widened some locations and are contributing sediment to the system.
- Reach #827 was also rated as FAR static. This reach is the main stem of Davey Creek and flows west into the Ruby Reservoir after leaving BLM land. The lower half mile of this two mile reach is comprised of a series of inactive beaver dams causing braided channels and is dominated by sedge, grass, willows and other deciduous plants. Above the beaver dams the stream flows beneath a heavy forested canopy. The banks lack herbaceous cover and are susceptible to impacts by cattle and wildlife. Conifer encroachment is also crowding out riparian deciduous woody species limiting biodiversity. Livestock crossings and trailing has over-widened the channel is some places which adversely impacts the natural sinuosity of the stream. Sediment run off into the reach from the road that runs adjacent to the stream is significant during spring run-off and storms.

<u>Belmont</u>

Eleven stream reaches flowing through about 6.5 of BLM administered land in the Belmont allotment rated FAR static, FAR down or Non-Functional (NF).

- Eight stream reaches in the allotment, covering about 5 miles, are rated FAR with a static trend (# 867, 822, 816, 821, 815, 817, 888, and 422). This means that the hydrological functions of the streams and health and vigor of the associated riparian plant communities are neither improving nor declining. The reasons for current conditions are varied and complex. Livestock utilization has impacted some of the reaches, but other factors such as juniper encroachment, forested habitat that limits the amount and diversity of bank stabilizing vegetation, roads which contribute sediment, browsing by wildlife and man-made push up dams all have additive impacts to the riparian resources.
- Reach # 885, a short reach (0.3 mi.) located in a very narrow and rocky drainage rated FAR with a downward trend. One of the primary reasons is the lack of plant diversity. Heavy juniper encroachment into the riparian zone has eliminated most other woody and herbaceous species. There are small sedge stands along channel in the steep upper portion of the reach, but down low the channel is over-widened and sediment laden due to livestock impacts.
- Reach # 887 is non-functioning, because the water from Sweetwater Creek is being diverted by a headgate directs the flow into a ditch leading to Williams Reservoir. According to Montana DNRC Water Rights Query the headgate and ditch are associated with water rights claims dating to 1883 and 1884. The flow rate and period of diversion

associated with the claims is 505 miners inches from April 15 to October 15. Vegetation on this reach include Basin wildrye, baltic rush and narrowleaf cottonwood.

- Reaches # 891 and 820 rated FAR with a downward trend. These two reaches are both part of Cottonwood Creek, are located next to the Cottonwood Creek road, and easily accessible to campers, hunters and livestock. Noted resource concerns are: lack of age-class diversity in the riparian vegetation community, spruce over-story shading out bank holding woody and herbaceous species, browsing of young aspen trees by wildlife and livestock, numerous over-widened crossings and raw banks stemming from cattle utilization and excessive sediment inputs.

Davey Creek

The Davey Creek allotment contains 17 individual streams reach that flow through 10.5 miles of public land. Of those only three reaches covering less than 2 miles, are not in PFC.

- Reach #809, the main channel of Davey Creek, is rated FAR with a static trend. Conditions observed by the IDT that led to this rating include: sediment from adjacent road, numerous cattle crossing resulting in over-widened and shallow places in the stream and impacts from historic placer mining activities.
- Reach #2404 is a short quarter mile stretch of Williams Creek. It is rated FAR with a slight downward trend primarily because of excessive sediment inputs from grading the adjacent county road and heavy juniper encroachment.
- Reach 829 is located on upper Dryden Creek and flows under a spruce/dogwood habitat type. Very little bank stabilizing vegetation is present and the channel is deeply entrenched. This is a low energy spring fed system that does not have sufficient flow to flush excess sediments. The system is not vertically stable and the lateral stream movement and natural sinuosity of the creek are being negatively impacted by the steep terrain and livestock impacts.

Garden Creek

The Garden Creek allotment has 33 stream reaches covering 21 miles on BLM public land. Of those, four reaches (1.96 miles) were rated FAR with a static trend. No reaches were rated FAR down or NF, while 29 reaches were rated either PFC or FAR with an upward trend.

The photos below contrast the condition of reach #823 on Cottonwood Creek from the fall of 1992 and fall of 2012 (post grazing). The IDT rated this reach FAR with an upward trend

Cottonwood Creek, reach #823, September 1992

Cottonwood Creek, reach #823, October 2012

because of improved channel dimensions, an increase in the herbaceous plant community including bank stabilizing, deep-rooted sedge plants and decreased sediment inputs. Many streams in the Garden Creek allotment are on an upward trend since last assessed in 1998.

- Reach #834 was rated FAR static by the IDT. It is a short spring brook covering about a third of a mile. It begins in a willow stand and runs through a grassy high mountain meadow. The willows growing around the spring source have been hedged by browsing wildlife and livestock. Also, trampling by livestock and wildlife has caused hummocking, channel over-widening and degradation in some sections of the reach.
- Reach 860, rated FAR static, runs beneath a spruce dominated forested canopy which shades out other riparian vegetation. Plant biodiversity is limited and the channel banks are susceptible to disturbance from livestock. The stream is not vertically stable as evidenced by active head-cuts in the channel. The bottom section of the reach is being grazed heavily resulting in raw banks, channel over-widening and high sediment loads.
- Reaches 873 and 874 are located within a quarter mile of each other on a north facing steep forested slope. These two reaches are almost identical and both were rated FAR static by the team. Current stream channel and vegetative conditions are not a result of present grazing pressure, but evidence of natural succession as conifers have expanded and shaded out most other vegetation. Decadent willows are evidence of the succession process. Most of the two channels are inaccessible to livestock because of heavy timber down fall. Reach 873 has one active head-cut created by a high flow event (storm, flood) in the relatively recent past.

Idaho Jack

Eight stream reaches, covering a little more than 5 miles, are located in the Idaho Jack allotment. Jack Creek and its tributaries are occupied by 100% pure population of westslope cutthroat trout (WCT). Reaches 856 & 857 were rated FAR static in 2013.

- Reach # 857, the main stem of Jack Creek, is 1.4 miles in length and is home to a population of pure WCT. Several smaller tributaries flow into Jack Creek from the timber slopes above. This upper section of Jack Creek flows through open, relatively flat meadows. Cattle watering activities are concentrated in this area which results in hoof disturbances to the stream banks and increased sediment inputs into the channel.
- Reach #856 is a small low energy interrupted tributary flowing into the main stem of Jack Creek from the south. The reach is comprised of several springs and short disconnected spring brooks. The overstory is dominated by conifers, but there are healthy aspen stands present also. Aspen regeneration and recruitment is very good, in spite of encroaching juniper. The only resource concern is being caused by livestock watering at the springs. Hoof action in the small wet meadows near the springs has caused extensive hummocking in places. Hummocking disperses the water, precludes the formation of a brook or channel and dries out the soil.

Developed Springs

The BLM's Rangeland Improvement Project System (RIPS) database shows 12 spring developments in the MRRW. BLM staff visited these developments to determine resource condition, condition of infrastructure, and water production (flow). Table 6 lists the spring developments on BLM land in the watershed.

Table 6: Developed Springs

Spring Name	Project Number	Allotment	Constructed
Cottonwood Hairpin	791	Belmont	2005
North Belmont	792	Belmont	2005
Davey #7	2401	Davey Creek	2006
Davey State	2402	Davey Creek	2006
Dryden Creek	476434	Davey Creek	1983
Ridgetop	476431	Davey Creek	1983
Drift Fence	476765	Garden Creek	1987
Left Fork Mormon	477235	Garden Creek	1993
Lightning	476768	Garden Creek	1987
Mormon Peak	477260	Garden Creek	1987
South Mormon	477053	Garden Creek	1993
Taylor Canyon	553	Garden Creek	Unknown
Tukudika	477279	Garden Creek	1987

Maintenance of water developments was a noted concern on several developments in the watershed. Maintenance problems include lines not being drained, sediment in troughs, plumbing not properly working, lack of float valves and or shutoff valves, and leaking troughs. These maintenance issues can negatively impact wetland hydrology and do not help attain the objective(s) that the development was originally intended to achieve (i.e., livestock distribution or mitigation of impacts to perennial streams). They may also impact water rights since water right holders are expected to conserve water. Though not related to maintenance per se, troughs may present wildlife hazards and escape ramps help mitigate the hazard. Properly maintained water developments are considered Best Management Practices for riparian resources. The BLM must report on BMP effectiveness as part of our participation in Montana's Nonpoint Source Management Strategy. Permittee partnership and cooperation is critical to achieve these goals.

Developed Springs Conditions by Allotment:

- Belmont: There are two spring developments in the Belmont allotment, Cottonwood Road Hairpin and North Belmont Spring. Both are in excellent working condition and only continued routine maintenance is required.
- Davey Creek: Davey Creek allotment has four spring developments, Davey #7, Davey State, Dryden Creek and Ridgetop. Davey # 7, Davey State and Ridgetop spring all are in good working condition and require routine maintenance. Dryden spring is no longer functional due to exposure to the elements.
- Garden Creek**:** There are seven springs in the Garden Creek allotment: Drift Fence, Left Fork Mormon, Lightning, Mormon Peak, South Mormon, Taylor Canyon and Tukudika. The origin of Taylor Canyon Spring is unknown. It is not functioning at this time. All other spring developments and associated exclosures in the Garden Creek allotment are 20 to 25 years old and are experiencing various levels of deterioration due to siltation and exposure to the elements. All are in need of maintenance and/or partial re-construction. Access to these springs is difficult.

Wetlands
As discussed above, 4.5% of the NWI wetlands in the MRRW are located on Public Land. For the most part they are associated with streams and as such were evaluated in association with the stream assessments.

Recommendations for Riparian Health

Riparian concerns were identified in the Belmont, Barton Gulch, Davey Creek, Garden Creek and Idaho Jack allotments. Livestock management changes will be evaluated in those allotments and other site specific locations to mitigate impacts to riparian/wetland habitat. Revisions to allotment management plans may include changes in timing, duration, frequency (resting pastures or allotments) and/or intensity of use as well as number of livestock authorized. Maintenance of dysfunctional rangeland improvement projects and/or new construction of water developments, pasture division fences and riparian corridor fences may also be considered.

A variety of riparian vegetation treatments may be appropriate to mitigate Rocky mountain juniper and Douglas-fir encroachment into riparian areas. The IDT noted a significant amount of encroachment into riparian habitat across the watershed. Prescribed fire, mechanical treatments or other means may be considered to reduce or eliminate these competitive species with the goal of increasing flora and fauna biodiversity.

Specific spring related recommendations are:

- Verify that routine maintenance is conducted by the permittees on all spring developments on an annual basis as agreed to in the Cooperative Agreements for the projects. If spring developments are dry and dysfunctional, they should be abandoned and infrastructure cleaned up. Exclosures should be constructed, maintained, reconstructed or removed depending on resource needs.
- Davey Creek allotment: Dryden Creek spring should be evaluated by engineering staff to determine the feasibility of re-development, otherwise it should be cleaned-up and abandoned.
- Garden Creek allotment: Drift, Left Fork Mormon, Lightning, Mormon Peak, South Mormon, Taylor Canyon and Tukudika Springs need maintenance and in some cases further evaluation to determine feasibility of redevelopment or cleanup and abandonment. The usefulness of the Hinch Creek Holding Pasture Fences, BLM Project 7266, should be reevaluated. Consider constructing an exclosure fence to protect Hinch Creek spring at the head of reach # 842.
- Pierce Canyon: clean up abandoned spring development on public land in T6S R5W section 24.

Water Quality

Western Montana Standard #3: *"Water quality meets State standards"*

Affected Environment

The 1987 Amendments to the Clean Water Act require States to develop plans for controlling non-point sources (nps) of water pollution. Montana has divided the State into water quality planning areas. The MRRW assessment area is located within the Ruby TMDL Planning area. The Montana-Dakotas BLM, through a Memorandum of Understanding, works with the State of Montana to control non-point water pollution. Guiding documents used to describe the affected environment include the Ruby River Watershed Total Maximum Loads and Framework for a Water Quality Restoration Plan, Montana's Water Quality Integrated Report and the Montana Nonpoint Source Management Plan. The Ruby River Plan (MTDEQ 2006) was completed in 2006 and approved by EPA in 2007. The Integrated Reports are submitted biannually, with the most recent report submitted in 2012. The Nonpoint Source Management Plan was updated in 2012. It should be noted that the scope of the TMDLs addressed by the Water Quality Integrated Report include sediment, temperature, habitat, metals and nutrient related water quality impairments.

DEQ has identified seven major land uses that contribute to nps pollution. Many of these land uses occur on BLM managed land: grazing, silviculture, unpaved roads, flow alterations from irrigation, mining and recreation. DEQ has identified a number of common pollutants associated with agricultural operations, some of which are associated with livestock grazing, including "sediment, nitrogen, phosphorus, salinity, and pathogens. Certain agricultural practices can also lead to significant changes in water temperature, a loss of riparian and aquatic habitat, and other serious problems" (MTDEQ 2012).

NPS water pollution affects water quality regardless of whether the stream is on the 303d list of streams requiring TMDLs; nps pollution needs to be addressed for waters of the State regardless of whether they are meeting or not meeting water quality standards. The BLM recognizes that non-degradation rules apply to waters that meet state standards. Many of the streams within the MRRW are tributary streams and are not listed.

Findings, Analysis and Recommendations

Procedure to determine conformance with Standard

The Montana Department of Environmental Quality (DEQ), Water Quality Planning Bureau, and Watershed Protection Section provide guidance on assessing water quality in relation to NPS. Montana DEQ recognizes PFC as a qualitative method of assessing the condition of riparian-wetland areas. DEQ believes PFC is an effective tool for riparian assessment and evaluation of the impacts of grazing management and other authorized uses on riparian health. Montana's NPS Agricultural Strategy for Pasture and Range Lands supports the BLM's use of PFC for assessment (MTDEQ2007). The BLM's 2010 "Memorandum of Understanding Regarding Water Quality Management on Bureau of Land Management (Administered) Lands in Montana

Between the Montana Department of Water Quality and the United States Department of the Interior Bureau of Land Management" documents the BLMs strategy for managing and controlling NPS water pollution from the BLM managed lands and authorizations. The goal of this MOU is discussed in detail in a paper titled 'Using watershed function as the leading indicator for water quality' (Aron et al 2013). In short, there is growing recognition that the objective of the Clean Water Act to 'restore and maintain the chemical, physical and biological integrity of the nation's waters' is not being fully achieved (USEPA, 2012). The BLM's watershed approach of assessing land health, also known as ecosystem function, can be a leading (early) indicator to guide adaptive management as opposed to traditional water quality monitoring which is seen as a lagging indicator. As part of this MOU the BLM reports to DEQ actions taken to address NPS water pollution as well as effectiveness of Best Management Practices (BMPs). Water Quality Monitoring is conducted on Public Land by Montana DEQ as part of their responsibilities under the Clean Water Act. Additionally, as discussed in the Aron paper, the BLM has entered into a cooperative water quality monitoring agreement shifting some of the workload to Montana DEQ and freeing the BLM to focus more attention to watershed function.

Findings and Analysis

Montana DEQ has water quality reports for the following creeks, rivers and reservoirs in the MRRW: Cottonwood, Garden, Mormon, NF of Greenhorn and Sweetwater Creeks as well as Ruby River and Reservoir, on their Clean Water Act Information Center (CWAIC) website (see glossary). Table 7 provides CWAIC information. TMDLs have been prepared for some but not all pollutants.

Table 7: Montana DEQ 303-d Listed Streams

Name	Beneficial Uses	Probable Sources of Impairment	Probable Causes of Impairment
Cottonwood Creek	Agriculture[1], Aquatic Life [2], Cold Water Fishery [n/a], Drinking Water [1], Industrial [n/a], Primary Contact Recreation [2]	Channelization, Grazing in Riparian or Shoreline Zones, Irrigated Crop Production, Unpaved Roads,	Alteration in streamside or littoral vegetative covers, Low flow alterations, Nitrogen(Total), Sedimentation/siltation,
Garden Creek	Agriculture[1], Aquatic Life [2], Cold Water Fishery [n/a], Drinking Water [1], Industrial [n/a], Primary Contact Recreation [1]	Grazing in Riparian or Shoreline Zones, UnpavedRoads	Alteration in streamside or littoral vegetative covers, Nitrogen(Total) Phosphorous (Total) Sedimentation/siltation
Mormon Creek	Agriculture[1], Aquatic Life [2], Cold Water Fishery [n/a], Drinking Water [1], Industrial [n/a], Primary Contact Recreation [1]	Grazing in Riparian or Shoreline Zones,	Alteration in streamside or littoral vegetative covers, Phosphorous (Total) Sedimentation/siltation
NF Greenhorn*	Agriculture[1], Aquatic Life [1], Cold Water Fishery [n/a], Drinking Water [1], Industrial [n/a], Primary Contact Recreation [1]	N/A	N/A

Name	Beneficial Uses	Probable Sources of Impairment	Probable Causes of Impairment
Ruby River Confluence of E,W & Middle Forks to Reservoir	Agriculture[1], Aquatic Life [2], Cold Water Fishery [n/a], Drinking Water [1], Industrial [n/a], Primary Contact Recreation [1]	Grazing in Riparian or Shoreline Zones, UnpavedRoads	Alteration in streamside or littoral vegetative covers, Phosphorous (Total) Sedimentation/siltation
Ruby River Reservoir to Confluence w/ Beaverhead	Agriculture[1], Aquatic Life [2], Cold Water Fishery [n/a], Drinking Water [1], Industrial [n/a], Primary Contact Recreation [2]	Flow alterations, Grazing in Riparian or Shoreline Zones, Irrigated Crop Production	Alteration in streamside or littoral vegetative covers, Low flow alterations Phosphorous (Total) Sedimentation/siltation Temperature
Ruby Reservoir	Agriculture[1], Aquatic Life [1], Cold Water Fishery [n/a], Drinking Water [4], Industrial [n/a], Primary Contact Recreation [1]	N/A	N/A
Sweetwater Creek	Agriculture[1], Aquatic Life [3], Cold Water Fishery [n/a], Drinking Water [1], Industrial [n/a], Primary Contact Recreation [2]	Irrigated Crop Production Rangeland Grazing Unpaved Roads	Alteration in streamside or littoral vegetative covers, Chlorophyll a Low flow alterations Phosphorous (Total) Sedimentation/siltation Temperature

[1] Fully Supporting, [2] Not Supporting; *Sufficient Credible Data has been obtained for NF Greenhorn Creek and Ruby Reservoir. Both are currently supporting all beneficial uses. They remain on the DEQ CWAIC

Section 319 of the Clean Water Act addresses non-point source pollution through the application of Best Management Practices (BMPs). The BLM uses a variety of BMPs to address nonpoint source pollution resulting from silviculture, livestock grazing, road construction and maintenance and mining. Allotment Management Plans (AMPs) are recognized as grazing BMPs to the extent that they address non-point pollution (EPA2003). The BLM uses AMPs developed to improve riparian and upland conditions as an effective BMP to improve water quality. Western Montana Guideline #10 states "Livestock management should utilize BMPs for livestock grazing that meet or exceed those approved by the State of Montana in order to maintain, restore or enhance water quality." Other grazing BMPs used by the BLM include offstream water, exclosures and riparian fences.

The BLM's responsibilities under the 1987 amendments of the Clean Water Act are to evaluate the effectiveness of their BMPs. The watershed assessment is an evaluation of BMP effectiveness. For the MRRW assessment, the IDT used a combination of methodologies to evaluate the watershed characteristics, as well as condition and function of floodplains, springs, streams, and wetlands.

In conducting watershed assessments with respect to nonpoint water pollution, upland, forest, wetland and riparian assessments were used to determine how BLM management is affecting water quality. The BLM evaluates uplands for land cover condition (ability of plants, rocks, and litter to protect soil from erosion, promote infiltration and reduce runoff). Wetlands are assessed to determine their extent and condition and their ability to recharge ground water, cycle nutrients,

filter sediments, promote infiltration and mitigate flooding. Streams and their adjacent riparian areas are evaluated to determine channel morphology and stability, access to floodplains, species composition and condition of riparian vegetation. Wells, pipelines and spring developments are recognized as BMPs, and are evaluated to determine condition and effectiveness. Due to the extent of stream miles in the Dillon Field Office, temperature monitoring is limited to selected streams. PFC assessments also provide clues to stream temperature. Shallow, overwidened streams with limited vegetation receive more solar radiation and are more at risk for thermal impacts than deep narrow well vegetated streams. Improvements in channel condition and riparian cover directly correlate to reductions in thermal impacts. See Biodiversity Special Status Species page 57 for more details.

The assessment team also looks at current and historic mining, timber harvests, abandoned beaver dams, erosion from roads, and concentrated livestock waste.

There are 13 allotments in the MRRW. The Ruby Mountains Wilderness Study Area is also located in the MRRW. Of the 13 allotments, 7 have streams. Allotment Management Plans/BMPs have been developed for six allotments. A Final Decision was issued and new management was authorized for Fossil Basin and Garden Creek in 2002. In 2004, the BLM issued Final Decisions authorizing new Allotment Management Plans for Barton Gulch, Belmont North and South (combined to become Belmont), Davey Creek, and Idaho Jack. Ruby Dam Isolated was determined not to have riparian resources. A small wetland above the high water mark of Ruby Reservoir was identified subsequent to the 2004 Final Decision and determined to be PFC. North Fork AMP was assessed as part of the East Bench Watershed Assessment in 2008 and no riparian resources were identified. More comprehensive on the ground reconnaissance in 2012 and 2103, subsequently revealed riparian resources.

The 2013 field assessments, using the PFC assessments as an indicator for AMP-BMPs effectiveness, indicated that three allotments, Davey, Fossil, and Garden Creek, were improving, one, Barton Gulch, did not improve and one, Belmont was declining.

In addition to the Allotment Management Plans, there are numerous water developments in the watershed assessment area. Some of these were well designed and working effectively, others were in need of repair or were not providing sufficient water.
The ID team assessed forestry BMP effectiveness associated with the Barton Gulch timber harvest. BMPs for forestry were very effective. Road maintenance including culvert sizing and installations are also evaluated.

Refer to sections on upland, forestry and riparian health above for, PFC determinations and information that helps indicate where BLM resource conditions and/or authorized uses may be either contributing to or mitigating water quality impairment. The State makes Beneficial Use Determinations. The BLM shares their findings to assist DEQ in making Beneficial Use Determinations.

Recommendations for Water Quality

1. Continue working with Montana DEQ and Ruby Watershed Committee to implement the Ruby River Water Quality Restoration Plan.
2. Continue BMP implementation and effectiveness monitoring to address NPS pollution.
3. Continue to share Watershed Assessment findings with DEQ.
4. Continue implementation of Water Quality MOU (BLM-MOU-MT923-1030) between Montana DEQ and BLM, including submission of biannual reports.
5. Continue to implement the Montana Nonpoint Source Management Plan and strategies for Agriculture, Forestry, Mining and Road Maintenance.
6. Continue temperature monitoring on select streams.

Air Quality

Western Montana Standard #4: "*Air quality meets State standards."*

Affected Environment

The United States Environmental Protection Agency (EPA) has established National Ambient Air Quality Standards (NAAQS) that limit air pollutant concentrations of six principal pollutants (particulate matter, sulfur dioxide, carbon monoxide, nitrogen dioxide, ozone, and lead). The EPA also regulates additional pollutants such as hazardous air pollutants and greenhouse gases (GHGs), although these pollutants have no regulatory thresholds for ambient concentrations. Emissions of GHGs, including primarily carbon dioxide and methane, contribute to climate change.

Under the Clean Air Act Amendments of 1990, the EPA must regularly review and revise the NAAQS, ensure that the standards are attained (in cooperation with States), require control of hazardous air pollutant emissions, and set standards for air quality monitoring. Installation and operation of monitors is primarily carried out by State and local agencies and the monitors are typically located in population centers or near certain industrial sites. Monitors are rare in rural areas, unless air quality agencies have reason to believe that pollutant concentrations may approach or exceed ambient air standards in rural locations.

The closest air quality monitor is located in Butte, Montana. Pollutant concentrations at this monitor indicate high levels of small particulate, known as PM_{10}, that have a diameter less than or equal to 10 microns. PM_{10} exceeds the NAAQS within the Silverbow valley and the area is designated nonattainment for PM_{10}. Recent monitoring data also indicate some high $PM_{2.5}$ (diameter less than 2.5 microns) concentrations in winter due to wood burning on days with temperature inversions. According to Montana DEQ, high $PM_{2.5}$ concentrations are confined to a small area within Butte city limits.

For most of the year, air quality in rural southwestern Montana is excellent. Air quality issues in the MRRW develop predominantly during wildfires and are limited to $PM_{2.5}$ emissions, which can travel hundreds and even thousands of miles. Consequently, air quality in the MRRW can be affected by fires located far from the MRRW. Because pollutant emissions associated with

wildfires are largely beyond human control, exceedance of air quality standards that are associated with large wildfires are considered to be natural events and are typically exempted from consideration when determining NAAQS compliance.

The closest population centers to the MRRW are Alder, Virginia City, and Sheridan Montana. The 2010 U.S. Census population estimate for Alder (Census County Division) was 1150, Virginia City 190 and Sheridan 642 respectively. Madison County's population estimate, also for 2010, was 7691 (http://epa.gov/airquality/qa/monprog.html).

Findings and Analysis

Procedure to determine conformance with Standard
The Clean Air Act (CAA) of 1990, as amended (42 U.S.C. 7401 et seq), and Executive Order 12088 require the BLM to work with appropriate agencies to protect air quality, maintain Federal and State designated air quality standards, and abide by the requirements of State Implementation Plans.

The EPA delegated the authority to implement the provisions of the CAA to the State of Montana. Determination of compliance with air quality standards is the responsibility of the State of Montana. To address the issue of wildland fire, the EPA developed the 1998 Interim Air Quality Policy for Wildland and Prescribed Fires which required states to develop smoke management plans. Montana and Idaho responded by forming the Montana/Idaho Airshed Group and by developing the Montana/Idaho Smoke Management Program.

Air quality concerns in the planning area are primarily related to smoke. Smoke contributors in the planning area include wildfire, prescribed fires, private debris burning, agricultural burning, slash burning, and wood burning stoves and fireplaces. Wildfire can produce short-term adverse effects on air quality. Air quality and visibility can deteriorate due to temporary air stagnation during wildfire events, which are most common during the months of July, August, and September. Smoke from wildland and prescribed fires is the primary concerns affecting human health.

Prescribed burning is conducted in accordance with the Montana/Dakotas Fire Management Plan and is coordinated with MT DEQ and the Montana/Idaho Airshed Group. During prescribed fire season, the Smoke Monitoring Unit supports the Montana/Idaho Airshed Group to prevent or reduce the impact of smoke on area communities, especially when that smoke could contribute to a violation of national air quality standards. During the summer wildfire season, the Smoke Monitoring Unit assists state and local governments in monitoring smoke levels and providing information about smoke to the public, firefighters, and land managers.

Recommendations

Continue to follow burn plans and to coordinate with the Smoke Monitoring Unit.

Biodiversity

Western Montana Standard #5: *"Provide habitat as necessary, to maintain a viable and diverse population of native plant and animal species, including special status species"*

Affected Environment

The assessment area provides seasonal and year-long habitat for a wide variety of species. Wildlife uses are enhanced by the interspersion and diversity of grasslands, sagebrush, riparian, rocky outcrops and forested areas. Specific habitat conditions and associated recommendations are also described above in the Upland Health and Riparian Health sections.

Sagebrush Habitats and Sagebrush Dependent Species
Sagebrush and grassland habitat types make up 53% of BLM administered lands in the MRRW. Of this, 51% is in the sagebrush/mountain shrub cover type, making it the most common vegetation community on BLM lands in the watershed, and 2% is grassland. Sagebrush species in the watershed include Wyoming big sagebrush at mid to lower elevations with Basin big sagebrush interspersed, black sage, mountain big sagebrush, three-tipped sagebrush, and low sage. The variety of sagebrush provides habitat for pronghorn, mule deer, sage grouse, and a suite of bird species.

Lower elevation sagebrush communities provide important winter habitat for mule deer, pronghorn, and sage grouse. Higher elevation mountain big sagebrush communities provide elk calving and sage grouse brood-rearing habitat, as well as spring, summer and fall habitat for a variety of species often in association with forested habitat.

In March, 2010 the U.S. Fish and Wildlife Service (USFWS) found that listing the greater sage grouse under the Endangered Species Act was warranted but precluded by higher priority listing actions, designating the greater sage grouse as a candidate species. Sagebrush comprises nearly 100% of sage grouse winter diets and provides thermal, hiding, and nesting cover. Broods require a high protein diet of forbs and insects, usually found in riparian habitats. The *Management Plan and Conservation Strategies for Sage Grouse in Montana* (MFWP 2005) is used as a guideline for sage grouse habitat management. Approximately 21% of the total watershed and 23% of BLM land in the MRRW is within a sage grouse Priority Management Area. Approximately 40% of the total watershed and 26% of BLM land in the watershed is within a sage grouse General Management Area.

Pygmy rabbits are endemic to sagebrush and are the only rabbit on the continent to dig their own burrows. Pygmy rabbits not only require sagebrush for forage and cover, but also deep alluvial soil to dig burrows. Sagebrush comprises nearly 100% of their winter diet and over half of their summer diet.

Riparian, Aquatic and Wetland Habitat and Associated Species

The Middle Ruby Assessment area has 10 perennial streams on public land that support viable year-round fisheries. Common sport fish species in the assessment area are non-native brook trout (*Salvelinus fontinalis*), rainbow trout (*Oncorhynchus mykiss*) and brown trout (*Salmo trutta*). Brown trout and rainbow trout are occasionally found in the lower reaches of some streams and are common in the Ruby River. Brook trout are common in many of the area streams. Native species such as mountain whitefish (*Prosopium williamsoni*), longnose sucker (*Catostomus catostomus*), white sucker (*Catostomus commersoni*), mottled sculpin (*Cottus bairdi*) and westslope cutthroat trout (*Oncorhynchus clarki lewisi*) are found within the assessment area, but generally not on BLM. The exceptions are westslope cutthroat trout and mottled sculpin, which are present in several streams on BLM managed lands. Table 8 summarizes fish species found in the MRRW.

Table 8: Fisheries Streams and Fish Species Present on BLM Land

Stream	Species	BLM Stream Miles
Barton Gulch	Brook trout, rainbow trout	4.98
Idaho Creek	WCT / 94-99% purity	1.16
Jack Creek	WCT / 100% purity	1.71
Dark Hollow	WCT / 100% purity	1.87
North Fork Greenhorn Creek	**Chemically treated to remove non-native species. Native species re-introduction planned for 2015**	**1.51**
South Fork Greenhorn Creek	**Chemically treated to remove non-native species. Native species re-introduction planned for 2015**	**.87**
Cottonwood Creek	Brook/rainbow trout, mottled sculpin	2.53
Hinch Creek	Rainbow/cutthroat trout hybrids	2.91
Sweetwater Creek	Brook trout , rainbow trout , cutthroat trout hybrids, mottled sculpin	.52
Garden Creek	Rainbow trout, mottled sculpin	3.58

Riparian/mesic shrubs make up 2% of the BLM administered lands in the MRRW. Riparian areas provide important habitat for moose, elk, beaver, songbirds, and sage grouse. Columbia spotted frogs and western toads occur in several areas throughout the watershed. Riparian, aquatic, and wetland habitat offers habitat diversity and are crucial water sources for wildlife. Succulent forbs, largely found in riparian areas, are a key component of sage grouse brood diets. Wildlife and livestock concentrate in riparian habitat, as it provides green vegetation later into the summer and fall, resulting in a disproportionate amount of use in these areas.

Aspen in the MRRW is also an important forage, cover, and nesting component for various species including elk, moose, and ruffed grouse. Riparian woodlands support the highest diversity of landbird species of all habitats. Riparian corridors are crucial to several northern-breeding neotropical migrants and breeding or wintering species, even though they may not carry water year-round (Rich et al., 2004). The Partners in Flight Bird Conservation Plan for Montana lists 107 bird species for priority status in five habitat groups. The objective of this plan is "to focus on restoring healthy ecosystems that will sustain productive and complete bird communities" (Montana Partners in Flight, 2000). Most species are summer residents that use habitats ranging from lower elevation wetlands to high elevation forests for breeding and raising

young. Some species are migratory, but small populations may stay yearlong depending on seasonal conditions. The USFWS has a list of 22 "Birds of Conservation Concern" for Bird Conservation Region (BCR) 10 (Northern Rockies U.S. portion only), many of which depend on riparian habitat for all or part of their lifecycle (USDI, 2008). Table 9 lists the 18 species that potentially occur within the MRRW.

Table 9: USFWS Birds of Conservation Concern, BCR 10

Bald Eagle	Williamson's Sapsucker
Swainson's Hawk	Olive-sided Flycatcher
Ferruginous Hawk	Willow Flycatcher
Peregrine Falcon	Loggerhead Shrike
Long-billed Curlew	Sage Thrasher
Flammulated Owl	Brewer's Sparrow
Calliope Hummingbird	Sage Sparrow
Lewis's Woodpecker	McCown's Longspur
Black Rosy-Finch	Cassin's Finch

Generalist or Widespread Species

The MRRW lies within portions of Montana hunting districts (HD): HDs 322, 326, and 330 for deer and elk; HD 331 for moose; HD 321 for antelope; HD 331 for mountain goat.

The elk herd in the Gravelly Elk Management Unit, which includes HDs 322, 326, and 330 is very healthy and is over 18% above population objectives (pers. comm. Waltee, 2013). Elk winter range use is influenced by weather, hunting and predation pressure, snow depths and snow texture. Where elk calve from year to year also depends on the weather and snow depths in the area.

Mule deer numbers are below long-term averages but remain distributed across all suitable habitats (pers. comm. Waltee, 2013). White-tailed deer populations are healthy and are mostly distributed along primary riparian areas including the Ruby River and Sweetwater Creek (pers. comm. Waltee, 2013). Mule deer depend on browse during the winter, choosing habitat with big sagebrush, mountain mahogany, and Rocky Mountain juniper. Curlleaf mountain mahogany is found on rocky slopes and ridges throughout the watershed. Mountain mahogany provides year-round cover and forage for deer and is a crucial source of winter forage for many wildlife species. It is a good source of protein for wintering big game.

Mountain mahogany is a large component of moose winter diets. Although there are no population objectives or structured surveys for moose in this area, moose populations are healthy and they remain distributed across all suitable habitats (pers. comm. Waltee, 2013). Age structure of bulls remains diverse and well balanced and the majority of cows are observed with a calf (pers. comm. Waltee, 2013).

Pronghorn antelope are distributed across all suitable habitat in the watershed and numbers are close to long-term averages (pers. comm. Waltee, 2013). Antelope utilize sagebrush and grassland habitats year-round.

Mountain goats do not occupy the MRRW. They are found in the Snowcrest Mountains to the south and Tobacco Root Mountains to the north. A bighorn sheep population was re-introduced into the Greenhorn Mountains in February 2003. Bighorn sheep utilize habitats with steep topography containing sagebrush, diverse forb communities, rock, and in proximity to mature coniferous forest cover (pers. comm. Waltee, 2013). Table 10 shows the primary game species found in the MRRW and the habitats they use at different times of the year.

Table 10: Primary Game Species and Habitat Use

Species	Forested*	Sagebrush*	Riparian*
Pronghorn		**Y**	
Bighorn sheep		**Y**	
Black bear	**Y**	**S**	**S**
Mountain lion	**Y**		**Y**
Elk	**S, C**	**W, C**	**Y**
Moose	**Y**	**Y**	**Y**
Mule deer	**S, C**	**Y**	**W**
White-tailed deer			**Y**
Dusky grouse	**Y**		**Y**
Ruffed grouse	**Y**		**Y**
Sage grouse		**Y**	**B**

*Y=yearlong, W=winter, S= summer, C=calving/fawning, B=breeding/brooding

Special Status Species

"Special Status Species" refers to both plants and animals and includes proposed species, listed species, and candidate species under the Endangered Species Act (ESA); State-listed species; and BLM State Director-designated sensitive species (USDI 2001). Special Status Species are vital to maintain watershed biodiversity. Table 11 lists all Special Status Species that potentially occur within the MRRW during all or part of the year.

Table 11: Special Status Species

Animal Species	Current Management Status	Occurrence: Resident (R) Transient (T)	Preferred habitat
Canada Lynx (L*ynx canadensis*)	Threatened	T	Forest
Grizzly Bear (*Ursus arctos horribilus*)	Threatened	R	Forest
Greater Sage Grouse (*Centrocercus urophasianus*)	Candidate	R	Sagebrush shrubland
North American Wolverine (*Gulo gulo*)	Proposed Threatened	T	Forest
Mammals			
Fringed myotis (*Myotis thysanodes)*	Sensitive	T	Forest Grassland Sagebrush shrubland
Gray Wolf (*Canis lupus*)	Sensitive	R	All

Long-eared Myotis (*Myotis evotis*)	Sensitive	R	Forest
Long-legged Myotis (*Myotis volans*)	Sensitive	R	Forest
Pygmy Rabbit (*Brachylagus idahoensis*)	Sensitive	R	Sagebrush shrubland
Townsend's Big-eared Bat (*Corynorhinus townsedii*)	Sensitive	R	Forest Sagebrush shrubland
Birds			
Bald Eagle (*Haliaeetus leucocephalus*)	Sensitive	R	Riparian/wetland
Black Tern (*Chlidonias niger*)	Sensitive	R	Wetland
Black-backed Woodpecker (*Picoides arcticus*)	Sensitive	T	Forest
Bobolink (*Dolichonyx orysivorus*)	Sensitive	R	Grassland
Brewer's sparrow (*Spizella breweri*)	Sensitive	R	Sagebrush shrubland
Common Loon (*Gavia immer*)	Sensitive	T	Wetland
Ferruginous Hawk (*Buteo regalis*)	Sensitive	R	Sagebrush shrubland
Golden Eagle (*Aquila chrysaetos*)	Sensitive	R	Riparian/wetland Sagebrush Shrubland
Great Gray Owl (*Strix nebulosa*)	Sensitive	R	Forest
Loggerhead Shrike (*Lanius ludovicianus*)	Sensitive	T	Sagebrush shrubland
Long-billed Curlew (*Numenius americanus*)	Sensitive	R	Grassland
Marbled Godwit *(Limosa fedoa)*	Sensitive	R	Mudflats, shoreline
McCown's longspur (*Calcarius mccownii*)	Sensitive	T	Grassland
Northern Goshawk (*Accipiter gentilis*)	Sensitive	R	Forest
Peregrine Falcon (*Falco peregrinus anatum*)	Sensitive	R	Riparian/wetland
Sage Sparrow (*Amphispiza belli*)	Sensitive	R	Sagebrush shrubland
Sage thrasher (*Oreoscoptes montanus*)	Sensitive	R	Sagebrush shrubland
Swainson's Hawk (*Buteo swainsoni*)	Sensitive	R	Riparian/wetland Sagebrush shrubland
Three-toed Woodpecker (*Picoides tridactylus*)	Sensitive	R	Forest
Amphibians/Fish			
Boreal/Western toad (*Bufo boreas*)	Sensitive	R	Riparian/wetland/forest
Westslope cutthroat trout *(Oncorhynchus clarki lewisi)*	Sensitive	R	Stream

Plant Species	Current Management Status	Known from BLM lands?	Habitat
Buff fleabane (*Erigeron parryi*)	Sensitive	Yes	Skeletal, limestone-derived soils of ridge crests, slopes and outcrops at 4,500-7,000 feet.
Beaked spikerush (*Eleocharis rostellata*)	Sensitive	No	Wet, often alkaline soils, associated with warm springs or fens in the valley and foothills zones.
Mealy primrose (*Primula incana*)	Sensitive	No	Saturated, often calcareous wetlands.
Taper-tip desert-parsley (*Lomatium attenuatum*)	Sensitive	Yes	Scree or dry, gravelly soil of south- or west- facing slopes in mountains, canyons, and foothills.
Ute ladies' tresses (*Spiranthes diluvialis*)	Threatened	No	Alkaline wetlands, swales and old, meander channels often on the edge of the wetland or in areas that are dry by mid-summer.
Tree Species	**Current Management Status**	**Known from BLM lands?**	**Habitat**
Whitebark Pine (*Pinus albicaulis*)	Candidate	Yes	High elevation sub-alpine zone.

Special Status Wildlife

According to the Interagency Grizzly Bear Study Team (IGBST), the current Greater Yellowstone Area (GYA) grizzly bear population is roughly 700 individuals. The population was delisted from the ESA in 2007, then relisted as threatened in 2009. The relisting was based on the USFWS not adequately explaining how declines in whitebark pine would not threaten the future of grizzly bears in the Yellowstone ecosystem. A Yellowstone grizzly bear food synthesis report was completed to answer this question. The report concludes that grizzly bears easily switch food sources and the substantial whitebark pine decline in the GYA since 2002 has not resulted in a decline in the Yellowstone grizzly population. As this watershed assessment report was being prepared, the food synthesis report was under peer review. Pending peer review, this report is expected to supplement a proposal to delist the population sometime in 2014. Grizzly bears are resident in the Gravelly Range portion of the watershed, which is also within the Demographic Monitoring Area used by the IGBST to assess all demographic criteria for the population. The Dillon Field Office is outside the Grizzly Bear Recovery Zone, which depicts an area surrounding Yellowstone National Park where inter-agency grizzly bear recovery efforts are concentrated to restore viability of the grizzly bear population to the point where federal protections offered under the ESA are no longer necessary (USDI, 2013b).

Canada lynx are listed as threatened under the ESA. The Dillon Field Office does not contain any lynx critical habitat. The nearest critical habitat is on the Gallatin National Forest, east of highway 191. Forested areas may provide temporary habitat for transient lynx dispersing from established lynx populations, but these areas likely do not contain all physical and biological features in adequate quantities and spatial arrangements to support lynx populations over time (USDI, 2013a). The forest habitat within the DFO is generally drier than the preferred moist boreal forests that include dense understories that provide foraging habitat and cover for the lynx's main prey, snowshoe hare (USDI, 2013a).

The wolverine is proposed to be listed as threatened under the ESA. The comment period regarding this proposal ended on December 2, 2013. Wolverines occur in coniferous montane forest types, preferring rugged, roadless, isolated habitats. Home range size in western Montana averages 150 mi^2 for females and 163 mi^2 for males (Foresman, 2012). Wolverines are more likely to occur at higher elevations on Forest Service land in the Gravelly Range, with transient individuals on BLM lands.

The Northern Rocky Mountain population of gray wolves, including Montana wolves, was delisted from the list of Endangered and Threatened Wildlife in 2011 as part of the Appropriations Act. To avoid relisting, Montana will comply with federal regulations to manage wolves in a manner that will guarantee that the state maintains at least a minimum of 150 wolves and 15 breeding pairs (MFWP, 2013). Since delisting, a hunting season for wolves has been implemented in Montana. The MRRW lies within wolf management unit (WMU) 320. The combined maximum hunting and trapping bag limit is five wolves per person during the 2013-14 season. In 2012, a minimum estimate of 132 wolves in 24 verified packs, 8 of which qualified as a breeding pair, were documented in southwestern Montana in the Montana Portion of the Greater Yellowstone Experimental Area (GYA) (Bradley et al., 2012). Conflicts between wolves and livestock are an issue.

Long-eared myotis and long-legged myotis are associated with forests containing old-growth characteristics, but are also found in many habitats where suitable roosts exist. They roost in buildings, caves, mines, trees, and rock outcrops. Townsend's big-eared bats are found in a variety of habitats from western mesic Douglas-fir forests to more arid Rocky Mountain juniper-limber pine-curlleaf mountain mahogany vegetative types (Foresman, 2012). Fringed myotis occurs in a variety of habitats, from low- to mid-elevation grass, woodland, and desert regions (Foresman, 2012).

The bald eagle and golden eagle are protected under the Bald and Golden Eagle Protection Act, and are BLM sensitive species. Cooperative interagency monitoring is occurring through the Montana Bald Eagle Management Plan. There are two bald eagle nests within the MRRW. Golden eagles, ferruginous hawks, and Swainson's hawks are common throughout the watershed. The watershed includes the ferruginous hawk Sweetwater Breaks Raptor Management Area. This area has the second highest ferruginous hawk nest density in Montana and one of the highest densities in all of North America. High nesting populations occur as the result of clustering within or near special habitat features, availability of high prey populations, and/or low levels of human disturbance (USDI, 2004). While there are no known peregrine falcon nest sites in the MRRW, nests are typically located on cliff ledges, ideally in areas with a wide view, near water, and close to plentiful prey (Montana Natural Heritage Program, 2013).

The Brewer's sparrow, sage sparrow, and sage thrasher utilize sagebrush habitats. McCown's longspur and long-billed curlew nest in dry, shortgrass prairies. Bobolinks are found in open fallow fields, tallgrass prairies, and damp meadows. Northern goshawk and great gray owl habitat consists of mature forests with clearings such as bogs, meadows, and wetlands for foraging. Loggerhead shrikes are associated with open woodlands, and have also been documented nesting in sagebrush, bitterbrush, and greasewood.

Black terns, common loons, and marbled godwits are associated with lakes, rivers, ponds, sandbars, and shoreline. In the MRRW these species are most likely found around Ruby Reservoir and the Ruby River. Black-backed woodpeckers inhabit early successional, burned forest of mixed conifer, lodgepole pine, Douglas-fir, and spruce-fir. Three-toed woodpecker nesting habitat includes coniferous forests or logged areas and swamps. Their diet consists primarily of bark beetle larvae, also tree sap and insects. Western toads breed in any clean standing water and may wander miles from their breeding sites through coniferous forests and subalpine meadows, lakes, ponds, and shoreline (Werner et al., 2004).

Special Status Fish

Native westslope cutthroat trout (WCT) in Montana is currently listed as a special status species. The populations in the MRRW are characterized by isolated populations found in small stream habitat. Remaining pure populations are a result of some form of barrier that has prevented introgression by rainbow trout.

The WCT have declined to three small populations in the assessment area. Genetically pure populations are found in Jack Creek, Dark Hollow Creek and in the Meadow Fork of the North Fork of Greenhorn Creek. Idaho Creek supports a hybridized WCT population that ranges from 94% on BLM to 99% in the headwaters above a small log barrier.

WCT surveys beginning in 2007 determined that the headwaters of the North Fork Greenhorn and Dark Hollow Creeks still supported small populations of genetically pure WCT. In 2008, a joint MTFWP, FS and BLM WCT restoration effort was initiated within the Greenhorn drainage. From 2008 through 2012 over 3000 nonnative eastern brook trout were removed from the headwaters of North Fork Greenhorn and Dark Hollow Creeks to bolster the remaining genetically pure WCT populations. In 2012, a fish barrier was constructed in the lower reaches of the drainage on private land to support restoration efforts within the drainage. In the summer of 2013, a non-native removal was took place using chemical piscicide, that treated over 19 miles of stream. An additional treatment is planned for 2014 to ensure all nonnatives are eliminated.

Prior to application of piscicide, personnel from MTFWP, BLM, B-D National Forest and Turner Enterprise, conducted a fish salvage within Dark Hollow Creek and the Meadow Fork of North Fork Greenhorn Creek to collect as many genetically pure cutthroat as possible. Collected WCT were held outside the portions of the drainage that were being chemically treated. Following treatment, all salvaged WCT were released back into Meadow Fork and Dark Hollow Creeks. When completed, genetically pure westslope from Dark Hollow, Meadow Fork and Jack Creek will be re-introduced throughout the drainage. If additional genetically pure populations are verified within the Ruby drainage, they will likely also be incorporated into this restoration project to increase the genetic diversity of this population.

Special Status Plants

Buff fleabane and Taper-tip desert-parsley prefer a habitat with rugged topography such as steep talus slopes and sparse vegetation. Due to the fact that livestock don't prefer this type of terrain and because there is not much forage in these types of habitats, livestock grazing is not a direct

threat to these species. The known populations of these plant species in the MRRW face no anthropogenic threats.

Mealy primrose, beaked spikerush, and Ute ladies' tresses all prefer wetland/riparian habitats. All three of these species are found within the MRRW, but none of the three species have been found on BLM administered land. Thorough inventory of these wetland/riparian habitats has been completed on BLM administered lands. The only documented populations of these three species are found on privately owned land. Ute ladies' tresses is a threatened plant species and is known from only a handful of occurrences in southwest and south-central Montana on private land. Habitat types occupied by Ute ladies' tresses are; seasonally flooded river terraces, subirrigated or spring-fed abandoned stream channels and valleys, and lakeshores. In addition, 26 populations have been discovered along irrigation canals, berms, levees, irrigated meadows, excavated gravel pits, roadside barrow pits, reservoirs, and other human-modified wetlands. (USFWS, 2013)

During the summer of 2010, the U.S. Fish and Wildlife Service announced a 90-day finding on a petition to list whitebark pine (*Pinus albicaulis*) as endangered or threatened and to designate critical habitat. In July of 2011, the finding was released; whitebark was given a warranted but precluded listing with a priority of 2 and is currently on the candidate species list (For a complete description of whitebark pine in the MRRW see Forest and Woodland Habitat section below).

Noxious Weeds and Invasive Species

Noxious weeds are defined in the Montana Weed Management Plan as "plants of foreign origin that can directly or indirectly injure agriculture, navigation, fish or wildlife, or public health." Currently there are 35 weeds on the statewide noxious weed list that infest about 7.6 million acres in Montana. Of these 35, the only one of major concern in the MRRW is spotted knapweed.

Spotted knapweed (*Centaura stoebe*), is one of the more aggressive noxious weeds in the Dillon Field Office. Spotted knapweed is found scattered throughout the MRRW especially along roads and in other disturbance areas. Motor vehicles, livestock, wildlife, and recreation activity can all spread knapweed seeds.

Biological controls such as the Urophora fly (*Cyphocleonus achates*), a knapweed root-boring weevil, and *Larinus minutus*, a knapweed flower weevil are present at release sites within the watershed. These insects help to control seed production and help to limit the spread and competitiveness of spotted knapweed

Other invasive and/or noxious weeds present in isolated locations are Houndstongue *(Cynoglossum officinale)*, Hoary cress (Whitetop) *(Cardaria draba)*, Black henbane *(Hyoscyamus nigar),* Canada thistle *(Cirsium arvense)* and Cheatgrass *(Bromus tectorum).*

Cheatgrass is established in disturbed areas throughout the watershed. Relatively large infestations were observed by the IDT in the major stream corridors, especially within the lower elevations adjacent to the streams and on south facing slopes. Cheatgrass is an extremely competitive early cool season species that flourishes in disturbed sites. Old mining sites, roads,

construction locations, and other disturbed areas provide cheatgrass with the opportunity to establish and spread into adjacent habitats upon disturbance.

Since 1989, BLM has been involved in cooperative control efforts with Madison County. Throughout this period, the goal has been to prevent new noxious weed infestations and control or eradicate existing infestations on public lands within Madison County using Integrated Pest Management (IPM). Table 12 shows recent treatments and inventories.

Table 12: Recent Weed Inventories and Treatments

Year	Acres Treated	Acres Inventoried
2012	50	4400
2011	30	2000
2010	40	3500
2009	235	1500
2008	40	1700

Invasive Aquatic Species

There are no known populations of aquatic invasive species found within the Middle Ruby River Watershed.

Forest and Woodland Habitat and Associated Species

Forest and woodland habitats comprise approximately 27% of all ownerships, and approximately 44% of BLM administered lands within the MRRW. Effective precipitation and aspect influences the establishment and composition of forests and woodlands. The close association of forests with adjoining sagebrush and riparian habitats supports a broad array of wildlife species. This habitat provides important thermal and hiding cover, including security habitat for big game. Forest and woodland habitat offers high protein browse species in the fall and winter, as well as year-round, for deer, elk, and moose. Forests in the MRRW provide habitat for a large variety of species including mountain lions, dusky grouse, ruffed grouse, northern goshawk, black bear, and bobcat. This habitat provides important linkage corridors for grizzly bears, Canada lynx, gray wolves, and other large carnivores. Forest-dwelling bird species require suitable nesting and foraging habitat. Several bird species help protect forests by eating millions of damaging insects, such as the western spruce budworm.

Forest Vegetation and Biophysical Site Descriptions

Based upon field reconnaissance, local monitoring data, and LANDFIRE National data, the dominant forest types within the MRRW are shown in Table 13 along with the approximate distributions within the watershed.

Table 13: Dominant Forest Types and Distribution (All Ownerships)

Forest Type	Forested Acres by Type	% of Watershed
Douglas-fir Forest and Woodland	33,228	21%
Spruce-fir/Lodgepole Pine Forest and Woodland	7,440	5%
Subalpine Woodland and Parkland	2,731	2%

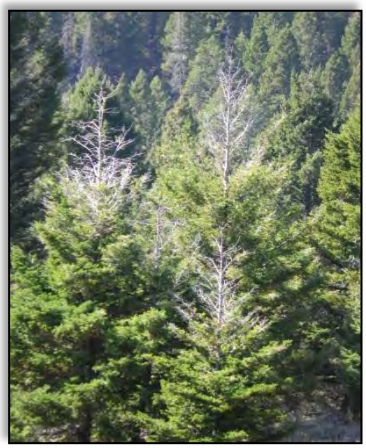
Aspen Forest and Woodland	479	<1%
Limber Pine-Juniper Woodland	611	<1%

Douglas-fir Forest and Woodland

The xeric Douglas-fir type primarily exists on lower foothills immediately above grasslands/shrublands in elevation. Slopes range from gentle to steep and are generally dominated by Douglas-fir with an understory of graminoides and sparse shrubs. Historically, these stands are typically open and dominated by moderate to large diameter Douglas-fir. Limber pine may be present. Lodgepole pine can co-dominate in cooler portions of the mapping zones. This forest type corresponds with cool, dry Douglas-fir and limber pine habitat types and often forms an ecotone with mountain grasslands/sagebrush. Higher elevations of this type border dry subalpine fir systems and persistent lodgepole pine in frost pockets and cooler areas of the map zone (LANDFIRE, 2011a).

Suppressed stand of Douglas-fir considered at a high risk for future DFB infestations, Davey Creek Allotment, July 2013

Throughout the MRRW, western spruce budworm is present at moderate to high levels. Defoliation caused by spruce budworm is most evident in densely stocked stands of co-dominant Douglas-fir and younger trees. These trees are generally less than 100 years old and have expanded outside of their normal range that persisted prior to European settlement. After several years of heavy defoliation, branch dieback, top kill, and tree mortality can occur. Cones and seeds of all host species are also destroyed (Hagle, 2003).



Heavy Defoliation and top kill of early seral Douglas-fir, Davey Creek Allotment, July 2013

Trees that have been heavily defoliated and are also drought stressed increase the stand hazard for Douglas-fir beetle (DFB). The DFB is a native bark beetle and is currently at endemic population levels in the MRRW. At low or endemic levels, mortality is typically found in scattered larger diameter Douglas-fir growing in mixed or pure stands that have been stressed due to drought, windfall, fire scorch, defoliation, or root disease (Schmitz and Gibson 1996; Weatherby and Their 1993). Douglas-fir trees most susceptible to attack from DFB are those larger than 14" DBH, older than 120 years, and growing in dense stands (Weatherby and Their 1993). In areas where susceptible trees are abundant, populations can build and spread rapidly to adjacent trees (Schmitz and Gibson 1996).

Post Harvest Douglas-fir Stand, Barton Allotment, May 2012

Douglas-fir stands in the MRRW were observed with a diversity of successional stages; however, the structure has made a shift from the historic reference condition due to lack of fire. Most Douglas-fir stands are mid-seral closed canopies that average 100 years or less and are comprised of densely stocked Douglas-fir. These trees have poor growth form (taper) and are highly suppressed due to local stressors including drought, competition, and severe defoliation and damage due to western spruce budworm. Stands with heavy defoliation from western spruce budworm are at high risk for future DFB infestations. Late seral stands across all ownerships within the watershed have high mortality due to epidemic Douglas-fir beetle infestations within the last five years. The outbreak cycle appears to have returned to endemic populations as few stands were noted with recent mortality during the assessment. The IDT noted recent Douglas-fir expansion in the transition zone between foothill sagebrush communities and mature Douglas-fir forests. The IDT also noted that within recent timber harvest units, trees exhibited high vigor and showed few signs of current insect and disease activity.

Dusky grouse forage on Douglas-fir needles and buds in the winter and, along with other birds, heavily rely on Douglas-fir communities for cover. Several bird species extract seeds from Douglas-fir cones or forage for seeds on the ground (Steinberg, 2002). Douglas-fir habitat types provide excellent hiding and thermal cover for deer, elk, and bighorn sheep. It also provides nesting and/or roosting habitat for numerous bird species including great-horned owls, sharp-shinned hawks, and northern goshawks.

Spruce-fir/Lodgepole Pine Forest and Woodland

This type occurs in a relatively high precipitation zone (15-35 inches/year) which usually comes in the winter months as snow. Lodgepole pine, subalpine fir and Engelmann spruce dominate and can be found within the subalpine zone, the lower extent at about 6500ft and the upper extent at about 8500ft. Lodgepole pine comprises a greater component on dryer sites and earlier successional stages, and can be a canopy dominant for over 250 years in some stands. Pockets of pure lodgepole pine with shrub, grass or barren understories are common. At high elevations and southerly aspects, whitebark pine may occur. Douglas-fir may be an early seral component at lower portions of this type. Aspen may be present, east of the Continental Divide. Understory shrubs will be more prevalent on east and north-facing aspects. At lower elevations this type is adjacent to upper montane, including Douglas-fir. At higher elevations, it is adjacent to Subalpine Woodland and Parkland (LANDFIRE, 2011a). Lodgepole/spruce/subalpine fir forests provide summer habitat for mule deer and elk, and yearlong habitat for moose and large carnivores. Following disturbance, lodgepole will rapidly colonize and develop into dense, even-aged stands. At approximately 100 years of age, insect, disease, and/or blow down create small openings in forest canopy maintaining a mid-development closed stand.

Lodgepole pine stand with spruce/subalpine fir understory. Davey Creek Allotment July 2013.

Mountain pine beetle (MPB) is present at epidemic levels throughout the MRRW. Stands most susceptible to attack from MPB are pure, mature lodgepole pine that are densely stocked (Sturdevant 2009). The MPB is a native insect to western pine forests found in North America and endemic

population levels are almost always present in host stands (Thompson 2009). Larger diameter (greater than 8 inch Diameter at Breast Height (DBH)) pines are usually targeted by the beetle because of the thick layer of phloem which provides an adequate food source while populations build. After the larger trees of a stand have been killed off, beetles will infest smaller diameter trees (Amman et al. 2002). Trees as small as 3 inch DBH on the Helena NF were reported as being infested in the current outbreak (N. Sturdevant, pers. comm., 2009). Beetle populations then decline to endemic levels in the host stand (Amman et al. 2002). MPB can influence successional stage, species composition and stand density by accelerating succession as the lodgepole pine is removed and more shade-tolerant species are promoted. Large scale insect infestations may create large patches of early seral conditions and/or create conditions that lead to large, stand-replacement fires (LANDFIRE, 2011a).

Subalpine Woodland and Parkland

These forests occur in the upper subalpine zone (6000-9500ft) on moderate to steep terrain (eg, 40-70% slope). Landforms include ridgetops, mountain slopes, glacial trough walls and moraines, talus slopes, land and rock slides, and cirque headwalls and basins. Some sites have little snow accumulation because of high winds and sublimation, which increases summer drought conditions. Lower subalpine forests border at lower elevations, including lodgepole pine, Douglas-fir, Engelmann spruce and subalpine fir types (LANDFIRE, 2011a).

High elevation five-needled pine.
Garden Creek Allotment June 2013.

Forest communities range from nearly homogeneous stands of five-needled pines on the harshest, highest elevation sites to mixed species including shade tolerant firs. Vegetation is stunted with short, dwarfed trees, including krummholz vegetation on the harshest sites.

Historically, whitebark pine dominated on southerly aspects, while northerly aspects were dominated by subalpine fir and Engelmann spruce. Lodgepole pine may be present as an early succession species. In this harsh windswept environment trees are often stunted and flagged from wind damage. Whitebark pine is a keystone species in many of these forests. Mature whitebark pine trees improve local conditions on harsh sites and facilitate the establishment of less hardy subalpine species. In the absence of fire this system shifts to a more shade tolerant forest through succession (LANDFIRE, 2011a). The cones and seeds of whitebark are a primary food source for several wildlife species due to their high caloric and fat content. Seed dispersal is done almost entirely by the Clark's nutcracker, a bird that caches the seeds which will eventually germinate, if not found again by the Clark's nutcracker, bears, rodents or other birds. Whitebark pine has been recognized as keystone species of high elevation habitats. They are important resources for wildlife food sourcing, snowpack retention, and watershed protection.

Warming temperatures have allowed pine beetles to move higher in elevation, where they are devastating whitebark pine. Unlike lodgepole, whitebark pine is not expected to regenerate and recover in many places after beetle populations decline. The loss of this keystone species has serious implications for snow pack retention, wildlife and fisheries, as well as the function and structure of our entire western subalpine ecosystem.

Above-left: Branch infected with white pine blister rust.
Above-right: Stand conversion to subalpine fir in the absence of fire.
Below: Typical stand with >90% overstory mortality as a result of MPB attack.
Barton Gulch, 2013

Whitebark and limber pine are rapidly declining across their range due to the exotic pathogen white pine blister rust (WPBR). The fungus causes branch and stem cankers that eventually girdle the tree leading to top kill or death of severely infected trees (Hagle, 2003).

Whitebark pine is present in all successional stages in the MRWW. Epidemic MPB activity within the watershed occurred at landscape levels in recent years with greater than 90% mortality of the mature overstory in some places. Field surveys conducted indicate that many of these decadent stands are being regenerated with more shade-tolerant conifer species. Subalpine-fir and spruce are dominant, and whitebark pine regeneration is present, but with little representation in the understory.

Aspen Forest and Woodland

These are upland forests and woodlands dominated by aspen without a significant conifer component (<25% relative conifer tree cover). Elevations generally range from 5,000-10,000ft, but occurrences can be found at lower elevations in some regions. Distribution of this ecological system is primarily limited by adequate soil moisture required to meet its high evapotranspiration demand, and secondarily is limited by the length of the growing season or low temperatures. The understory structure may be complex with multiple shrub and herbaceous layers, or simple with just an herbaceous layer. The herbaceous layer may be dense or sparse, dominated by graminoids or forbs. Aspen decline varies across the region. Conifer expansion, drought and nearly a hundred years of fire suppression, as well as uncharacteristic ungulate browsing has reduced the productivity of some clones or created stands lacking suckers for regeneration (LANDFIRE, 2011a).

Conifer expansion into Aspen Forests and Woodland Habitats. (*Above)* Hynch Creek, August 2013, (*Below)* Williams Creek, August 2013.

Aspen stands within the MRRW were observed to be lacking a middle age component, and regeneration appeared to be heavily browsed. Nearly all stands observed on the assessment are at a high risk of being converted to a conifer type where juniper and Douglas-fir have become established in the place of aspen regeneration. The IDT noted evidence of poplar borer activity in some aspen stands. The larvae of this insect bore into the stems, roots and branches causing the tree to weaken and break. Fungi often enter through the galleries and woodpecker holes, contributing to the tree's death.

Many animals browse aspen year-round, but it is especially valuable during fall and winter when protein levels are high relative to other browse species (Howard, 1996). Aspen is an important browse species for ungulates including deer, elk, and moose. It also provides hiding cover, summer shade and some thermal cover for ungulates in the winter, as well as hiding and thermal cover for many small mammals. Aspen also provides nesting and foraging habitat for a variety of bird species including dusky grouse, dark-eyed junco, house wren, chipping sparrow, and pine siskin. Aspen buds, flowers, and seeds are palatable to many bird species. Ruffed grouse depend on aspen for foraging, courting, breeding, and nesting throughout most of its range. Aspen buds, catkins, and leaves provide year-round food for ruffed grouse.

Limber Pine-Juniper Woodland This type occurs in foothill and lower montane zones into the western Great Plains at elevations from 3300-7900ft and is commonly associated with Rocky Mountain juniper. Open canopies dominated by limber pine are found in shallow soils with high rock component, often gravelly and calcareous on moderately steep to steep slopes, typically on steep, rocky, well-drained, windswept, and

Fossil Basin, August 2013

Davey Creek Allotment, August 2013

nutrient-poor sites on exposed ridges and summits. The shrubs layer is sparse to moderately dense and herbaceous layers are sparse, often significantly different than the surrounding community. Wildfires are less frequent in limber pine communities than in other conifer habitats because of low fuel accumulation associated with poor soil development and limited grass and forb productivity. Limber pine at lower elevation appears to be short lived compared to those found at high elevation (LANDFIRE, 2011a). Limber pine seeds provide critical food for rodents and birds, including squirrels and Clark's nutcrackers, which also cache the seeds for later use. Other birds, small mammals, and bears benefit from these caches.

Limber pine in the MRRW does not have a diverse age class. Individual trees and isolated pockets were noted with MPB mortality and/or WPBR present, as well as several trees that appeared healthy and unaffected by either.

Fire Ecology and Fire Regimes of the Middle Ruby River Watershed

As a prominent disturbance process in southwestern Montana, fire is directly tied to land health by affecting seral stage diversity, age classes, and landscape vegetation structures. Understanding the historic role of fire helps inform decisions on ecological status, trend and treatment needs. Recently, fire regimes for most terrestrial communities have been mapped and textually described for vegetation types across the entire U.S. (LANDFIRE, 2011a). These descriptions give context for assessing land health, reference conditions, and functioning ecosystems.

Biophysical Settings (BpS) are most simply defined as the native vegetation communities present in the pre-Euro-American era, and therefore developed under the influence of natural disturbances such as fire. BpS's describe vegetation communities at a larger scale than Ecological Sites, and as such can be applied to characterize broad areas such as watersheds. Each BpS description describes the historic composition and dominance of seral stages for that type, as well as the historic fire frequency and severity. Together, this information describes a reference condition, or a standard against which current conditions may be compared. Comparing Biophysical Settings to current conditions is useful for identifying trends in forest and non-forest vegetation communities. Based upon field reconnaissance and LANDFIRE National data, the dominant BpS's found in the entire MRR watershed include several species of big sagebrush, Douglas-fir forest, and subalpine conifer forests. Many other individual BpS's are present within this watershed that are isolated or comprise a small percentage of the total area; these BpS's are grouped in the "other" category in the table below.

Successional processes, seral stage descriptions, and historic fire regimes for these types are described in the LANDFIRE BpS description documents for Map Zone 19 & 21 (LANDFIRE 2011a). These descriptions of historic conditions were compared with current conditions to depict landscape trends in vegetation and fire regime departure. The approximate distribution of the dominant BpS(s) in the watershed, are presented in Table 14.

Table 14: Distribution of Dominant BpS (All Ownerships)

Biophysical Setting	Acres in MRR	% of MRR
Inter-Mountain Basins Montane Sagebrush Steppe	43,866	29%
Inter-Mountain Basins Big Sagebrush Steppe	26,719	17%
Middle Rocky Mountain Montain Douglas-fir Forest and Woodland	23,348	15%
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	10,432	7%
Inter-Mountain Basins Big Sagebrush Shrubland	9,398	6%
Rocky Mountain Subalpine/Upper Montane Riparian Systems	7,128	5%
Northern Rocky Mountain Dry-Mesic Montane Mixed Condifer Forest – Ponderosa Pine-Douglas-fir	6,877	4%
Inter-Mountain Basins Big Sagebrush Shrubland-Wyoming Big Sagebrush	6,619	4%
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	4,161	3%
Northern Rocky Mountain Lower Montane-Foothill-Valley Grassland	2,980	2%
Other	12,257	8%

Fire Regimes in the Middle Ruby River Watershed

The fire regime concept is used to describe the fire frequency, behavior, ecological effects, seasonality, pattern, and type for a given ecosystem or vegetation type. Based upon the most current fire regime classification system, each BpS corresponds to a unique fire regime (Schmidt et al., 2002). Table 15 outlines fire regime and descriptions.

Table 15: Natural Fire Regimes and Descriptions

Regime	Frequency	Severity	Severity Description
I	0-35 years	Low/Mixed	Generally low-severity fires replacing less than 25% of the dominant overstory vegetation; can include mixed-severity fires that replace up to 75% of the overstory.
II	0-35 years	Replacement	High-severity fires replacing greater than 75% of the dominant overstory vegetation.
III	35-200 years	Mixed/Low	Generally mixed-severity; can also include low-severity fires.
IV	35-200 years	Replacement	High-severity fires.
V	200+ years	Replacement/ Any severity	Generally replacement-severity; can include any severity type in this frequency range.

Mountain Big Sagebrush

Fire Regime: Mountain big sagebrush dominated communities are found above about 7000 feet in elevation, and on sites that annually receive 12-20 inches of effective precipitation. This vegetative community is characterized by Fire regime Group I. Fire is a major disturbance factor for mountain big sagebrush and likely played a large role in maintaining this habitat as a sagebrush/grassland. Periodic fire restricted conifer establishment on sites capable of supporting trees, and held in check the conversion of sagebrush habitat to forest habitat. Mountain big

sagebrush has the fastest recovery rate of the three subspecies of big sagebrush. Fire size for this type is larger than other big sagebrush species because of greater fine fuel load, but some unburned pockets remain after fires, often resulting in a patchy mosaic. The fire return intervals vary from 10-200yrs. However, estimating historic fire regimes for sagebrush ecosystems is tenuous at best and often based on fire scar and age structure data from adjacent forest types, shrub age structure and fuel characteristics. Fire regimes also vary considerably across the range of mountain big sagebrush, based on factors like elevation, soil depth, slope, aspect, adjacent vegetation, frequency of lightning and climate. While the majority of fires were likely stand-replacing, some mixed severity fire may have occurred. Mixed severity fires were likely small in area, but ignitions may have occurred as frequently as 5-20yrs. There were probably also portions of this system that never carried fire because of sparse fuel. Historic fires likely occurred during the summer months and were wind driven events. Lightning ignitions are variable and affect fire frequency on regional landscapes in the Northern Rockies. Fire may spread from adjacent forested communities. Mountain big sagebrush does not re-sprout following fire and re-colonization of burned areas must come from either a short-lived seed bank or seed dispersed by plants in unburned patches or adjacent stands.

Current Conditions: The mountain big sagebrush stratum is moderately departed from reference conditions due to fire exclusion and the effects of conifer expansion. The proportions of mid- to late-development mountain big sagebrush are near reference conditions, however the early development sagebrush component is lacking throughout the watershed. Douglas-fir trees are establishing in areas where conditions are suitable for conifers and are converting former sagebrush habitat into closed canopy, dense forest habitat

Left: Untreated conifer expansion near Laurin canyon 2005; *Right:* Same location near Laurin canyon 2013.

Several prescribed burn treatments were implemented on BLM-administered land during the late-2000's on the north side of the MRR watershed, between Laurin Canyon and Pierce Canyon. These burns were located at the interface between the mountain big sagebrush and Douglas-fir forest, and were prescribed to reduce conifer expansion into the existing sagebrush. During the watershed assessment in 2013, the IDT found the mountain big sagebrush seedlings have reestablished in most of the burned areas. The Douglas-fir trees adjacent the burn treatments are continuing to expand, and in some places the relatively young stands of Douglas-fir are nearing canopy closure, shading out the remaining sagebrush.

Wyoming Big Sagebrush
Fire Regime: Big sagebrush dominated vegetation communities found in valley bottoms, swales and the lower slopes below about 7000 feet in elevation are characterized by Fire Regime Group IV, but may also encompass Group IV. Fire return intervals are estimated to average approximately 60yrs, and range from 10-150yrs. Fires were mostly stand replacing, though mixed severity fire was probably present where fuels were discontinuous. The fire disturbance size likely resembled the patch size of the vegetation, ranging from tens to thousands of acres. Reestablishment of these big sagebrush species following fire is slow due to lengthy successional development and site limitations.

Current Conditions: The lower elevation Wyoming big sagebrush stratum is moderately departed from reference conditions and its historic fire regime. Much of this plant community is in a late development succession class, resulting in predominately mature sagebrush plants. Young sagebrush plants are generally present below the mature sage over-story, but there are very few patches of post-fire, early development sagebrush/native grassland. The presence of the non-native grasses in combination with historic grazing practices results in uncharacteristic attributes that contributes to a slight departure from reference conditions.

Douglas-fir Forest and Woodland
Fire Regime: The Douglas-fir forest in this watershed is best characterized by Fire Regime Groups I and III. Fires were predominantly surface and mixed-severity, with a mean fire interval of 7-80 years. The drier sites with more frequent fire return intervals support relatively open stands, while wetter sites support more closed stands. Occasional stand replacement fires may also occur. Much of the Douglas-fir forest on dry, south-facing slopes at the sagebrush-forest interface was historically affected by fires in adjacent vegetation. Abundant evidence of past fires is present in the lower elevation, mature Douglas-fir timber stands, primarily in the form of fire scars on large diameter relic trees. The low frequency and wide spacing of existing relic trees and stumps in these stands indicates historic low-severity fires likely promoted and maintained a fairly open Douglas-fir forest. Mixed-severity fires occurred primarily in denser stands, and at higher elevations. The mean fire interval in these stands was lengthened, with slightly more late-development, closed-canopy forest structure.

Douglas-fir increases in canopy density in the absence of fire disturbance. Much of this landscape today has canopy cover denser than the historic range of variability. Canopy closure of >80% in this forest type is considered uncharacteristic. Many of the lower elevation, dense Douglas-fir stands (<100 years old) found near the present sagebrush-forest eco-tone have sagebrush skeletons on the ground, which indicates these sites were previously dominated by sagebrush.

Current Conditions:
The Douglas-fir forest stratum is highly departed from reference conditions due to altered stand structure. The lower elevation dry sites exhibit greater departure than moister, higher elevation sites. Past timber harvest on adjacent private lands, followed by more than a century of fire exclusion, has promoted an increase of dense, closed canopy Douglas-fir forest. Herbaceous understory vegetation is sparse in many stands due to nearly complete canopy closure.

Dry Mesic Spruce-Fir Woodland
Fire Regime: The Spruce-Fir dominated forests are found at higher elevations or on cooler, moister aspects than Douglas-fir forests. This forest type is characterized by Fire Regime Groups IV or V; primarily moderately long-interval mixed and stand-replacement fires. Lightning strikes are frequent, but will often result in small, patchy spot fires. The low elevation extent of this forest type was likely affected by the more frequent fire intervals of the adjacent, drier Douglas-fir forest. More moist sites, or sites protected from fire by topographic features have much longer fire intervals, possibly up to 600 years. Fire sizes ranged widely from single tree spot fires, to many thousands of acres. Variability of climate, topography and other site factors can result in a wide range of representation of successional stages on the landscape. Fire regimes in this system are strongly related to climatic cycles. Long-term changes in climate as well as inter-annual climate variability will affect the frequency of fire in this system and its distribution along an elevation gradient.

Current Conditions:
The Spruce-Fir forest stratum is moderately departed from its natural fire regime. Fire has not recently affected large portions of this forest type in this area. The current fuel loading is sufficient to propagate stand replacing fire in many areas, but only under very dry, and windy conditions. Fuel loading is anticipated to increase in lodgepole pine-dominated stands as a result of recent beetle-caused mortality.

Rocky Mountain Subalpine/Upper Montane Riparian Systems
Fire Regime: The highest elevation forest types in this watershed are dominated by 5- needle pines, subalpine fir, Engleman spruce and lodgepole pine. This forest type is characterized by Fire Regime Groups III and IV, primarily long-interval (eg, 100-200+ year) mixed severity (25-75% top kill) and stand replacement fires. Ignitions are frequent due to lightning, though fires seldom carry due to lack of fuel from the slow-growing vegetation. Nonlethal surface fires may be possible where short grasses provide a continuous ground fuel; individual tree torching is more common. Climate variability and slow fuel loading could extend the stand-replacing fire interval to many hundreds of years.

Current Conditions: The subalpine forest stratum is within the range of variation for its natural fire regime. Fire has not recently affected large portions of this forest type in this area, which has led to predominantly mid to late-development stands. However, most of the whitebark and limber pine is being affected by both white pine blister rust and mountain pine beetle. White pine blister rust is not a native disease agent, therefore the current whitebark pine die-off is creating an uncharacteristic condition. Mortality caused by these agents will increase fuel loading and will lead to more open stands dominated by tree species not susceptible to blister rust or pine beetle. Even with increased fuel loading, many fires that start in these high elevation stands will continue to be inhibited from spreading by rock, scree and green and/or sparse vegetation. Fires that start in lower elevation, drier forest types may affect the fringes of the subalpine forest.

Fire Regime Condition Class

Fire Regime Condition Class (FRCC) is a general index providing two pieces of information: the historic fire regime group, and the condition class. Fire Regime Groups are described in the previous section and summarized in Table 16 below. Condition class reflects the degree of ecological departure when current conditions are compared against modeled reference conditions in terms of two main ecosystem components: fire regime and associated vegetation. This departure is from changes to one (or more) of the following ecological components: vegetation characteristics (species composition, structural stages, stand age, canopy closure, and mosaic pattern); fuel composition; fire frequency, severity, and pattern; and other associated disturbances (e.g. insect and disease mortality, grazing, and drought).

Three fire regime condition classes have been defined (Schmidt et al. 2002) based on the following criteria: FRCC 1 represents ecosystems with low (<33 percent) departure and that are still within an estimated historical range of variation as determined by modeling for the pre-Euro-American era; FRCC 2 indicates ecosystems with moderate (33 to 66 percent) departure; and FRCC 3 indicates ecosystems with high (>66 percent) departure (Hann and Bunnell 2001; Hardy et al. 2001, and Schmidt et al. 2002). A low departure indicates current conditions are characteristic of those occurring in the natural fire regime and associated vegetation. A high departure indicates uncharacteristic conditions that did not occur within the natural fire regime. Condition classes were assessed using the FRCC Software Application.

Table 16: FRCC Summary (All Ownerships)

Biophysical Setting Setting	Fire Regime I-V	Condition Class 1 (acres)	Condition Class 2 (acres)	Condition Class 3 (acres)	Total Acres
Inter-Mountain Basins Montane Sagebrush Steppe	I & IV	7,017	35,264	1,585	43,866
Inter-Mountain Basins Big Sagebrush Stepp	III	8,908	12,936	2,071	23,915
Middle Rocky Mountain Montane Douglas-fir Forest and Woodland	I & III	6,667	15,892	1,194	23,427
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	V	17	10,034	381	10,432
Inter-Mountain Basins Big Sagebrush Shrubland	IV	7,177	0	2,221	9,398
Rocky Mountain Subalpine/Upper Montane Riparian Systems	III	1,208	4,550	1,370	7,128
Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest-Ponderosa Pine-Douglas-fir	I	433	5,989	455	6,877
Inter-Mountain Basins Big Sagebrush Shrubland-Wyoming Big Sagebrush	IV	2,266	4,285	68	6,619
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	IV	185	3,967	9	4,161

Northern Rocky Mountain Lower Montane-Foothill-Valley Grassland	II	234	88	2,658	2,980
Other BpS acres not included in Assessment					12,257
Total Acres		34,112	93,005	12,012	139,129
Percent of Watershed in each condition class (excluding other BpS acres)		24%	67%	9%	

Findings, Analysis and Recommendations

Procedure to Determine Conformance with the Standard

This Standard is an overall assessment of biodiversity and plant and wildlife habitat. The present state of each allotment and habitat type was compared to the natural and historic condition. The indicators described under the definition of Standard #5, as well as condition/function of the other standards, specifically uplands and riparian, were considered to determine whether or not the Biodiversity Standard was met. The IDT considered the range of natural variation within this ecosystem as well as the species composition, condition of available habitat, and forest health to determine the condition/function of biodiversity.

Findings and Analysis

Sagebrush Habitats and Sagebrush Dependent Species

There is one sage grouse lek in the watershed, and several leks within ten miles of it. The lek within the watershed is on private land. The lek, nesting habitat, and brood-rearing habitat have been documented in the Belmont allotment. Sagebrush habitat in the MRRW is in good condition. Sage grouse typically nest within two miles of a lek. An improvement in riparian conditions in the Belmont allotment would be advantageous to sage grouse for brood rearing.

Pygmy rabbits and/or sign have been documented in a couple of locations within the MRRW nearly a decade ago. However, no pygmy rabbits or sign were documented during surveys at these sites, as well as additional sites, in 2013. Improving herbaceous cover in the Garnet allotment would be beneficial for sagebrush grassland wildlife species, including sage grouse and pygmy rabbits. The DFO will continue to survey for pygmy rabbits within the MRRW.

Some areas that are currently sagebrush grassland habitat may be converted to forest or woodland cover types with continued expansion of Douglas-fir and juniper. In the continued absence of fire, mountain sagebrush and grasslands in southwestern Montana are likely to become more homogenous as Douglas-fir trees continue to encroach (Heyerdahl et al., 2006). Cheatgrass concerns were also noted in the Garden Creek allotment. If cheatgrass continues to expand, reducing native herbaceous species, it would be detrimental to sagebrush grassland wildlife species with the loss of forage and cover, and possible increase in fire frequency.

Riparian, Aquatic and Wetland Habitat and Associated Species

There are active beaver dams along the north and south forks of Greenhorn Creek and along the Ruby River below the dam. There are historic beaver dams along several riparian reaches throughout the watershed, with more recent beaver activity along the Middle Fork of Stone

Creek. These dams create wetlands and ponds for riparian vegetation and the associated wildlife species including moose and various songbirds such as warbling vireos, cedar waxwings, lazuli buntings, house wrens, and black-capped chickadees. Suitable beaver habitat may be affected by juniper establishment in riparian areas, namely the Greenhorn Creek drainage, loss of aspen stands, and lack of regeneration of woody riparian species. Improving riparian health in several allotments will enhance foraging, hiding, and nesting habitat for the wildlife species listed above, as well as others.

Fish habitat conditions on streams within the MRRW assessment area ranged from poor to excellent. Non WCT streams generally have not had habitat surveys conducted on them.

Cottonwood Creek: Fish distribution surveys were conducted in 2013. Eastern brook trout were present throughout the entire drainage with one rainbow/cutthroat hybrid was also collected in the headwaters. During the distribution survey, an ocular habitat survey was conducted. Fishery habitat was noted as lacking, specifically, lack of stream bank riparian vegetation, low pool quality, excessive levels of bank disturbance and the stream was noted as having high levels of sediment over much of the survey length. A majority of this sediment is originating from the county road which parallels the stream for much of its length. However, based on riparian conditions, it is likely that some of the sediment was originating from stream banks. Fish habitat on this stream on BLM would be considered to be in poor condition. Current livestock use is a contributing factor to poor habitat conditions. While low stream flows in 2013 are certainly a big factor in elevated stream temperatures, the lack of stream bank and overhead vegetative stream cover is a also a contributing cause for the extended elevated water temperatures this drainage experienced in 2013 (See Table 17 below).

Sweetwater Creek: The actual stream channel has been completely dewatered by an irrigation diversion. The entire stream flow now travels down a man-made ditch. Current conditions are not favorable for fisheries.

Barton Gulch: Fish habitat is in fair to good condition. This stream was historically heavily placered for gold along its entire length. Pool quality is fair to good and it appears that most of the fine sediment is passing through the system. Stream bank conditions overall were in poor to fair condition. Current livestock use is having an impact on stream banks where they have access to the stream. Additionally, there is a county road that runs adjacent to the stream which is contributing sediment to the system. Past channel modifications from historical mining are also impacting habitat conditions in the drainage.

Hinch Creek: A fish distribution survey was conducted during the 2013 field season on BLM managed reaches. Rainbow/cutthroat hybrid trout, primarily juveniles, were found to occupy the stream to within a mile of last water. During the survey, habitat conditions were observed and noted. Habitat conditions were found to be fair to good condition. Pool habitat on BLM was abundant but quality was relatively low. Most pools were shallow. Several road crossings were noted that are contributing sediment. It appeared that a high flow event in the last several years altered the stream channel and caused it to shift in several spots. Based on this observation as well as the amount of sediment deposited outside the channel, this event could be still influencing pool quality in the system. Hinch Creek experienced 9 days of elevated water

temperatures (see table 17 below). These temperatures can most likely be attributed to low flows. With the exception of the headwaters, the majority of the drainage is timbered and not exposed to direct sunlight.

Garden Creek: No habitat or fisheries surveys have been conducted within this drainage. During the watershed assessment, habitat conditions were noted. Fishery habitat conditions observed were generally low quality. However, it appears that riparian conditions are improving over those observed during the 2003 assessment.

Habitat surveys were conducted on all WCT streams in the assessment area and the findings are discussed below under Special Status Species, page 60. Additional riparian habitat conditions on non-WCT streams are discussed above under the Riparian and Wetland Areas section, pages 18-29.

Generalist or Widespread Species

Overall, upland conditions were met throughout the MRRW, providing adequate habitat for big game and other generalist species. The majority of the watershed contains mule deer winter range. Elk winter range spans the Ruby Mountains and western side of the Greenhorn Mountains from Greenhorn Creek north to Williams Creek. Elk winter range in the Garnet allotment is reduced by livestock grazing. Cheatgrass in the Garden Creek allotment may lead to a reduction in cool season bunchgrasses important for elk winter range. Elk winter range utilization data gathered in the Cottonwood Creek area averaged 10.8% utilization of bluebunch wheatgrass and 7% utilization of Idaho fescue. In the Davey Creek area utilization averaged 11.2% for bluebunch wheatgrass and 7.9% for Idaho fescue. In the Idaho Creek area utilization averaged 25.4% for bluebunch wheatgrass. Sagebrush grassland habitat with adjacent forest cover in the Ruby Mountains supports important elk calving grounds. Conifer encroachment is converting sagebrush and grasslands to forest and woodland cover types within elk calving areas.

The lower elevation sagebrush grasslands at the southern end of the watershed, western side of the Greenhorn Mountains, and northeastern end of the Ruby Mountains provide antelope winter range. MFWP does not have an accurate recent count of the Greenhorn Mountains bighorn sheep population (pers. comm. Waltee, 2013). While bighorn sheep core habitat spans the western side of the Greenhorn Mountains from Barton Gulch to south of Powder Gulch, the majority of bighorn sheep occupy the north and west fronts of the Greenhorn Mountains and the east front of the Ruby Mountains (pers. comm. Waltee, 2013).

Net-wire and barbed-wire fences that are no longer in use represent an entanglement hazard, especially for antelope, deer, and elk and moose calves. Barbed wire fences with more than four wires, wires spaced too closely, or wires higher than 40-inches or lower than 16-inches hinder wildlife movement between pastures. Fences for modification, removal, or rebuilding have been identified in several MRRW allotments.

Spring developments are an important water source for wildlife, but associated tanks can be fatal when escape ramps for birds and small mammals are not installed in them. Escape ramps will be installed in stock tanks that are lacking them.

Special Status Species
Overall, throughout MRRW sensitive wildlife species habitat is adequate. In allotments that didn't meet riparian/wetland standards, an improvement in this habitat will enhance conditions for cover, forage, and nesting. In areas where conifer encroachment is converting sagebrush grassland into forest, sagebrush obligate sensitive species' habitat would eventually be lost. In the Garnet allotment, increasing native cool season bunchgrasses will be beneficial for sensitive bird species nesting and foraging, as well as hiding cover for potential pygmy rabbits that may inhabit this allotment.

WCT population estimates have been conducted on Jack and Dark Hollow Creeks. These streams support isolated but relatively healthy populations of WCT in relation to stream size. Populations in these two streams ranged from 12 individuals per 300' in Jack Creek, to 6 per 300' feet in Dark Hollow Creek. Population monitoring has not been conducted in Idaho Creek. However, based on WCT numbers observed while completing genetic collections, overall numbers appear to be healthy.

Table 17: Watershed Stream Temperature Monitoring

Stream/Year	Avg. temperature 6/1-9/1	Max. temperature 6/1-9/1	# of days stream temperatures reached or exceeded 60 f
Dark Hollow 2011	46	57	0
Dark Hollow **2013**	50	61	3
N. Fork Greenhorn **2013**	50	63	14
S. Fork Greenhorn **2013**	48	56	0
Jack Cr 2011	45	56	0
Jack Cr **2013**	50	63	7
Cottonwood Cr **2013**	54	66	32
Hinch Cr **2013**	51	63	9
Barton Gulch **2013**	51	63	17

*A thermograph was placed in Idaho Creek in 2013. However, a faulty battery resulted in no recorded data

Throughout the west, the threat of impacts of increasing water temperatures on fisheries habitat due to climate change is a growing concern. Studies have linked water temperature with lower cutthroat performance in water temperatures >59F (DeStatso and Rahel 1994; Dunham et al. 1999; Novinger 2000). Water temperature monitoring within the assessment area was initiated in 2011 on some streams. An early snow melt in 2013 combined with below normal spring precipitation, had area streams entering the summer in low flow conditions. As a result, streams endured extended periods of elevated water temperatures in 2013. Comparing 2011 data with that collected in 2013 indicates that stream temperatures were somewhat higher in 2013 across the watershed. In most cases where temperatures peaked above 60 degrees F, it was for short periods of one to 3 hours during midday with temperatures in most streams dropping back into the 40's or 50's overnight. The exceptions were NF Greenhorn Creek, Cottonwood Creek and Barton Gulch, which experienced extended periods of elevated water temperatures.

The North Fork of Greenhorn Creek also experienced a high number of elevated temperature days. However, in this case habitat conditions are most likely not a contributing cause. This drainage is heavily vegetated throughout its entire length with habitat conditions generally in excellent condition. The elevated water temperatures experienced can most likely be attributed to low stream flows in 2013.

The Barton Gulch drainage is relatively heavily vegetated throughout its entire length with habitat conditions generally in fair to good condition. The elevated water temperatures experienced can most likely be largely attributed to low stream flows in 2013.

WCT habitat surveys conducted on BLM lands during the 2012/2013 field season within the MRRW indicate that overall WCT habitat in the assessment area is in good condition. Riparian vegetative conditions on Jack Creek are less than desired. Several studies have indicated, cutthroat trout reproduction can be impacted by low levels of fine sediment (Ringler and Hall 1975; Irving and Bjornn 1984; Weaver and Fraley 1991; Horan et al. 2000; Ireland 1993). Sediment inputs could negatively impact populations if levels reach the point where reproduction and pool formation are impacted. However, habitat surveys in the area indicate that sediment is not a factor limiting WCT. Using the baselines identified in the "Beaverhead Sediment Total Maximum Daily Loads and Framework Water Quality Protection Plan" (Montana DEQ. 2012), streams < 15 foot wetted width would be expected to have a minimum of 90 pools per stream mile. As shown in Table 18 below all WCT streams exceed this minimum by a healthy margin.

Table 18: Stream pool frequency/depth/particle size

Stream	Pool Frequency (per mile)	Mean Stream Pool Depth	Mean Streambed particle Size	Riparian Habitat Condition Trend 2003/2013
Jack	168	7.1"	2"	FAR / FAR
NF Greenhorn	190	9.5"	3.25	PFC / PFC/DFC
SF Greenhorn	180	7.6"	2"	PFC / PFC/DFC
Dark Hollow	240	6.4"	2"	PFC / PFC/DFC
Idaho	165	10.7"	2"	PFC / PFC

Jack Creek - Habitat conditions overall on BLM are in fair to good condition. However, portions of the riparian area are less than desired due to excessive livestock use and will need to be addressed. Pool habitat was found to be abundant albeit slightly lower than expected for stream size. Additionally, mean pool depth was slightly shallower than expected. Lower pool numbers/depth could be linked to excessive sediment loads moving through the system. However, mean stream bed particle size did not indicate this. Spawning habitat was abundant throughout the drainage and population surveys indicate that reproduction is successfully occurring.

Greenhorn Complex (NF, SF Dark Hollow) - habitat conditions within this drainage are in excellent condition. There is no currently authorized livestock use in this drainage. This drainage was chemically treated in 2013 to remove non-native salmonids.
Idaho Creek - Habitat conditions on BLM administered lands are in good condition and trending upwards. A culvert located on BLM may be a passage issue for some age class WCT. However,

this may be desirable as it may also somewhat hinder non-native brook trout and lower purity WCT from freely moving within the drainage.

See discussion above in Forest and Woodland Habitat and Associated Species for whitebark pine.

Forest and Woodland Summary
Refer to the Forest and Woodland Habitat and Associated Species section above. Overall, forested habitats across all ownerships of the MRRW have undergone structural, compositional and density shifts. Past management practices related to mining, agricultural and forest product removal; fire suppression/exclusion and changing climate has resulted in forests that are typically overstocked. Stands are predominantly trees in small size classes that exhibit greater homogeneity in age classes; and an increase in climax, shade tolerant conifer species compared to historical conditions. Due to these current forest conditions, the hazard for insect and disease activity in many areas in the MRRW is high, and several stands have high levels of recent mortality.

Fire Regime Condition Class Summary
The FRCC table above shows when considering the top 10 dominant non-riparian BpS's, 67%-76% of the MRRW is in Condition Class 2 or 3, which corresponds to a moderate-high departure from pre-European settlement conditions. Fire exclusion has caused many big sagebrush and low elevation forest communities to stall in mid to late-development succession classes. This has resulted in little representation of early seral classes, and continued conifer expansion into mountain big sagebrush communities. The non-native blister rust affecting high elevation whitebark pine also contributes to this departure.

Recommendations for Biodiversity

Recommendations included under previous sections in this document would also enhance habitat conditions within the MRRW.

Recommendations:

Wildlife

- Modify old net-wire fence, dilapidated fences, and fences with improper wire spacing to meet wildlife-friendly specifications and ensure that new fences are built to BLM specifications. Remove any unnecessary fences and work with private landowners to improve BLM-private boundary fences.
- Continue to maintain wildlife escape ramps in all stock tanks in the watershed.
- Continue pygmy rabbit surveys in the watershed.
- Work with MFWP to collect an accurate count of the Greenhorn bighorn sheep population.
- Identify fences that pose a collision hazard with sage grouse or other wildlife and install fence markers to improve visibility and reduce the risk of collision.
- Analyze springs, seeps and associated pipelines to determine if modifications are necessary to maintain the continuity of the pre-development riparian area within sage-

grouse habitats. Make modifications where necessary, considering impacts to other water uses when such considerations are neutral or beneficial to sage-grouse.

Fisheries

- Consider using prescribed fire, mechanical treatments, or other means to reduce conifer density within the riparian corridor in the NF/SF Greenhorn Drainage.
- Look for cooperative opportunities to improve WCT habitat conditions on private land downstream of BLM in the Jack Creek drainage. Consider riparian juniper removal and possibly corridor fencing.
- Reduce livestock impacts to stream banks and riparian areas on BLM in Jack and Cottonwood Creeks.
- Increase stream bank woody vegetative cover along BLM managed portions of Cottonwood Creek. This may require willow plantings and riparian fencing.

Noxious Weeds and Invasive Species

- Continue to address localized weed infestations in the MRRW assessment area cooperatively with Madison County and other agencies, landowners and partners as appropriate.
- Continue the existing education effort on weed identification and prevention measures with the public that use this area.
- Monitor and treat infestations of noxious weeds found within areas that are targeted for prescribed burning. These treatments would occur both before and after burning takes place.

Forest and Woodland

- Consider using prescribed fire, mechanical treatments, or other means to make progress towards shifting vegetation back to historic composition, structure and density.
- Explore opportunities to enhance/improve/protect "Priority Habitats" such as aspen, mahogany, whitebark pine and limber pine.
- Consider commercial harvest to salvage timber stands currently affected by forest insects and diseases, and sanitation treatments to reduce future insect and disease impacts.
- Continue annual protection of whitebark pine through application of pheromones. Cones may be collected as crops are available.

Additional Issues and/or Concerns

Travel Management

As a result of the 2006 Dillon Field Office RMP, public motorized wheeled vehicle use is limited to those routes designated as open. All other routes are considered closed, with few exceptions to accommodate administration of permits, to access private lands, or other limited circumstances. Corrections of mapping errors in the original route designations in the RMP will be made through this watershed assessment process and specified in the environmental assessment and decision record.

Recommendation

- Analyze, and make necessary adjustments to route designations where concerns were documented, with an emphasis on routes within the Ruby Mountain WSA.

Abandoned Mine Lands

The AML program is an ongoing program which has been addressing legacy mining issues throughout southwest Montana. AML work will continue until all environmental and physical safety issues that can be resolved have been completed. Reclamation will be prioritized by the magnitude of the environmental problem, the severity of the safety risk, funding available, and/or the partnerships available to conduct the work. It will be conducted on a watershed or district scale when possible.

To determine the best reclamation method for each mine a detailed field evaluation must be conducted. Sites with potential water quality issues are reviewed under the CERCLA process, those with physical safety issues only are addressed under the NEPA process. Site assessment includes, but is not limited to, a review for a potentially responsible party (PRP), the geochemical character of the waste rock and tailings impoundments, delineation of the extent of contaminant transport, a cultural inventory and clearance through SHPO, evaluation of the sites for potential animal habitat, and a sensitive plant species review. The reclamation method chosen for each mine is based on the relative importance of the critical components of the site as well as the accessibility/workability of the area. As work progresses, mining areas which have not been sufficiently inventoried will be assessed.

Recommendation

- Continue addressing legacy mining issues within the MRRW through the AML program.

Interdisciplinary Team Composition

Core IDT members:

David Early, Rangeland Management Specialist, IDT Leader
Katie Benzel, Wildlife Biologist
Joe Sampson, Fuels/Fire Management Specialist
Emily Guiberson, Forester
Paul Hutchinson, Fisheries Biologist
Chris McGrath, Outdoor Recreation Planner/Wilderness
Steve Armiger, Hydrologist/Riparian Coordinator
Pat Fosse, Supervisory Natural Resource Specialist

Support IDT members:

Laurie Blinn, GIS Specialist
Michael Mooney, Weeds Specialist
Jason Strahl, Archeology
Bob Gunderson, Mining
Dave Williams (Butte Field Office), Geology
Kelly Savage, Rangeland Management Specialist/Special Status Plants

Other support personnel:

Floyd Thompson, Montana/Dakotas BLM Range program lead
Mike Philbin, Supervisory Physical Scientist, Montana/Dakotas BLM State Office
Jake Chaffin, Montana/Dakotas BLM Wildlife and Fisheries program lead
Weston Miller, Forestry Technician
Berett Erb, Range Technician
Joe Dunn, Range Technician
Leea Anderson, Range Technician
Bryce Nelson, Range Technician
Tempe Regan, Wildlife Technician
Aaron Brashear, Wildlife Technician
Kate Allder, Administrative Assistant
Ellen Daugherty, Administrative Assistant

Glossary

303(d): 303(d) Threatened and Impaired Waters List. Under Section 303(d) of the Clean Water Act (CWA) or Act, states, territories, and authorized tribes are required to develop lists of impaired waters every two years (i.e., Section 303(d) list). The states identify all waters where required pollution controls are not sufficient to attain or maintain applicable water quality standards. States are required to establish priorities for development of TMDLs for waters on the 303(d) List (40C.F.R. §130.7(b)(4)).

303(d) and 305(b): 303(d) and 305(b) Integrated Report. EPA recommended approach to integrating water quality conditions data submitted by states under Clean Water Act sections 303(d) and 305(b). EPA guidance provides recommended organization for states' Integrated Report submittals.

Adit: a nearly horizontal passage from the surface in a mine.

Allotment: an area of land designated and managed for grazing of livestock.

Allotment Categories: The Bureau of Land Management has established three Management Categories: Improve (I), Maintain (M), Custodial (C). **Category I**: Allotments where current livestock grazing management or level of use on public land is, or is expected to be, a significant causal factor in the non-achievement of land health standards, or where a change in mandatory terms and conditions in the grazing authorization is or may be necessary. **Category M:** Allotments where land health standards are met or where livestock grazing on public land is not a significant causal factor for not meeting the standards and current livestock management is in conformance with guidelines developed by the State Directors in consultation with Resource Advisory Councils. **Category C:** Allotments where public lands produce less than 10 percent of the forage in the allotment or are less than 10 percent of the land area. An allotment should generally not be designated Category C if the public land in the allotment contains: 1) critical habitat for a threatened or endangered species, 2) wetlands negatively affected by livestock grazing.

Allotment Management Plan (AMP): a documented program developed as an activity plan that focuses on, and contains the necessary instructions for, the management of livestock grazing on specified public lands to meet resource conditions, sustained yield, multiple use, economic and other objectives.

Alluvium: clay, silt, sand, gravel or similar detrital material deposited by running water.

Animal unit month (AUM): amount of forage necessary for the sustenance of one cow or its equivalent for a period of 1 month.

Anthropogenic: caused or influenced by humans.

Area of Critical Environmental Concern (ACEC): areas within the BLM administered lands where special management attention is required to: (1) protect and prevent irreparable damage to important historic, cultural or scenic values, fish and wildlife resources, or other natural systems or processes, or (2) protect life and safety from natural hazards.

Aridic Soil Moisture Regime: dryer than Ustic soil moisture regime, and moisture is considered "limiting" to plant growth. Areas that are considered arid have little to no chemical leaching so areas where salts are present usually have serious salinity issues because there is not enough "water" to leach them through the profile.

Biotic integrity: Capacity of a site to support characteristic functional and structural communities in the context of normal variability, to resist loss of this function and structure due to a disturbance, and to recover following such disturbance. (One of the three attributes of rangeland health).

Breccia: a rock composed of sharp fragments embedded in a fine grain matrix (as sand or clay).

Census County Division: Census county divisions (CCDs) are geographic statistical subdivisions of counties established cooperatively by the Census Bureau and officials of state and local governments in states where minor civil divisions (MCDs) either do not exist or are unsatisfactory for census purposes.

Climax plant community: the final or stable biotic community in a successional series; it is self-perpetuating and in equilibrium with the physical habitat.

Colluvium: is the name for loose bodies of sediment that have been deposited or built up at the bottom of a low-grade slope or against a barrier on that slope, transported by gravity.

Conformably: Geology: from conformable. Having an unbroken sequence of strata, characteristic of uninterrupted deposition.

Cryic Soil Temperature Regime: soils in this temperature regime have a mean annual temperature higher than 0 degrees but lower than 8 degrees Celcius, with a difference between mean summer and mean winter soil temperatures greater than 5 degrees C at 50 cm, and COLD summer temperatures.

CWAIC: Montana DEQ operates the Clean Water Act Information Center (CWAIC) to provide information to the Public about the quality of Montana's rivers, streams, lakes and wetlands in relation to Montana's Water Quality Standards. The CWAIC displays results of water quality assessments derived from available water monitoring data and information. CWAIC also provides access to Montana's Water Quality Integrated Report (305b & 303d), public comment submittal form, and online mapping tools. http://deq.mt.gov/wqinfo/CWAIC/default.mcpx

DEQ: Department of Environmental Quality

Ecological site: a kind of land with specific physical characteristics which differs from other kinds of land in its ability to produce distinctive kinds and amounts of vegetation and in its response to management.

Endemic: a population of potentially injurious plants, animals, or viruses that are at low levels.

Epidemic: pertaining to populations of plants, animals, and viruses that build up, often rapidly, to unusually and generally injurious high levels – *synonym* outbreak – *note* many insect and other animal populations cycle (periodically or irregularly) between endemic and epidemic levels.

Fellfield: a community of dwarfed, scattered plants or grasses above the timberline where the dynamics of frost (freeze and thaw cycles) and of wind give rise to characteristic plant forms.

Fen: a type of wetland fed by surface and/or groundwater. Fens are characterized by their water chemistry, which is neutral or alkaline.

Forest land: land that is now, or has the potential of being, at least 10 percent stocked by forest trees (based on crown closures) or 16.7 percent stocked (based on tree stocking).

Frigid Soil Temperature Regime: soils in this temperature regime have a mean annual temperature higher than 0 degrees but lower than 8 degrees, with a difference between mean summer and mean winter soil temperatures greater than 5 degrees C at 50 cm, and WARM summer temperatures.

Functional-at-risk (FAR): riparian wetland areas that are functional, but an existing soil, water, or vegetation attribute makes them susceptible to degradation.

General Management Area: Sage grouse habitat based off of Schroeder's 2004 map of current sage grouse distribution.

Geomorphology: is the scientific study of landforms and the processes that shape them.

Glacial Till: is unsorted glacial sediment. It is that part of glacial drift which was deposited directly by the glacier.

Greenline: that specific area where a more or less continuous cover of vegetation is encountered when moving away from the center of an observable channel. The greenline is often, but not necessarily, located at the water's edge.

Hummocking: a form of micro-topographic relief characterized by raised pedicels of vegetated soil as much as 0.6 m (2ft) higher than the surrounding ground which results from long term large animal trampling and tracking in soft soil. Vegetation on the pedicels usually differs from that on the surrounding lower area due to moisture difference between the two levels. Hummocking is also caused by abnormal hydrologic heaving.

Hydric soil: soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part.

Hydrophyte: plants growing in water or on a substrate that is at least periodically deficient in oxygen due to excessive wetness.

Hydrologic function: the capacity of the site to capture, store, and safely release water from rainfall, run-on, and snowmelt (where relevant), to resist a reduction in this capacity, and to recover this capacity following degradation (one of the three attributes of rangeland health).

Hydrologic Unit: the USGS has developed a system of geographic units based upon watersheds. These units were originally subdivided to four levels. Subsequently two additional subdivisions have been developed. Currently there are six levels, with the sixth being the smallest unit.

Hydrologically Connected: Hydrologically connected is used in this document in the same sense as in Rapanos vs. United States in the question of isolated wetlands. That is there is continuous surface connection. It is acknowledged that there are other definitions.

Interrupted Stream: a stream with discontinuities in space. A stream which surfaces and subs at various locations along a length of channel.

Krummholz: the shrubby, multistemmed form assumed by trees and other woody vegetation near the treeeline.

Lands With Wilderness Characteristics: those lands that have been inventoried and determined by the BLM to contain wilderness characteristics as defined in Section 2 (c) of the Wilderness Act. These are separate from lands already designated as Wilderness or wilderness study areas.

Lentic: standing or still water such as lakes and ponds.

Litter: The uppermost layer of organic debris on the soil surface, essentially the freshly fallen or slightly decomposed vegetal material, including persistent and non-persistent organic matter that is in contact with the soil surface.

Lotic: flowing or actively moving water such as rivers and streams.

Moraine: accumulated glacial debris - a mass of earth and rock debris carried by an advancing glacier and left at its front and side edges as it retreats.

National Wetland Inventory: The National Wetlands Inventory (NWI) was established by the US Fish and Wildlife Service (FWS) to conduct a nationwide inventory of U.S. wetlands to provide biologists and others with information on the distribution and type of wetlands to aid in conservation efforts. To do this, the NWI developed a wetland classification system (Cowardin *et al.* 1979) that is now the official FWS wetland classification system and the Federal standard for wetland classification (adopted by the Federal Geographic Data Committee on July 29, 1996: 61 Federal Register 39465). The NWI also developed techniques for mapping and recording the inventory findings. The NWI relies on trained image analysts to identify and classify wetlands and deepwater habitats from aerial imagery.

Neotenic: retention of juvenile characteristics in adults of a species, as among certain amphibians.

Nonpoint source pollution (NPS): pollution originating from diffuse sources (land surface or atmosphere) having no well-defined source.

Obligate wetland species: plant species that occur almost always under natural conditions in wetlands.

Palustrine: from the Latin "palus" or marsh. non-tidal wetlands dominated by trees, shrubs, persistent emergent plants, emergent mosses or lichens.

Parent Material: the underlying geological material (generally bedrock or a superficial or drift deposit) in which soil horizons form.

Pedestal: plants or rocks that appear to be elevated as a result of soil loss by wind or water erosion.

Piscicide: a substance used to kill fish.

Priority Management Area: Sage grouse habitat that was formerly called sage grouse core areas/habitat, as mapped by Montana Fish, Wildlife and Parks.

Proper functioning condition (PFC): lotic riparian-wetland areas are considered to be in proper functioning condition when adequate vegetation, landform, or large woody debris is present to: Dissipate stream energy associated with high waterflows, reducing erosion and improving water quality; Filter sediment, capture bedload, and aid floodplain development; Improve flood-water retention and ground-water recharge; Develop diverse ponding and channel characteristics to provide the habitat and the water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses; Support greater biodiversity

Pugging: is tracking depressions left by large animals (typically hooved animals, but occasionally humans) left in fine textured soil. Moist clay or silt usually has a consistency to hold tracks. Upon drying, pugged areas will have a hard, irregular surface, difficult to walk across. Bare soil may or may not be present**.**

Riparian zone: the banks and adjacent areas of water bodies, water coursed, seeps, and springs whose waters provide soil moisture sufficiently in excess of that otherwise available locally so as to provide a moister habitat than that of contiguous flood plains and uplands.

Rosgen Classification System: A classification system for natural rivers in which a morphological arrangement of stream characteristics is organized into relatively homogeneous stream types. Morphologically similar stream reaches are divided into 7 major stream type categories that differ in entrenchment, gradient, width/depth ratio, and sinuosity in various landforms. Within each major category are six additional types delineated by dominant channel materials from bedrock to silt/clay along a continuum of gradient ranges.

Seral: of, relating to, or constituting an ecological sere.

Sere: a series of ecological communities that succeed one another in the biotic development of an area or formation.

Soil/site stability: the capacity of a site to limit redistribution and loss of soil resources (including nutrients and organic matter) by wind and water (one of the three attributes of rangeland health).

Spring brook: a channel that carries water from a spring. Where there is sufficient flow, the channel forms a perennial stream. Frequently in arid environments, the flow is insufficient to create a perennial stream. Groundwater emerges at the springhead, flows a short distance within the spring brook, and then submerges.

Topography: the study of Earth's surface shape and features. It is also the description of such surface shapes and features (especially their depiction in maps). The topography of an area can also mean the surface shape and features themselves.

Total Maximum Daily Load (TMDL): the goal of the Clean Water Act (CWA) is "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." Under section 303(d) of the CWA, states are required to develop lists of impaired waters. The law requires that states establish priority rankings for waters on the lists and develop TMDLs for these waters. A TMDL is a calculation of the maximum amount of a pollutant that a water body can receive and still safely meet water quality standards.

TMDL Planning Areas: Montana DEQ is using a watershed approach to address TMDLs based on the premise that water quality restoration and protection are best addressed through integrated efforts within a defined geographic area. DEQ has divided the state into 91 watershed planning areas to facilitate development of TMDL/water quality restoration plans.

Ustic Soil Moisture Regime: it is wetter than aridic soil moisture regime and moisture is present during the time of year that is suitable for plant growth.

Wilderness Characteristics: these attributes include the area's size, its apparent naturalness, and outstanding opportunities for solitude or a primitive and unconfined type of recreation. They may also include supplemental values.

Woodland: forest communities occupied primarily by noncommercial species such as juniper, mountain mahogany, or quaking aspen groves. All western juniper forest lands are classified as woodlands, since juniper is classified as a noncommercial species. Woodland tree and shrub canopy cover varies, but generally individual plant crowns do not overlap.

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Appendix A

An List of Plants
And Wildlife Species List
Found On or Near BLM Lands
Within the Middle Ruby River Watershed

(Plant scientific names and alphanumeric codes presented in the following table correspond to those found in *The PLANTS Database* http://plants.usda.gov; and the *Synthesis of the North American Flora*. Plant common names are generally those listed for the State of Montana in the above references unless BLM resource specialists are aware of a more frequently used locally accepted plant name.)

Common Name	Scientific Name	USDA Symbol
Agoseris	*Agoseris* ssp.	AGOSE
Alfalfa	*Medicago sativa*	MESA
Alkali sagebrush	*Artemisia arbuscula ssp. longiloba*	ARARL
Alpine forget-me-not	*Eritrichium ssp.*	ERITR
Alpine timothy	*Phleum alpinum*	PHAL2
Alumroot	*Heuchera ssp.*	HEUCH
American bistort	*Polygonum bistortoies*	POBI6
Baltic rush	*Juncus arcticus ssp. littoralis*	JUARL
Basin big sagebrush	*Artemisia tridentata ssp. tridentata*	ARTRT
Basin wildrye	*Leymus cinereus*	LECI4
Beaked sedge	*Carex utriculata*	CAUT
Beaked spikerush	*Eleocharis rostellata*	ELRO2
Bearded wheatgrass	*Elymus trachycaulus ssp. trachycaulus*	ELTRT
Bebb willow	*Salix bebiana*	SABE2
Bitterroot	*Lewisia rediviva*	LERE7
Black cottonwood	*Populus balsamifera ssp. trichocarpa*	POBAT
Black henbane	*Hyoscyamus nigar*	HYNI
Bladderwort	*Utricularia ssp.*	UTRIC
Blue flax	*Linum perenne*	LIPE2
Blue grama	*Bouteloua gracilis*	BOGR2
Blue wildrye	*Elymus glaucus*	ELGL
Bluebells	*Mertensia*	MERTE
Bluebunch wheatgrass	*Pseudoroegneria spicata*	PSSP6
Bluegrass	*Poa ssp.*	POA
Bluejoint reedgrass	*Calamagrostis canadensis*	CACA4
Booth's willow	*Salix boothii*	SABO2
Bottlebrush squirriltail	*Elymus elymoides*	ELEL5
Broom snakeweed	*Gutierrezia sarothrae*	GUSA2
Buckwheat	*Eriogonum ssp.*	ERIOG
Buff fleabane	*Erigeron ochroleucus*	EROC
Bull thistle	*Cirsium vulgare*	CIVU
Canada thistle	*Cirsium arvense*	CIAR4
Cheatgrass	*Bromus tectorum*	BRTE
Cinquefoil	*Potentilla ssp.*	POTEN
Clustered field sedge	*Carex praegracilis*	CAPR5
Common cattail	*Typha latifolia*	TYLA
Common dandelion	*Taraxacum officinale*	TAOF
Common juniper	*Juniperus communis*	JUCO6
Common mullein	*Verbascum thapsus*	VETH

Common Name	Scientific Name	USDA Symbol
Common snowberry	*Symphoricarpos albus*	SYAL
Common yarrow	*Achillea millefolium*	ACMI2
Cow parsnip	*Heracleum maximum*	HEMA80
Coyote willow	*Salix exigua*	SAEX
Creeping juniper	*Juniperus horizontalis*	JUHO2
Curl-leaf mountain mahogany	*Cercoarpus ledifolius*	CELE3
Currant	*Ribes ssp.*	RIBES
Cutleaf daisy	*Erigeron compositus*	ERCO4
Deathcamas	*Zigadenus ssp.*	ZIGAD
Douglas-fir	*Pseudotsuga menziesii*	PSME
Dyer's woad	*Isatis tinctoria*	ISTI
Drummond's willow	*Salix drummondiana*	SADR
Elephanthead	*Pedicularis groenlandica*	PEGR2
Elk thistle	*Cirsium foliosum*	CIFO
Engelmann spruce	*Picea engelmannii*	PIEN
Foxtail barley	*Hordeum jubatum*	HOJU
Fringed sagewort	*Artemisia frigida*	ARFR4
Geyer willow	*Salix geyeriana*	SAGE2
Greasewood	*Sarcobatus vermiculatus*	SAVE4
Green needlegrass	*Nassella viridula*	NAVI4
Green rabbitbrush	*Chrysothamnus vividiflorus*	CHVI8
Grey horsebrush	*Tetradymia canescens*	TECA2
Heartleaf arnica	*Arnica cordifolia*	ARCO9
Houndstongue	*Cynoglossum officinale*	CYOF
Idaho fescue	*Festuca idahoensis*	FEID
Indian paintbrush	*Castilleja ssp.*	CASTI2
Inflated sedge	*Carex vesicaria*	CAVE6
Indian ricegrass	*Achnatherum hymenoides*	ACHY
Kentucky bluegrass	*Poa pratensis*	POPR
Leafy spurge	*Euphorbia esula*	EUES
Lewis flax	*Linum lewisii*	LILE3
Limber pine	*Pinus flexilis*	PIFL2
Limestone larkspur	*Delphinium bicolor ssp. calcicola*	DEBIC
Lodgepole pine	*Pinus contorta*	PICO
Low sagebrush	*Artemisia arbuscula ssp. arbuscula*	ARARA
Lupine	*Lupinus ssp.*	LUPIN
Meadow barley	*Hordeum brachyantherum*	HORR2
Mealy primrose	*Primula incana*	PRIN
Montana sweet pea	*Thermopsis montana*	THMO6
Mountain big sagebrush	*Artemisia tridentata ssp. vaseyana*	ARTRV
Mountain brome	*Bromus carinatus*	BRCA5
Mountain snowberry	*Symphoricarpos oreophilus*	SYOR2
Musk thistle	*Carduus nutans*	CANU4
Narrowleaf cottonwood	*Populus angustifolia*	POAN3
Nebraska sedge	*Carex nebrascensis*	CANE2
Needle-and-thread	*Hesperostipa comata*	HECO26
Nodding brome	*Bromus anomalus*	BRAN

Common Name	Scientific Name	USDA Symbol
Northwestern groundsel	*Packera conterminal*	PACO53
Oniongrass	*Melica bulbosa*	MEBU
Owl-clover	*Orthocarpus ssp.*	ORTHO
Phlox	*Phlox spp.*	PHLOX
Pinegrass	*Calamagrostis rubescens*	CARU
Plains pricklypear	*Opuntia polyacantha*	OPPO
Planeleaf willow	*Salix planifolia*	SAPL2
Prairie junegrass	*Koeleria macrantha*	KOMA
Prairie smoke	*Geum triflorum*	GETR
Pussy-toes	*Antennaria ssp.*	ANTEN
Quaking aspen	*Populus tremuloides*	POTR5
Redoiser dogwood	*Cornus sericea ssp. sericea*	COSES
Redtop	*Agrostis gigantean*	AGGI2
Rocky mountain groundsel	*Packera streptanthifolia*	PAST10
Rocky mountain iris	*Iris missouriensis*	IRMI
Rocky mountain juniper	*Juniperus scopulorum*	JUSC2
Rubber rabbitbrush	*Ericameria nauseosa*	ERNA10
Rush	*Juncus ssp.*	JUNCU
Sandberg bluegrass	*Poa secunda*	POSE
Sandwort	*Arenaria ssp.*	ARENA
Scarlet globe-mallow	*Sphaeralcea coccinea*	SPCO
Sedge	*Carex ssp.*	CAREX
Shy wallflower	*Erysimum inconspicuum*	ERIN7
Short-fruited willow	*Salix brachycarpa*	SABR
Shrubby cinquefoil	*Dasiphora fruticosa ssp. floribunda*	DAFRF
Silverweed cinquefoil	*Argentina anserine*	ARAN7
Silver sagebrush	*Artemisia cana*	ARCA13
Slender sedge	*Carex lasiocarpa*	CALA11
Slender wheatgrass	*Elymus trachycaulus*	ELTR7
Smooth brome	*Bromus inermis*	BRIN2
Spotted knapweed	*Centaurea stoebe ssp. micranthos*	CESTM
Spruce	*Picea ssp.*	PICEA
Stemless mock goldenweed	*Stenotus acaulis*	STAC
Sticky geranium	*Geranium viscosissimum*	GEVI2
Stiffleaf penstemon	*Penstemon aridus*	PEAR2
Stonecrop	*Sedum ssp.*	SEDUM
Subalpine fir	*Abies lasiocarpa*	ABLA
Sweetscented bedstraw	*Galium triflorum*	GATR3
Taper-tip desert-parsley	*Lomatium attenuatum*	LOAT
Thick-spike wheatgrass	*Elymus lanceolatus*	ELLA3
Thinleaf alder	*Alnus incana*	ALIN2
Three-tip sagebrush	*Artemisia tripartita*	ARTR4
Threadleaf sedge	*Carex folifolia*	CAFI
Timothy	*Phleum pratense*	PHPR3
Tufted hairgrass	*Deschampsia cespitosa*	DECE18
Ute ladies' tresses	*Spiranthes diluvialis*	SPDI6
Water birch	*Betula occidentalis*	BEOC2

Common Name	Scientific Name	USDA Symbol
Water sedge	*Carex aquatilis*	CAAQ
Water smartweed	*Polygonum amphibium*	POAM8
Western meadow-rue	*Thalictrum occidentale*	THOC
Western wheatgrass	*Pascopyrum smithii*	PASM
Western yarrow	*Achillea millefolium var. occidentalis*	ACMIO
Wheeler's bluegrass	*Poa wheeleri*	POWH2
Whiplash willow	*Salix lucida ssp. lasiandra*	SALUL
White clover	*Trifolium repens*	TRRE3
White sagebrush	*Artemisia ludoviciana*	ARLU
Whitebark pine	*Pinus albicaulis*	PIAL
White-stemmed Globe-mallow	*Sphaeralcea munroana*	SPMU2
Winterfat	*Krascheninnikovia lanata*	KRLA2
Wolf's willow	*Salix wolfii*	SAWO
Wyoming big sagebrush	*Artemisia tridentata ssp. wyomingensis*	ARTRW8
Yampa	*Perideridia gairdneri*	PEGA3
Yellow sweetclover	*Melilotus officinalis*	MEOF
Yellow willow	*Salix lutea*	SALU2

Wildlife Species List

Birds

Bald eagle (*Haliaeetus leucocephalus*)
Black rosy-finch (*Leucosticte atrata*)
Black tern (*Chlidonias niger*)
Black-backed woodpecker (*Picoides arcticus*)
Bobolink (*Dolichonyx orysivorus*)
Brewer's sparrow (*Spizella breweri*)
Calliope hummingbird (*Stellula calliope*)
Cassin's finch (*Carpodacus cassinii*)
Chipping sparrow (*Spizella passerina*)
Clark's nutcracker (*Nucifraga Columbiana*)
Common loon (*Gavia immer*)
Dark-eyed junco (*Junco hyemalis*)
Dusky grouse (*Dendragapus obscures*)
Ferruginous hawk (*Buteo regalis*)
Golden eagle (*Aquila chrysaetos*)
Great gray owl (*Strix nebulosa*)
Great horned owl (*Bubo virginianus*)
Greater sage grouse (*Centrocercus urophasianus*)
Green-tailed Towhee (*Pipilo chlorurus*)
House wren (*Troglodytes aedon*)
Gray partridge (*Perdix perdix*)
Lewis' woodpecker (*Melanerpes lewis*)
Loggerhead shrike (*Lanius ludovicianus*)
Long-billed curlew (*Numenius americanus*)

Marbled godwit (*Limosa fedoa*)
McCown's longspur (*Calcarius mccownii*)
Northern goshawk (*Accipiter gentilis*)
Olive-sided flycatcher (*Contopus cooperi*)
Peregrine falcon (*Falco peregrinus*)
Pine siskin (*Carduelis pinus*)
Ruffed grouse (*Bonasa umbellus*)
Sage sparrow (*Amphispiza belli*)
Sage thrasher (*Oreoscoptes montanus*)
Sharp-shinned hawk (*Accipiter striatus*)
Swainson's hawk (*Buteo swainsoni*)
Three-toed woodpecker (*Picoides tridactylus*)
Williamson's sapsucker (*Sphyrapicus thyroideus*)
Willow flycatcher (*Empidonax traillii*)
Wilson's phalarope (*Phalaropus tricolor*)

Mammals
Badger (*Taxidea taxus*)
Beaver (*Castor canadensis*)
Big brown bat (*Eptesicus fuscus*)
Bighorn sheep (*Ovis canadensis*)
Black bear (*Ursus americanus*)
Bobcat (*Lynx rufus*)
Canada lynx (*Lynx Canadensis*)
Coyote (*Canis latrans*)
Elk (*Cervus elaphus*)
Fringed myotis (*Myotis thysanodes*)
Gray wolf (*Canis lupus*)
Grizzly bear (*Ursus arctos*)
Hoary bat (*Lasiurus cinereus*)
Little brown myotis (*Myotis lucifugus*)
Long-eared myotis (*Myotis evotis*)
Long-legged myotis (*Myotis volans*)
Long-tailed weasel (*Mustela frenata*)
Moose (*Alces alces*)
Mountain lion (*Puma concolor*)
Mule deer (*Odocoileus hemionus*)
North American wolverine (*Gulo gulo*)
Pronghorn (*Antilocapra americana*)
Pygmy rabbit (*Brachylagus idahoensis*)
Red fox (*Vulpes vulpes*)
Silver-haired bat (*Lasionycteris noctivagans*)
Townsend's big-eared bat (*Corynorhinus townsedii*)
Western small-footed myotis (*Myotis ciliolabrum*)
White-tailed deer (*Odocoileus virginianus*)

Amphibians
Boreal/Western toad (*Bufo boreas*)
Columbia spotted frog (*Rana luteiventris*)